Zeszyty Naukowe
Quality. Production. Improvement

No. 2(3)
2015
pp. 88-99

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THE IMPROVEMENT OF PRODUCTION IN THE FOOD INDUSTRY

Abstract: This chapter presents an analysis of the answers given it the question contained in the BOST questionnaire referring to the Toyota's house roof (mission of enterprise). Enterprise producing food products were presented. It was shown analysis of respondent's characteristics. Next structure of assessments was determined and some statistical graphs were built.

Key words: BOST method, toyotarity, Toyota's house roof, importance series

1. Characteristics of the research enterprise

The researched enterprise was established in the fiftieth years of the 20th century. In the eighties it was built lobby of juices with the line for spilling them and building of the stamping press of fruits. In the nineties a new modernised line for apple concentrates was stayed. In this period for the enterprise worked about 950 persons. The fruit-vegetable food-processing of park is important and the biggest production part in the enterprise and the following sectors are entering its composition:

- fruit-and-vegetable processing - in large jars which are allocated for and wide assortment of canned vegetables for the export and local market. Here and production of preserves meant for commercial networks also takes squares under their private labels,
- juices and drinks - production of nectars, juices and drinks about and large number of different tastes,

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– food concentrates - here is mainly a production of concentrate and the apple aroma, concentrate of the black currant and cherry.

At present enterprise have 84 containers about total volume 2100 ton that are destined for storing concentrate.

One of the main products of the enterprise is gherkins. They are product mainly from cucumbers. It should be fresh, healthy, without mechanical damages. The shape of the cucumber should be straight (about the maximum bow 10mm), the colour of the cucumber should be green (typical of the variety). It is pouring over gherkins about the concentration 1.5% is consisting of: acetic acid 10%, water, the somersaults and the sugar. Next are added spices for gherkins: the black pepper, the marjoram, the bay leaf, the horseradish, the garlic, the dill and the allspice. They are packed in the ravine twist-off for capacities 0.9 litre. The production process of gherkins consists of many operations and the preparatory action. The longest during the production process is operation 5, where the time of soaking cucumbers lasts from 1h to 27h, and the pasteurization lasts for 30 minutes. Applied methods of the gherkins control are the following: the method of indicating the general acidity, the conventional method, the method of determining mass of vegetables, the visual method. In Table 8.1 and division put together of technological operations stayed with taking the duration of the operation into consideration and the number of workers needed for the workmanship. Production process of gherkins id divided on adding value, not-adding value and essential operations not-adding value.

Table 1. The combination of technological operations adding value, not-adding value and essential not-adding value

No.	Name of operation	Time	Operation			
			Adding	Not-adding value	Essential not-adding value	Number of workers
1.	Magazine of raw materials	-		✓		1
2.	Transport	30s		✓		1
3.	Preliminary control	1min			✓	4
4.	Transport	30s		✓		-
5.	Preliminary processing	2h				1
6.	Transport	30s		✓		-
7.	Real processing	1min				1
8.	Transport of cucumbers	20s		✓		-
9.	Technological and test operation	3min			✓	1
10.	Transport of cucumbers	1min		✓		-
11.	Magazine	-		✓		1
12.	Transport	15s		✓		3
13.	Preliminary processing	5min				-
14.	The technological operation and the transport	2min				-
15.	Operation of the final control	30s			✓	2
16.	Transport	15s		✓		-
17.	Magazine of raw materials	-		✓		1
18.	Operation of the control and the transport	2min				1
19.	Preliminary processing	20s				3
20.	Transport	10s		✓		-
21.	Real processing	10s				-
22.	Operation of the control and	15s			✓	2

	the transport					
23.	Appropriate operation	10s				1
24.	Transport	15s		✓		-
25.	Technological operation	30s				1
26.	Transport	45s		✓		-
27.	Technological processing	30 min				1
28.	The technological operation and the transport	5min				-
29.	Technological operation	1min				2
30.	Technological operation	15s				2
31.	Transport	20s		✓		-
32.	Technological operation	10s				1
33.	Operation of the control and the transport	25s			✓	1
34.	Technological operation	1min				2
35.	Operation of the transport	15s		✓		1
36.	Operation of storing	-		✓		1

Source: own study

2. The way of results obtaining

In the enterprise a BOST survey was conducted. In the purpose to form an opinion it is essential to know the opinion of workers from different ranks in enterprise. It was made on the base of 14 principles of the Toyota (BORKOWSKI S. 2012a). It lets on better look on the enterprise by eyes of workers. BOST is survey where the questions are so well-matched as to judge enterprise and its immaterial stores are possible.

This chapter presents an analysis of the answers given to the question contained in the BOST questionnaire, referring to the roof of Toyota's house (mission of enterprises) (BORKOWSKI S. 2012b).

Employees have answered the following question: *"**Which factor is the most important in your enterprise?"*** Fill in the blanks with 1; 2; 3; 4; 5 (5 the most important factor) (BORKOWSKI S. 2012c).

JA		Quality
KO		Cost
CR		Execution time
BP		Work safety
MZ		Attitude of the crew

In Table 2 was presented characteristics of respondents in table set.

Table 2. Respondents features in researched company

Sym-	Feature indication and its characteristics					
bol	MK	WE	WI	SC	MR	TR
1	Man	<Average	< 30	< 5	1	Normal
2	Woman	Average	31 - 40	6 to 10	2	Transfer
3		Higher I	41 - 50	11 to 15	3	Finance
4		Higher II	51 - 55	15 to 20	4	
5			56 - 60	21 to 25	5	
6			61 - 65	26 to 30	6	
7			> 66	31 to 35		
8				> 36		

Source: own study

In the Fig 1 was presented in the graphic way numerical characteristics of respondents of the examined enterprise.

Analysing Fig. 1a it was claimed that amongst respondents was more women. Respondents constitute the highest group with the university education (Fig. 1b). Analysing the age of respondents (Fig. 1c) constitute that the largest group is to 30 year of the life. Fig. 1d is presenting the number of respondents on account of the work experience.

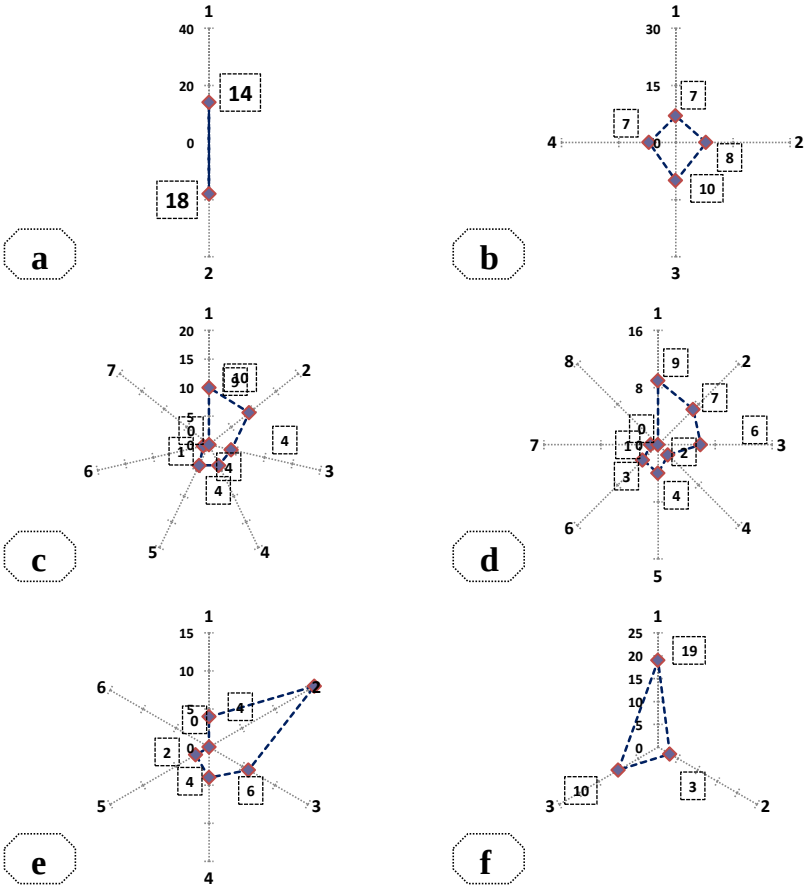


Fig. 1. Numerical (radar graph) characteristics of respondents with consideration: a), gender, b) education, c) age, d) work experience, d) mobility, e) way of recruitment.

Source: own study

Workers constitute a large number of respondents, that with work experience below 5 years. Analysis of the mobility of workers (Fig. 1e), is showing, that the enterprise is the second place of employment for them. Way of employment (Fig. 1f) is pointing, that 19 persons from respondents was employed in the normal mode.

3. The results concerning the structure

Fig. 2 is presenting box-and-whisker plot and its elements: basic graphs, quartiles Q_1, Q_2, $M - Q_1$, $Q_2 - M$, length of the upper and bottom plot (BORKOWSKI S., KNOP K., BARTCZAK M. 2011).

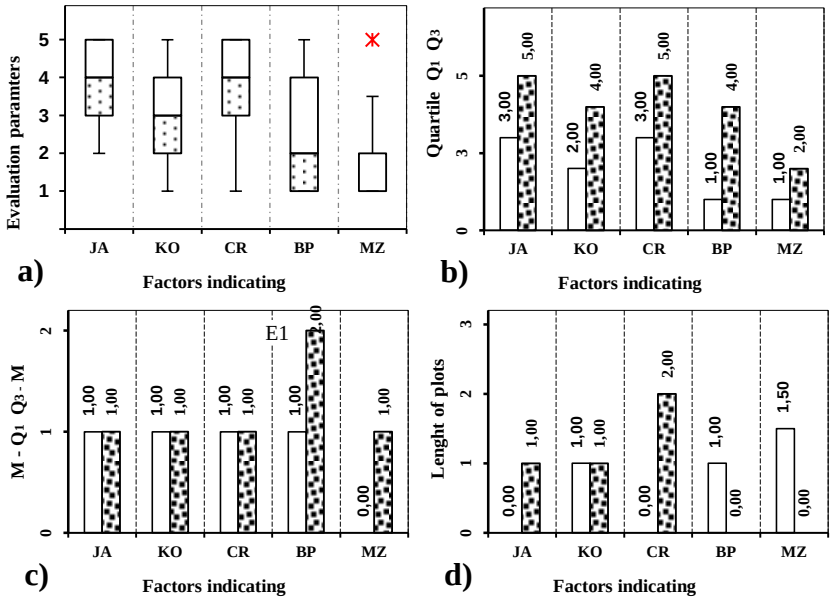


Fig. 2. Elements of the Toyota's house roof. Box-and whisker plots and its elements: a) basic graphs, b) quartiles Q 1 Q 2, c) M - Q 1, Q 2 - M appropriately, d) length of the plot: upper (without filling), bottom (filled) for factors in E1 area.

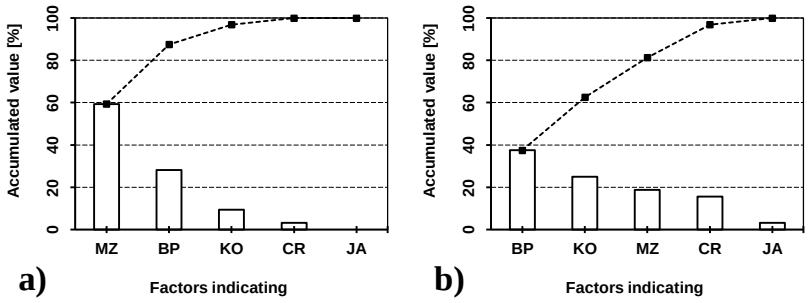
Source: own study

Analysing Fig 2a we notice that the strongest asymmetry of the disintegration refers to the factor *Execution time* (CR). Here a strong right-hand asymmetry of the disintegration is appearing. Disintegration of the factor *Attitude of the crew* (MZ) proves about right-hand skewness, where a positive asymmetry is appearing. Analysing the disintegration of

the factor *Cost* (KO) we notice that the most symmetrical disintegration of the factor is appearing, the plot is equal length however the box is divided evenly. Analysing Fig. 8.2b in the case of the factor *Quality* (JA) and *Execution time* (CR) the first quartile is 3, and third quartile 5. For the factor *Cost* (KO) amounts to the first quartile 4, and third quartile 3. Analysing the factor *Work safety* (BP) we notice that the first quartile is 4 but the third quartile is only 1. Analysing Fig. 3c it is possible to state, that in three cases the quality, the cost, execution time after subtracting the median from the first quartile the result is 1, from the third quartile of the median the result is also 1. Analysing the length of the plot (Fig. 2d) we notice, that in for two factors the quality and the execution time are not acting as the upper plot, however for three factors the job security, the morale of the crew and the cost are acting as the bottom plot.

4. Significance sequences deciding on the enterprise development

On the basis of numerical data and percentage structure of significance rates assigned to factors belonging to area E1 the Pareto charts have also been created and presented in Fig. 3. The Pareto chart shows, in descending order, relative share of each element in the overall effect. This method has been applied to demonstrate the participation of each element in the area, and then to arrange all elements according to their level of significance (BORKOWSKI S., ULEWICZ R. 2008).



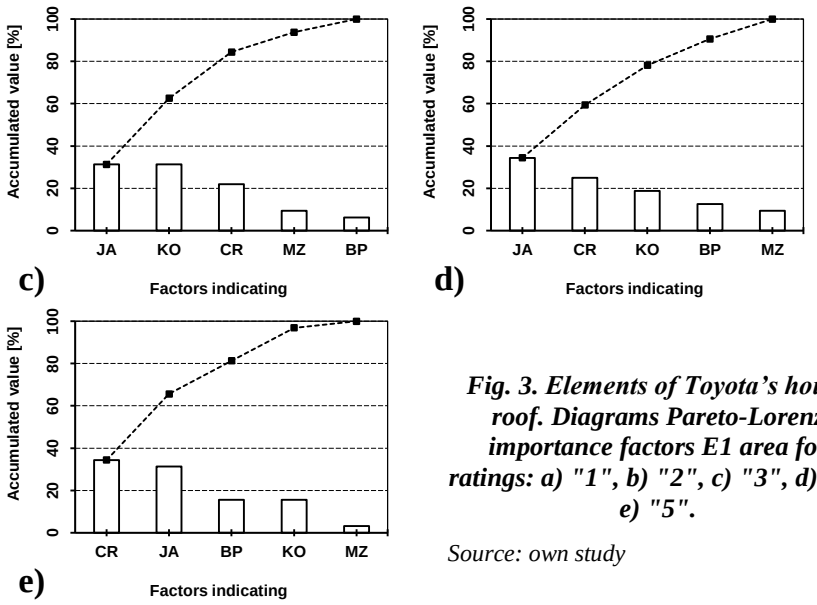


Fig. 3. Elements of Toyota's house roof. Diagrams Pareto-Lorenz importance factors E1 area for ratings: a) "1", b) "2", c) "3", d) "4" e) "5".

Source: own study

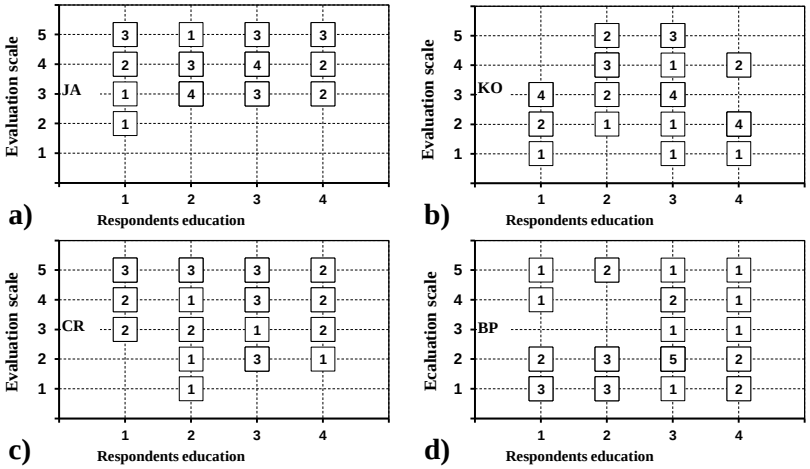
Large number of evaluations for the assessment „1" received a factor *Attitude of the crew* (MZ), and accumulated value is taking out nearly 60%. Factor *Quality* (JA) did not receive the lowest assessment. In Fig. 3b respondents factor *Work safety* (BP) have most often judged to the assessment „2", where accumulated value is taking out nearly 40 %, and factor *Quality* (JA) received fewest assessments on the level „2". In the case of Fig. 8.3c large number of voices on the assessment „3" received factor *Quality* (JA) and *Cost* (KO), where accumulated value for both taking out more than 30%. Factor *Work safety* (BP) was judged on the level „3" polled by the smallest group. Analysing Fig. 4d it is possible to notice, that factor Quality (JA) received the most votes for the assessment „4", and accumulated value is taking out 35%. In the case of the assessment „5" (Fig. 3e) factor *Execution time* (CR) was recognized as the most important in the examined enterprise. Also *Quality* (JA) was appraised highly by workers.

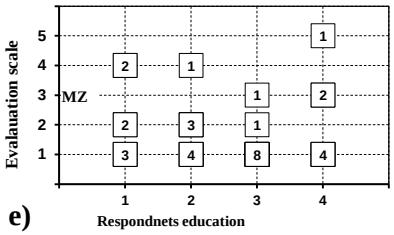
As a result of tests the following significance sequences have been determined:

- Evaluation "1": MZ > BP > KO > CR > JA,
- Evaluation "2": BP > KO > MZ > CR > JA,
- Evaluation "3": (JA ; KO) > CR > MZ > BP,
- Evaluation "4": JA > CR > KO > BP > MZ,
- Evaluation "5": CR > JA > (BP ; KO) > MZ.

5. Map of choice numbers for a given rate depending on respondents' features

Fig. 4 presents the significance rate for the factors from the E1 area depending on respondents' feature - education.





e)

Fig. 4. Elements of Toyota's house roof. An influence of respondents education on topography maps of evaluation for factors in E1 area: a) JA, b) KO, c) CR, d) BP, e) MZ.

Source: own study

Analysing Fig 8.4a we notice, that the factor *Quality* (JA) was recognised as the most important (assessment „5") by 1 person with the average education and by 3 persons with the lowlier than averages, higher I and higher II. Analysing the disintegration of voices for the factor *Cost* (KO) (Fig. 4b) we state that assessment „5" pointed 2 persons having averages educating and 3 persons with higher II education level. Analysing Fig 8.4c we state, that the *Execution time* (CR) in the enterprise was judged by the importance of the factor to the assessment „5" by 2 persons having the higher II university education and 3 persons with educations lower than average. Analysing Fig 8.4d we state that the influence of the education did not influence for the factor Work safety (BP) because on distribution of evaluations. Disintegration of assessments for the factor *Attitude of the crew* (MZ) (Fig. 4e) is the following: 1 person with the higher II university education recognised as most important for the enterprise this factor. The lowest assessment for this factor was shown by 3 respondents with the lowlier than averages education, for 4 respondents with the average and higher II education.

6. Summary

The BOST survey conducted in enterprise representing food industry, with particular focus on the question concerning the elements of the roof of Toyota's house. In the enterprise a BOST method was conducted, 32 persons filled in a questionnaire. The results has demonstrated that employees regard *Quality* (JA) as the most important element in their

companies. It is confirmed by the significance of the factor sequences – elements of the roof of Toyota's house. Attitude of the crew (MZ) and Work safety (BP) is perceived by employees as the least important element. This may be caused by the fact that the surveyed enterprises are modern enterprises, which pay special attention to the safety of employees, therefore the staff feels so secure that it treats safety at work as a secondary element.

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