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# Determinants of Quality Management Efficiency in Polish Food Processing Industry

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# DETERMINANTS OF QUALITY MANAGEMENT EFFICIENCY IN POLISH FOOD PROCESSING INDUSTRY

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**Abstract.** A questionnaire method has been used to collect the empirical data on the food processing enterprises. Data were collected for 36 out of 68 enterprises having ISO 9001 / 2 (April 2000). Value chain as a modelling power of competitive advantage, determinants of quality management system efficiency, participation of knowledge and skills in formation of firm competence were discussed.

## INTRODUCTION

Since 1992 the structure of food processing industry has been undergoing deep changes, and the following processes and their acceleration were observed:

- industrialization of food processing,
- deepening of food processing,
- modernization of production potential,
- rapid privatization,
- concentration,
- vertical integration and modernization of management [1,2].

As a result, processing of new materials grew by 16%, production of traditional food by – 32% and the processing of new items by more than 100% [1,3]. This occurred due to investments, which amounted approximately \$750 millions per year during the period of 1992-1994. The total investments differ for particular branches. For example in the period of 1992-1997, investments in brewery sector amounted ~\$700 mill, in the dairy sector ~\$600 mill, in the meat sector ~500, while in the branches of bakery and poultry ~\$70 mill each. The wine sector received \$40 mill. The total investment **increased to the level** of \$1.4 billion per year in the period of 1996-1999 [1,3]. The main investment activity was aimed at:

- technology and final products,
- branches of high development rate, of domestic market or exports (mainly to the eastern countries),
- the leading groups in the sector.

Those findings support the statement that direct foreign investments in Poland concentrated in the sectors of highly processed foods, such as confectionery, beverages, and ice cream and rare in other sectors. In addition to financial capital, foreign investors transmitted technology and managerial know-how from home markets [4].

Significant changes occurred in the distribution channel of food products. The rapid growth of concentration at all stages of the food chain has increased concern about the use of market power by food manufacturers and retailers to the detriment of farm produces and final consumers [5] at its both endings. Farmers are often specialized in the production of particular foodstuffs through extensive investment in sunken assets, especially in dairy, meat and poultry, sugar beet, fruits and vegetables. They represent exit barriers to the chain and cause farm production to be non-elastic in a short period of time.

Large chains of hypermarkets dominate food retailing in the UE and US [5]. In Poland the giant stores emerged as well and their chains endanger small stores and wholesale houses of early transformation period. This process is weakening the market position of the processing companies.

The food processing companies are getting more interested in constant access to raw foodstuffs of high or superior quality. This tendency strengthens the land and production concentration and specialization processes in the rural areas, especially in the dairy, sugar, meat and poultry sectors. The foodstuff's process in Poland becomes close to world prices for grains, poultry and live hogs. The average level of the food processing costs in Poland is also high, and the average effectiveness is lower than in UE by approximately 40% [2]. The effectiveness is much lower than average in dairy or plant oil branch and comparable to UE in beverages and feed industry. In addition, the effectiveness of branch leaders, due to former deep restructuring and modernization, is higher than branch average in feed industry and beverages. In all branches the co-existence of large enterprises and SME has been observed [6].

Positive macro-economic conditions of increasing competitive advantage observed during the period before 2000 (high GDP, falling inflation rate, strong national currency) are good starters for increasing competitive advantages of particular Polish companies in near future. The following factors:

- low vertical integration of agricultural production with the processing,
- not superior quality standards of products,
- not sufficient technology progress,
- old habits as a heritage of economy of shortage,

- non-market prices of raw products and lower effectiveness of processing,
- low market shares

will decrease the competitive advantage (strength) of company.

Among these factors, quality of products and application of quality management system (QMS) belong to very important competitive advantages. The descriptions of the quality term are numerous in the literature. Among them "fulfilling the customers needs or requirements" and "degree to which a set of inherent characteristics fulfil requirements" [7] are very popular and self-explaining. The family of ISO standards 9000, 9001 and 9004:2000 lays stress on "process approach as the ongoing control that it provides over the linkage between the individual processes within the system of processes, as well as over their combination and interaction". Food quality is a very complex phenomenon as a construct of nutrition value, sensory attributes and disposability, each of which being split into several components [8]. Identification of consumer requirements allows a better use of input elements, resources and tools, and technology. From the other side, measurement of perceived quality standards and customer satisfaction, supported by statistical means, causes the quality improvement activity. Process orientation increases the bargaining power of customer, both at the input and at the output side of the process.

Customer and process orientation could be demonstrated and communicated to the public by an enterprise by means of QMS e.g. ISO 9001:2000 or HACCP. Until now, approximately 70 Polish food processors gained the ISO certification [9]. The vigorous activity towards HACCP systems is now being observed, however the exact figures are not known yet.

The impact of quality on competitive advantage of enterprise is not straightforward. In fact, it rather relies on many independent variables. And it was the aim of this research, supported by the Committee of Scientific Research (grant 5 PO6J 016 16), to study the impact of quality management systems on competitive advantage of Polish food processing enterprises during the pre-accession period.

ISO certification increases competitive advantage of enterprise as an internal resource (soft). Quality management system increases the value for customer, and certification can be means of securing the desired quality level of raw materials, products and delivery [10]. The competitive position depends also on external resources, e.g. quality of foodstuffs, raw materials and others inputs. In addition, co-operation with suppliers, and especially with distribution channels, adds value in the marketing chain to the product quality [11,12].

## **CHARACTERISTICS OF THE SAMPLE**

A questionnaire has been used to collect the empirical data for the period 1999-2000. At the beginning, the target food processing enterprises were selected out of the list of 500 biggest processing enterprises in Poland [13] for 1997 on the basis of two conditions:

- 1) high basic competitiveness (e.g. large market share and profitability in the period of 1996-1999),
- 2) interpersonal relations with managers.

The preliminary questionnaire followed by an interview has been presented to and answered by 22 managers. Results were published previously [14,15].

The improved questionnaire has been presented to all 68 food processing enterprises having ISO management system in April 2000 [9]. Finally 36 questionnaires returned back (53% of total population). Duration of practising ISO differs from more than 5 years in 4 enterprises, through 3-4 years in 16 and 1-2 years in 12. Four companies have gained certification only recently. The investigated population was composed of 5 state companies (mainly production of alcohol) and 31 private. The last group collects 11 foreign, 13 polish companies, 4 co-operatives and 3 private enterprises with **state share**. Foreign companies operate in the confectionery (7), sugar (1), plant oils (1), fruit and vegetables (1) and brewery (1) sectors. This distribution matches the Walkenhorst finding [4]. Countries standing higher on the competitive ranking list attract more FDI. According to Sachs et al. [16], Poland with its 3-rd competitive position among CEEC occupies 4th position when concerning FDI per capita and attracts lots of funds. It is clear that more competitive economy is a strong base for lowering production and transaction costs to investors, as well as for export.

The following branches participate in the analysis (the number of enterprises are given in the brackets): dairy (5), confectionary (6), sugar (3), plant oils and margarine (2), fruit and vegetables (4), meat (3), fish (2) spices and fast-food (1) coffee-tea (2), alcohol (7), cereals (1).

25 and 23 enterprises exceed 20% of regional market share, and country market share, respectively. The financial standing of 28 firms was referred to as dynamics of sales and net profit in the period 1996-1999. There is no regular tendency, except in the sugar beat or plant oil processing enterprises. Generally, the dynamic of indicators has been decreasing since 1997.

At present, investigated enterprises are competitive on the market, however in the future this position will decrease, unless same positive measures are undertaken. According to self-assessments, the financial standing is good in 19 enterprises, satisfactory in 12, and very good only in 4. 31 enterprises are competitive on foreign markets and export their products.

## **VALUE CHAIN AS COMPETITIVE ADVANTAGE**

The analysis of tasks incorporated in conceptual value chain is usable in building the permanent competitive advantage. It is assumed that competitive advantage is supported by value creation for a customer [15,17]. Enterprises following this idea are developing themselves and distinguish among competitors on the market. This creation affects both internal and external resources. The strength of the value chain depends on continuous improvement of all particular tasks and on strengthening the links between them. In the food sector the value chain describes all activities, from the farmer's field to the consumer's kitchen table [18].

The analysis of data from the questionnaire emphasises the impact of customers (required quality) and producer (cost, profit and rate of production) on quality management assumed as competitive advantage.

The results show that the production cost per unit decreased slightly in 19 enterprises and was kept constant in 14. The similar applies to productivity.

Two explanations of these facts are possible:

- a) processes and productivity were set at optimum before certification,
- b) introduction of quality management system increases paper work and control/prevention operations.

The most cost-decreasing components are: co-ordination and control, optimising of material consumption, purchase of high quality raw materials and impact on purchase price. Increase of the machinery productivity and production scale follows in the middle. The last two places on the ranking list are occupied by optimising transport costs and sharing costs of purchase with supplier.

The conclusion could be drawn, that enterprises decrease the production costs mainly by means of improving internal processes (no. 9, 10, 5, 7) and influencing suppliers (1, 2). Unfortunately, the impact of transportation costs optimisation is not sufficient and it is a very weak link in the value chain.

In addition, due to implementation of quality management system, the number of warranty claims decreased by 39 % and material waste by 31 %. The economising of usage of materials and raw products increased by approximately 27 %, as compared to before the ISO stage.

**Table 1: Components of production costs and their importance**

No.	Component	Mean	Ranking
1	Purchase of quality raw materials	7.05	3
2	Impact on purchase prices	6.90	4
3	Optimising transport costs	5.11	9
4	Decreasing of employment	5.16	8
5	Increasing of production scale	6.33	6
6	Sharing costs with supplier	3.83	10
7	Increasing the productivity of machinery	6.39	5
8	Specialization of production/service	5.35	7
9	Co-ordination and control	7.21	1
10	Optimising of material use	7.15	2

\* On the scale from 10 (very important) to 1 (not important).

Almost all managers said, that ISO certification increased confidence in co-operation with external (farmers, distribution outlets) and internal customers, and the image of their enterprise on the market. Similar results were achieved for example for UK's meat sector [19]. There, the ISO certification became a common business practice and a vital condition of doing business. Food processors, wholesalers and retailers are pushing suppliers of the lower link in value chain to become ISO registered.

## **DETERMINANTS OF QMS EFFICIENCY**

In this report, the efficiency of quality management system has been understood as a multi task activity. In the preliminary questionnaire the highest rank was given to: functional links, product and process control, co-ordination and supervision, executed by top management [14,15]. In depth-analysis (improved questionnaire) including 36 enterprises supported the earlier conclusions. For example, almost all enterprises control quality in own laboratories (with only one exception). Only 28 enterprises use prevention and 14 apply statistical process control tools to manage their production process. The most frequently used tools are control charts and flow diagrams. Check lists, Pareto analysis and histograms were rarely used, and the Ishikawa method, FMEA and QFD were not used at all.

It means that expertise in this field is limited and many enterprises rely on final quality control only.

32 enterprises use independent laboratories to confirm the quality of their products. This activity is developed by Quality Control Department, which is subordinated to CEO in 27 cases. The possession of own laboratory for sensory analysis was declared by only 1 enterprise.

Food processing enterprises depend on their customers and should understand current and future customer needs, preferences and quality evaluations, should meet customer requirements and if necessary strive to exceed and to mould



customer expectation. The customers are dispersed and diversified in preferences, style of life, buying power, social behaviour etc. The knowledge of factors mentioned above is necessary for successful market segmentation and elaboration of appropriate marketing strategy.

The technique most widely used for individual customer screening is the questionnaire. 29 investigated enterprises do use various questionnaires to learn about their customers. Remaining enterprises, which do not conduct such research, use other means: a) order a survey or b) buy ready reports from specialized marketing agencies. Some firms use both means simultaneously.

Only 15 enterprises are more active, and beside examination of customer preferences at the moment, try to mould them. It was very interesting to learn more about the methods they were applying. The following activities were mentioned: presenting (showing) novel applications of traditional products and how to use new products, promoting and testing of new products, introduction to the market of products which were suggested by consumers, advertising and promotion, pricing policy, indoor and outdoor testing. In addition, some firms use better and newer technologies, which allows deeper processing, positive image of their branch public relations, and quality system requested by clients or customers. Now a day, HACCP – Hazard Analysis and Critical Control Points become a standard and a barrier of entry to the market. Its aim is to minimize hazard and risk (of chemical, physical and microbiological origin) associated with consumption of food.

The results achieved and our knowledge of food processing industry allows us to conclude that market orientation and consumer information is superficial and fragmentary. Many enterprises do not explore this field and do not mould new needs and expectations. Our results allow us to emphasize that innovations and consumer information are not a source of competitive advantage in at least 75% of the investigated population.

It is known that information, knowledge, skills, resources etc. are necessary inputs in developing new products or even copying the branch leader's novelties. We studied the qualitative relations between innovative activity, duration after certification of ISO quality management system and the type of production in the period between 1997 and the 1<sup>st</sup> half of 2000. Only 18 enterprises (50%) have given appropriate answers to the questions asked. The enterprises from most innovative branches: confectionary, alcohol, fruit-vegetables, meat and spice are introducing to the market more than 6 novelties per year. On the other side is brewery and spice production with 1 or 2 new products per year. Dairy, fish and cereals processors occupy the range in between (2-6 innovations). The results indicated also that a longer period after certification increased activity and profits. For example in the years 1998 and 1999 the income from new products, higher than 10% of total income, was achieved by only 5 enterprises - those with longer QMS duration after

certification. The innovative activity in various branches of food processing industry is associated to a great extent with ownership status and former foreign investments. Some similarities between questionnaire responses and literature data occur. For example according to Hermann [20] more than 16 hundreds innovations were invented in food processing industry in Germany in the period of 1993-1994.

Six branches: spices with food additives, homogenates, confectionery, dairy (with cheese), meat and fruit-vegetables introduced to the market approximately 70% of all innovative products. The number of true innovations was only about 70.

There is no doubt, that innovative activity associates with investment rate. Only 15 (out of 36) answers were given. Analysis of financial data obtained for the period of 1997 up to the 1<sup>st</sup> half of 2000 leads to several conclusions. The rate of investment increase is 2-3 times higher than profit and 3-5 times higher than depreciation in this period. At the beginning of this period the rate of investment was higher than in 1999; in many enterprises the year 1998 was the worst one, due to so-called "Russian crisis". The following methods and tools were quoted as used during the invention process: experimental design, ideas of technology staff, (including research and development), application of theoretical achievements or suggestions given by customers, optimization of recent technologies and products or copying the existing products. The results sound promising. Our knowledge of the food industry however shows, that experimental design technique is not known in Poland. The use of QFD, FMEA or other mathematically – supported tools is rather doubtful in this industry at the present. Perhaps the answers were overoptimistic or respondents were not able to follow the meaning of the questions.

The knowledge of the consumer and the market among investigated enterprises is not satisfactory, and it is in fact not a true competitive advantage.

## **KNOWLEDGE AND HUMAN RESOURCES MANAGEMENT IN FORMATION OF COMPETENCE**

A modern enterprise should provide and promote educational activity among employees. Only well educated staffs are flexible to react to changes in the working environment. Those changes mainly depend on technical progress and new managerial methods. The knowledge of new techniques of management among Polish CEO's in food processing is low. For example Efficient Consumer Response [21,22] that supports the industrialisation of agriculture sector, and the concepts of value chain are not known. Almost all interviewed (95 %) managers said that they "arrange training according to fixed schedule, as required by quality management system". In addition, temporary events take place, if necessary. Approximately 70 % of the examined enterprises use a level

of financial resources similar to those of their competitors. It is known from the literature [23] that human resource development is much more significant than technological programs for creation of competitive advantage. A very valuable lesson arrives from the paper by Clark and Montgomery [24], who studied the identification of competitors by managers. Even in the USA, managers usually name too few competitors, and hence should focus more on competitors as defined by customers and be aware of asymmetry in competitive perception. They should also periodically revise how they identify competitors and track potential competitors. For Polish managers the examples of western colleagues who believed to “know” their business and environment and were then completely surprised by an “innocent” competitor [25], should be very informative, and worthy of studying.

## CONCLUSIONS

1. Investigated sample reflects the general assembly of enterprises. Their regional and national-wide market share is large. However, the market position and financial standing are declining.
2. Implementation of QMS is necessary to improve basic competitiveness. Basic competitive advantages are as follows: cost analysis, value for customer, diversification of products, innovativeness.
3. QMS increases the basic skills of an enterprise. However, only the conversion of skills into value for customers can ensure permanent competitive advantage.
4. QMS may disturb the balance between current resources and skills of an enterprise; as a result the efficiency of resources may decrease. One must have in mind that resources split into strong and weak advantages and profit creators.
5. The knowledge of various aspects of customer preferences and requirements is limited at present and must be increased. The systematic investigation will improve the list of characteristics expected by customer and will lead to product innovations.
6. Continuous improvement of processes and potentials is the main goal of QMS. Enterprises implementing ISO affect on the value chain of suppliers by requesting higher and stable quality, scale of production quality of transport and stability of delivery. This is possible due to partnership and co-operation. For example enterprises may deliver seeds, technical means, equipment and knowledge to selected suppliers of raw foodstuffs.
7. Application of simple SPC tools in food processing enterprises is at satisfactory level. However, some very valuable and powerful tools (e.g. Ishikawa diagram, FMEA, QFD) are still not known.
8. With few exceptions, all food-processing enterprises use their own quality control laboratories. But only few owe a sensory analysis laboratory.

Enterprises use questionnaires to study consumer's preferences and only occasionally buy "know-how" from marketing agencies. The knowledge of consumer preferences, requirements and expectations, and of the context of buying is still limited.

There is no doubt that implementation of QMS will increase competitive advantage of food processing enterprises. Competitive advantage of Polish industry – competitive advantage of the nation – will be a sum of enterprise's advantages. For that reason the Polish state should support all enterprises implementing ISO 9001:2000 and HACCP QMS by all possible means.

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