

Formation of New Segments of the Market Through Quality Function Deployment of Innovative Production

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Abstract— Last time consumers even more often choose the products balanced on structure or exempted from components which can cause food allergies. But products also need to taste good, and consumers want to know they are eating good food. Transparent, recognizable ingredients are important too. In this regard designing of the personalized food at the request of the consumer becomes the relevant direction of development of food technologies. This article has aimed to step into the crucial scope of dairy technology, watching QFD indifferently with different aspects including the notions above, in order to help organizations take more precise steps in deciding how to use QFD in its most efficient way in food industry, and more specifically, lactose-free and sugar-low ice cream technology.

Keywords— *QFD, Food Industry, Food Product Development, lactose-free, ice cream.*

1. INTRODUCTION

In the last time in Russia, as well as around the world, the trend of increase in number of the consumers demanding specialized, personal approach to satisfaction of the needs for the food answering to specific features of an organism stands out clearly. Now the problem is solved due to online services for selection, preparation and delivery of the personal menu according to inquiries of consumers. However for a wide range of consumers ready-made products which will answer an optimum ratio price/quality are required (in this case joins in the concept "quality" also special requirements). In this regard, producers are faced by a difficult problem of detection of such requirements, development of innovative products, adaptation of productions to new properties. In the conducted research for the solution of the specified questions the function of quality was structuring on the example of an innovative product – lactose-free, sugar-low and gluten-free ice cream

2. RELEVANCE

According to the Union of pediatricians of Russia, about 16-18% of percent of the population of the Russian Federation suffer from intolerance of lactose in different degree. According to the experts it is about 25-26 million people [1]. The main category – children and teenagers [2, 3, 4].

Lactose insufficiency amplifies as approaching the Far East of Russia and Asia, in particular. On statistical data, from problems of a gastrointestinal tract, frustration of food and a

metabolism 35,4 thousand people in Khabarovsk Krai suffer [1]. Dietary food, including delactosed is recommended to this category of the population.

Increase in consumption of lactose-free products can arise in case of deterioration in an ecological situation, lowering of the level of health care as these factors will lead to growth of diseases and other problems with health that can lead to growth of purchases of specialized food [5]. Also growth of consumption of lactose-free products can increase in view of strengthening of the personalized preferences and allocation of an accurate segment of consumers of "beauty" and "fitness" of products. It can be provoked by complex and long-term marketing policy of the company or group of companies, including through the whole country.

At the same time, consumers who are forced to limit consumption of dairy products because of low digestion of lactose aren't ready to refuse completely consumption of such products and constantly look for substitutes [6, 7]. However, producers can't offer an analog with the necessary properties because of low study of demand yet, namely what properties of ice cream are necessary for consumers.

3. PURPOSE AND RESEARCH PROBLEMS

Research objective was studying of technical characteristics of ice cream with the lowered content of lactose/lactose-free, sugar and gluten by means of application of QFD-planning and allocation of a new segment of production in the market of ice cream [8, 9].

For achievement of a purpose the following tasks have been solved:

1. To study consumer preferences of the population of Khabarovsk (Russia) concerning consumption of ice cream.
2. To analyze structure of the range of the ice cream realized in the market of Khabarovsk (Russia).
3. To define the nomenclature of consumer properties and technical characteristics of new ice cream.
4. To define by structuring function of quality technical characteristics and to develop model of a ready-made product (ice cream).

4. REVIEW

Last time consumers even more often choose the products balanced on structure or exempted from components which can cause food allergies. But products also need to taste good, and consumers want to know they are eating good food. Transparent, recognizable ingredients are important too. In this regard designing of the personalized food at the request of the consumer becomes the relevant direction of development of food technologies. This article has aimed to step into the crucial scope of dairy technology, watching QFD indifferently with different aspects including the notions above, in order to help organizations take more precise steps in deciding how to use QFD in its most efficient way in food industry, and more specifically, lactose-free and sugar-low ice cream technology.

Quality Function Deployment (QFD) is a systematic approach to help facilitate the product development process by making sure the customer requirements are being considered throughout the process, and then reflecting his voice in the final product. One of the industries QFD has stepped into is the food industry [10, 11].

This struggle has been going on between the two attitudes, each presenting the pros and cons. This article has aimed to step into the crucial scope of dairy technology, watching QFD indifferently with different aspects including the notions above, in order to help organizations take more precise steps in deciding how to use QFD in its most efficient way in food industry, and more specifically, dairy technology (ice cream).

In the world market the new segment of foodstuff - FreeFrom is more and more accurately allocated recently [12].

FreeFrom – the universal term used for designation of food which have been developed to exclude one or several components on which at, at least, some consumers can be or allergic reactions as intolerance.

Allergy – the standard immune process expressed by super sensitivity of immune system of an organism at repeated influences of allergen on earlier sensitized this allergen an organism [13].

The international agency according to food standards demands that availability of 14 certain allergens has been emphasized on labels of a product [14, 15]. It: the flakes containing gluten; crustacea; mollusks; fish; eggs; peanut; nuts (nut trees); soy; milk; celery; mustard; sesame; lupine; sulfur dioxide (if above 10mg/kg, or 10 mg/l).

Some people transfer collateral reactions to substances, especially products which haven't started reaction of immune system [16-18]. These reactions are usually classified as in tolerance or sensitivity and have very wide range of the reasons, symptoms and degrees of expressiveness. Some diseases or separate symptoms, such as gee's disease or phenylketonuria can be caused by certain products or food components, such as gluten or amino acid phenylalanine respectively.

It is necessary for production of this direction observance of three basic rules:

1. productions have to exclude hit of allergens regardless of a type of a product (as now on marking of chocolate the

producer writes that "... the product may contain traces of nuts, milk", etc.);

2. foodstuff has to have the attractive organoleptic profiles which aren't conceding to "habitual" products;

3. only natural ingredients;

4. Free-from foods not only have to be made without allergen ingredients, they still also have to taste good and be nutritious.

From here it is obvious that it is necessary to reconsider significantly approaches to production and to develop innovative compoundings of FreeFrom products [19, 20]. But at the same time, the most problem is the question of a standard regulation both the term "FreeFrom", and conditions under which production can be recognized that. It is a way rather long as it was with organic production where and still there were not resolved questions.

However, the policy pursued by the state of rather food sector can contribute to the intensive development of the sector of FreeFrom and spread production as lifestyle, to similarly healthy food or as a part him. From this point of view, the most perspective is development of production of FreeFrom within the program "National Technological Initiative-2035" of the FoodNet market and the direction of the personalized food [21]. In this regard researchers have an opportunity to use tools and support at various levels.

Analyzing the market of specialized food of the Russian Federation it has been revealed that such concept as FreeFrom practically doesn't meet, it is presented by separate products and in very limited volume though the needs for such products are huge.

5. RESULTS AND DISCUSSION

Basic data for QFD planning were the results of market researches which have defined the main characteristics which need improvement, degree of their importance and range of values and also as other producers solve similar problems

Expansion of function of quality passes through four phases (processes) of carrying out QFD. The phase (process) No. 1 - to Identify the purposes on quality. To project and develop a product (QFD of the first level). Transfer of wishes of the consumer to technical characteristics of a product. Main question "What Is Wanted by Consumers and What We in This Occasion Will Undertake?". At this stage of the requirement and the consumer's wish by means of the matrix chart are transformed to characteristics of production. Identification of the major characteristics of production (lactose-free, sugar-low, gluten-free, a whippability, taste and color) meeting expectations of the consumer and providing its competitiveness in the market and also their ranging on importance degree became the end result of the first phase.

More than a half of the interviewed respondents pay much attention to taste and a smell of ice cream, at the same time appearance, the consistence and the nature of melting are important approximately for 30% of respondents. Ponderability coefficients for these indicators have been defined proceeding from requirements of normative documents and results of poll (figure 1). As only 17% have

specified not intolerance of lactose (or prefer to the lactose-free products for other reasons), the coefficient of ponderability has made 2 in selection of respondents. Ranging of other characteristics was carried out by an expert method.

Phase (process) No. 2 – To project and develop components (QFD of the second level).The main ways of improvement of characteristics of a product and further carrying out the corresponding works providing expeditious updating of characteristics of production depending on reaction of the market to her emergence have been offered.

Phase (process) No. 3 – To project and develop production (QFD of the third level). Transfer of technical characteristics of components to process parameters. Main question "As We Will Reach Necessary Values of Parameters of a Product". Design of process provides transformation of characteristics of the designed production in the concrete technological operations providing production with the set properties. This phase QFD assumes identification of critical parameters of each operation and the choice of methods of their control (fig. 1).

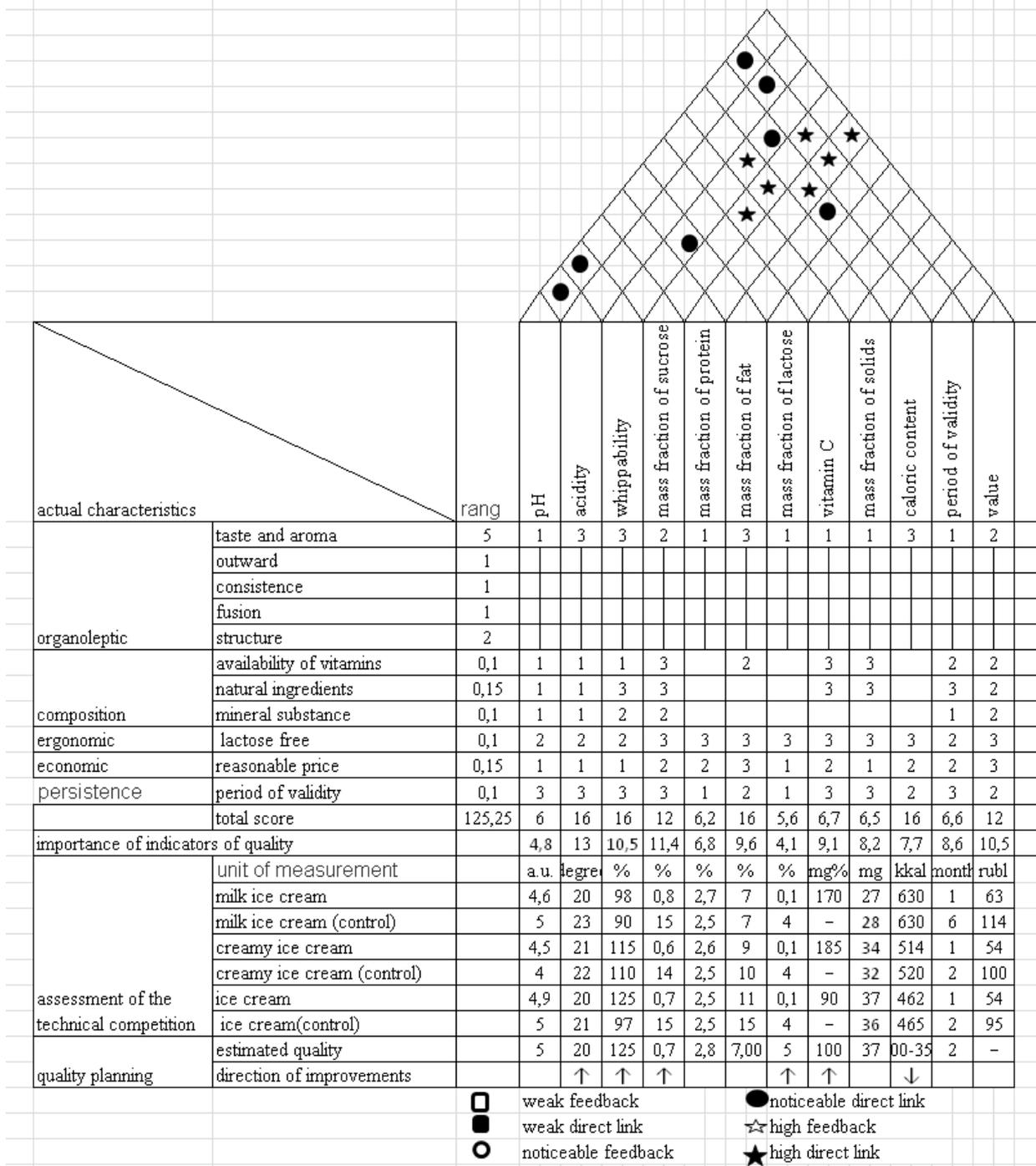


Fig. 1. Quality Function Development of innovation ice creame

Phase (process) No. 4 – To provide quality of production, (QFD of the fourth level). Transfer of parameters of process to the operated way of implementation of production operations.

6. CONCLUSIONS

On the basis of the house of quality the technology and a compounding of lactose-free, sugar-low and gluten-free ice cream.

Market researchers have established that consumers are ready to buy an innovative product in case of the decision by a product of their problem and also in case of following to fashionable trends in the field of healthy nutrition.

The following reasons can become the reason or a reason for the first purchase:

1. Emergence in family of the child at whom after the three-year period of formation of immunity reaction to lactose begins to develop. It can be shown in the form of allergic reaction or in lack of tolerance to allergen factor;

2. An acquired disease of the digestive tract (DT), exacerbation of the diseases connected with a metabolism in an organism. It can be also development of lactose insufficiency at adult age;

5. Following to fashion or trend of a healthy lifestyle and healthy nutrition. Observance of dietary programs or regular prevention of food;

6. Desire to try a new product in the market.

The key moment in the course of consumption is the uniqueness of the products combining traditional character of properties, an available source of calcium and minerals for the frequent use, which are easily acquired with milk and fermented milk products. All this thanks to extremely low content of lactose in a product – is lower than 0,1% of 100 grams of production. Thus, the people suffering from absence or small amount of the enzyme splitting lactose can use products, without being afraid of reaction of an organism to a factor hostile to an organism.

The reviewed example has allowed selected a problem of limitation of the offer of FreeFrom and also has shown need of additional marking of production which has necessary properties for recognition and easier identification by the consumer. As has shown, the QFD planning which is carried out researches is one of the most convenient instruments of planning of technical properties of production according to consumer preferences.

References

[1] http://elementy.ru/catalog/6400/Soyuz_pediatrov_Rossii_pediatr_russia_ru.

[2] Pereira MA, Jacobs DR, Van Horn L, Slattery ML, et al. Dairy consumption, obesity, and the insulin resistance syndrome in young adults. *JAMA* 2002;287:2081-2089 (Pereira MA, et al.,2002)

[3] Lactose intolerance". Genetics Home Reference. U.S. National Library of Medicine. Retrieved 2014-01-20. (National Library of Medicine, 2014)

[4] National Institutes of Health Consensus Development Conference: Lactose Intolerance and Health. Final Statement. 2010. <http://consensus.nih.gov/2010/lactosestatement.htm>. Accessed: December 15, 2011. (Lactose Intolerance and Health, 2010)

[5] Brill H (September 2008). "Approach to milk protein allergy in infants". *Can Fam Physician* 54 (9): 1258– 64. PMC 2553152. PMID 18791102. (Brill H,2008)

[6] I. Noya, V. Vasilaki, V. Stojceska, S. González-García, C. Kleynhans, S. Tassou, M.T. Moreira, E. Katsou, An environmental evaluation of food supply chain using life cycle assessment: a case study on gluten free biscuit products, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.08.226

[7] Beilharz, J.E., Maniam, J., Morris, M.J., 2014. Shor exposure to a diet rich in both fat and sugar or sugar alone impairs place, but not object recognition memory in rats. *Brain Behav. Immun.* 37, 134 – 141.

[8] Celis-Morales C, Livingstone K M et al. Effect of personalized nutrition on health-related behaviour change: evidence from the Food4me European randomized controlled trial. *Int. J. Epidemiol.* 2016; doi: 10.1093/ije/dyw186

[9] Carlos Celis-Morales Katherine M Livingstone Cyril FM MarsauxAnna L Macready Rosalind Fallaize Clare B O'Donovan Clara WoolheadHannah Forster Marianne C Walsh Santiago Navas-Carretero / *International Journal of Epidemiology*, Volume 46, Issue 2, 1 April 2017, Pages 578–588.

[10] Sullivan Larry P. Quality Function Deployment – a system to assure that customer needs drive the product design and production process // *Quality progress.* – 1986. - №6. P. 39-50.

[11] Vahouni G. V. Quality Function Deployment / G. V. Vahouni // *Fed. Pros.*, 1982. Vol. 41. №11. – P. 2801-2806.

[12] Bond, M., Meacham, T., Bhunnoo, R., Benton, T.G., 2013. Food waste within global food systems. A Global Food Security report. Available at: www.foodsecurity.ac.uk

[13] National Institutes of Health Consensus Development Conference. "Lactose Intolerance and Health." February 22-24, 2010. <http://consensus.nih.gov/2010/lactosestatement.htm>. Accessed March 1, 2010. (Lactose Intolerance and Health,2010)

[14] Laneville S.I. Effect of preparation conditions on the characteristics of whey protein - xanthan gum complexes / Laneville S.I., Paquin P., Turgeon S.L. // *Food Hydrocolloids.* - 2000. T. 14. - № 4. - C. 305-314.

[15] European Commission, 2013. Food industry. Available at: http://ec.europa.eu/enterprise/sectors/food/eu-market/index_en.htm

[16] Tsuda H. Milk and dairy products in cancer prevention: focus on bovine lactoferrin / Tsuda H., Sekine K., Ushida Y., Kuhara T., Takasuka N., Igo M., Han B.S., Moore M.A. Mutation // *Research/Reviews in Mutation Research.* - 2000. T. 462. - № 2-3. - C. 227-233.

[17] Moorman, P. G. and Terry, P. D., Consumption of dairy product and the risk of breast cancer: a review of the literature, *Am. J. Clin. Nutr.*, 80, 5, 2004. (Moorman, P. G. and Terry, P. D.,2004)

[18] Heaney RP. Effects of protein on the calcium economy. In: *Nutritional Aspects of Osteoporosis* 2006. Burckhardt P, Heaney RP, Dawson-Hughes B, eds. Elsevier Inc., Amsterdam, 2007, pp. 191. (Heaney RP, 2007)

[19] Høst A. Cow's milk protein allergy and intolerance in infancy. Some clinical, epidemiological and immunological aspects. *Pediatr Allergy Immunol* 5:1-36, 1994. (Høst A.1994)

[20] Suchy FJ, Brannon PM, Carpenter TO, Fernandez JR, et al. National Institutes of Health Consensus Conference: Lactose Intolerance and Health. *Ann Intern Med* 2010;152(12):792-796. (Suchy FJ, et al.,2010)

[21] <http://www.nti2035.ru/>