IMPORTANCE OF VISUAL MANAGEMENT IN METAL AND AUTOMOTIVE BRANCH AND ITS INFLUENCE IN BUILDING A COMPETITIVE ADVANTAGE

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Abstract: The aim of the study is to assess the extent to which visual management is significant in the production process on detecting problems in the production hall and in building an internal competitive advantage in the studied two strategic branches in Poland: metal and automotive. The innovative "BOST – Toyota's management principles in questions" survey research was used to assess visual management's importance. 20 companies were surveyed, and responses were obtained from 689 respondents. Analyses showed greater importance of visual management in the metal branch than in the automotive branch, while the greater impact of this system on revealing problems and building a competitive advantage in the automotive branch, which resulted from the specific objectives of this system in the analysed branches. The results emphasize the specific background of the importance of visual management in the analysed branches. The analysis linking the importance of the visual management system with the impact on creating a competitive advantage meets the expectations of managers looking for alternative and low-cost ways to increase the company's competitiveness. Companies need to understand that the sooner a problem is discovered, the better, because sooner can be taken corrective action to prevent it from happening again. Effective detection problems in the production hall supported by the visual management tools and their elimination is a way of reducing costs and building an internal competitive advantage.

Key words: visual management/control, 2nd Toyota's management principle, BOST research, competitive advantage.

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Introduction

To build a competitive advantage, manufacturing companies must continuously improve the quality of products and services offered. The high quality of manufactured products or services, combined with their quick delivery and attractive price, allows a company to generate an attractive market offer in line with customer expectations (Diaz-Garrido et al., 2008). Quality and efficiency are considered as a critical success factor by the management of prosperous organisations (Sütőová et al., 2018). In the course of the production or service process, managers face many problems. Their quick identification and effective

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solution increase the efficiency of the company operating and allow creating a competitive advantage (Sigalas & Pekka-Economou, 2013; Badenhorst-Weiss and Weber, 2016). Problems are steps that companies take on the road to be a better competitor (Abe et al., 2015). To identify quickly problems in the production hall or generally in a place where added value is created and to solve them, companies implement various approaches and use different tools. They implement management concepts such as Lean, Six Sigma, and TOC to be more effective in achieving your objectives in terms of quantity, quality, time, cost and health and work safetyn (Urban & Rogowska, 2020; Tran et al., 2020). They also use often-simple tools such as the Andon system or visual management/control systems so that problems can be seen immediately, at a glance for all concerned (Knop, 2020).
For the manufacturing company to be sure that it produces products that meet the customers' requirements, it must first control them. The control is an inseparable element of every production process, and so far, it has not been omitted, but attempts to improve it are still being made (Kang et al., 2018). Managers use management and control techniques in the workplace with a strong emphasis on their transparency (Albu & Flyverbom, 2016) which allow to quickly improving their processes. Their aim is to actively participate in all people in the company in the process of problem-solving, which demands mutual and quick communication about what happened and what is currently happening in a given area in the company (Kang et al., 2018) also in automated and robotic systems (Ulewicz & Mazur 2019). Easy access to information on the type of actions taken and the effects of these actions, as well as guidelines on how to deal with problems, allow to quickly identify problems that threaten the quality and minimise the time needed to take necessary remedial actions (Kleynhans, 2016). There is a need to provide information for employees in the points of 'value creation' (Jap. Gemba) the fastest and easiest possible way, the best by the 'first glance' (Suárez-Barraza et al., 2011). In this sense, companies use various types of solutions in the field of visual management, which help identify different problems at first glance, also quality problems, what allows eliminating them and may contribute to increasing the company's competitive advantage (Tezel et al., 2016). In this research area, an important issue for cognitive purposes is assessing the importance of the visual management system in the production process and analysis of the impact of that system on creating competitive advantage of enterprises.
The aim of the study is a comparative assessment of the importance of visual management in the production process, made by employees of 20 companies in the metal and automotive branches in Poland in one of the voivodship (1) as well as analysis of the impact of the visual management system on revealing problems and creating competitive advantage of enterprises (2). The first aim (1) is related to conducting a questionnaire survey called BOST (Borkowski et al., 2014), enabling the determination of the importance of visual control in the functioning of the production process. This goal is related to Toyota's second management principle,

which mandates the creation of a continuous and smooth process of revealing problems. The second aim (2) is related to using survey question regarding the analysis of the impact of the visual management system on revealing problems in the production hall, which gives companies the possibilities of creating a competitive advantage. The benefits of a visual management system in the aim of building a competitive advantage will be underlined.

Literature review

The terms coinciding with the Visual Management (VM) term are visual control, visual workplace, visual factory, shop floor management, visual tools and visual communication (Tezel et al., 2009). Bell & Davison (2013) stated that VM has two parts – the visual (something you can see) and the management (the action you take based on the visual). Liff & Posey (2004) indicated that it is a management system that attempts to improve organisational performance through connecting and aligning organisational vision, core values, goals and culture with other management systems, work processes, workplace elements, and stakeholders, using stimuli, which directly address one or more of the five human senses (sight, hearing, feeling, smell and taste). According to Galsworth (1997), VM is a management approach that utilises either one or more of information giving, signalling, limiting or guaranteeing visual devices to communicate with "doers", so that places become self-explanatory, self-ordering, self-regulating and self-improving. Several researchers emphasised that VM can be employed wherever there are a communication need and interaction between human and process elements (Bititci et al., 2016; Gergle et al., 2013). Visual management is generally can be used in any enterprise and in any process, not only in the production process but also in logistics process (Nowicka-Skowron & Ulewicz, 2015), maintenance and work safety (Ingaldi & Ulewicz, 2020).

In Toyota Motor Company (TMC), according to Liker (2004) the VM has a special place is one of the production techniques of the company's excellence, integrated with the process of creating added value. As Liker & Meier (2005) and Koskela et al. (2018) claimed, the VM is the heart of Toyota's production system, an essential element that complements and reinforces other elements of this system. For Toyota, the most important about VM is the fact that leads to undertaking a specific action, which indicates the problem-solving process. Many tools applied in Toyota, as Imai (2012) emphasised, are VM measures applied in order to make all deviations from standards evident, problems disclosure and to facilitate the flow.

Among Toyota's fourteen management principles formulated by Liker (2004), two directly stress the importance of VC in Toyota: the second and seventh. Toyota's second management principle requires "creating a continuous and fluid process of revealing problems". According to this principle, it is important to create a rapid flow of material and information and connects people and processes in such a way that problems become apparent when they arise. Among the VC tools used for flow

management and visualisation of problems in Toyota are used: Kanban cards, Hejiunka boards, material flow direction indication, area markings, storage fields, production line diagrams (Greif, 1991). Toyota's seventh management principle is "to use visual control so that no problem is hidden" (Liker, 2004). This principle emphasizes that visual control is primarily to reveal problems, which is to enable their solution. In this area, there are used visual documents (A3 reports, visual standards), information boards, Andon systems which are more or less technically advanced, so simple visual solutions (Ercag & Dotlić, 2017), based on the PDCA cycle (Imai, 2012).

Obtaining a competitive advantage is manifested in better use of external and internal factors affecting the market position of the enterprise, including primarily resources and skills (internal factors) (Kraja and Osmani, 2015). As Zahra and Das (1993) indicated among the group of internal factors, organizational and economic factors are of great importance for building competitive advantage, among which are such as organization of production and work (1), enterprise management system (2) and organization of marketing activities (3). In particular, the impact of VM can be related to the first two areas (1 and 2). Galsworth (2017) emphasized that the VM system affects the efficiency of obtaining, transferring and using production information, which is an objective condition for decision solutions. Thanks to VM the right information goes in a fast and easy way to right people in the company (1) which allow managing company (2) better, is conducive to making the right decisions which effects is reflected in the organization's reducing cost and increasing profits.

Furthermore, Ortiz and Park (2010) claimed that operational production management and control supported by VM tools allows for tracking progress, informing about problems in this area, which gives the chance to make quick corrections. The detected problems are the basis for the verification of work standards at workplaces and cause their change (1). If problems are not detected efficiently, then they cannot be managed and eliminated. Effective business management is the skilful management of the organization's business problems, which is supported by VM tools (2) (Slimani et al., 2019).

The goal of VM in any organisation is to reinforce system alignment and improve the organisations' performance (Bititci et al., 2016). According to Galsworth (2017), Liker (2004), Pomffyová and Bartková (2016) VM improves safety, efficiency (productivity), quality, safety and effectiveness of a process without a great deal of management interaction, reduces of costs and provides employees greater control over their environment. Aas and Alaassar (2018) further emphasise that VM has an impact on decision-making in the entrepreneurial process.

It can be indicated, referring to Eriksson and Fundin (2018), that VM helps organisations create and sustain a competitive advantage in two significant ways. First, it ensures that an organisation's internal structure, management systems, work environment, and culture are aligned with its mission and values. Second, it

focuses on employees' attention on critical performance goals, making sure that employees know what is expected of them at all times and are committed to the organisation's success. As Tsan-Ming et al. (2009) emphasised "Quality and delivery time, costs" coming from every employee; in other words, habit and attitude of the employees directly affect the core competitiveness of an enterprise. VM form "forms" to "habits". Its ultimate goal is to make the production process in order, reduce errors and problems, and facilitate management which allows achieving goals better and faster and translates into the economic result of the business.

Based on the literature analysis, the following two research questions were formulated:

1. What is the importance of visual control in the series of importance factors of Toyota's second management principle?
2. To what extent does the visual inspection contribute to the disclosure of problems in the production hall and what is related to creating a competitive advantage?

The answers to these questions were obtained because of applying the appropriate research methodology, presented in the next section, in relation two analysed branches of electromechanical industry: metal and automotive.

Methodology

The questionnaire "BOST – Toyota's management principles in questions" (Borkowski et al., 2014) was used to determine the importance of visual control. BOST survey is a tool that is an attempt to transform Toyota's management principles into survey questions; is as a result of a fascination the philosophy, culture, style of management, approach to process improvement and Toyota's culture of "obsession" about quality and performance (Borkowski and Knop, 2014) which elements were described in the book (Liker, 2004). The BOST survey can be described as a tool for assessing the "entry" of production and service companies on the "Toyota route". It aims to prove that in many enterprises, the crew (often subconsciously) uses elements of management principles that may never have heard of, these are Toyota's management principles (Mielczarek and Knop, 2016). BOST research has been used both in production and in service enterprises (e.g. hotels) (Borkowski et al., 2015).

To measure the importance of VC in the production process it was used the E3 area from the BOST survey, which refers to the idea of the second Toyota's management principle (Liker, 2004). In the description of this principle, the factor of visual control (SW) appears. The content of the E3 question is as follows: E3. "What is the most important factor in the production process? In the box type 1; 2; 3; 4; 5; 6 (6 as the most important factor)" (Borkowski and Knop, 2014):

CP ☐ Continuous problem disclosure system
PE ☐ Interrupted production after detecting a quality problem

SZ ☐ Standard tasks, processes, documents
EU ☐ Granting power of attorney down
ST ☐ Using only reliable technology
SW ☐ The use of visual control

To assess the factors from the E3 areas the BOST survey it was used a numerical rating scale (ordinal) (using numbers from 1 to 6), i.e. the respondents' task was to rank the factors from the least to the most important, where the value "1" means the least important factor. The research group consisted of operators of workstations (production workers) in the surveyed enterprises. In order to implement the BOST research, a method of collecting data from primary sources and a form of auditorium survey, direct, was used (Groves et al., 2009). BOST research was conducted among 20 companies from two branches of the electromechanical industry, i.e. the metal (ME) and automotive (MO). The choice of this industry was made due to its strategic role in the Polish economy. At the same time, the selection of these two branches was dictated by their strategic role in the electromechanical industry itself. The metal and automotive branches are among the most expansive in the Polish electromechanical industry (CSO, 2019), and they are generally also the most globalized branches with high and constantly growing competitiveness due to common world market influence and main global players actions (Stefko et al., 2012). The selection of enterprises was limited to one from sixteen voivodship in Poland – Silesian voivodship, where the number of enterprises from these branches is the largest, and these enterprises employ the largest number of employees (CSO, 2019). In order to compare the results between branches, an equal number of compared enterprises was chosen - 10. The sample of these enterprises was selected in a quasi-random manner (Groves et al., 2009). The basic criterion for selecting entities for research was the confirmed use (in the course of preliminary analyses - conversations with representatives of companies) of the visual control system. Then, ten enterprises were randomly selected within each branch, and a random sample of respondents consisting of production employees of these enterprises was selected. The total number of respondents surveyed was 689, within the branches surveyed - 356 (MO) and 333 (ME).

Thurstone's method of comparative judgement (Pollitt, 2012; Borkowski and Knop, 2014) was used to build a one-dimensional metric preference scale of factors the second Toyota's management principles and indicate the place of analysed factor (SW). The scale of preferences was built based on the rankings of respondents for individual factors. These rankings have been processed into results of pair comparisons. The result of using the method was the location of the factors on the interval one-dimensional scale of comparative assessments, which allowed to obtain information on their degree of similarity or differences and allowed to distinguish a group of similarly perceived factors (based on the distance on a one-dimensional assessment scale). Based on the place of factors on the one-dimensional metric preference scale, summarizing importance series were also

built to indicate the place of the SW factor and thus determine the relative level of its importance.
It will be used a non-parametric *Z* Mann-Whitney test (MacFarland and Yates, 2016) to determine if there are significant differences in assessing the importance of visual control (SW factor) between the branches studied.
In order to assess the importance of the role of visual management in building a competitive advantage, the following question was asked: "To what extent, in your opinion, visual control tools contribute in revealing problems on the production hall in your enterprise. Please, indicate the number on the rating scale":

0	1	2	3	4	5	6	7	8	9	10
No impact										A very big impact

The basic statistical measures (mean, standard deviation) were calculated to assess the structure of the ratings for the question above in the analysed branches.

Results and discussion

The one-dimensional compartmental scale of comparative assessments for the factors of the second Toyota's management principle in the metal branch (for ten companies in total) is shown in Figure 1.

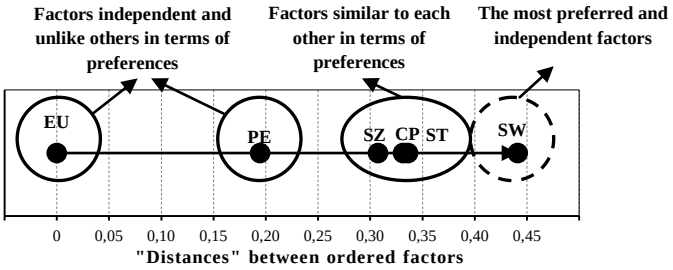

Figure 1: Thurstone's scale of comparative assessments for the factors of second Toyota's management principle. It refers to the metal branch (MT)

Four areas can be distinguished in the structure of the examined factors. The use of visual control (SW) is the most preferred factor in the metal branch with a level of importance that is different from the other factors. Visual control tools significantly support the managing production processes in enterprises in this branch, supervise and control its course, inform about problems with the parameters of machines and devices, help maintain order and cleanliness at workstations (5S). Elements of visual management are permanently present in in the most applied quality control

methods in the metal branch – visual inspection and visual testing (Szklarzyk, 2014). The popularity of visual quality control methods in the metal industry was also reflected in the importance of the visual management system in the production process in the metal branch.

The one-dimensional compartmental scale of comparative assessments for the factors of the second Toyota's management principle in the automotive branch is shown in Figure 2.

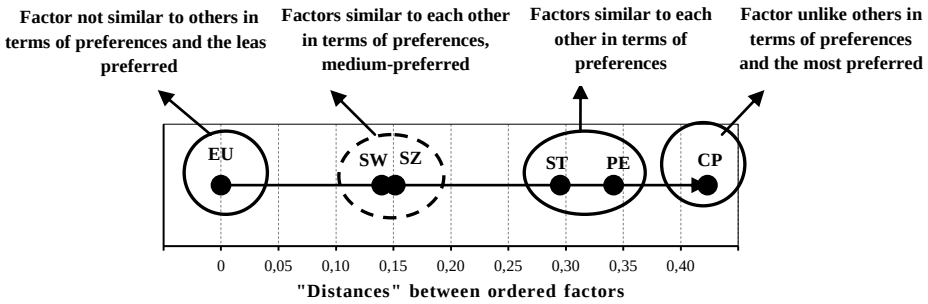

Figure 2: Thurstone's scale of comparative assessments for the factors of the second Toyota's management principle. Refers to the automotive branch (MO)

Four areas of preferred factors should be indicated in the automotive branch. The analysed factor (SW) belongs to the second group of preferred factors together with standard tasks, processes and documents (SZ). This factor is in the penultimate place in the importance series. It does not mean that the visual control system is not important overall, it only means, that compared to other factors, the use of visual control is less important. Other factors marked as CP, PE, ST, SZ have been indicated as more crucial, having the greater significance in supervising and controlling the course of the production process and in ensuring an appropriate level of quality in the automotive branch. The most important factor in the production process turned out to be the continuous problem disclosure system (CP). The automotive branch uses various types of lean manufacturing and SPC tools that are designed to reveal problems in the production process. The implementation of continuous flow based on one piece flow, preventive maintenance, mistake-proof system (Jap. Poka-Yoke) also Shewhart's control charts are those solutions that in the automotive branch contribute to the stable and pro-quality implementation of the production process (Mazur & Momeni, 2019). In this branch are implemented systems that allow separation of man from the machine (Jap. Jidoka) and allow the production (machine, line) to be stopped independently or with the help of an operator after detecting a problem threatening the quality of the product. Standardization of processes, tasks and documents (SZ) shows significant similarity in assessing importance with the analysed factor. Standardization, together with visual control perform here an important control

function – they remind contractors how to organize a workplace and how to perform the tasks entrusted to them. Standardization and visualization are elements that are often implemented together because of the benefits of continuous improvement. They allow management to monitor the correctness of the process on an ongoing basis. Visual control tools in the automotive branch are communication aids and are used to help drive operations and processes in real-time (Parry and Turner, 2006). VM tools in the automotive branch allow to better engaging in problem-solving and continuous improvement with Team Leaders and their teams (Bateman et al., 2016).

The importance ratings of the factor the use of visual control (SW) was compared between the analysed branches. Based on the adopted level of significance $\alpha = 0.05$ and the calculated Z statistic from the Mann-Whitney test ($Z = 4.538$, $p = 0.000006$), it was shown that there are statistically significant differences in the ratings between analysed branches. The surveyed employees from the metal branch assessed significantly higher the importance of the SW factor than employees from the MO branch, which also show the box-plot (Fig. 3).

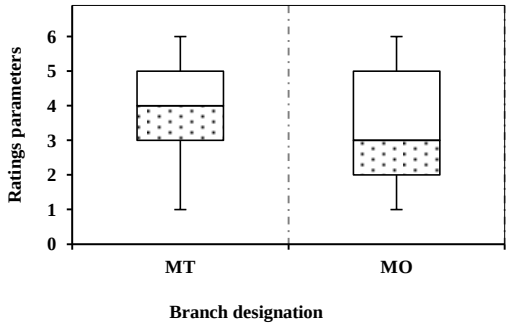

Figure 3: Box-plot for data set for "the use of visual control (SW)" factor ratings. Comparative analysis for the metal (ME) and automotive (MO) branches

The importance series of factors for the branches studied have been collated to show the location of the SW factor and interrelationships in perceiving the importance of factors between studied branches (Fig. 4).

The SW factor was the most important factor in the metal branch; in turn, it was one of the less important in the automotive branch. This factor differentiated the branches studied the most. The importance of visual control is specific/characteristic for the branches surveyed. The surveyed branches are not similar in this area. An important factor differentiating the perception of the importance of this factor in the analysed branches is the high popularity of visual inspection and visual testing systems in the metal branch (Szklarzyk, 2014). In

addition, an important factor is a strong emphasis on to the constant disclosure of quality problems and stopping the production after their detecting in the automotive branch, which is not always possible in the metal branch due to the specificity of some processes - continuous, apparatus.

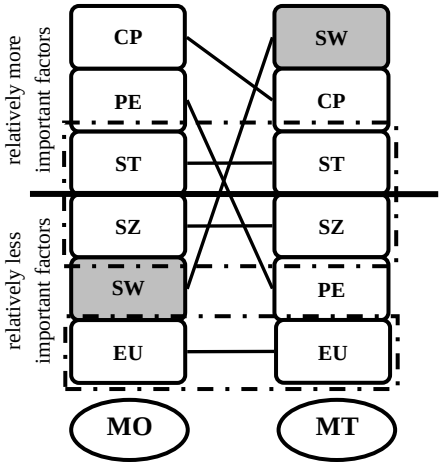

Figure 4: Importance series for the factors of second Toyota's management principle. Comparative analysis for the metal (MT) and automotive (MO) branch

Very interesting results were noticed after assessing the impact of the VC system on the detection of problems in the production hall in two branches. The basic statistical measures of this assessment are presented in Fig. 5.

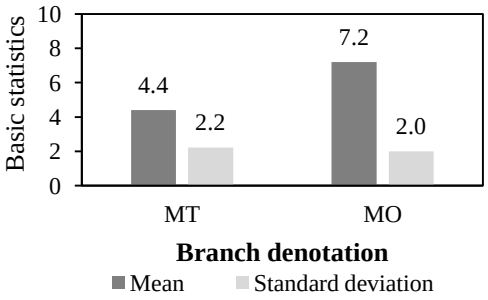

Figure 5: A statistical measures of the data set referring to the impact of the visual management system on the detection of problems on the shop floor

The VC system has a more significant impact on detecting problems in the automotive branch than in the metal industry, according to the surveyed employees. In the automotive branch, VC tools are more involved in detecting quality problems and in interrupting production. In the metal branch, VC tools are responsible for production quality control, monitoring its progress in real-time, informing about potential problems with machines and devices, about incorrect

process parameters, their aim is to maintain the process at an acceptable quality level. The possibilities of the visual control system in building an internal competitive advantage lie in faster-capturing production and quality problems in the production hall and their effective solution. The visual control system is more involved and has more impact in quality problem detection in the automotive branch than in the metal branch, where is more focused on quality control and monitoring the operating status of machines. In the automotive branch visual control systems give more opportunity to faster solving the problems; allow to reduce the cost and increase competitive advantage.

The assessment of the importance of visual control as an element of the second Toyota management principle, with the additional linking of this system with creating the competitiveness of enterprises, was an innovative element of the research conducted. Other publications only emphasized the general impact of the visual management system itself on creating and sustain competitive advantage for organizations (Liker, 2004; Liff & Possey, 2004; Galsworth, 2017; Bittici et al., 2016), without presenting the methods of this assessment, or only indicated the importance of this system in the organization as one of the Lean tools or the meaning of Lean concept itself, where visual control is one of its tools, in reducing costs (Nassereddine & Wehbe, 2018; Koloszar, 2018).

The conducted research does not provide direct, strong measurable assessment of the impact of the visual management system on creating a competitive advantage, because they are based on the subjective opinions of employees, users of this system, who use visual control solutions to reveal problems, thanks to which they can be solved and the company's operating efficiency can be increased. For this reason, in the next stage of the author's research, the research objective will be to measurably determine the impact of the visual management system on the effectiveness of the company's operation, and in particular, the impact of this system on reducing the company's costs using appropriate indicators. Additional explorative and longitudinal research is required to understand the long-term impact of visual management system in increasing organizations competitiveness.

Conclusion

The article presents the results of the analysis and assessment of the importance of visual control among the factors of the second Toyota management principle in two branches of the electromechanical industry: metal and automotive and indicates the power of the impact of visual management in revealing problems and in increasing the competitiveness of companies from the analysed branches. In the course of the analysis of the results, answers to the research questions were obtained. Studies have shown that the use of visual control against the background of other factors of Toyota's second management principle is more important in the metal branch than in the automotive branch. The importance of visual control system in the production process is a factor, which substantially differs these two branches.

Conducted analyses have shown similarity of ratings on the factor the use of visual control (SW) for ratings on the factor standard tasks, processes and documents (SZ) in the automotive branch and the lack of similarity in the ratings of this factor to other factors of the second Toyota's management principle in the metal branch.

The popularity of visual tools in the metal industry is due to the large share of these solutions in quality control methods popular in this industry, such as visual inspection and visual testing. Visual control tools, which in this branch take the form of more technologically advanced solutions, are primarily aimed at ensuring uninterrupted operation of machines and devices by informing about problems with their operating parameters. In contrast to the automotive industry, where visual control tools are often technically simple solutions (Andon), aimed at monitoring the flow of production and related problems, are used often by workers to stop production when a quality problem is detected.

Conducted research also indicated that in the automotive branch, the visual control system has a stronger impact on facilitating communication, current detecting problems, and reducing waste than in the metal branch. More orderly, the reality of production in the automotive branch, with clear and legible standards, caused that the problems are discovered faster there, and can be also quickly solved. After detecting problems, they are immediately resolved by employees together with Team Leaders. A culture of approaching problems is created, which are treated as an opportunity to gain new knowledge about the process and its weaknesses. Employees try to deal with problems at the source of their occurrence by creating visual control aids and using mistake-proofing tools (Poka-Yoke). This approach to the problems can translate into specific results in terms of effectiveness and efficiency of production processes and in effects the faster increase competitive advantage. Because the visual control system has a greater impact on revealing problems, effective communication (Stacho et al., 2019) in the companies from the automotive branch than in the metal branch, a competitive advantage can be built in the automotive branch in a faster way.

Each enterprise that strives for the competitiveness is forced to implement a corporate management concept containing the feedback system that identifies and promptly responds to weaknesses of an enterprise and thus provides important information that contributes to, and efficiently provide, solutions eliminating these weaknesses (Gonos et al., 2017). The importance of visual control system in detecting problems, its role in the communication between employees and employees versus management is a factor that tells about the company's ability to achieve quality and cost goals and thus possibilities to increase its internal competitive advantage. It is also important the effectiveness of solving the problems and the amount of time and resources used to resolve the problem.

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ZNACZENIE ZARZĄDZANIA WIZUALNEGO W BRANŻY METALOWEJ I MOTORYZACYJNEJ I JEGO WPŁYW NA BUDOWNICTWO, PRZEWAGA KONKURENCYJNA

Streszczenie: Celem pracy jest ocena, na ile zarządzanie wizualne jest istotne w procesie produkcyjnym w wykrywaniu problemów na hali produkcyjnej oraz w budowaniu wewnętrznej przewagi konkurencyjnej w badanych dwóch strategicznych branżach w Polsce: metalowej i motoryzacyjnej. Do oceny znaczenia zarządzania wizualnego wykorzystano innowacyjne badanie ankietowe „BOST - Zasady zarządzania Toyotą w pytaniach". Przebadano 20 firm, a odpowiedzi uzyskano od 689 respondentów. Analizy wykazały większe znaczenie zarządzania wizualnego w branży metalowej niż motoryzacyjnej, natomiast większy wpływ tego systemu na ujawnianie problemów i budowanie przewagi konkurencyjnej w branży motoryzacyjnej, co wynikało ze specyficznych celów tego systemu w analizowanych branżach . Wyniki uwypuklają specyfikę znaczenia zarządzania wizualnego w analizowanych branżach. Analiza łącząca znaczenie systemu zarządzania wizualnego z wpływem na tworzenie przewagi konkurencyjnej wychodzi naprzeciw oczekiwaniom menedżerów poszukujących alternatywnych i niskokosztowych sposobów na zwiększenie konkurencyjności firmy. Firmy muszą zrozumieć, że im szybciej problem zostanie wykryty, tym lepiej, ponieważ szybciej można podjąć działania naprawcze, aby zapobiec jego ponownemu wystąpieniu. Skuteczne wykrywanie problemów na hali produkcyjnej wsparte narzędziami zarządzania wizualnego i ich eliminacja to sposób na redukcję kosztów i budowanie wewnętrznej przewagi konkurencyjnej.

Słowa kluczowe: zarządzanie / kontrola wizualna, 2. zasada zarządzania Toyoty, badanie BOST, przewaga konkurencyjna.

视觉管理在金属和汽车行业的重要性及其对建筑的影响竞争优势

摘要: 该研究的目的是评估视觉管理在生产过程中对检测生产车间中的问题以及在波兰研究的两个战略分支(金属和汽车)建立内部竞争优势的重要性。创新的"BOST-丰田在管理中遇到的问题"调查研究用于评估视觉管理的重要性。调查了20家公司，并从689名受访者中获得了答复。分析表明，金属部门的可视化管理比汽车部门更重要，而该系统对汽车部门揭示问题和建立竞争优势的影响更大，这是由于该系统在分析的部门中的特定目标导致的。结果强调了在分析的分支中视觉管理的重要性的特定背景。该分析将可视化管理系统的重要性与创造竞争优势的影响联系起来，满足了寻求替代和低成本方式提高公司竞争力的管理人员的期望。公司需要了解，发现问题越早越好，因为可以尽早采取纠正措施以防止问题再次发生。借助可视化管理工具支持的生产车间中有效的检测问题及其解决方法，是降低成本和建立内部竞争优势的一种方法。

关键字: 视觉管理/控制，第二丰田的管理原则，BOST研究，竞争优势。