

QUALITY MANAGEMENT SYSTEM AS A TOOL OF PROCESS CONTROL FOR FOOD AND AGRO INDUSTRIES

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The new ISO 9001:2000 standards have changed determination and implementation of quality and the systems in connection of quality.

One of the most important changes is, that the quality systems focus more and more on the customer requirements – i.e. not only those ones that are in every detail described in the corresponding contracts, but the so called “hidden” requirements are also considered. These “hidden” requirements are living only in the customer’s mind. The aim of the new ISO standard is to describe and also satisfy these hidden requirements as well as possible.

We discuss our experiences, theoretical and practical results in these fields, including quality audit experiences and some Internet methods for the investigation of customer requirements in food and agro industries.

Keywords: Quality Management, ISO 9001:2000, customer requirements and satisfaction, Internet forms, food and agro industries

Introduction

A great number of prescription, rules, standards and monitoring practices are ensuring “from farm to fork”, that the food we eat becomes and remains safe and healthy, free from harmful substances, such as microbes or chemicals [2-4]. As important as the properties above, is that the foodstuff should satisfy customer’s expectations in taste, shape, shelf-life, price, etc.

We investigated how to use the new elements of ISO 9001:2000 [6] – measuring customer confidence, continuous improvement of processes and production, – applying the modern tools of information technology.

Food quality and –safety in agro sector specific quality management systems

Generally the food/agro specific Quality Management System (QMS) works as it is shown in *Fig.1*.

The elements of QMS that are shown in *Fig.1* have the given effectiveness as it follows:

- GMP/GAP (Good Manufacturing Practice / Good Agricultural Practice) are covering the basic requirements
- HACCP (Hazard Analysis, Critical Control Points) foresees the special entities of food safety
- QA (Quality Assurance) foresees the general entities of food safety
- TQM (Total Quality Management) contains the Q-developing strategy

Application of the first three elements is necessary to introduce the TQM to food/agro activity.

The Quality Assurance Systems (QAS) according to the ISO 9000:94 standards have been created for industrial activities. Some elements of these standards are not compatible with food/agro activities, they were only in the last years transformed and introduced there. The new ISO 9000:2000 standards are taking in account these specialties of food/agro industry.

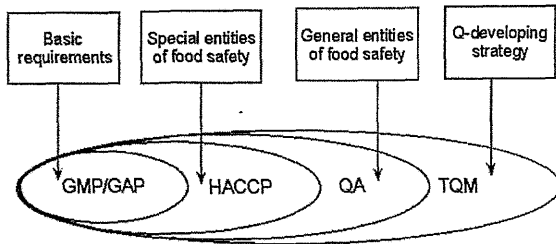


Fig.1 Basic elements and their effects of QMS in food/agro industries

HACCP system is one of the methods, which helps to ensure food safety by a simple but effective way. It identifies hazardous problems in advance – uses briefly the following steps: identifies potential hazards and the corresponding critical control points, establishes control procedures, monitoring procedures, corrective actions, effective record keeping procedures and the procedures of verification [1].

Both GMP and HACCP programs are building QM toward the new ISO 9000:2000 requirements.

The new ISO 9001:2000 standards and the implementation of quality

The new edition of ISO 9001 carries a title, which does not include the term QA. This reflects the fact, that the QMS requirements not only address the QA of product conformity, but also include the need for an organisation to demonstrate its capability to achieve customer satisfaction.

The ISO 9001:2000 standard encourages the adoption of the process approach for the management of the organisation and its processes, as it is shown in Fig.2.

Any activity or operation receives inputs and converts them to outputs, so it can be considered as a process. In the new process approach of the QM model the most important input elements are the customer requirements, similarly, the most important output element is customer satisfaction. This approach is true, right and clear in the food/agro sector – of course if we are in another field of the economical life (i.e. education) then it is an important question how to define customer and how to define satisfaction.

One of the most important changes of QMS: focusing more on the customer requirements and satisfaction

To show the real importance of the changes in the new ISO 9001 standard we cite the points corresponding to the most important input/output definition of the process approach of QMS:

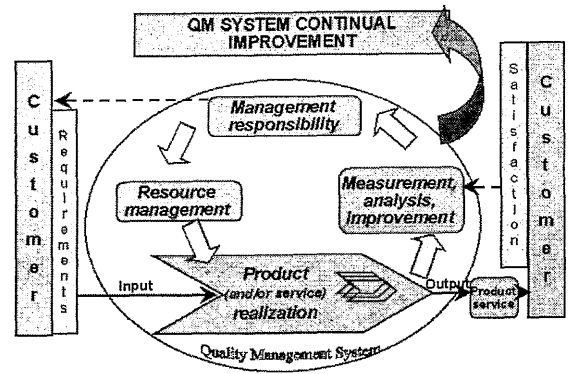


Fig.2 Quality Management process model

- (5.2) Top management shall ensure that customer needs and expectations are determined and converted into requirements with the aim of achieving customer confidence.
- (5.6.1) The organisation shall establish a QMS ... ensuring that the product and/or service conform to customer requirements.
- (7.2.1) The organisation shall establish a process for identifying customer requirements.
- (7.2.3) The organisation shall implement arrangements for communication with customers, with the aim of meeting customer requirements.
- (8.2.1) The organisation shall determine and establish processes for measurement of QMS performance. Customer satisfaction shall be used as one measure of system output.
- (8.2.1.1) The organisation shall monitor information on customer satisfaction and/or dissatisfaction. The methods and measures for obtaining and utilising such information and data shall be defined.
- (8.4) The organisation shall analyse applicable data to provide information on
 - customer satisfaction and/or dissatisfaction
 - conformance to customer requirements

As we see among these citations, it is a very important part of an effective working QMS, how to determine the measuring method of customer requirement and satisfaction. In the 21st century Internet offers a good tool for data collection in these fields, and Information technology, and computer programs make it easy to use the methods of Mathematical Statistics on the collected data sets.

Internet methods and experiences in identification and analysis of customer requirements and satisfaction

Using our quality audit experiences, two Internet questionnaire forms have been created to identify and to investigate customer requirements, satisfaction and preferences. One of them is developed for the “end

Fig.3 Internet form for general food “end customers”

Fig.5 A row answer file of the first Internet form

Fig.6 User form of the first evaluation step of the e-replies of the first Internet form

Fig.4 Postharvest Internet form about fruits and vegetables

correct evaluation, and it is not easy to successfully suggest farmers to use Internet. (Although even Internet surfing will become more and more general, and not only in the cities!)

Both Internet forms collect e-replies that are evaluated by a VBA program. An example from the row answer files of the first form is shown in Fig.5 and the user form of the first evaluation step is shown in Fig.6.

As one can see, the E-replies have to be encoded. This procedure is made by the VBA program, which was built into an Excel module. By this way the Statistical and graphical tools of Excel are available for the evaluation of the data set. In our first attempt we did not want to put complicated questions on the Internet. In the work of one of the co-authors [4], it was proved, that too long or complicated questions on Internet do not lead to enough and high quality information, which are necessary to carry out Statistical tests precisely.

For the evaluation of the first Internet form, we have chosen a control group, too. The members of the control group filled in the same questionnaire, but they have got a “hard copy”. As long as the Internet using group handed in forms containing less than 10% of theoretically wrong or not usable answers, among the “hard copy” answers we have found more than 30% wrong, not correctable ones. Of course, the two groups are from different ages – Internet using people are mostly young, and the control group covered 18-60 year old customers, mostly above 40 year old people. We consider as correctable answer for example, if the customer writes an “o” or a “-” character instead of “0”

customers”, using shopping centers for the food consumption of their own household, and the second, special one put questions from the postharvest point of view to the small, medium or big ventures about fruit and vegetable consumption. The Internet questionnaire forms are shown in Figs.3 and 4, they are available in the following URLs:

<http://knight.kit.bme.hu/bea>

and

<http://knight.kit.bme.hu/postharvest>

In the first Internet form we investigated general food consumption, as it occurs in a real household. We collected data about the preference of the big SC-s, including the percentages of shopping different food in the most preferred and in other SC-s. It was very important in these questionnaires to take in account the difference in the ages of the Internet using group and of the hard copy fulfilling control group.

The second questionnaire was made for agricultural and horticultural firms growing or producing fruit and vegetables. The questions covered those properties of the most important fruits/vegetables in Hungary that are influenced by the postharvest activities and procedures. From the point of view of Mathematical Statistics this second Internet form has not enough answers for the

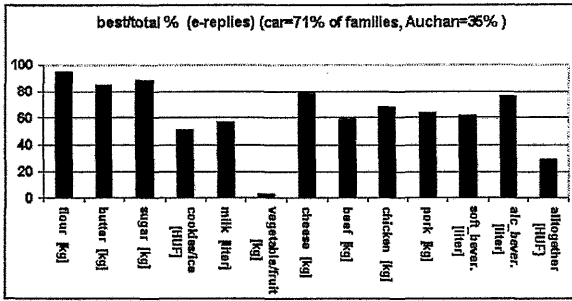


Fig.7 A part of the statistical evaluation of the first Internet form

character or an unfilled box. These errors can be automatically (by software) corrected in e-replies, or by the time typing the data in the computer in the case of hard copy answers. We have taken in account the possibility in the Internet questionnaire to reject and give back wrong replies, but in our first attempt we wanted to compare the percentage of wrong replies, too, and the hard copy users can not get back their wrong answers in a short way.

In both – Internet or Hard copy replying – groups the number of customers using car for food shopping is quite high. As best properties for the most preferred shopping centre they mentioned the low prices, the possibility to buy several kinds of food in the same place, and the comfortable parking places for their cars.

Comparing Internet and hard copy replies we found an interesting difference between the two groups in fruit/vegetable and in meat consumption. The members of the Internet using group buy only a very small part of their fruit/vegetable needs ($\approx 5\%$) in the most preferable shopping centre, this percentage in the other group is considerably higher ($\approx 25\%$). The difference between their meat consumption is not as considerable, but in this field the “hard copy” group’s consumption in the most preferred SC is lower. See Figs.7 and 8.

Conclusions

The new ISO 9001:2000 standards focus considerably more on the customer requirements and satisfaction in QMS.

Our goal was to create Internet and computer using methods to identify, investigate and evaluate customer requirements and satisfaction. Process approach of QMS uses these points as most important input and output of the system. As a first attempt we have developed two Internet forms, that are available on the URLs:

knight.kit.bme.hu/bea and
knight.kit.bme.hu/postharvest.

Using these forms we could avoid a lot of formal errors in the replies, and of course the statistical evaluation is easier if we have from the very beginning a computer database. In the future we want to extend our evaluation process and program by determining the most suitable statistical methods and building in these methods in our computer program.

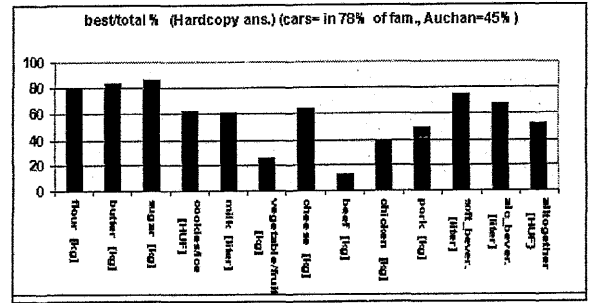


Fig.8 A part of the statistical evaluation of the first Internet form

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SYMBOLS

GMP	Good Manufacturing Practice
GAP	Good Agricultural Practice
HACCP	Hazard Analysis, Control of Critical Points
QA	Quality Assurance
QAS	Quality Assurance System
QM	Quality Management
QMS	Quality Management System
SC	Shopping Centre
TQM	Total Quality Management
VBA	Visual Basic for Application

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