INTEGRATED QUALITY MANAGEMENT WITH APPLICATIONS IN ENVIRONMENTAL QUALITY IMPROVEMENT AND FOOD SECURITY

ABSTRACT

This paper presents an interdisciplinary approach in integrated quality management, with applications in quality process management, environmental quality as well as food quality and security management, in terms of the three European standards: ISO 9001: 2008 (currently ISO 9001: 2015) ISO 14001: 2015 and ISO 22000: 2005 in accordance with the requirements of the quality assurance system HACCP (Hazard Analysis Critical Control Points). This integrated approach of the elements related to the requirements of the three standards, brings together the concerns and results of the research conducted throughout the academic career in a complex interdisciplinary work in integrated quality management. In the context of this approach the prospects of development of the proposed themes is highlighted, their sustainability being supported by the applicability of the results, surpassing the conceptualisation stage, focusing on the applicability component in the three areas namely quality management, environmental quality control and quality assurance of products.

In the 24 years of academic research, the addressed topics, their results in close harmony and connection with the teaching activity, outlines the motivational framework of the purpose of the habilitation thesis in terms of multidisciplinary approaches seeking the causes, effects and ways to improve the quality of products and of the environment.

Quality is a highly complex concept, which is found in all stages of production and the existence of a product / service based on the performance / achievement of the requirements set by standards, regulations, etc. and reflecting upon the satisfaction level of consumers (in terms of their needs) as well as upon the quality of life in general, in terms of ensuring a clean environment free from pollution and other factors that may adversely affect the health of the human component.

Quality management system is required to be managed in such a way as to allow a process approach of the entire system, focusing on identifying non-conformities, corrective and preventive actions in order to achieve continuous improvement. In fact, from the perspective of its structure and content the thesis is focused on these important issues, as integrant part of the management system.

The paper is structured in three parts:

The motivational framework of the habilitation thesis; Scientific contribution and results achieved; Directions and perspectives;

The first part "***The motivational framework of the habilitation thesis***" substantiates the motivation in elaborating the habilitation thesis taking into consideration the following: skills tested in achievements throughout my academic career, professional development, scientific contribution and achievements as well as the future projection of my career's future development perspectives.

The interdisciplinarity of the subject allowed to compile, within the framework of my habilitation thesis, the results of my research obtained over the years enframing them into the integrated quality management domain, with applications in quality management, environmental quality as well as food quality and safety management.

The second part "***Scientific contribution and results***" is divided into three sections, namely: Management of quality processes, Management of environmental quality and Management of food quality and food safety.

In the first section, Management of quality processes, I started from the idea that the process approach to a system required to be based on customer expectations (INPUT) and their satisfaction (OUTPUT), regardless of the activity of the organization, the mission and objectives. Whether core processes (CP) or support process (SP), they must meet customer expectations in terms of results, feedback or simply of the work well done.

One of the successful research in this area was represented by determining quantitative and qualitative benchmarks (benchmarking) for the core processes of our institution, according to ARACIS Methodology. The results were unexpectedly good, scientific papers being developed (The rollers on Benchmarking in the Higher Education Quality Assessment) presented and published in journals indexed DBI (currently 15 citations in international and ISI databases). In October 2010, in the international conference organized by ARACIS "*2nd International Conference: Institutional Strategic Quality Management - ISQM2010"* I presented the paper *"Quality Management Integrated in the Academic Activity"*, where besides the issues related to establishing qualitative and quantitative benchmarks comparable to those of other higher education institutions, have shown the importance of internal audit conducted in accordance with ISO 9001: 2008 (at that time already being implemented in the university). Results consisted in the development of a set of procedures, including a procedure for benchmarking, as well as the development of tools that have been implemented in universities in the country and abroad, forming a team of internal auditors and the development of tools necessary to carry out audits. From the first months I managed to

improve our processes carried out within the institution, thus ensuring continuous quality improvement.

In the second section, ***Management of environmental quality***, concerns about the identification of nonconformities in this area of interest are highlighted, with a great emphasis on the preventive and corrective measures. Studies were conducted largely in Zlatna, heavily industrialized area until 2004, when industrial activity was finished. The findings reveal an intense environmental pollution, high content of heavy metals in the soil with adverse effects on plant development and undesirable effects on the inhabitants of the area. Determination of heavy metals in the soil, allows important insights into the pollution level and into the potential toxicity to vegetation in the area and indirectly to the population.

Moreover, the representation of the pollutants concentration in the soil may underlie ecological restoration of the Zlatna area. Among the methods recommended I mention: applying calcium lime (increasing pH of the soil reduces mobility of heavy metals), deep plowing (bringing to the surface of the soil from the lower part of the soil profile, which has a lower heavy metal content), applying biological methods, such as cultivation of plants with low affinity to heavy metals or, on the contrary, the intensive cultivation of the strongly bioaccumulative species, a long period of time, in order to diminish the presence of these elements in the soil (in this respect plants are grown: either those which are not used for human alimentation/animal feed, or other bioaccumulative plants that are afterwards incinerated).

Research continued trying to identify solutions to remove heavy metals from the soil, but also from the mine waters which still pollute the ground, so in the period 2010-2013 a study was carried out on the possibility of removing metal ions from acid water from "Larga de Sus" mine (Zlatna). A very important aspect was the fact that young researchers were involved, namely one postgraduate and one PhD student (at the time, the Doctoral School of UBB Cluj Napoca), now a PHD graduate. The results are extremely encouraging and presently continue with the elaboration of a doctoral thesis at the Doctoral School within The Technical University Cluj Napoca.

In the third section, ***Management of food quality and food safety***, we started from the idea that in relation with any nonconforming product corrective and preventive action must be taken into consideration. The quality of a product can be highlighted in terms of quality characteristics: physical, chemical, microbiological, psychosensorial and aesthetic, aiming also to identify the causes leading to alteration / modification of these properties, so that the degree of consumer satisfaction or safety are not jeopardized. In this context, the efforts

related to research was directed toward product contamination section (physical, chemical or microbiological), in terms of factors relating to environment, technology to create a product or to the distribution stage that any product undergoes.

In a first step we integrated research in the field of environmental quality control into the research related food security and safety. Thus, we determined the degree of contamination of food with heavy metals in the industrialized areas (Zlatna) or actually tried to identify products contaminated with chemicals on the market, products that did not originate from an industrialized area (ex. Contamination of honey with heavy metals). The findings highlight the existence of plant materials with high hyperaccumulator potential so in the perspective of rehabilitattion of damaged farmland by pollution, to be able to take into account ecological methods. The highest levels were recorded in the following plant materials: cabbage, spinach, turnip, beet, apples. There is a category of plants which have accumulated heavy metals in low amounts: corn, beans, peppers.

At the same time, it has been found that the accumulation of heavy metals in plants presents a variability strongly determined by the type of metal, species and plant organs analysed (for example, the presence of high concentrations of cadmium in white grapes and close to normal concentration values of copper and lead in the same material). Uptake mechanisms are different for metal ions, but those absorbed in the roots by any mechanism are in competition with each other. High acidity maintains a high level of mobility and accessibility of heavy metals, primarily copper and lead; the heavy metal cations are mobile under acidic conditions and with increasing pH their mobility and availability decreases.

Another important aspect in the research was represented by the testing of food additives, less toxic in terms of the efficiency of the preservation of juices (potassium sorbate vs sodium benzoate), as well as issues related to preservatives in processed meat products (nitrates / nitrites). The use of food additives is justified only when it serves one of the objectives set out in legislation. Any of these objectives, may them be economically or technologically profitable, will not be considered if they endanger the health of the consumer. In research conducted it was determined that allowed values of nitrates / nitrites addition were exceeded, which requires taking easy measures related to meat products to protect consumers.

The third part ***"Directions and perspectives"*** deals with directions and academic career development perspectives, through direct actions which will support the implementation of the objectives and future directions of development. It starts from the idea that education is one of the basic foundations of society, academic career having autonomous features related to combining education with research, but also with immediate and future needs of the

economic and social realities, for which most students are studying, going through three training cycles: Bachelor, master and PhD.

Teaching and research requires skills and specific abilities, which is acquired and perfected through continuous work.

Attention will be paid on continuous improvement of teaching, axiological orientation and quality of the educational process, forecasting results and evaluating the effectiveness of employment, research and development activities and increasing scientific reputation.

The general conclusions of the paper highlight the sustainability of the results and the actions that will support the implementation of the objectives and future directions of development, and maintenance / continuous improvement of all processes / activities in mind, according to what all requirements and regulations in the areas of interest are represented may that be professional or scientific.