Development of the information model for consumer assessment of key quality indicators by goods labelling

S Koshkina\textsuperscript{1, a} and L Ostrinskaya \textsuperscript{2, b}

\textsuperscript{1}Omsk State Technical University, 11, Mira av., Omsk 644050, Russia
\textsuperscript{2}Siberian State Automobile and highway University, 5, Mira Pr. Omsk 644080, Russian

\textsuperscript{a} E-mail: ksn_omsk@inbox.ru, \textsuperscript{b} E-mail: l_i_romanova@mail.ru

Abstract. An information model for "key" quality indicators of goods has been developed. This model is based on the assessment of standardization existing state and the product labeling quality. According to the authors’ opinion, the proposed "key" indicators are the most significant for purchasing decision making. Customers will be able to use this model through their mobile technical devices. The developed model allows to decompose existing processes in data flows and to reveal the levels of possible architectural solutions. In-depth analysis of the presented information model decomposition levels will allow determining the stages of its improvement and to reveal additional indicators of the goods quality that are of interest to customers in the further research. Examining the architectural solutions for the customer’s information environment functioning when integrating existing databases will allow us to determine the boundaries of the model flexibility and customizability.

Keywords: information model, labeling, quality of goods, specialized environments of data processing.

1. Introduction
National systems of standardization and goods control quality are not harmonized. The systems of certification and labeling in various countries are different. The existing imperfection of information environments, the lack of integration between them, the incompleteness of data bases on the composition and quality of goods require the creation of unified information environment that allows controlling the quality of goods and their compliance to standards by labeling. There are no integrated information environments for the support of the customer's purchasing decision. There is a conflict of interests of consumers and producers regarding their interest in observing of all the quality standards for goods.

Labeling is the main carrier of the current information about the product. It performs an information function, transferring information about the product characteristics, its quality composition and shelf life to the potential buyer. Combining the efforts of various scientific knowledge branches representatives will allow managing the quality of goods at various levels of impact: at mega-, meta- and micro levels.

The study of the subject area revealed an inadequate degree of investigation of the issues analyzed in the scientific literature. There are some works devoted to individual and several specific aspects of product quality marking standardization. But a harmonious system of scientific views on the problem under investigation has not been created yet. There is no data processing environment which will provide controlling the quality of goods and monitoring their compliance with standards through labeling on the territory of individual states and at the international level. There is no integrated information environment for it. This problem is serious and requires immediate action, because the
quality control products are becoming a state goal now. The important task of each state is to ensure the safety of its citizens. Labeling should provide the customer with the necessary information through the use of applied information and advising the environment, which will be able to provide the customers with a solution in the form of advice. It will be possible using the information model, describing the process of forming information about consumer goods properties.

2. Statement of the problem
In the subject area of the study are included the existing information systems which are including the information about labeling and quality control of products. The subject of research is the information space of the customers in the decision-making process of the purchase of goods. On the basis of the interdisciplinary approach to the improvement of the information function of marking is being developed the Information model, describing the process of forming information about consumer goods properties. Using of this information will enable the integration of databases on the composition and quality of goods. It will help to make a purchasing decision which is based on the use of modern information technologies by consumers and the mobile technical devices available to them.

3. Theory
Various aspects of the need to improve the information function of marking have been studied by some researchers. We pay special attention to the labeling of consumer goods and food products. Perception of quality is investigated in a number of works. The information function of marking contributes to the evaluation of the quality of consumer goods [1]. Now it is increased the attention to eco-labels [2]. Many consumers give their preference to environmental and organic products. It is important to obtain reliable information about the quality of these products. The importance of eco-labeling in the decision to purchase is devoted to the publication of the results of the scientific research of Grankvist G. and Anders B. [3].

In the article of Tihonova O. and Reznichenko I. the possibility of assessing the quality of food products labeling through the development of consumer criteria for evaluation based on the systematization and classification of specific requirements, imposed to it both by regulations and by consumers in general. The assessment of consumer properties labelling on the proposed evaluation criteria will more fully realize all of its functions, provide high quality and meet all the consumers information needs [4].

An information carrier is a production and trademarks of the goods. The labeling contains the following elements: text, image and information. The commodity-sign symbolism in the modern food industry uses in its development a large amount of visual information as an important tool for marketers in the competition for the potential consumer [5].

There is the point of view on the color in labeling role in making a purchasing decision. Meng Shen, Lijia Shi and Zhifeng Gao examined the impact of label colors (red or blue) on consumers' cognitive effort and willingness-to-pay (WTP). This study found that red labels led to longer response time in decision-making than blue labels did. The research results indicate that color influences significantly on the WTP assessment concerning the certain attribute on food labels [6]. Therefore, we have to recognize the subjectivity of the decision to buy goods. It is necessary to improve the information function of labelling, because it is difficult for the buyer to make the right decision about the purchase.

As a result, we can say that the integration of databases on the composition and quality of goods for decision-making has been poorly studied. The ability to verify the quality of goods by labelling based on the use of modern information technologies by consumers and the mobile technical devices available to them have not been studied in scientific literature. We emphasize that insufficient attention has been paid to the modeling of the process of regulating information about the consumer properties of the product by its labeling. This problem is urgent for each country and the world as a whole. The extent of available data which is intended for use is very impressive. The available information contain the key characteristics of the goods and the factors of these characteristics providing. Their processing is possible only through the using of modern information technologies such as big data, cloud computing, expert systems, support systems and decision-making, monitoring and others. The ability of modern producers and consumers to immediately apply the skills and use
digital environment will help them to apply all the collected, processed and stored information for the control of the goods quality.

4. Results and Discussion

The analysis of the subject area has identified the currently existing types of information systems for the support of standardization, labelling and quality control of products. Information model, describing the process of forming information about consumer goods properties was developed according to the IDEF0 methodology.

We offer an essential definition for the description of the developed information model. This model is shown in figure 1. This definition will describe key quality indicators of goods. The abbreviation KQI means "The goods key quality indicators". It means the indicators which characterize the basic consumer properties of the product and those which are most important for the customer decision to purchase.

In the developed Information model there are several KQI:
1) quality indicators declared by the goods manufacturer;
2) shelf life which is confirmed by the seller;
3) rating of the producer which is obtained on the basis of information received from controlling and public organizations;
4) product safety based on the goods composition. It is characterized by the useful and dangerous properties of the constituent ingredients;
5) customer reviews based on the specialized social network data and information.

For the buyer, the final assessment should be formed based on the evaluation of the goods KQI. In this case, one should take into account that the customer is not interested in large data flows, especially when he is in a trading organization (in store or in office etc.). It will be important for him to get a minimum of useful information through a single request format. This format should contain very concise information. Its purpose is to help customer in quickly making decision. His decision can be "to buy" or "not to buy".

The information and advisory environment should be implemented taking into account the customer's mobility and his possibly of changing geo-location. This environment should be oriented towards the use mobile devices of customers. The customer should receive a minimum useful amount of information for making his decision. For this purpose it is necessary to distinguish a number of key
parameters. Key parameters should be essential. On the basis of these selected parameters the universal algorithm for the customer "Advice" information environment development will be developed. This "Advice" will be used for making a decision on purchasing the desired product.

For the formation of the "Advice", a matrix with the values of the goods key quality indicators can be processed in the algorithm. This algorithm mathematical model is to develop an opinion in the form of a possible "Advice". This advice can have one from the three following variants:

- This product is recommended for purchase;
- This product is not recommended for purchase;
- This product has doubtful consumer qualities.

The recommended matrix format is shown in figure 2, where X is the value of a particular quality.

![KQI of the goods](image)

**Figure 2.** The elements of the key quality indicators of goods matrix.

These key quality indicators of goods can have one of the value described below:

0 – Its level is low. Its qualitative properties have a questionable nature or they were lost.
1 – Its level is neutral. Its quality properties are close to the standards.
2 – Its level is high. Consumer properties of this product satisfy the KQI.

First and foremost, the minimum required amount of data at the output of the information system is determined. Then the question arises, what will be the basis of their receipt. It is also important to determine what available information resources should become sources of data at the input.

At this stage, these questions are not sufficiently studied yet. The authors are going to analyze the subject domain of the input data streams in the nearest future. Currently, the integration of databases is studied. Realization of the data flows architecture is carried out at the stage of existing data processing decomposition.

This presented information model has a lot of input values. All these values are regulated legally and by the regulatory framework existing in every country.

Business process modeling starts with the information model development. This model describes the process of obtaining optimal and useful information about consumer properties of goods. The users of this process are customers, producers, sellers, control organizations and public organizations.

### 5. Conclusion

The inconsistencies of national standardization and certification systems and of information environment imperfection were revealed. As the analysis shows, there is no integration between them. The databases of goods ingredients and quality are incomplete. The authors developed an information model, describing the process of forming information about consumer goods properties by its labeling. This model allows us to decompose the existing processes in data streams. On this basis the architectural solutions for different levels of information processing can be constructed.

There is a need to continue the research in the chosen direction. In the future, a more in-depth analysis of the decomposition levels of the presented information model will be possible. Various quality indicators of goods can be added into this model later. These added indicators will be relevant for customers.

The development of architectural solutions for the information environment functioning will help to define the boundaries of flexibility and customizability of the model. It is important to create an improved information environment that will ensure the goods quality control. This control is based on the using of modern information technologies and mobile technical devices by customers.
References

[1] Kenyon G N and Sen K C 2015 The Perception of Quality (Springer-Verlag London)
[2] Kümpel Norgaard M and Brunso K 2009 Food Quality and Preference 20 (8) p 597-606
[3] Grankvist G and Biel A 2007 Predictors of purchase of eco-labelled food products: A panel study. Food Quality and Preference 18 (4) p 701-708
[4] Tihonova O and Reznichenko I 2013 Research Journal of International Studies 8-3 (15) p 73-77
[5] Popova I 2015 Bulletin of NGIEI 7 (50) p 66-79
[6] Meng Shen, Lijia Shi and Zhifeng Gao 2018 Food Quality and Preference 64 p 47-55