VISUAL CONTROL AS A KEY FACTOR IN A PRODUCTION PROCESS OF A COMPANY FROM AUTOMOTIVE BRANCH

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Resume
This article presents a theoretical basis for one type of control in enterprises – visual control. It presents the meaning of visual control in the Toyota Production System and BOST researches as a tool of measure, among other things, the importance of visual control in production companies. The level of importance of visual control usage as one of the production process elements in the analysed company was indicated. The usage of visual control is a main factor in a production process of the analyzed company, the factor which provides continuous help to employees to check whether the process differs from the standard. The characteristic progression of production process elements was indicated and the SW factor (the use of visual control) took the third place, PE factor (interruption of production when it detects a problem of quality) turned out to be the most important one, while the least important was the EU factor (granting power of attorney down). The main tools for this evaluation : an innovative BOST survey - Toyota's management principles in questions, in particular, the Pareto-Lorenz diagram, radar graph and series of importance as graphical interpretation tools, were used to present the importance of each factor in relation to individual assessments.

Available online on April 2013: http://www.qpij.pl/

Article info

Article history:
Received 10 September 2013
Accepted 07 November 2013

Keywords:
visual control,
BOST method,
survey,
importance,
Pareto-Lorenz diagram.

ISSN 2353-5156

1. A visual control and its meaning in the Toyota Production System

Visual control (visibility management, management by visibility, management by sight) is any communication device used in the work environment that tells us at a glance how work should be done and whether it is deviating from the standard. Visual controls are designed to make the control and management of a company as simple as possible.

The techniques of visual control include: *5S principle, light signaling (the so-called andon), sign of the floor, sign boards, the border examples of products, Kanban cards, working instruction*s (Fig. 1). The best visual indicators are right at the work site, where everyone can jump out at you and clearly indicate by sound, sight, and feel the standard and any deviation from the standard. Visual control focuses on the principle that "picture says more than 100 words."

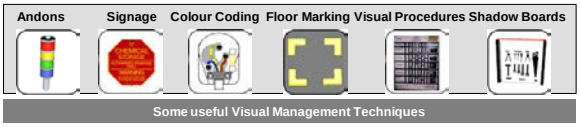

Fig. 1. Examples of the visual control tools most commonly used

A visual control is a basic principle and element in many modern management and production and quality improvement conceptions, f.ex. *LEAN MANUFACTURING*, *GEMBA KAIZEN* and production systems in many of the biggest production companies in the

world, among others, in *TOYOTA PRODUCTION SYSTEM*.

Visual control has a special place in the Toyota Motor Company. It is one of the production techniques that is connected with company's perfection and integrated with the process of increasing added values. The Toyota Way recognizes that visual control complements humans because we are visually, tactilely, and audibly oriented.

Visual control is an essential tool in the Toyota Production System. The 7th rule of the Toyota management claims: "*Use visual control so that no problems remain hidden.*"

Visual control brings the Toyota Motor Company measurable results:

- increasing productivity,
- reduces defects and errors,
- helps in meeting deadlines,
- it facilitates communication,
- improves safety, lowers costs and
- generally gives employees more control over their own environment (LIKER J.K. 2005, BORKOWSKI S., KNOP K. 2012).

2. BOST researches and visual control evaluation

The BOST researches - the Toyota management principles in questions - is a tool, exactly the survey which allowed MEASURING, among other things, the importance of visual control and its elements in a production and service company.

The BOST researches allow bringing answers to questions like:

- What is the meaning of individual elements of visual control?
- How the importance (of elements) of visual control is perceived by production workers and their supervisors?

There were constructed E3 and E7 questions in order to find answers to those questions (Fig. 2).

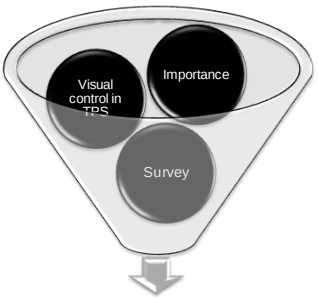

Fig. 2. Results of a filtration process – questions in the BOST researches concerning evaluation of visual control elements

The content of the E3 question is as follows: *What element is the most important one in the production process? Put 1, 2, 3, 4, 5, 6 (6 stands for the most important factor).*

CP		The continous system of problems disclosure
PE		Interruption of production when it detects a problem of quality
SZ		Standard tasks , processes , documents
EU		Granting power of attorney
ST		Use only reliable technology
SW		**The use of visual control**

The content of the E7 question is as follows: *Which element of visual control is the most important? Put 1, 2, 3, 4, 5, 6 (6 stands for the most important factor).*

CS		Cleanliness	UP		Participation in production places
EP		Flow	ME		Monitoring
TI		Signboard	GW		Graphic presentation of results

The estimation of these factors should be undertaken by production workers and their supervisors in order to find characteristic relations (BORKOWSKI S. 2009, BORKOWSKI S. 2012D, BORKOWSKI S., KNOP K., RUTKOWSKI T. 2011).

3. Results of visual control importance evaluation

A series of production process factors in the company of the automotive branch was determined. The E3 survey questions were sent and answers were received from 45 production workers and 15 managers of the audited entity. The question included in the BOST survey is of E3 area: *" What element is the most important one in the production process?"*. Respondents were asked to answer this question by making prioritization of six factors of the production process using a 1-6 scale.

Table 1 shows numerical and percentage (parentheses) juxtaposition of importance assessment for the factors of the E3 area (BORKOWSKI S., KNOP K., CHORYŁEK K. 2011).

Table 1. Numerical and percentage juxtaposition of importance assessment for the factors of the E3 area

Evaluation	Factors					
	CP	PE	SZ	EU	ST	SW
1	15 (25.0)	6 (10.0)	5 (10.0)	15 (25.0)	7 (11.7)	11 (18.3)
2	5 (8.3)	10 (16.7)	12 (20.0)	13 (21.7)	13 (21.7)	7 (11.7)
3	12 (20.0)	7 (11.7)	8 (13.3)	12 (20.0)	9 (15.0)	12 (20.0)
4	6 (10.0)	14 (23.3)	17 (28.3)	7 (11.7)	6 (10.0)	10 (16.7)
5	14 (23.3)	12 (20.0)	9 (15.0)	6 (10.0)	12 (20.0)	7 (11.7)
6	8 (13.3)	11 (18.3)	8 (13.3)	7 (11.7)	13 (21.7)	13 (21.7)

Basing on Table 1 the Pareto-Lorenz graphs were made to show the importance of the factors referring to the third principle of the Toyota manegement (WOLNIAK R., SKOTNICKA B. 2008) (Fig. 3).

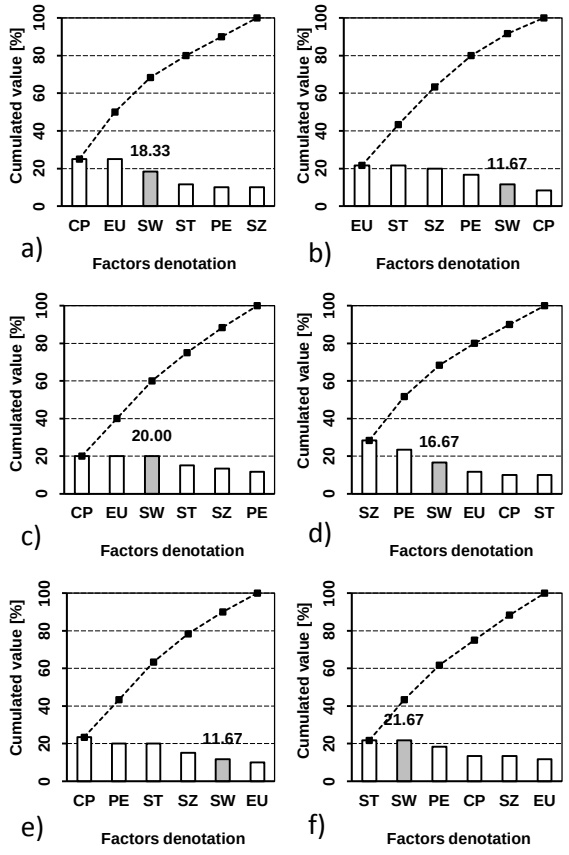

Fig. 3. Pareto-Lorenz graphs – evaluation structure for: a) "1", b) "2", c) "3", d) "4", e) "5", f) "6"

Figure 3 shows that the area of *the use of visual control (SW)* is an important factor in the production process of the analysed company, in total, the highest rating "4", "5" and "6" were indicated by 50.01% of the respondents. Taking this factor into account most of the ratings were at the level of "6" – 21.67%, while the minimum ratin was "2" – 11.67% of the responses.

According to the workers the *interruption of production when it detects a problem of quality (PE)* is the most important element of the production process; most of the respondents gave this factor the highest rating "5" and "6", respectively 36.66% and 53.33%.

Use only reliable technology (ST) is the second important factor of the production process, according to the respondents' opinion. 21.7% of responses give this factor the highest rating "6" and 20% give rating "5". The workers knew that the use of only reliable technology improves the production process, ensures high quality of the manufactured products and increases the comfort of work.

Standard tasks, processes, documents (SZ) for only 13.3% of the respondents had a big influence on the production process. The "5" rating gave 15% of the respondents; a similar proportion was noted for "3" rating – 13.3% of responses gave this rating. So we can state that *standard tasks, processes, documents* (SZ) are of average importance for the production process.

The continuous system of problems disclosure (CP) was not an important factor of the production process. The highest rating "6" was given only in 13.3% of the responses, whereas the least important "1" - in 25% of the responses. These ratings could speak well about a low consciousness connected with the importance of this factor and its influence on products quality.

Granting the power of attorney (EU) is the least important factor of the production process according to the employees. The percentage of the lowest ratings – "1" and "2" – amounted to 46.7%. Only 11.7% of the employees gave this factor the "6" rating.

With the use of a radar graph (Fig. 4) there was shown the average value of each of the production process factors (ULEWICZ R., MAZUR M., KNOP K. 2012).

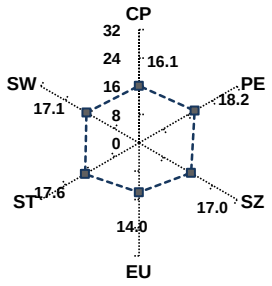

Fig. 4. Radar graph of the average of factors evaluation of E3 area

Based on this graph, a series of importance of the production process factors was constructed (Fig. 5).

Fig. 5. Characteristic series of importance of production process factors

We can notice that the factor *the use of visual control (SW)* occupied the third place in the series of importance of the production process factors.

4. Conclusions

The aim of this study was to evaluate the importance of the production process factors, in particular *the use of visual control (SW)* factor, in the company of the automotive industry. The main tool for this evaluation was an innovative BOST survey - Toyota's management principles in questions.

Basing on the findings of E3 area of BOST we can say that in the analysed company:

- the use of visual control is the main factor in the production process, it is a very important element which completes and intensifies other elements of the production system, it leads to a specific action and in the analysed company this usually means a problem-solving process,
- *the use of visual control (SW)* factor occupied the third place in the series of importance of the production process factors,
- the most important factor of the production process, according to the employees, was the *interruption of production when it detects a problem of quality* (PE), and the least important factor was *granting the power of attorney* (EU),
- a characteristic of the production process importance series can be presented by dependency: PE>ST>SW>SZ>CP>EU.

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