

Chapter 3

ENSURING COMPETITIVENESS AND THE FORMATION OF NEW FORMS OF ENTREPRENEURSHIP IN PANDEMIC CONDITIONS

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**ENSURING THE
COMPETITIVENESS
OF RESTAURANTS
BY DETERMINING
THE QUALITY OF
DIETS**

Introduction

A qualitative index of a product is a quantitative characteristic of one or several properties of a product, which characterize its quality, and is considered in terms of certain conditions of its creation, exploitation or consuming (Azgaldov, Kostin, 2011; Topol'nik, Ratushnyj, 2008) [1, 2].

According to the amount of characterized properties the indexes are divided into simple and complex (Topol'nik, Ratushnyj, 2008) [2]. Simple qualitative index identifies one of its properties, for example contents of water, sugar, fat etc (Kuzmin et al, 2014, 2016, 2017, 2020)

[3-7]. They are determined by the industry regulatory document.

Complex index identifies several properties of a product. It can be related to both set of properties, which determine quality and certain group of properties (Topol'nik, Ratushnyj, 2008) [2]. If ever one index is equal to zero, complex index is also equal to zero (Azgaldov, Kostin, 2011; Topol'nik, Ratushnyj, 2008) [1, 2].

There are two methods of a product quantitative estimation – differential and complex. A product quantitative estimation is a set of operations, which includes: qualitative indexes' nomenclature selection of a product, value determination of these indexes and their comparison with basic indexes (Niemirich, Novosad, 2013) [8].

Qualimetric methods can be used in any food as well as the results of their research. Method of a product quantitative estimation is based on comparison of the set of simple indexes' values of an estimated product with a certain set of base indexes' values, called differential (Topol'nik, Ratushnyj, 2008) [2].

Complex method of a product quantitative estimation is based on expressing of the estimation rate by one number, which is a result of grouping of selected simple indexes to one complex index (Azgaldov, Kostin, 2011; Topol'nik, Ratushnyj, 2008) [1, 2].

Each qualitative index, being a quantitative characteristic (extent) of one of object's quality model (fact) should reflect (to greater or lesser extent) the ability (property) of the object (fact), meet public demands (interests, values) in certain conditions. Therefore, in order to form a qualitative index we should take into account following qualitative components: public demand, certain conditions, object and extent of its meeting. Qualitative index should provide an answer to the question: to what extent is this object (fact) able to meet public demand (interest, value) (Topol'nik, Ratushnyj, 2008) [2].

Well grounded choice of production indexes in estimating its qualitative rate has high priority. In order to make this choice, we should have at hand the nomenclature of qualitative indexes' groups which meets demands of need and sufficiency.

Materials and methods

The daily ration of human nutrition (breakfast, lunch, dinner) and the norms of the physiological needs of the average person – to determine the complex quantitative assessment of the quality of diets. An additive mathematical model as most widespread in a qualimetry is used for joining the quality rating into the generalized (complex) index. Methods

– qualimetric (Azgaldov, Kostin, 2011; Topol’nik, Ratushnyj, 2008) [1, 2]. Method of a diet complex quantitative estimation (Topol’nik, Ratushnyj, 2008) [2]:

1. Index values for set diets are determined from the formula:

$$P_{ij} = \frac{M_{ij}}{\sum M_{ij}}, \quad (3.1)$$

M_{ij} – content of nutrient materials in group j in nutrition products included in the diet.

2. Analogously, due to recommended norm, basic indexes are determined:

$$P_{ij}^{basic} = \frac{M_{ij}}{\sum M_{ij}}, \quad (3.2)$$

M_{ij} – regulatory i nutrient material in group j of daily ration material.

3. Simple indexes’ estimation of proteins, fats, carbohydrates is calculated by the formula:

$$K_{ij} = \left(\frac{P_{ij}}{P_{ij}^{basic}} \right)^z, \quad (3.3)$$

P_{ij} – index of a nutrient material in daily ration;

P_{ij}^{basic} – basic (balanced) value of index of a nutrient material in daily ration (according to norms of physiological needs);

z – index, that considers the influence of changing index value on qualitative rate of an object, that is equal to plus 1 in proteins and carbohydrates content estimating and minus 1 in fats content estimating.

4. Weight coefficient value of nutrient materials m_{ij} is calculated by the formula:

$$m_{ij} = \frac{\frac{\sum P_{ij}^{basic}}{P_{ij}^{basic}}}{\sum \left(\frac{\sum P_{ij}^{basic}}{P_{ij}^{basic}} \right)}. \quad (3.4)$$

Complex qualitative index of meal due to nutrient materials equation for two-level structure is determined from the adaptive model:

$$K_o = \sum_{i=1}^l M_j \cdot \sum_{j=1}^{n_i} m_{ij} \cdot K_{ij} \quad , \quad (3.5)$$

M_j – weight coefficient value of nutrients.

Results and discussions

According to norms of physiological needs of a common person we have developed complex qualitative index of meal.

Norms of physiological needs of a common person at the age from 18 to 59 for total amount of nutrient materials, g: 617 (proteins – 88; fats – 107; carbohydrates – 422); total amount of mineral matters, mg: 11150 (sodium (Na) – 5000; potassium (K) – 3750; calcium (Ca) – 800; magnesium (Mg) – 400; phosphorus (P) – 1200); total amount of vitamins, mg: 90,3 (thiamine (B_1) – 1,6; ribofflavinum (B_2) – 1,8; perydoxine (B_6) – 1,9; cevitic acid (C) – 85,0).

1. Complex quality rating of breakfast

Due to norms of macronutrients, mineral matters and vitamins content, included in breakfast dishes, the calculation of nutrient materials found in canteen menu is provided (Table 3.1).

Absolute values of qualitative indexes of macronutrients, mineral matters and vitamins calculated by the formula (3.1) are the following: for proteins – $P_p = 0,19$; fats – $P_f = 0,32$; carbohydrates – $P_c = 0,49$; sodium – $P_{Na} = 0,65$; potassium – $P_K = 0,23$; calcium – $P_{Ca} = 0,02$; magnesium – $P_{Mg} = 0,02$; phosphorus – $P_P = 0,09$; thiamine – $P_{B1} = 0,01$; ribofflavinum – $P_{B2} = 0,01$; perydoxine – $P_{B6} = 0,01$; cevitic acid – $P_c = 0,97$.

Analogously to the recommended norms of physiological needs basic values have been determined from the formula (3.2). Basic qualitative indexes of macronutrients, mineral matters and vitamins are the following: for proteins – $P_p^{basic} = 0,15$; fats – $P_f^{basic} = 0,17$; carbohydrates – $P_c^{basic} = 0,68$; sodium – $P_{Na}^{basic} = 0,45$; potassium – $P_K^{basic} = 0,34$; calcium – $P_{Ca}^{basic} = 0,07$; magnesium – $P_{Mg}^{basic} = 0,03$; phosphorus – $P_P^{basic} = 0,11$; thiamine – $P_{B1}^{basic} = 0,02$; ribofflavinum – $P_{B2}^{basic} = 0,02$; perydoxine – $P_{B6}^{basic} = 0,02$; cevitic acid – $P_c^{basic} = 0,94$.

Table 3.1

**Calculation of macronutrients, mineral matters and vitamins
content included in breakfast dishes**

Nutrient materials	Name of the dish					Total
	White cabbage stewed	Butter.	Sausages of the 1st grade	Wheat bread from a flour of 1 grade	Black coffee with sugar	
Weight, g	100	10	100	100	200	510
Macronutrients, g:						
proteins	1,0	0,06	18,8	7,6	0,34	27,8
fats	3,2	8,25	34,0	0,9	1,10	47,45
carbohydrates	5,5	0,09	3,8	49,7	14,32	73,41
Mineral matters, mg:						
<i>Na</i>	754,0	7,40	1808,0	488,0	0,00	3057,40
<i>K</i>	468,0	2,30	424,0	127,0	77,00	1098,30
<i>Ca</i>	20,6	2,20	14,0	26,0	10,00	72,80
<i>Mg</i>	10,4	0,30	34,0	35,0	0,00	79,70
<i>P</i>	10,2	1,90	298,0	83,0	13,00	406,10
Vitamins, mg:						
<i>B₁</i>	0,01	0,00	0,0	0,16	0,00	0,17
<i>B₂</i>	0,01	0,01	0,0	0,08	0,00	0,10
<i>B₆</i>	0,03	0,00	0,0	0,06	0,00	0,09
<i>C</i>	12,00	0,00	0,0	0,00	0,00	12,00

Weight coefficient value of nutrient materials m_{ij} has been calculated due to the recommended norms of physiological needs by the formula (3.4). Weight coefficients are the following: proteins – $m_p = 0,50$; fats – $m_f = 0,40$; carbohydrates – $m_c = 0,10$; sodium – $m_{Na} = 0,03$; potassium – $m_K = 0,05$; calcium – $m_{Ca} = 0,25$; magnesium – $m_{Mg} = 0,50$; phosphorus – $m_P = 0,17$; thiamine – $m_{B1} = 0,36$; riboflavinum – $m_{B2} = 0,32$; perydoxine – $m_{B6} = 0,31$; cevitamic acid – $m_c = 0,01$.

Simple indexes' quality rating of proteins, fats, carbohydrates has been calculated by the formula (3.3) using data from. Simple indexes' estimation is the following: from proteins – $K_p = 1,31$; fats – $K_f = 0,54$; carbohydrates – $K_c = 0,72$; sodium – $K_{Na} = 1,45$; potassium – $K_K = 0,69$; calcium – $K_{Ca} = 0,22$; magnesium – $K_{Mg} = 0,47$; phosphorus – $K_P =$

0,80; thiamine – $K_{B1} = 0,78$; ribofflavinum – $K_{B2} = 0,41$; perydioxine – $K_{B6} = 0,35$; cevitamic acid – $K_c = 1$.

Complex qualitative index of meal due to nutrient materials equation for two-level structure has been determined from formula (3.5), in which weight coefficient values (M) are for macronutrients – 0,35; vitamins – 0,55; mineral matters – 0,1.

Due to the calculation results breakfast has complex quality rate $K_o = 0,67$.

2. Complex quality rating of dinner

Due to norms of macronutrients, mineral matters and vitamins content, included in dinner dishes, the calculation of nutrient materials found in canteen menu is provided (Table 3.2).

Table 3.2

Calculation of macronutrients, mineral matters and vitamins content included in dinner dishes

Nutrient materials	Name of the dish						Total
	Vinaigrette with herring	Rice soup	The liver is fried	Boiled pasta	Wheat bread	Kissel from cherries	
Weight, g	150	500	50	150	100	200	1150
Macronutrients, g:							
proteins	3,84	9,1	11,6	15,60	7,6	0,14	47,88
fats	0,23	10,4	5,1	1,35	0,9	0,00	17,98
carbohydrates	20,58	33,0	6,9	112,80	49,7	28,60	251,58
Mineral matters, mg:							
Na	159,00	1254,0	304,0	15,00	488,0	6,00	2226,0
K	432,00	174,0	133,0	186,00	127,0	46,00	1098,0
Ca	73,95	39,2	9,0	27,00	26,0	10,00	185,15
Mg	69,00	30,2	11,0	24,00	35,0	4,00	173,20
P	102,45	76,7	213,0	130,50	83,0	12,00	617,65
Vitamins, mg:							
B_1	0,14	0,11	0,16	0,26	0,16	0,00	0,82
B_2	0,21	0,09	1,31	0,12	0,08	0,00	1,81
B_6	0,30	0,29	0,79	0,09	0,06	0,03	1,56
C	26,10	8,30	0,00	0,00	0,00	4,00	38,40

Absolute values of qualitative indexes of macronutrients, mineral matters and vitamins calculated by the formula (3.1) are the following: for proteins – $P_p = 0,15$; fats – $P_f = 0,06$; carbohydrates – $P_c = 0,79$; sodium – $P_{Na} = 0,52$; potassium – $P_K = 0,26$; calcium – $P_{Ca} = 0,04$; magnesium – $P_{Mg} = 0,04$; phosphorus – $P_P = 0,14$; thiamine – $P_{B1} = 0,02$; ribofflavinum – $P_{B2} = 0,04$; perydioxine – $P_{B6} = 0,04$; cevitic acid – $P_c = 0,90$.

Quality rating of simple indexes for a group of nutrient materials has been determined from the formula (3.3), as a result the values are the following: for proteins – $K_p = 1,06$; fats – $K_f = 3,06$; carbohydrates – $K_c = 1,16$; sodium – $K_{Na} = 1,15$; potassium – $K_K = 0,76$; calcium – $K_{Ca} = 0,60$; magnesium – $K_{Mg} = 1,12$; phosphorus – $K_P = 1,33$; thiamine – $K_{B1} = 1,09$; ribofflavinum – $K_{B2} = 2,13$; perydioxine – $K_{B6} = 1,74$; cevitic acid – $K_c = 0,96$.

Complex qualitative index of meal due to nutrient materials equation for two-level structure has been determined from formula (3.5). Due to the calculation results breakfast has complex quality rate – $K_o = 1,65$.

3. Complex quality rating of supper

Due to norms of macronutrients, mineral matters and vitamins content, included in supper, the calculation of nutrient materials found in canteen menu is provided (Table 3.3).

Absolute values of qualitative indexes of nutrient materials calculated by the formula (1) are the following: for proteins – $P_p = 0,08$; fats – $P_f = 0,09$; carbohydrates – $P_c = 0,82$; sodium – $P_{Na} = 0,41$; potassium – $P_K = 0,35$; calcium – $P_{Ca} = 0,09$; magnesium – $P_{Mg} = 0,02$; phosphorus – $P_P = 0,13$; thiamine – $P_{B1} = 0,01$; ribofflavinum – $P_{B2} = 0,01$; perydioxine – $P_{B6} = 0,02$; cevitic acid – $P_c = 0,95$.

Quality rating of simple indexes of nutrient materials has been determined from the formula (3.3), as a result the values are the following: for proteins – $K_p = 0,59$; fats – $K_f = 1,83$; carbohydrates – $K_c = 1,20$; sodium – $K_{Na} = 0,91$; potassium – $K_K = 1,05$; calcium – $K_{Ca} = 1,26$; magnesium – $K_{Mg} = 0,65$; phosphorus – $K_P = 1,16$; thiamine – $K_{B1} = 0,70$; ribofflavinum – $K_{B2} = 0,75$; perydioxine – $K_{B6} = 1,00$; cevitic acid – $K_c = 1,01$.

Complex qualitative index of meal due to nutrient materials equation for two-level structure has been determined from formula (3.5). Due to the calculation results supper has complex quality rate – $K_o = 0,94$.

4. Complex quality rating of daily ration

According to the canteen menu original data is calculated for determination of daily ration (Table 3.4).

Table 3.3

**Calculation of macronutrients, mineral matters and vitamins
content included in supper**

Nutrient materials	Name of the dish				
	Milk soup with rice	Milk soup with rice	Custard gingerbreads	Tea with sugar	Total
Weight, g	250	100	50	200	600
Macronutrients, g:					
proteins	6,15	3,05	4,80	0,20	14,20
fats	7,85	5,25	2,80	0,00	15,90
carbohydrates	23,20	20,80	77,70	16,00	137,70
Mineral matters, mg:					
<i>Na</i>	455,50	384,00	11,00	0,00	850,50
<i>K</i>	191,50	479,00	60,00	6,00	736,50
<i>Ca</i>	150,50	27,60	9,00	1,00	188,10
<i>Mg</i>	20,50	26,75	0,00	1,00	48,25
<i>P</i>	122,50	97,15	41,00	0,00	260,65
Vitamins, mg:					
<i>B₁</i>	0,05	0,14	0,08	0,00	0,27
<i>B₂</i>	0,16	0,13	0,04	0,00	0,33
<i>B₆</i>	0,08	0,32	0,06	0,00	0,46
<i>C</i>	0,65	20,10	0,00	0,00	20,75

Absolute values of qualitative indexes of nutrient materials are the following: for proteins – $P_p = 0,14$; fats – $P_f = 0,13$; carbohydrates – $P_c = 0,73$; sodium – $P_{Na} = 0,55$; potassium – $P_K = 0,26$; calcium – $P_{Ca} = 0,04$; magnesium – $P_{Mg} = 0,03$; phosphorus – $P_P = 0,12$; thiamine – $P_{B1} = 0,02$; riboflavinum – $P_{B2} = 0,03$; perydoxine – $P_{B6} = 0,03$; cevitic acid – $P_c = 0,93$.

Quality rating of simple indexes of nutrient materials has been determined by the formula (3.3), as a result the values are the following: for proteins – $K_p = 0,99$; fats – $K_f = 1,35$; carbohydrates – $K_c = 1,07$; sodium – $K_{Na} = 1,23$; potassium – $K_K = 0,79$; calcium – $K_{Ca} = 0,56$; magnesium – $K_{Mg} = 0,76$; phosphorus – $K_P = 1,08$; thiamine – $K_{B1} = 0,93$; riboflavinum – $K_{B2} = 1,46$; perydoxine – $K_{B6} = 1,31$; cevitic acid – $K_c = 0,98$.

Complex qualitative index of meal due to nutrient materials equation for two-level structure has been determined from formula (3.5). Due to the calculation results daily ration has complex quality rate $K_o = 1,15$.

Table 3.4

Calculation of macronutrients, mineral matters and vitamins content for daily ration

Nutrient materials	Name of the dish			
	Breakfast	Dinner	Supper	Total
Weight, g	510,00	1150,00	600,00	2260,00
Macronutrients, g:				
proteins	27,80	47,88	14,20	89,88
fats	47,45	17,98	15,90	81,33
carbohydrates	73,41	251,58	137,70	462,69
Mineral matters, mg:				
<i>Na</i>	3057,40	2226,00	850,50	6133,90
<i>K</i>	1098,30	1098,00	736,50	2932,80
<i>Ca</i>	72,80	185,15	188,10	446,05
<i>Mg</i>	79,70	173,20	48,25	301,15
<i>P</i>	406,10	617,65	260,65	1284,40
Vitamins, mg:				
<i>B₁</i>	0,17	0,82	0,27	1,26
<i>B₂</i>	0,10	1,81	0,33	2,24
<i>B₆</i>	0,09	1,56	0,46	2,11
<i>C</i>	12,00	38,40	20,75	71,15

Obtained values of complex qualitative index of breakfast, dinner, supper and daily ration are brought in the Table 3.5.

Table 3.5

Complex quality rating of daily rations

Name	Breakfast	Dinner	Supper	Daily ration
K_o	0,67	1,65	0,94	1,15

Due to the data, we can draw a conclusion that the biggest value of the complex index $K_{o\max} = 1,65$ is obtained in breakfast, the lowest value is typical for dinner $K_{o\min} = 0,67$. Whereas, supper is considered to be the most balanced meal with value $K_o = 0,94$, which is close to the optimal value of complex quantitative rating $K_o = 1,00$. Quality rating of daily rations in hotels and restaurants provides an opportunity to

determine diet balance due to the norms of physiological need for daily ration.

Conclusions

Method of quality rating of daily rations in hotels and restaurants is considered. The structure of qualitative indexes and results of experimental research of complex diet quantitative rating are represented. Taking into account the norms of physiological need of a common person, complex qualitative rate of one meal and daily ration in a canteen is calculated. For this daily ration, complex qualitative indexes for group of macronutrients, mineral matters and vitamins are identified. The most balanced values of the complex qualitative index are determined which are common to super with rate $K_0 = 0,94$.

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