

The Impact of Quality Management Systems on the Effectiveness of Food Supply Chains

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Abstract – The main objective of this publication was to examine the impact of the implementation of the requirements of standardized quality management system on the functioning of the food supply chains. Empirical studies were carried out in November and December 2015 on a group of 38 Polish companies, being a part of integrated food chain having implemented and certified quality management systems. On the basis of studies and analyses it can be stated that: quality management systems have a positive impact on improving food supply chains, especially in areas such as: improving logistics of customer servicing and simplifying quality control.

Keywords – Food, supply chain, ISO, Management systems, Quality.

1. Introduction

The continuous development of industry's competitiveness and technology means that organizations wanting to stand out in the market by the quality of offered products and services, as well as the attention to customer needs must strive to integrate key processes and management concepts. According to Ahumada and Villalobosa [1] traditional approach to supply chain management of food must be changed and enhanced with new

concepts. The adoption of this thesis provides a basis for the integration of logistics with modern concepts of quality management. These concepts are in fact improving internal processes within the organization and put focus on client's needs. Thus, the interaction of these teachings with implementation of developed solutions to the food supply chain should lead to an increase in quality of food products. According to many authors [2-7] especially food supply chains should be interested in implementing the concept of quality management, this is due to the following conditions of food products:

- Relatively short shelf life determined by the microbiological and physiological processes occurring in them,
- Difficulty to control the quality parameters resulting from seasonality, differential of varieties and species, etc.,
- Preliminary pre-processing of agricultural products whose control is limited.

Another element in favor of the integration of quality management systems and logistics in the food supply chain is the relatively complex and complicated process of determining customer requirements. The problems of this issue stem from the following facts [8,9]:

- Changes in the demographic structure of consumers,
- Changes in consumption habits triggered by popularity of various forms of catering outside the home, serving new dishes, and cultural factors [10,11].
- The increase in demand for specialty food (vegetarian, low fat, high protein, vitaminized etc.).
- It appears that now consumers understand that nutrition may affect their health and well-being, primarily in relation to prevention of chronic diseases [12]. Therefore today foods should not be intended only to satisfy hunger and to provide necessary nutrients for humans but also to prevent nutrition-related diseases and improve physical and mental well-being of the consumers [13].

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Presented above factors in creating of quality and modern changes in the structure of food consumption undoubtedly create the need for a systematic approach to quality management in the food supply chain. With this view agree Rong et al. [14] recognizing that one of the most challenging tasks in today's food industry is control of the product quality throughout the food supply chain. This is due to the fact that food's quality is determined by all factors leading to consumer's full satisfaction. You can therefore assume that the quality of the product is determined by a combination of its tangible and intangible features, in which the key role is played by a well-functioning supply chain in terms of logistics and quality [15,16]. It is because customers put more and more attention to such logistic aspects as: after-sales services, proximity to the place of purchase, selection of products, product freshness, and speed of delivery, ability to deliver products to customer's place of living or packaging.

It should be emphasized that the quality and safety of food is a cumulative value [17,18]. They are created by both the characteristics of the product itself shaped by the adopted technology and formulation, as well as by the factors and conditions accompanying the formation. These include methods of supply, production and distribution, mechanisms of control, applied standards and standardized systems and concepts of quality management [19,20].

Bearing in mind the above theory, the idea behind this publication was to examine the actual impact of standardized quality management system to the functioning of the food supply chain and to develop a general model of quality management in the food chain, which by combining the concept of quality management and logistics will increase the efficiency of the entire supply chain.

2. Research methodology

The main objective of this publication was to examine the impact of the implementation of the requirements of standardized quality management system on the functioning of the food supply chains.

Selection of work is attributed to the following reasons:

- In the literature is still not enough studies on the impact of quality management systems to the functioning of the food supply chains,
- The concept of the food chain supply is very important today, not only in terms of scientific knowledge, but also practical impact on the functioning of the business.

- The attention to the quality of food products is particularly important in the context of consumer satisfaction in the European Union [21].
- By integrating quality management and logistics in a thoughtful manner, enterprises can achieve a synergistic effect of significantly streamlining their functioning.

Empirical studies were carried out in November and December 2015 on a group of 38 polish companies, being a part of integrated food chain having implemented and certified quality management system according to ISO 9001, ISO 22000 or ISO 9004. The research tool was a questionnaire sent to management representatives. The questionnaire consisted of 12 closed questions and 4 open questions.

3. Research results

The following section will present the results of the survey. The target of the first question was to determine the impact that implementing of quality management systems had on improving food supply chains (Fig. 1.).

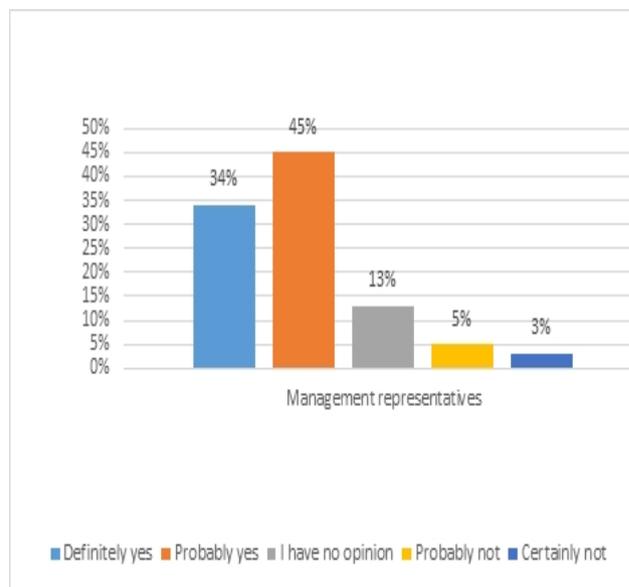


Figure 1. The impact of the quality management system on improvement to food supply chain
Source: Author's research

Analyzing the distribution of provided answers leads to the conclusion that the vast majority of respondents (79%) observed very substantial and significant impact of the implementation of the system requirements for the improvement of the food supply chain. Representatives of the organizations that didn't note the positive impact were in minority (8%). In-depth analysis led to the conclusion that

among the skeptical organizations, dominant are companies that implemented only one quality management system (ISO 9001). In addition, these systems have been implemented relatively recently (the system operates from 1 to 3). This situation partly explains the lack of observed positive effects in these organizations; because it is generally acknowledged that the systems need a longer time to fully mature within the company.

Furthermore, within organizations noticing the greatest system's impact on improving supply chain dominate those companies that have 2 or 3 developed, mature and integrated systems. On the basis of these observations, it can be assumed that the work on the development of quality management systems is resulting in its positive impact on the functioning of logistics processes.

The purpose of the next question was to determine which aspect of the supply chain is particularly benefiting by the implemented quality management systems. The distribution of responses is presented in Fig. 2.

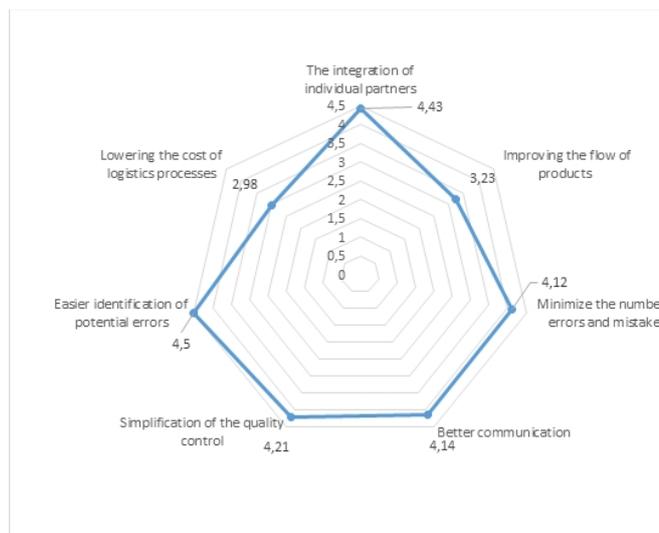


Figure 2. The influence of quality management systems for the betterment of the individual aspects of the supply chain

Source: Author's research

Analysis in Fig. 2. reveals that the areas most supported by quality management systems include:

- Enabling the identification of potential errors: this is due to the fact that the ISO 9001 standard in its provisions obliges the company to apply strict requirements for identification of purchased components. This allows entrepreneurs to efficiently and quickly locate the source of potential problems

- Reinforcing relationships with partners: it is one of the basic principles on which quality management systems are based. Implementation of the common objectives, transfer of knowledge and technology and mutual trust leads to increased efficiency and effectiveness of the functioning of supply chains.
- Simplifying processes related to quality control: implementation and integration of the overall concept of quality management in the supply chain, not only leads to an increase in pro-quality awareness of its individual cells but can also develop strict procedures for dealing with products moved through the supply chain.

Whereas the areas of the supply chain that quality management systems have the lowest impact, respondents received:

- Improvements in the flow of product: according to the respondents, the quality management systems assists logistics processes within organization; however, the process of the physical movement of products does not have a significant impact.
- Lowering the cost of logistics processes: the relatively low scoring of positive impact in this aspect is due to the fact that reduction of number of errors and mistakes minimizes the cost of the so called low quality, however, implementation, maintenance and improvement of systems generate significant costs. However, according to the authors, the expenses incurred for the development of quality management systems in the long term should bring companies substantial profits.

The last area that has been analyzed was the impact of standardized quality management system on the improvement of the logistics services for customer. On the general question regarding the impact of standardized quality management systems for customer's logistics service in the food chain, 95% of respondents believed that the impact is large or very large. The results are not surprising, because the idea of quality management systems is well being of the customer as a primary objective. In order to deepen the analysis, respondents were asked to assess the impact of the improvement to the various phases of customer servicing (Fig. 3.).

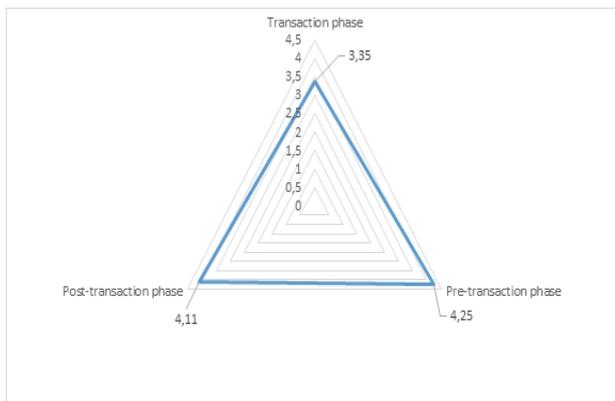


Figure 3. The influence of quality management systems for the betterment of the individual phases of the logistics customer service

Source: Author's research

Based on the analysis of the results and responses contained in the open-ended question the following can be stated:

- Management quality systems are impacting mostly the pre-transaction phase of serving clients. This phase of pre-transaction activities is more related to policy for defining the service level and related activities in qualitative and quantitative terms.
- You can also observe a relatively big impact of quality management systems for the betterment of post-trade phase. This is due to the fact that the systems in their requirements oblige the company for continuous collection of information from customers, which according to the respondents are used for better implementation of customer's logistics services.
- Customer service during the transaction phase is associated with routine tasks performed in the logistics supply chain. These tasks need coordination for the entire system to be efficient and effective in delivering service to the customer per the desired standard.
- According to the respondents in this area, the quality management systems are the least useful, but to a limited extent are streamlining implementation of logistics processes.

In order to verify the results obtained χ^2 independent test was applied. On the basis of calculations it was found that:

- Organizations in which the quality management systems operate over 5 years to a greater extent notice their positive impact on customer's logistics services ($p = 0.0057$).
- Organizations that have more than one system notice in more cases noticed the positive impact of concept of quality on improvement of the food supply chains ($p = 0006$).
- Organizations recognizing the fact of operating in effective and efficient supply chains are positive about the fact of implementation and improvement of quality management systems.

4. Proposed model of quality management in the food chain

On the basis of this study and the analysis of literature it can be assumed that the use of modern concepts of quality management in the food supply chains can certainly be considered as a way towards improvement in meeting customer requirements and in improvement to logistics processes. Improving the quality of the food supply chain translates into an increase in the value of logistics services and improvement to the relationship between the individual elements in the supply chain [21]. However, according to Sharma et al. [22], globalization of manufacturing operations, also present in the food sector is leading to a situation in which the use by businesses of many different food safety standards can generate problems and increase operating costs. Therefore, there is a need to develop a model of harmonizing quality management in the food chain. With this statement agrees Silva et al. [23] recognizing that one of the most important determinants of the smooth operation of supply chains is to maintain appropriate standards of quality. You should be aware of the fact that both the integrated functioning of the food supply chain and developed optimal quality standards cannot be based on fragmentary and accidental actions. To achieve the desired effect, the whole action must be carefully designed, and then methodically implemented. Therefore, the following section will present general model of quality management in the food chain (Fig. 4.).

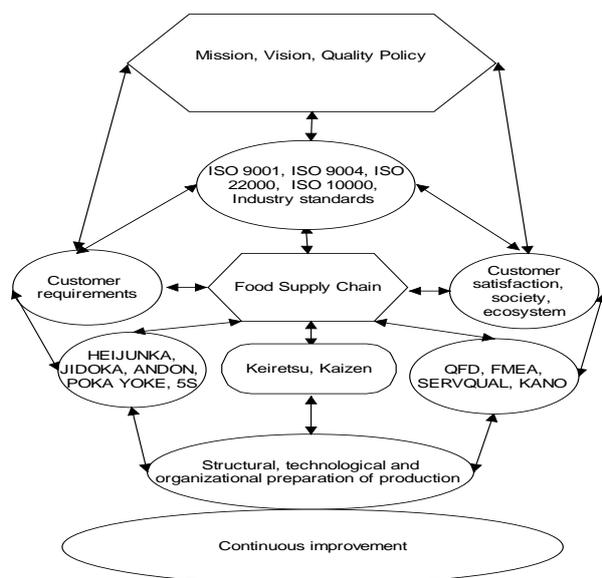


Figure 4. Model of quality management in the food chain
Source: Author's research

Enterprises implementing the proposed model should pay particular attention to the following [24,25]:

- Quality management model is imbedded into the vision and strategy of the organization's Management System. It supports and integrates processes of quality management and logistics by which facilitates the implementation of the strategy.
- The mission, objectives and tasks of logistics should be established prior to implementation of the model. This will allow determining the role of the quality department within the quality management in the food chain.
- Designing, control and management of quality is created based on customer requirements [26] as well as by the market and is supported by chosen instruments, concepts and quality management systems. The idea behind this model is to develop a philosophy of total quality management system throughout the logistics chain.
- The premise of the model is to reach outside (to the customers) and strengthening the relationship between the participants of food supply chain.
- The model highlights the importance of efficient communication systems within the organization and between the individual participants of the food chain and stakeholders.
- The model is based on the integration of type IV (integration of basic systems with industry's system).

- The foundation of the model is a process of continuous improvement, not only the process itself, but also the improvement to undertaken methods of Improvement (philosophy of Kaizen, 5S method).
- Equally important is the improvement of manufacturing technology and logistics infrastructure. Modern concepts of quality management must take into the account the advances of technology.
- Quality verification at source should gradually be replaced by audits, which should be treated as a basis for the exchange of information, process improvement, the development of closer relationships and growth.
- Logistics subsystems and organizations participating in them must be included in the implementation of adopted philosophy of quality management. Each link is important because it carries out tasks that affect the improvement into the process of customer servicing.
- Joint development of remedial programs and procedures.

5. Conclusion

The issue of quality in the food supply chain is quite complex. Each of the logistic subsystem has a strictly assigned goal and differently shapes the quality of the food product. On the basis of studies and analyzes it can be stated that:

- quality management systems have a positive impact on improving food supply chains, especially in areas such as: improving collaboration with suppliers, improve logistics of customer servicing and simplifying quality control,
- implementation of quality management systems should be based on carefully selected strategy, what allows increase of their efficiency and effectiveness,
- quality management systems have the smallest impact on the improvement of processes directly related to the physical flow of products.

Furthermore, given the specificity of food supply chains and their impact on the quality of food products, which is shaped by all its participants, it is necessary to implement a complex quality solution in food supply chain. According to the author, the model characterized in this publication should be helpful in developing the overall concept of quality management in the food supply chain.

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