Quality Management Software in the Food Industry

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Abstract: In the food industry, quality management has become crucial to companies responsible for ensuring that the safety of products complies with the strict government regulations and/or copes with the increasing customer demand for new products and shorter product development cycles, whilst simultaneously having to protect their brands from food scandals or other adverse situations. In this paper we categorize what food manufacturers find when investigating the market for quality management software in order to identify room for new applications and products.

1 Introduction

Quality management approaches have been developed and adopted for over three decades extending from the manufacturing industry to every other possible economical activity [TS07]. Quality management has evolved from statistical, product-oriented approaches to participation-oriented practices that include the involvement of workers, suppliers and customers. In the food industry, quality has acquired relevance since the consumer became increasingly aware of quality and governments were compelled to take more responsibility for public health and safety as affected by food products [LMJ02]. Alongside this however, information technology has also continued to evolve; in the last 50 years the world entered into a software rich environment aimed at the optimization of critical business processes. IT efforts can and do act as supportive components that help businesses to achieve their strategic objectives by speeding up access to accurate information about operations, customers, competitors and suppliers.

When quality becomes part of the organizational culture and influences the strategic objectives of the organization, then it becomes necessary to encompass quality efforts with the corresponding information technology infrastructure and align both initiatives to attain the desired results. This paper intends to provide an overview of some of the software applications available in the market today that are related to quality management. A quick review of the most common quality management systems is presented in the following section to depict the relevant issues in the food industry.

2 Quality Management Systems and Food Quality

A quality management system is a set of policies, processes and procedures required for the planning, execution and support of a quality initiative [Eb02]. The basic structure of a quality management system can be fragmented into the following categories: core processes, management processes and support processes linked to key indicators such as product quality, process quality, supplier quality and employee satisfaction to name a few [Pf02]. For the sake of simplicity, we distinguish four main functional phases of quality management to match the requirements of each phase with corresponding software features or capabilities [Gr07; YG01]. (Numbers refer to columns in Figure 1.)

2.1 Quality Design

A common path to product and quality design comprises an analysis of customers' requirements, company strategy and regulations. All the procedures to collect and analyze this information are in denominated Requirements Management (4). Once the product requirements have been analyzed, the product design is performed by means of tools such as Product Design (1), Advanced Product Quality Planning (2), Quality Function Deployment (3), Failure Mode and Effects Analysis (5), Engineering Data Management/Product Data Management (EDM/PDM) (6), and Process Simulation (7). The tools listed are also part of the set of requirements for quality management software.

2.2 Quality Control

When products and production processes are defined and developed, it is necessary to control them during the manufacturing of food products. Quality controlling means to understand the ongoing process of evaluating performance and taking corrective action if necessary. It involves technological and managerial elements. The requirements to software included within this phase of the quality system are: Data Collection (8), Production Part Approval Process (PPAP) (9), Process Control (10), Corrective and Preventive Action (11), Test Planning (12), Control of Inspection, Measuring and Test Equipment (13), Calibration (14), Inspection and Test Status (15), Measurement Analysis Systems (16), Statistical Process Control/Statistical Quality Control (17), Product Identification and Traceability (18), and Statistical Tools (19).

2.3 Quality Improvement

Customers, competition and governments constantly demand innovation and improvements in products and processes. This phase involves coping with change and altering the 'status quo' by means of a systematic approach to improvement. It takes documentation, measurement and analysis having both management and employee involvement as a basis. Evaluating available software in this phase comprises ten features: Management Responsibility (20), Training (21), Performance Appraisal (22), Process Management (23), Document and Data Control (24), Quality Handbooks (25),

Supplier Management (26), Management of non-conformance (27), Complaint Management (28), and Error Management (29).

2.4 Quality Assurance

To guarantee quality requirements, such as safety, reliability, and service, a set of systems and norms have been developed under the name of quality assurance systems. Typically, Quality Audits (30) are performed to monitor procedures linked to action. Risk analysis (31) is also a technique used to identify and assess factors that may jeopardize the success of the quality system. Hazard and operability analysis (32) is a systematic method for examining complex facilities or processes to find actual or potentially hazardous procedures and operations so that they may be eliminated or mitigated. Specific to the food industry, Hazard Analysis and Critical Control Points (HACCP) (33) is a systematic preventive approach to food safety that addresses physical, chemical and biological hazards as a means of prevention.

3 Exploring the Software Market

The present research comprises an overview of 45 companies producing quality management software during the months of May and June 2007. These companies were identified using internet searches and recommendations from quality associations such as the German Society for Quality Management. Most of the information was obtained through the companies' websites. The 45 companies surveyed offer 84 software products with different scopes with regard to the four phases listed above. From our sample 26 percent of the organizations had a focus on the food industry and its particular requirements, and 28 percent of the products contained features relevant to the sector. In Figure 1, we present the survey results. We use the terms 'General' and 'Food Industry Specific' to designate products that were designed without having any specific industry in mind and products designed with a food-industry oriented perspective, respectively.
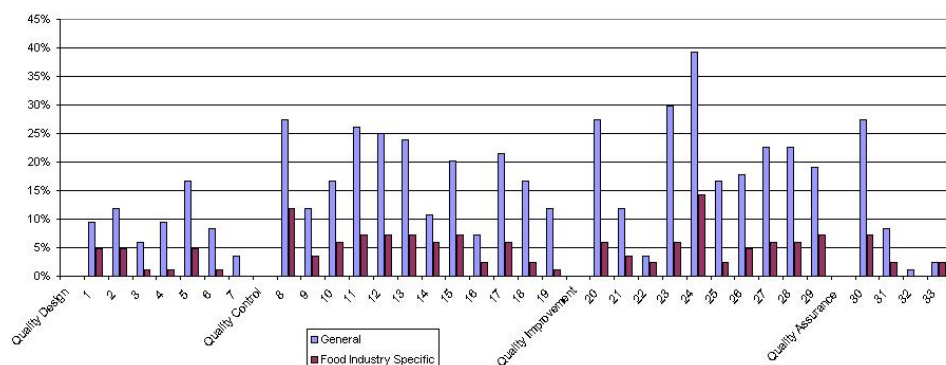

Figure 1: Quality Management Applications

In the context of quality design, it is evident that there is significant room for more software support in topics such as Quality Function Deployment, requirements management, and EDM/PDM. In the case of EDM/PDM, the lack of solutions for the food sector may be due to its relative recent deployment and application in manufacturing industries; however, as has been the case with other quality tools, it may also extend to the food industry. The same may be argued when considering PAPP, which was originally designed in the confinements of the automotive industry but may also extend its application to other sectors.

Another hot issue in quality management of food and agricultural products is identification and traceability [HT07]. Nevertheless, despite vivid discussions about RFID and other advanced solutions, the number of products available is not numerous. Employee involvements represented by training and performance appraisal functionalities were also found to be scarce. A possible explanation for this phenomenon may be due to the fact that they are also in the scope of human resource management software. HACCP and risk analysis tools were also found to have little resonance among software developers. The first is fundamental to maintain cost-effective, ongoing food safety programmes; the latter has been emphasized as a quantitative approach to improve the scientific basis for HACCP.

4 Conclusions

From our analysis of the software market we can conclude that the IT support of quality management in agribusiness is still limited. This parallels the comparatively low prevalence of quality management techniques in the sector and leaves room for new applications and products better tailored to the demands of the industry.

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