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Krzysztof Mielczarek [1], *Marek Krynke*[2]

PRODUCTION IMPROVEMENT IN THE ENTERPRISE FROM METALLURGICAL BRANCH

Abstract: In the chapter were presented enterprise producing iron goods. Results of the BOST survey were introduced. The research was connected with the first Toyota management principle. It was made analysis of respondent's characteristics among the employees of enterprise. Structure of rates for factors describing the first Toyota management principle and significance sequences deciding on the development of enterprise was presented.

Key words: BOST method, toyotarity, the metallurgical industry, first Toyota management principle

1. Characteristics of the researched enterprise

Research company is one of the largest steel manufacturers in Poland. It is producing: long products – section iron, tracks and train accessories, mining casings used in the building, the track transport and the mining industry and flat products - used by the automotive industry, home appliances and building industry. In the chapter was presented one department being located in southern Poland.

The following production units are included in a Unit: production of limestone for the steelworks and agglomerating plant and converter plant with three converter. Steel producing is a complex process. In it physical and chemical reactions are occurring oxidizing and reducing, running in liquid steel and in cinder and on the border between them, as well as between the cinder track with atmosphere of the stove.

[1] mgr inż., Politechnika Częstochowska, Wydział Zarządzania, Instytut Inżynierii Produkcji, e-mail: mielczarek@zim.pcz.pl
[2] dr inż., Politechnika Częstochowska, Wydział Zarządzania, Instytut Inżynierii Produkcji, e-mail: krynke@zim.pcz.pl

Converter method consists in blowing oxidizing gas through (air or oxygen) through the molten crude iron. Then silicon, manganese and coal are oxidizing included in the crude iron, and sometimes sulphur and phosphorus. Hot metal ladle (Fig 1) is being prepared in the Workshop before every trigger from the converter.

Fig. 1. Hot metal ladle in the researched company.
Source: own study

Apart from steel in the oxygen converter also a converter cinder track that is being evacuated to the pile-driver with the help of slag ladge.

2. Presentation of respondent's structure

The personnel rating are the best indicator of the correctness of individual areas in the enterprise (SYGUT P. 2014). To the purpose of analysing satisfying the staff, a hierarchy of importance of influencing factors to the correctness of action given area and raising the quality by

the vision and satisfying in the company, a BOST questionnaire form was carried out (KRYNKE M., MIELCZAREK K. 2014).

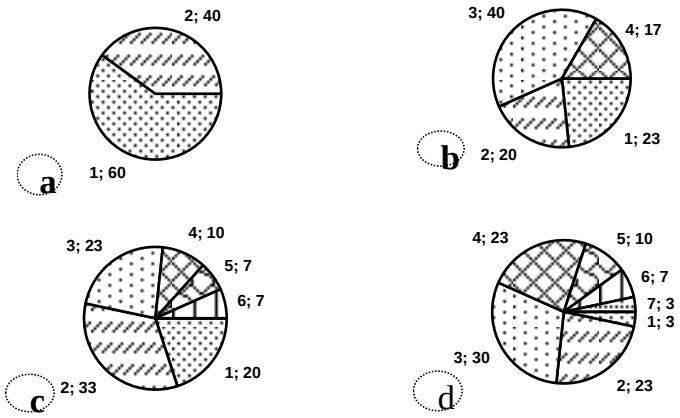
In Table 1 was presented characteristics of respondents in table set.

Table 1. 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

On the basis of collected results circular graphs presenting participation of the given feature in the set (Fig. 2).



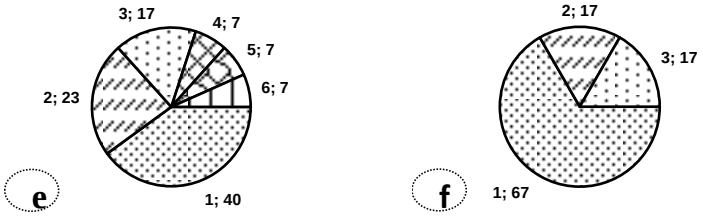


Fig. 2. Percentage (circular charts) characteristics of respondents with consideration: a) gender, b) educations, c) age, d) work experience, e) mobility, f) way of employment.

Source: own study

From all respondents, women presents 40% of examined crew (Fig. 2b). The majority of respondents has the university education. In the case of age (Fig. 2c) the most workers were from 31 to 40 years (33% of examined crew). The largest groups constituted persons with the work experience on level 11 - 15 years (30%). Analysing the personal feature of respondents – mobility (Fig. 2e) we observed that persons, for whom the current job is first constituted the majority of respondents. Analysing way of recruitment (Fig. 2f) we noticed that persons with contract of employment constituted the largest group – (67% of the whole).

3. List of results basing on first Toyota management principle

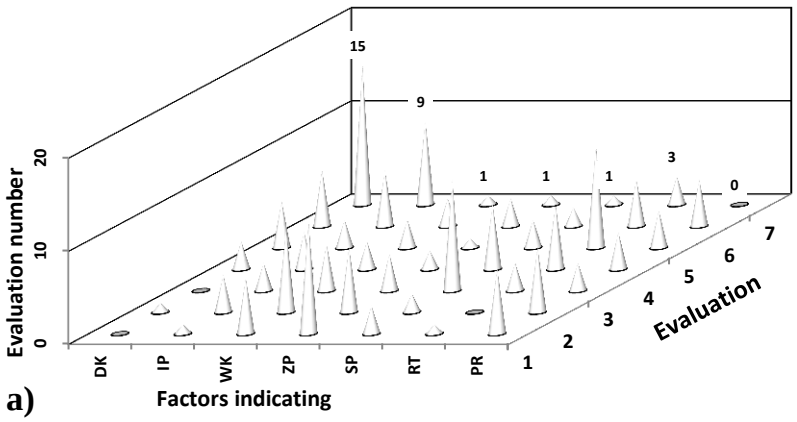
Tests were carried out based on conducted BOST surveys (BORKOWSKI S. 2012b) among the employees of the chosen enterprise (metallurgical company). Respondents were asked to answer the following question (BORKOWSKI S., MIELCZAREK K., BARTELEWSKA A. 2011):

What factors decide the development concept of your company? Fill the blanks with 1; 2; 3; 4; 5; 6; 7 (7 the most important factor) (BORKOWSKI S., KNOP K., BARTCZAK M. 2011)**.**

DK		Customer's interest

IP		Product innovation
WK		Cooperation with partners
ZP		Confidence in relations with employees
SP		Independence and responsibility of employees
RT		Development of technology
PR		Company culture care

Spatial arrangements being a visual comparison were created of value of evaluations in individual scales for the concrete factor – Fig. 3. In Fig. 3a numerical structure of evaluations get by every factor from respondents was presented and in Fig. 3b presents spatial percentage structure of factors evaluations. The last line in the Fig. concerns evaluation 7 and are presenting general disproportion in the scope of appearing of assessments for individual factors describing first Toyota management principle.



a)

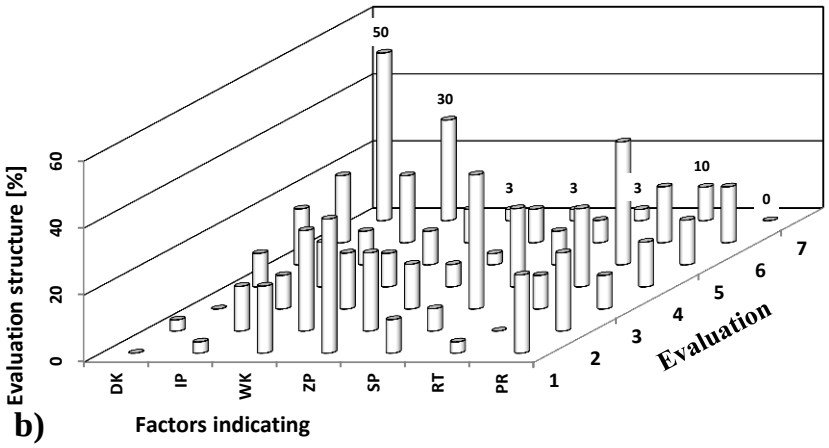


Fig. 3. Spatial presentation of results: a) numbers of evaluations, b) structures of evaluations.

Source: own study

Analysing included data in the Fig. we state that in a production process according to respondents the most important element was: *customer's interest* (DK). It received 15 voices for assessment 7 what constitutes the half of all voices for this factor. For respondents *product innovation* (IP) was also an important facto r– 9 voices (30% of the whole). The most evaluations 1 received a factor *confidence in relations with employees* (ZP). It received 40% voices for these evaluations – 12.

4. Structure of rates for factors describing the first Toyota management principle

A structure of evaluations from respondents for each factors describing the first Toyota management principle is a next element of analysis (BORKOWSKI S. 2012a). In Fig. 4 a graphical disintegration of shares was presented for every evaluations of for average.

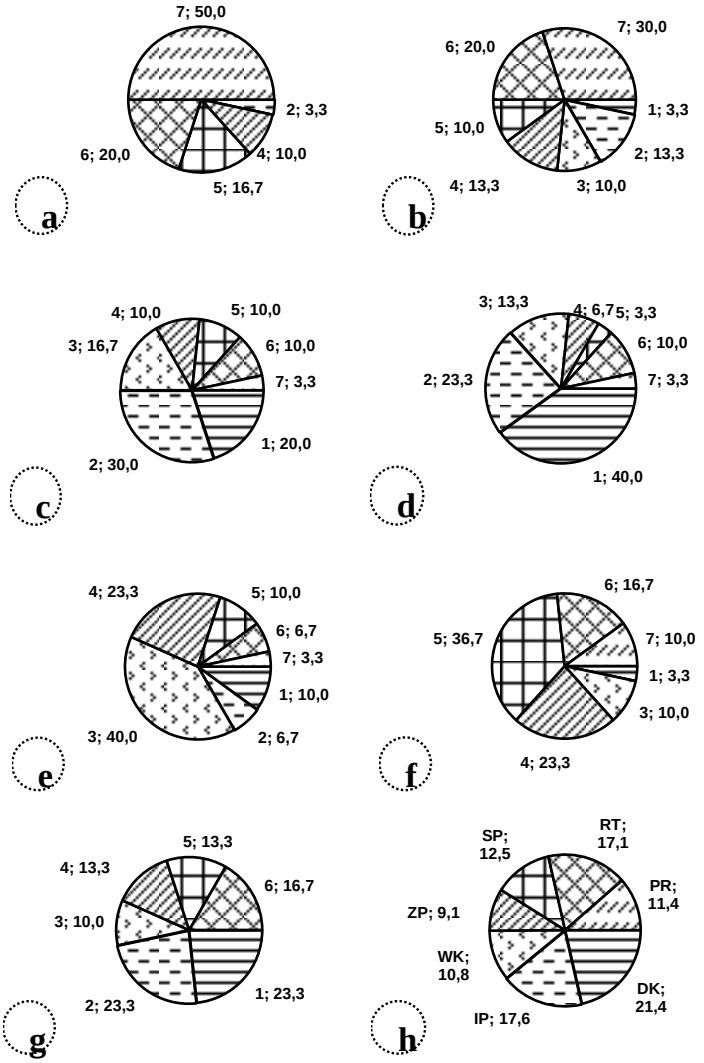


Fig. 4. Circular charts - structure of importance evaluations for factors of first Toyota management principle: a) DK, b) IP, c) WK, d) ZP, e) SP, f) RT, g) PR, h) average.

Source: own study

Analysing the structure of evaluation (Fig 4a) concerning *customer's interest* (DK), it is possible to observe that this factor is playing a significant role for respondents. 50% assigned the whole of respondent's evaluation „7". The remaining structure of assigned evaluations in the decreasing order given by respondents looks as follows: evaluation „6" – 20% respondents, the evaluation „5" – 16.7 %. It results from it that for respondents this factor is playing considerable influence in the development of the enterprise. Describing Fig. 13.4h containing medium importance of evaluations for each factor we observed, that biggest average received a factor *customer's interest* (DK) - 21.4 %, and a factor *product innovation* (IP). – 17.6% .The least received a factor *confidence in relations with employees* (ZP). – 9.1%. In the development of the enterprise a good of the customer, an innovation of the product are most important according to respondents.

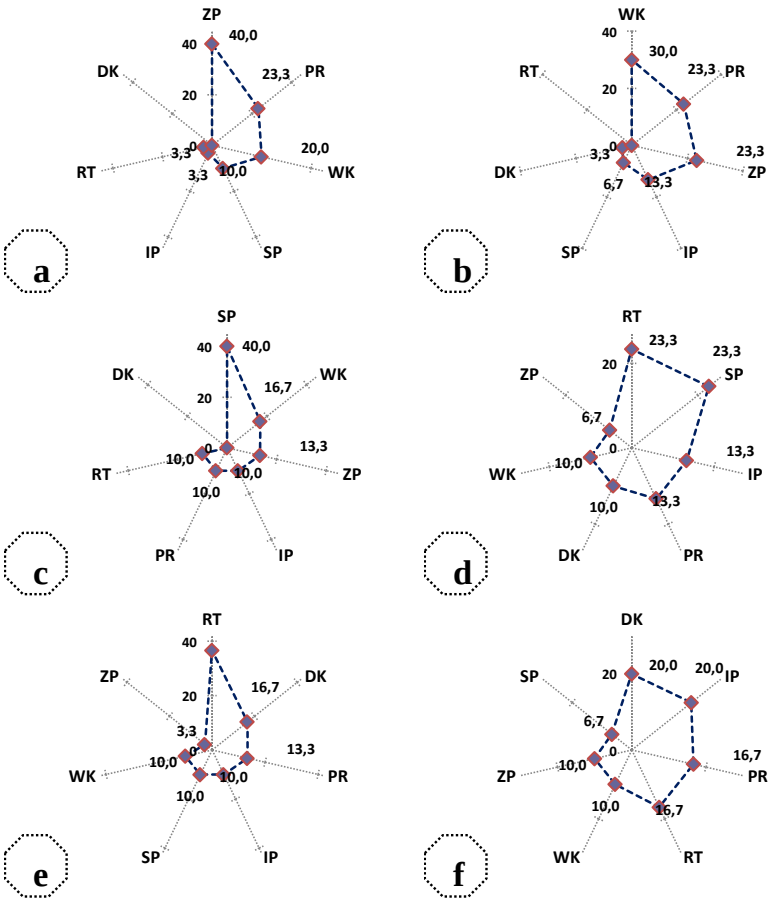
The structure of the BOST questionnaire form concerning the first Toyota management principle is characterized by the fact that should appropriately put factors in order in turn from most important assigning evaluation 7 to least important – assigning the evaluation one. In Table 2 spreading of individual factors was described.

Table. 2. Place of factors describing first Toyota management principle in importance series for individual evaluations

Evaluation	Place of factors in importance series						
	1	2	3	4	5	6	7
1	*ZP*	*PR*	*WK*	*SP*	*IP*	*RT*	*DK*
2	*WK*	*PR*	*ZP*	*IP*	*SP*	*DK*	*RT*
3	*SP*	*WK*	*ZP*	*IP*	*PR*	*RT*	*DK*
4	*RT*	*SP*	*IP*	*PR*	*DK*	*WK*	*ZP*
5	*RT*	*DK*	*PR*	*IP*	*SP*	*WK*	*ZP*
6	*DK*	*IP*	*PR*	*RT*	*WK*	*ZP*	*SP*
7	*DK*	*IP*	*RT*	*SP*	*WK*	*ZP*	*PR*

Source: own study

On the basis of Table 2 radar graphs introduced in Fig. 5 were created. It shows importance depicting the percentage disintegration of factors describing the first Toyota management principle. On individual graphs they are arranged in the decreasing order according to the direction of movement of pointers of the clock having begun from hour 12:00, percentage shares of the assigned evaluations by respondents for each factor.



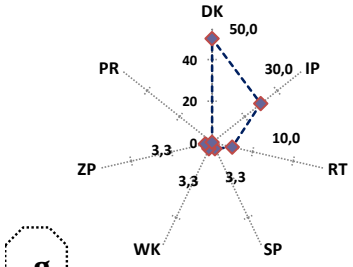


Fig. 5. Radar graph for importance factors of first Toyota management principle for evaluations: a) „1", b) „2", c) „3", d) „4, e) „5", f) „6", g) „7".
Source: own study

Basing on data included on radar graphs the importance series for individual evaluations were built:
evaluation 1:

$$ZP > PR > WK > SP > (IP; RT) > DK \quad (1)$$

evaluation 2:

$$WK > (PR; ZP) > IP > SP > DK > RT \quad (2)$$

evaluation 3:

$$SP > WK > ZP > (IP; PR; RT) > DK \quad (3)$$

evaluation 4:

$$(RT; SP) > (IP; PR) > (DK; WK) > ZP \quad (4)$$

evaluation 5:

$$RT > DK > PR > (IP; SP; WK) > ZP \quad (5)$$

evaluation 6:

$$(DK; IP) > (PR; RT) > (WK, ZP) > SP \quad (6)$$

evaluation 7:

$$DK > IP > RT > (SP; WK; ZP) > PR \quad (7)$$

Analysis of the relation showed that for all cases of the equal percentage participation of given factors had appeared. Factors in brackets are a symbol of identical value meaning the case of these factors

for the given evaluation. An occurrence of the change of the factor position in the importance series is also happening together with the height of a marking scale. Factor *customer's interest* (DK) appeared on the position dominating only for evaluation „6" and „7". For the evaluation „1" and „3" the factor took the last place.

5. Summary

The starting point for changes (improvement) is recording the existing condition. The present situation is definitely known best by participants of the processes implemented in a given enterprise. It was put through a research enterprise from the metallurgical branch. Employees were asked to produce their opinions on the present condition of the glassworks company and as respondents they expressed their opinions concerning strategic development factors contained in the description of the first Toyota management principle.

The BOST method was used to achieve this goal.To sum up it is possible to notice the importance of factors determining the first Toyota management principle, that a factor *customer's interest* (DK) is most important for respondents. This factor got the average evaluation from respondents on the level 6.0. A second factor was *product innovation* (IP) with average on the level 4.9. Not much less 4.8 received a factor *development of technology* (RT). A factor in the fourth position is *independence and responsibility of employees* (SP) with average on the level 3.5. A factor that got the smallest average of evaluation from respondents is *confidence in relations with employees* (ZP) – 2.5. Carrying out analysis of respondent's replies subjected to the BOST questionnaire form showed the diversity, as for importance of subjective factors describing the first Toyota management principle. In this way the correctness of factors selection which describes the first Toyota's management principle has been proved and confirmed by rates, which have demonstrated diversity in terms of statistical features and

significance sequences. Therefore, they are "sensitive" to conditions existing in this particular enterprise.

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