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Partnership with suppliers in accordance with the Toyota way on the example of companies from the metal sector

Partnerstwo z dostawcami w zgodzie z drogą Toyoty na przykładzie przedsiębiorstw sektora metalowego

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Abstract. Increasingly, when taking action on a company, it is essential to bear in mind the relationship between supplier and customer, which is a crucial element in determining a company's presence in the market. In this area, human capital, knowledge and intellectual capital are also increasingly appreciated, especially in the long term. More and more companies understand that knowledge management is a step towards improving not only the selected process (in the case under study, in the area of cooperation with suppliers) but also the entire organization. The purpose of this article is to check whether in companies operating in Poland in the metal industry, the staff subconsciously uses elements of knowledge management - implementation of practices developed in the company, modification of existing procedures, sharing knowledge in the team, independent actions to improve the performance of work - which may be she had never heard. The research instrument that allowed to obtain the results was a questionnaire. The most important element of the review of the obtained results was the analysis of the importance of

knowledge management factors and their impact on the formation of mutual relations between suppliers and partners of selected enterprises in the metal industry in the context of selected Toyota management principles. The adopted approach made it possible to identify differences in the responses of the respondents in both groups of enterprises, while providing a basis for further research on the directions of improving cooperation with suppliers using elements of knowledge management.

Keywords: knowledge management, 14 principles Toyota, improvement of partnership relations, forms of cooperation, metal sector

Abstrakt. Coraz częściej podejmując działania dotyczące przedsiębiorstwa, należy mieć na uwadze relacje pomiędzy dostawcą a odbiorcą, które są niezbędnym elementem decydującym o jego obecności na rynku. W tym obszarze coraz częściej doceniany jest również kapitał ludzki, wiedza oraz kapitał intelektualny, zwłaszcza w długim okresie. Coraz więcej przedsiębiorstw rozumie, że zarządzanie wiedzą, to krok w kierunku doskonalenia nie tylko wybranego procesu (w badanym przypadku w obszarze współpracy z dostawcami), ale również całej organizacji. Celem niniejszego artykułu jest sprawdzenie, czy w przedsiębiorstwach działających w Polsce w branży metalowej, załoga podświadomie wykorzystuje elementy zarządzania wiedzą - wdrażanie wypracowanych w przedsiębiorstwie praktyk, modyfikacja istniejących procedur postępowania, dzielenie się wiedzą w zespole, samodzielne działania usprawniające wykonywanie pracy - o których być może nigdy nie słyszała. Instrumentem badawczym, który pozwolił na uzyskanie wyników była ankieta. Najważniejszym elementem przeglądu otrzymanych wyników była analiza ważności czynników zarządzania wiedzą oraz ich wpływu na kształtowanie się wzajemnych relacji pomiędzy dostawcami i partnerami wybranych przedsiębiorstw branży metalowej w kontekście wybranych zasad zarządzania Toyoty. Przyjęte podejście umożliwiło zidentyfikowanie różnic w odpowiedziach ankietowanych w obu grupach przedsiębiorstw, dając jednocześnie podstawy do dalszych badań nad kierunkami doskonalenia współpracy z dostawcami, wykorzystując elementy zarządzania wiedzą.

Słowa kluczowe: zarządzanie wiedzą, 14 zasad Toyoty, doskonalenie relacji partnerskich, formy współpracy, sektor metalowy

Introduction

Human capital, knowledge, and intellectual capital play a significant role in any enterprise. More and more often, when taking actions concerning a company, it is necessary to bear in mind the relations between the supplier and the recipient, which constitute an essential element determining the company's presence on the market. Companies should be aware that proper logistics cooperation with suppliers may contribute to increasing customer value and thus stand out on the market more effectively among competitors. In this area, human capital is also increasingly appreciated as an essential factor affecting the competitiveness of an enterprise, especially in the long term. Even though the volume and value were a function of labour inputs and material capital in terms of traditional production, in the current approach has been expanded to include the quality of human capital. An organisation's human capital can be analysed in two essential aspects. The first one concerns the quantitative aspect, which - as the name suggests - refers to the number of people employed in a given enterprise. In this aspect, every person employed in the company is important, regardless of the position. The second dimension of human capital consists in the qualitative dimension. In this context, human capital constitutes a system of interrelated and interdependent elements

that largely determine the uniqueness of human resources in a given enterprise (Białasiewicz, 2013). Human capital consists mainly of employee competencies – knowledge, skills, and abilities. J. Ross, G. Ross and N.C. Dragonetti, among the elements of human capital, mention attitudes (which include employee motivation, behaviour, as well as beliefs), mental fitness (including analytical skills, synthesising skills, tendency to innovate, as well as the ability to adapt to changing conditions), as well as competences, which include: knowledge, skills, and capabilities (Ross, et al., 1997). Slightly different components of the human capital are mentioned by K. Bratnicki and J. Strużyna (Bratnicki and Strużyna, 2001). They distinguish competence (knowledge, skills and talents), intellectual dexterity (innovation, entrepreneurship), and motivation (leadership, willingness to act, commitment). As already mentioned, the element of human capital in an enterprise consists of employees' competencies, i.e. their knowledge, experience, and skills. In source literature, knowledge management is defined in various ways with often different distribution of accents, different components used, and research perspectives. This results from a very broad and to some extent abstract nature of knowledge, which contributes to the incomplete transparency and clarity of this issue. An analysis of the definitions of knowledge available in the source literature makes it possible, on the one hand, to note the frequent interpretative or area-specific differences between them and, on the other hand, thanks to this diversity, to understand more fully the meaning of knowledge, its complexity and multifacetedness. Knowledge is presented as valuable and accepted information, assigned with a structure (Probst, Raub, and Romhardt, 2002), integrating data, facts, information, and often hypotheses (Brilman, 2002) used in an effective manner (Armstrong, Taylor, 2016). It consists of truths and beliefs, views and concepts, judgments and expectations, methodologies and know-how (Wiig, K., 1997), codified experiences (Skrzypek, 2011), values, as well as expert insight into an issue that provides an assessment framework (Davenport, and Prusak, 1998). In economic terms, knowledge is treated in two ways: as information and as assets. In the first approach, knowledge is treated as information that can be processed and used to make rational economic decisions. In the second approach it is an economic good that can constitute private property and as a good may be an object of trade (Łobesko, 2004). It is worth remembering that knowledge in a company consists primarily in “know-how” – the experience of the company and its employees, their output and achievements. This also means information about production processes or the method of production in a given company. “Know-how” concerns especially staff competences, recruitment methods, and creating a new product. In addition to “know-how”, companies also include “know-what” – it is the so-called operational knowledge based on facts, “know why” – employees must know what the company's strategy is and how to implement it, and “know-who” – referring to the knowledge of experts in a given field of a production plant (Kłak, 2010; Hock-Doepgen, et al., 2021).

Knowledge management is a modern concept of strategic management concerning a contemporary organisation, which aims at creating intellectual capital and an organisation's value based on the knowledge resources obtained from the environment and already possessed (Walczak, 2010). Knowledge management in an enterprise consists in a set of processes enabling creating, disseminating, and taking advantage of knowledge to achieve an organisation's objectives (Grudzewski and Hejduk, 2011; Wyrozebski and Pawlak, 2021), a deliberate, systematic strategy of business optimisation that selects, distils, stores, organises, packages, and transmits information relevant to the business of a given enterprise in a manner that improves the effectiveness of employees and the competitiveness of the enterprise (Beregón, 2003; Abbas, 2020). It is a simultaneous ability to create and retain the greatest possible value necessary in a company's main activity (Tiwana, 2003; Hock-Doepgen, et al., 2021).

Knowledge management is often characterised by three basic models in the source literature: Japanese, process, and resource. The resource knowledge management model treats it as a strategic resource in a given enterprise. In this model, the key resources and competences of employees constitute the basic element of building competitiveness (Knosala, 2017). In its terms knowledge is perceived as the most important resource of an enterprise and its sources can be both internal and external in nature. In terms of this model, five key elements having an impact on the effectiveness of knowledge management can be identified (Sopińska and Wachowiak, 2006; Tabaszewska, 2012):

- the ability to import knowledge from the environment,
- the ability to efficiently integrate acquired or developed methods and technologies,
- a system encouraging employees to experiment,
- implementing methods and techniques of group work and team problem solving,
- the ability to develop and maintain key competences which include systems (physical, technical, and management), the knowledge and skills of employees, the developed and implemented standards and values.

The process model aims to increase the amount and value of information possessed by a company thanks to identification, selection, storage, reproduction, segregation, and dissemination. In this field, despite agreeing as to the main principle of creating a model, there are significant differences – between individual authors – in the type and number of components taken into account. The most frequently indicated elements include: creation or acquisition, purification, dissemination, use, monitoring (Davenport and Volpel, 2001; Abbas, 2020), selection, sale (Beckmann, 1999), evaluation (Holsapple and Joshi, 2000) and codification (Sunassee and Sewry, 2002; Monticolo, Lahoud, and Barrios, 2020). The most common concept, identifies six elements (Probst, Raub and Romhardt, 2002): locating knowledge, acquiring

knowledge, developing knowledge, sharing and disseminating knowledge, using knowledge, and preserving knowledge.

The last of the aforementioned groups of knowledge management models is the Japanese model, created by Nonaka and Takeuchi, (Nonaka and Takeuchi, 2000) based on converting explicit and implicit knowledge and treating these two types of knowledge as complementary to each other, whereby (Karwowski, 2011):

- explicit knowledge is codified, archived, transmitted and clearly formulated, and its sources may consist in, for example, instructions, strategies, procedures, reports, and any databases;
- implicit knowledge has a personal character, is specific for the context, often difficult to formulate, grasp, and transfer, and its basic sources are: informal processes of communication between employees and historical understanding.

It is based on human nature and behaviours within the company. In accordance with the assumptions of the creators of the Japanese knowledge management model, one should base on creating value, which actually is not subject to knowledge management in itself. The managing staff should signal specific problems to their subordinate employees in such a manner so that knowledge based on their experience is generated without additional interference. More complex issues should be divided into individual elements and simplified so that an employee can solve them independently. Thanks to such an approach, employees will be able to take advantage of their experience and skills, which is going to solve a given problem and at the same time contribute to creating new knowledge in the company.

Despite research already published in the last century in the scientific literature concerning implementing knowledge management in production or service processes, such as introducing independent actions aimed at improving the work performance of an employee, creating a culture of knowledge sharing in a team, or implementing practices developed in a given company (Liao and Xiong, 2011; Chang and Chuang, 2011; Mathrani and Edwards, 2020), the issue of knowledge management is often neglected in production plants. As Fahad et al. notes, this is due to perceiving it in an erroneous manner, including a change in the philosophy of action, etc. Other studies (Davenport and Prusak, 1998; Bitkowska, 2020; Abbas, 2020) indicate the existence of some of the most critical sins in terms of knowledge management practices, the most significant of which is the perceived lack of a working definition of knowledge, emphasis on knowledge resources, disregarding knowledge flows, disregarding hidden knowledge, detaching knowledge from its applications, perceiving knowledge as existing outside the heads of individuals, focusing on the past and not on the future, underestimating the importance of experimenting, replacing human contacts with information technologies, or using inappropriate knowledge measures. However, the available studies (De Long and Fahey, 2000; Michailova and Husted, 2003; Sveiby and Simons, 2002; Bitkowska,

2020) also show that a large group of entrepreneurs does not understand and does not possess knowledge on how to properly manage it, and in most cases there is a lack of a specific set of solutions enabling the effective implementation of good practices. Furthermore, enterprises are not sufficiently involved in implementing the concept of knowledge management.

Nevertheless, more and more companies understand that knowledge management is a step towards improving not only the selected process (in the examined case in the field of cooperating with suppliers), but also the entire organisation. Due to the fact that in its set of 14 principles Toyota developed such that refer to effective logistics, the article takes advantage of the eleventh principle, as it specifically refers to the subject of relations between manufacturers and suppliers. As a company, Toyota adopts very high standards of excellence and expects all its partners to meet them. It is also important that Toyota helps its partners in achieving these standards. Supplier development is based on a series of precisely defined goals that need to be achieved. However, suppliers want to work with Toyota because they know that this will earn them the respect of competitors and other customers. One of the methods used by Toyota to improve its own competences is implementing Toyota's production system in the course of projects carried out jointly with suppliers. Toyota expects its suppliers to produce high-quality components in a manner no worse than its own plants, and to deliver them exactly on time. In order to learn together with suppliers, Toyota takes advantage of many different methods, primarily "learning by doing" processes, including minimal participation in formalised classroom-style training. Learning constitutes the result of independent improvement activities carried out in a factory hall. Working at Toyota is based on a flow system and its employees are engaged in continuous improvement. Precisely this commitment results in that employees possess great knowledge concerning the course of processes taking place at enterprises, as well as the possibilities of improving them. They constitute a rich source of information that can be used for research and analysis. Therefore, the survey method has been used in the study, as one of the techniques for obtaining information. The aim of the study will also consist in verifying whether the staffs of companies operating in Poland in the metal industry subconsciously take advantage of elements of knowledge management completely new to the employees. This will allow gaining information as to whether companies base on Toyota's philosophy, i.e. a system that engages all employees to constantly improve their work with suppliers. The effectiveness of taking advantage of knowledge management elements is closely dependent on the people, i.e. the employees who use them and the suppliers with whom the company cooperates. The collected and analysed data will allow companies to apply the correct strategy and in the long run also strengthen their competitive advantage on the market.

Research methodology

The basic premise for undertaking the research consisted in the indicated gap in publications concerning the impact of knowledge management on improving cooperation with suppliers in enterprises from the metal industry. The significance of the issue of human resource management during conducted manufacturing processes has been the subject of many empirical studies and theoretical considerations in recent years. In the literature, the efficiency of using resources is widely discussed, but only as if humans constitute merely a necessary element to achieve the goal. Therefore, it seemed interesting and important, taking into account the achievements of global and national literature, to undertake research aimed at assessing the impact of individual elements of knowledge management on relations and connections with suppliers in Polish companies from the metal industry. For this purpose, Toyota's 11th principle was used. Selecting precisely this principle was guided by the observation that it relates in particular to the subject of improving cooperation between producers and suppliers. The conducted study will be an attempt to determine the significance of knowledge management factors and their impact on developing mutual relations between suppliers and partners of selected companies in the metal industry. The obtained and analysed data will allow companies to apply proper strategies and, in the long term, also to strengthen their market advantage. Thanks to the research, it will be possible to achieve the main goal, which is:

- Presentation of the significant connections between the 11th principle of Toyota and the elements of knowledge management and cooperation with partners.

In order to verify the adopted research goal, a survey was carried out, consisting of respondents completing a questionnaire. No sensitive data was collected during the study and the respondents were guaranteed anonymity. The study was carried out from January to June 2021. Ultimately, 57 complete questionnaires have been acquired from companies with different employment sizes.

Partnership with suppliers according to Toyota

Today, it is becoming increasingly difficult to talk about partnership cooperation between enterprises. The problem lies in the low price level of parts produced in China, India, Vietnam, and other countries, which are difficult to match even despite suppliers' attempts to radically cut costs. The constant striving for the lowest price in the world results in a decrease in the quality of the offered products, because low wages result in employing unskilled workers. Toyota based its battle with this issue on a detailed selection of employees and investing in partnership with suppliers. Cooperation with current suppliers, in terms of which there are no qualitative complaints, is not interrupted only because cheaper alternatives have been found. Therefore, Toyota's partners can enjoy the same job security as its employees (Likier, 2004; Likier and Mejer, 2011).

Abandoning the possibility of short-term savings was primarily supported by five main benefits. The first of them is the quality that the company achieves by training people to notice emerging quality problems and teaching them the individual steps necessary to perform the commissioned work. Not only are the most modern machines and quality procedures in accordance with the ISO-9000 certificate essential for the company, but above all, people actively searching for the causes of the root problems and their pursuit of continuous improvement. All these elements together allow building the correct quality culture. A similar approach towards suppliers allowed to treat cooperators as partners, expecting the same from them. The Malcolm Baldrige Award Jury which sets quality standards among companies, included “partnership with key suppliers and customers as well as communication mechanisms” as one of the most important criteria for candidates for this award (Klimecka -Tatar, Rosak Szyrocka and Pająk, 2014).

The second benefit consists in the process of developing products and processes. Combining the product and process at the pre-design and engineering stages allowed to have an impact on the product’s lifetime. In the case of Toyota, properly planned and constructed cars make their higher quality profitable. If mistakes were made before the first vehicle was produced, the costs associated with warranty repairs for many years after finishing the production of the last car could lead the company to bankruptcy. That is why it is very important that all products designed and manufactured by external suppliers are made in close cooperation (Likier, 2004; Likier and Mejer, 2011).

Another reason for abandoning short-term savings in favour of a long-term partnership is the precision and delicate nature of the “right on time” delivery system. In its case, suppliers become an extension of the production line and a loss anywhere within the entire value stream always remains a damage and must be eliminated. Toyota’s management always tries to eliminate waste, and therefore it does not allow itself to cooperate with suppliers who do not do the same. Toyota strives to make every link in this chain equally solid and efficient.

The basis for Toyota’s long-term success is innovation concerning products, processes, and countless minor improvements within the company, which is the fourth important reason. Toyota works with suppliers to create specific R&D investment targets to develop innovative technologies to help Toyota remain a technology leader in its range.

Fifthly, Toyota understands that the overall financial health of a company depends directly on the financial condition of the individual components. Toyota cares for strong suppliers who will act positively for the entire company, because a weak partner may have problems with quality control, building stock, shipping proper parts precisely on time, and lowering prices.

In conclusion, it can be noticed that the advantages of partner relations go beyond the direct savings resulting from accepting a lower price. Partnering with suppliers in line with the Toyota way means more than just finding companies able to produce components. It is a complex set of interconnected systems and controls that actually constitute a cultural connection. The importance of using specific tools such as setting target prices, taking advantage of kaizen workshops, or reducing inventory through the intelligent use of information technology in supply chains has been repeatedly emphasised in the literature, but in reality Toyota has built a much more profound basis of relations that form the basis for developing a culture of continuous improvement (Likier, 2004; Likier and Mejer, 2011).

Toyota's supply chain can be presented in the form of a pyramid, which is called the "hierarchy of partnerships with suppliers". The term "hierarchy" is used because individual elements of these seven levels form the basis for the other elements (Fig.1).

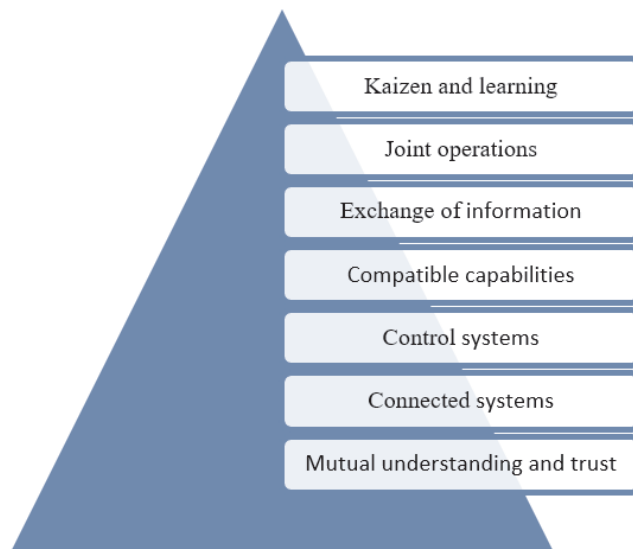


Fig. 1. Hierarchy of partnerships with suppliers

Source: Likier, J.K, Mejer, D.P., 2011. The Toyota Way. Fieldbook. MT Biznes. Warszawa

In managing according to Toyota's established way, honesty, high expectations, and challenges constitute the key characteristics of Toyota's relation with its suppliers. The company's striving to achieve high efficiency by forcing actions on suppliers is in complete opposition to the spirit of Toyota's production system.

Table 1 presents seven main distinctive features of partnership with suppliers. The basis of the relation consists in mutual understanding, and in the case of Toyota, it is the Genchi Genbutsu, which reflects the basic philosophy of coming and seeing everything directly with your own eyes, in order to have a thorough understanding of the situation. The term mutual understanding is understood as something more than just acquaintance, it means trust, commitment in the partner's success, as well as respect for the other party and its capabilities.

Table 1. Key partnership elements

Partnership features	Key elements
Kaizen and learning	<ul style="list-style-type: none"> - Sharing conclusions - Deming Cycle (PDCA) - Annual cost reduction
Joint operations	<ul style="list-style-type: none"> - Value Analysis/Value Engineering (VA/VE) - Supplier development - Research groups
Information sharing	<ul style="list-style-type: none"> - Precise data collection and analysis - Common language - Ongoing communication.
Compatible capabilities	<ul style="list-style-type: none"> - Engineering perfection - Operational perfection - Problem solving skills
Control systems	<ul style="list-style-type: none"> - Measurement systems - Feedback - Target quotes - Cost management models
Connected systems	<ul style="list-style-type: none"> - Alliance structure - Interdependent processes - Simultaneous use of sources
Mutual understanding and trust	<ul style="list-style-type: none"> - Trust - Commitment to the partner's success - Respect for the other party and its capabilities - Genchi genbutsu (actual part, actual place)

Source: Likier, J.K, Mejer, D.P. 2011, *The Toyota Way*. Fieldbook. MT Biznes. Warszawa

Combining systems constitutes another partnership feature according to Toyota's management principles and consists in closely connecting technical, social, and cultural systems. This combination goes beyond production and also includes strategies for developing new products. Every supplier must become an extension of Toyota's refined, lean systems.

Despite the trust that Toyota places in its suppliers, it uses extensive systems for measuring and monitoring the performance of its contractors. The management centre keeps track of the status of all delivered parts in order to react immediately when there is a risk of delayed delivery, quality problems, or any other issues. In such situations, Toyota expects suppliers to respond directly to any concerns about quality, cost, or delivery when the indicators show deviations and before there are any serious risks concerning production. The control also includes aggressive cost reduction initiatives. Toyota not only indicates the supplier's goal, but closely monitors progress in reducing costs to achieve these goals. The hoshin kanri approach is often used for this purpose, also called the implementation of principles, in which the upper-level management sets high-level goals, and the following level develops supporting tasks and creates a graph showing the relationship between their goals and those of the senior leadership. That is how, one gradually moves down to the level of production. Toyota is famous for its superior quality and perceives its suppliers as an extension of its own technical capabilities. It is not enough for partners to be able to produce parts in accordance with specifications, they also need to be innovative in the production process and work closely with Toyota in terms of product development processes. Suppliers in all development processes should be in full cooperation with Toyota engineers.

Exchanging information as the following feature of a partnership relation assumes that the data to provide should be carefully selected. Meetings of the company with cooperators are organised in detail, a specific time and location are determined, and a very detailed plan of transparent formats for exchanging information and data is developed. In unique design halls, competing suppliers are working on the same project for Toyota. Designing requires the most intensive involvement from suppliers, as this is the stage at which suppliers in a way "implement" their components into a given model. Communication consisting in the so-called "flooding" the partner with a wave of information is used. Such an intense exchange of information is necessary to optimise the vehicle development and production process.

The shared improvement actions offered by Toyota to suppliers result in that many companies would like to establish cooperation. Toyota's goal in teaching its suppliers the principles of lean production is not to provide them with information concerning specific tools or methods, but to learn a particular manner of thinking about problems and the process of continuous improvement. Toyota teaches all of this through practice and direct experience.

The above-mentioned six characteristics of happiness form the basis of Kaizen, i.e. continuous improvement and learning. It is widely believed that the learning process takes place only at the individual level and if individual employees leave the organisation or are moved to other tasks, they lose everything they have learned. Maintaining learning outcomes at the organisational level constitutes a much more significant challenge, and the learning of an enterprise as a whole seems almost impossible.

However, Toyota manages to do so. Thanks to solid foundations, the key to a learning enterprise is to develop standard processes that are subject to continuous improvement and perfection. These standards go beyond documented procedures and include common intuitive knowledge concerning the proper course of action. Toyota has developed a method of shared learning with suppliers called the *jischuken* concept. It is a combination of three Japanese words *Ji* (I), *shu* (automatically), and *Ken* (science, research, knowledge). Currently, the company associates its best suppliers precisely in such groups of joint expansion of knowledge. And because Toyota believes that theoretical training should be limited to the necessary minimum, this means “learning through practice”.

To sum up, for the entire network to succeed, it is essential to have strong leadership in the final assembly company, a partnership between the company and all its suppliers, and a robust and stable culture of continuous improvement and collaborative learning among partners. The absolute minimum in this case is a stable group of suppliers who operate on the basis of a common philosophy and constitute a part of a wider supply chain.

Analysis of results

The used set of questions concerned the importance of Toyota’s 14 principles from the point of view of the 4 areas of the Japanese knowledge management model. These principles are:

1. Basing management decisions on a far-reaching concept - even at the expense of short-term financial results.
2. Creating a continuous and seamless problem-solving process.
3. Using the pulling system to avoid overproduction.
4. Balancing the workload.
5. Creating a culture of interrupting processes in order to solve problems and right away achieve the correct quality.
6. Standard tasks as the basis for continuous improvement and empowerment of employees.
7. Applying visual inspection so that no problem remains hidden.
8. Using only reliable, thoroughly tested technology, serving employees and processes.
9. Educating leaders who thoroughly understand the work, live by the company’s general concept, and teach others.
10. Educating unique people and teams implementing the company’s general concept.

11. Respect in reference to a wide network of partners and suppliers as well as giving them challenges and helping to improve.
12. Personally, engaging to thoroughly understand the situation.
13. Slow decision-making by consensus and carefully considering all options, rapid implementation of decisions.
14. Remaining an organisation that is learning through continuous reflection and improvement.

The respondents were asked to rank elements of Toyota's 14 principles in terms of their impact on the studied area. Taking into consideration the addressed issue, the article focuses primarily on the results relating to Principle 11 "respecting a wide network of partners and suppliers, challenging them and helping them to improve".

The initial assessed area of the Japanese model was "independent actions improving the work performance". The values of the calculated averages are shown in Figure 2.

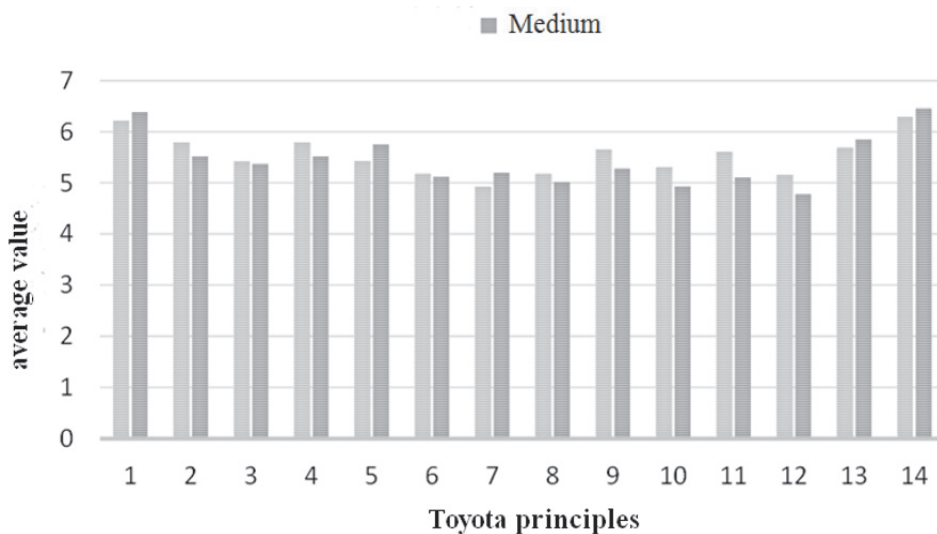


Fig. 2. Average values for the area of "independent activities improving the work performance"

Source: Own study

The order of importance of factors is presented in accordance with the formulae:

- large enterprises: 14 > 1 > 2 > 4 > 13 > 9 > 21 > 12 > 5 > 3 > 10 > 6 > 8 > 12 > 7
- medium-sized enterprises: 14 > 1 > 13 > 5 > 2 > 4 > 3 > 9 > 7 > 6 > 21 > 12 > 10 > 12

Table 2 shows the averages obtained for principle 11 in reference to selected statistical values.

Table 2. Selected statistical values for the area of “independent actions improving work performance”

	Large		Medium-sized	
Principle 11	5.61	-	5.10	-
average	5.54		5.45	
median	5.52		5.32	
min	4.92		4.78	
max	6.29		6.45	

Source: Own study

The presented research results allow to conclude that there are significant differences in terms of assessment concerning criteria between large and medium-sized enterprises. For example, principle 5 “creating a culture of interrupting processes in order to solve problems to right away achieve the correct quality” is rated much higher in medium-sized enterprises. The significance of principle 11 is assessed much higher in large enterprises (5th place) than in medium-sized enterprises (11th place). This indicates that in this type of enterprises there is greater awareness of the significance of improvement activities undertaken by individual employees from the point of view not only of the functioning of the enterprise itself but also of the correctness of cooperation processes with external partners. Employees are more aware that their behaviours and actions are able to improve the functioning of other entities within the value chain, thus increasing its effectiveness and increasing the adjustment to the end customer.

The following area of the Japanese knowledge management model is “sharing knowledge in a team”. The values of the calculated averages are shown in Figure 3.

The order of importance of factors is presented in accordance with the formulae:

- large enterprises: 2 > 4 > 14 > 1 > 5 > 3 > 9 > 2112 > 13 > 6 > 8 > 10 > 12 > 7
- medium-sized enterprises: 14 > 1 > 2 > 4 > 13 > 5 > 9 > 3 > 7 > 6 > 2112 > 0 > 8 > 12

Table 3 shows the averages obtained for Principle 11 concerning selected statistical values.

Table 3. Selected statistical values for the area of “sharing knowledge in a team”

	Large		Medium-sized	
Principle 11	5.49	-	5.00	-
average	5.57		5.48	
median	5.49	-	5.32	
min	4.98		4.83	
max	6.33		6.45	

Source: Own study

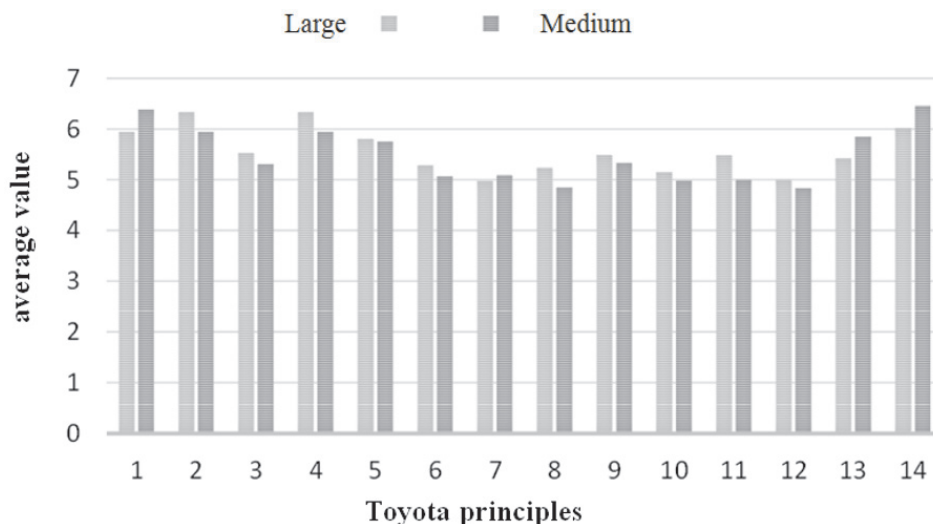


Fig. 3. Average values for the area of “sharing knowledge in a team”

Source: Own study

The most significant discrepancies in perceiving Toyota’s individual principles in both types of enterprises have been noticed in relation to principle 13 “making decisions slowly by consensus and carefully considering all possibilities, quickly implementing decisions”, concerning which much greater importance was attributed to medium-sized enterprises. Perhaps this is due to the different manner of organising actions resulting from a smaller number of people employed and – often – a smaller scale of activity. In both types of enterprise, the significance of principle 11 from the point of view of knowledge sharing in a team is rated relatively low (in large enterprises 8th place, in medium-sized enterprises 11th place). This is probably due to the nature of the knowledge-sharing process, which – in this case – is highly internal. Often the knowledge shared this way is confidential and, even though it usually considers the interests of external partners, it is definitely without their involvement.

Another area of the Japanese knowledge management model consists in “modifying existing procedures”. The values of the calculated averages are shown in Figure 4.

The order of importance of factors is presented in accordance with the formulae:

- large enterprises: 14 > 1 > 2 > 4 > 3 > 13 > 6 > 2 > 1 > 2 > 5 > 9 > 10 > 7 > 8 > 12
- medium-sized enterprises: 14 > 1 > 13 > 2 > 4 > 5 > 3 > 6 > 9 > 7 > 8 > 2 > 1 > 1 > 2 > 0 > 1

Table 4 shows the averages obtained for principle 11 in reference to selected statistical values.

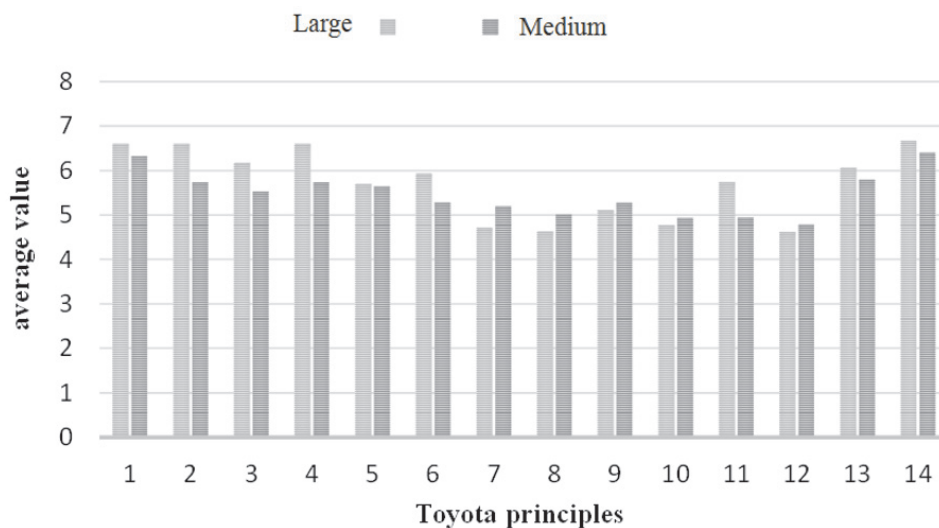


Fig. 4. Average values for the area "modifying existing procedures"

Source: Own study

Table 4. Selected statistical values for "modifying existing procedures"

	Large		Medium-sized	
	Value	Significance	Value	Significance
Principle 11	5.74	-	4.94	-
average	5.71		5.47	
median	5.83		5.40	
min	4.62		4.78	
max	6.67		6.40	

Source: Own study

The significance of principle 11 from the point of view of modifying existing procedures has been assessed as relatively low in both large and small companies. In this context, enterprises firmly put forward issues related to internal affairs, such as: "remaining a learning organisation thanks to continuous reflection and improvement", "basing management decisions on a far-reaching concept - even at the expense of short-term financial results", "creating a continuous and smooth process of disclosing problems". The critical issue in both groups of enterprises is ensuring such a manner of the organisation's functioning as to create conditions for continuous improvement, streamlining processes and thus improve both the efficiency of its functioning and becoming a better partner for cooperation for other entities on the market.

Another area of the Japanese knowledge management model is “implementing practices developed in the company”. The values of the calculated averages are shown in Figure 5.

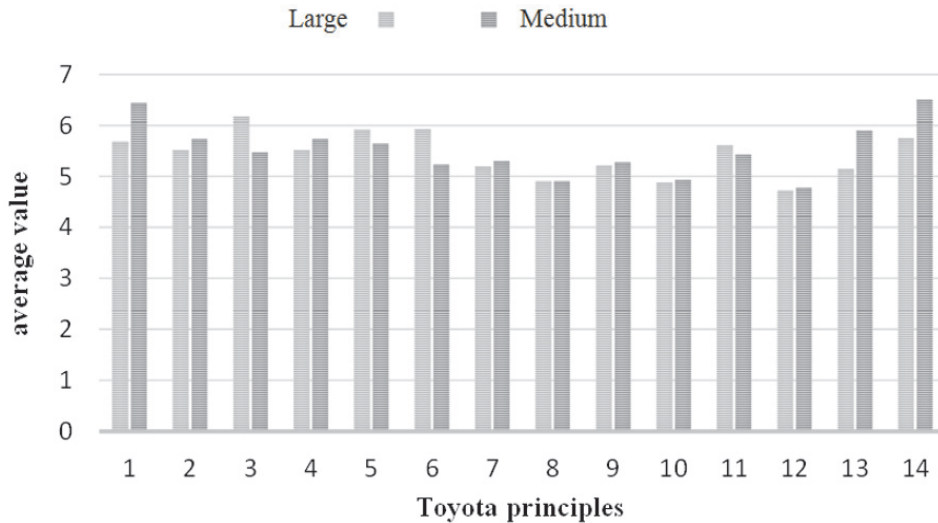


Fig. 5. Average values for the area of “implementing practices developed in the company”

Source: Own study

The order of importance of factors is presented in accordance with the formulae:

- large enterprises: 3 > 6 > 5 > 14 > 1 > 2 > 12 > 4 > 9 > 7 > 13 > 8 > 10 > 12
- medium-sized enterprises: 14 > 1 > 13 > 2 > 4 > 5 > 3 > 2 > 11 > 7 > 9 > 6 > 10 > 8 > 12

Table 5 shows the averages obtained for principle 11 for selected statistical values.

Table 5. Selected statistical values for the area of “implementing practices developed in the enterprise”

	Large		Medium-sized	
	Average	Median	Average	Median
Principle 11	5.61	-	5.43	-
average	5.44		5.52	
median	5.52		5.45	
min	4.73		4.78	
max	6.17		6.51	

Source: Own study

In relation to issues concerning implementing practices developed in the enterprise it is possible to notice significant differences in the manner of perceiving individual Toyota principles in both types of enterprises. In large companies, the principle of “using the pulling system to avoid overproduction” is rated much higher than in medium-sized companies. On the other hand, the principle of “making decisions slowly by consensus and carefully considering all possibilities, quickly implementing decisions” was rated higher in medium-sized companies in relation to large enterprises. In both types of companies, the significance of principle 11 is assessed as high (in large companies on the 6th position, in medium-sized companies on the 8th position). This clearly indicates an understanding that the implemented practices in many areas will relate to contacts and relations with external partners, affecting the nature and quality of these relations.

Conclusions

In order to meet current market demands and at the same time overcome economic difficulties, companies operating in the metal industry are forced to seek solutions that would strengthen or at least maintain their existing position on the market. Additionally, it is also very important for manufacturing companies to ensure the availability of resources, to provide them on time and at a given location. In these processes, the common element often consists in a person – irreplaceable at the current level of technology, and at the same time the most unreliable. In recent years, significant attention is given to issues related to managing people, and thus to the issue of taking advantage of their potential to improve the entire company. Proper management of human resources and knowledge in enterprises is one of the ways of achieving positive results in the process of improving the production and logistics system. Meanwhile, employees are often treated as an element of an enterprise that only allows to obtain a finished product by using the available machines. Their knowledge or experience is not fully used, and their opinion is overlooked when making decisions. Research results presented in the source literature allow to state that a person and its potential should be the subject of analysis carried out by the managing staff. It is precisely the employees directly involved in the given processes who can indicate “bottlenecks”, places that require special attention (and often also implementing changes), while their knowledge and experience are actually necessary in the process of improving companies from the metal industry. In the analysed scientific studies, during the conducted literature review, it was noted that the role of the human factor in an enterprise is strongly emphasised and, at the same time still underestimated, which results in failures when introducing changes in processes or entire systems. Additionally, in the literature, it is possible to notice that human capital is not combined with the logistics process in the context of improving cooperation

with partners. The current state of science provides many tools and methods for managing people and tools for improving logistics processes (Armstrong and Taylor, 2016; Armstrong and Taylor, 2017; Baron and Armstrong, 2008; Naprawski, 2021). Moreover, reviewing literature from recent years also indicates issues related to the place of human capital in contemporary business management (Dubois and Rothwell, 2008; Ciekankowski, 2014; Issacson, 2012; Urbaniak, 2014; Singh et al., 2021; Lam et al., 2021). However, there is a lack of studies regarding how individual methods, principles, or tools affect human capital, as well as improving the functioning and perfecting logistics processes. Due to the above, managing people and knowledge in the context of improving logistics processes occurring in an enterprise constitutes a field of science poorly researched so far, which makes it an interesting subject of analysis. Understanding that each industry operates on the basis of a different set of factors competitive to the research, it was decided to choose the metal industry. The main selection criterion consisted in understanding the industry and many years of research conducted among enterprises of this branch of the economy. A review of the literature related to the metal sector and the research carried out in it (An analysis of the potential for development of the metal sector in the Bytów powiat 2011; An analysis of the potential and development trends of the metal industry in Mazovia 2018; The metal sector in Eastern Poland) also indicates primarily the use of quantitative data (e.g. production volume, number of shortages in delivery, time and size of deliveries, delivery delays, and any statistical analysis). This is a significant obstacle in the decision-making process in managing cooperation and relations with partners, and thus, for innovative organisational changes in this area.

The conducted theoretical considerations, followed by empirical research and analysis of the obtained results allowed to formulate the following statements and conclusions:

1. There are significant differences in terms of assessing the significance of the Toyota's 14 principles between large and medium-sized enterprises. In some cases, these differences are negligible. However, the identified differences were evident for some of the studied areas. The most significant discrepancies in perceiving Toyota's individual principles in both types of enterprises have been noticed in relation to principle 13 "making decisions slowly by consensus and carefully considering all possibilities, quickly implementing decisions", which had a much greater importance in medium-sized enterprises. It was also noted that principle 5 "creating a culture of interrupting processes in order to solve problems to right away achieve the correct quality" is rated much higher in medium-sized enterprises.
2. The importance of Toyota's 11th principle in the context of the proper course of actions in each area of knowledge management based on the Japanese model is assessed higher in large enterprises.

3. From the point of view of independent actions improving the performance of work, the significance of principle 11 is assessed much higher in large enterprises (5th position) than in medium-sized enterprises (11th position), which indicates the existence of a more heightened awareness concerning the significance of improvement actions undertaken by individual employees both for the correctness of processes in a given enterprise and cooperation with external entities.
4. It is characteristic that in both types of enterprise, the significance of the 11th principle is assessed relatively low from the point of view of sharing knowledge in a team (8th place in large companies, and 11th place in medium sized-companies), which probably results from the internal nature of this process.
5. As part of modifying existing procedures in both types of companies, the significance of principle 11 was found to be lower than average. Managers in the researched enterprises focus mainly – within this area – on ensuring the correct conditions for constantly improving and perfecting both internal and external manners of operation.
6. In the field of implementing practices developed in a company in both types of enterprises, the significance of the 11th principle is assessed highly (6th position in large companies and 8th in medium sized-companies). At the same time, significant differences have been determined in the context of the importance of applying the pull principle (definitely higher rating in large enterprises) as well as conscious and deliberate decision-making (higher ratings in medium-sized enterprises).

BIBLIOGRAPHY

- [1] Abbas, J., 2020. Impact of total quality management on corporate sustainability through the mediating effect of knowledge management, *Journal of Cleaner Production*, 244, 118806, <https://doi.org/10.1016/j.jclepro.2019.118806>.
- [2] Anjaria, K., 2020. Negation and entropy: Effectual knowledge management equipment for learning organizations, *Expert Systems with Applications*, 157, 113497, <https://doi.org/10.1016/j.eswa.2020.113497>.
- [3] Armstrong, M., Taylor, S., 2016. *Zarządzanie zasobami ludzkimi (przekład)*. Warszawa: Wolters Kluwer Polska.
- [4] Armstrong, M., Taylor, S., 2017. *Armstrong's Handbook of Human Resource Management Practice*, 14th editions by Michael Armstrong, Kogan Page.
- [5] Baron, A., Armstrong, M., 2008. *Zarządzanie kapitałem ludzkim. Uzyskiwanie wartości dodanej dzięki ludziom*. Wyd. Oficyna a Wolters Kluwer business, Kraków.
- [6] Beckmann, T. J., 1999. *The Current State of Knowledge Management*, [in:] Liebowitz, J. (ed.) *Knowledge Management – handbook*. London: CRC Press.
- [7] Beregón, B., 2003. *Essentials of Knowledge Management*. New Jersey: John Wiley & Sons.
- [8] Białasiewicz, M., 2013. *Kształtowanie kapitału ludzkiego w organizacji*, Szczecin: Wydawnictwo Uniwersytetu Szczecińskiego.

- [9] Bitkowska, A., 2020. The relationship between Business Process Management and Knowledge Management - selected aspects from a study of companies in Poland, *Journal of Entrepreneurship, Management and Innovation Open Access*, 16 (1), 169-193, Available at: [10.7341/20201616](https://doi.org/10.7341/20201616).
- [10] Bratnicki, M., Strużyna J., 2001. *Przedsiębiorczość kapitał intelektualny*, Katowice: Wydawnictwo Akademii Ekonomicznej w Katowicach.
- [11] Brilman, J., 2002. *Nowoczesne koncepcje zarządzania (przekład)*, Warszawa: Polskie Wydawnictwo Ekonomiczne.
- [12] Chang, H.H. and Chuang, S.S., 2011. Social capital and individual motivations on knowledge sharing: Participant involvement as a moderator, *Journal Information and Management*, 48(1), 9–18, <http://dx.doi.org/10.1016/j.im.2010.11.001>.
- [13] Ciekankowski, Z., 2014. Kapitał ludzki najistotniejszym elementem w organizacji, *Zeszyty Naukowe Uniwersytetu Przyrodniczo-Humanistycznego w Siedlcach*, 101.
- [14] Davenport, T.H., and Prusak, L. 1998. *Working Knowledge*. Brighton: Harvard Business School Press.
- [15] Davenport, T.H. and Volpel, S., 2001. The rise of knowledge towards attention management, *Journal of Knowledge Management*, 5, 211-222. Available at: [10.1108/13673270110400816](https://doi.org/10.1108/13673270110400816).
- [16] Dubois, D., Rothwell, W.J., 2008. *Zarządzanie zasobami ludzkimi oparte na kompetencjach. Od tradycyjnego działu kadr do współczesnego HR*, Gliwice: Helion.
- [17] Fahey, L., Prusak, L., 1998. The Eleven Deadliest Sins of Knowledge Management, *California Management Review*, 40.
- [18] Grudzewski, W.M. and Hejduk, I., 2011. *Przedsiębiorstwo przyszłości. Zmiana paradygmatów zarządzania*. Master of Business Administration, 19(1), 95-111.
- [19] Hock-Doepgen, M., Clauss, T., Kraus, S., Cheng, Cheng-Feng., 2021. Knowledge management capabilities and organizational risk-taking for business model innovation in SMEs, *Journal of Business Research*, 130, 683-697, <https://doi.org/10.1016/j.jbusres.2019.12.001>.
- [20] Holsapple, C. and Joshi, K. D., 2000. An investigation of factors that influence the management of knowledge in organisations, *The Journal of Strategic Information Systems*, 9, 235-261. Available at: [10.1016/S0963-8687\(00\)00046-9](https://doi.org/10.1016/S0963-8687(00)00046-9).
- [21] Imai, M., 2018. *Gemba Kaizen Zdroworoządkowe Podejście Do Strategii Ciągłego Rozwoju* Wyd. 2, MT Biznes.
- [22] Issacson, W., 2012. *Steve Jobs*”, Insignis, Warszawa.
- [23] Karwowski, A., 2011. Zarządzanie wiedzą (1), *Bezpieczeństwo pracy*, 11/2004, 11-14.
- [24] Klimecka-Tatar, D., Rosak-Szyrocka, J., Pająk, B., 2014. Ocena współpracy partnerów logistycznych na przykładzie przedsiębiorstwa branży metalowej. Sekcja Wydaw. WZ. Politechnika Częstochowa.
- [25] Kłak, M., 2010. *Zarządzanie wiedzą we współczesnym przedsiębiorstwie*, Wydawnictwo Wyższej Szkoły Ekonomii i Prawa im. prof. Edwarda Lipińskiego w Kielcach, Kielce.
- [26] Knosala, R., 2017. (red.) *Inżynieria Produkcji. Kompendium wiedzy*, Warszawa: Polskie Wydawnictwo Ekonomiczne.
- [27] Lam, L., Nguyen, P., Le, N., Tran, K., 2021. The Relation among Organizational Culture, Knowledge Management, and Innovation Capability: Its Implication for Open Innovation, *Journal of Open Innovation: Technology, Market, and Complexity*, 7(1), 66, <https://doi.org/10.3390/joitmc7010066>.
- [28] Liao, K. and Xiong, H., 2011. Study on Knowledge Sharing of Community of Practice Based on Social Network Perspective, *I-Business*, 3(3), 283–286, <https://doi.org/10.4236/ib.2011.33037>.
- [29] Likier, J.K., 2004. *Droga Toyoty, 14 zasad zarządzania wiodącej firmy produkcyjnej świata*. Warszawa: Wydawnictwo MT Biznes.
- [30] Likier, J.K., Mejer, D.P., 2011. *Droga Toyoty. Fieldbook*. MT Biznes. Warszawa.
- [31] Łobesko, S., 2004. *Systemy Informacyjne w Zarządzaniu Wiedzą i Innowacją w Przedsiębiorstwie*, Szkoła Główna Handlowa, Warszawa.

- [32] De Long, D.W. and Fahey, L. 2000. 'Diagnosing Cultural Barriers to Knowledge Management, *Academy of Management Executive*, 14, 113–127.
- [33] Mathrani, S., Edwards, B., 2020. Knowledge-Sharing Strategies in Distributed Collaborative Product Development, *Journal of Open Innovation: Technology, Market, and Complexity*, 6 (4), 194, <https://doi.org/10.3390/joitmc6040194>.
- [34] Michailova, S., and Husted, K., 2003. Knowledge-Sharing Hostility in Russian Firms, *California Management Review*, 45(3), 59–77.
- [35] Monticolo, D., Lahoud, I., Barrios, P., Ch., 2020. OCEAN: A multi agent system dedicated to knowledge management, *Journal of Industrial Information Integration*, 17,100124, <https://doi.org/10.1016/j.jii.2019.100124>.
- [36] Naprawski, T., 2021. Towards agile knowledge management in an online organization, *Procedia Computer Science*, 192, 4406-4415, <https://doi.org/10.1016/j.procs.2021.09.217>.
- [37] Nonaka, I. and Takeuchi, H., 2000. *Kreowanie wiedzy w organizacji. Jak japońskie spółki dynamizują procesy innowacyjne (przekład)*. Warszawa: Poltext.
- [38] Oli, A.A., Dhanasekaran, C., 2021. A study related to product service systems (PSS), SERVQUAL and knowledge management system (KMS) – A review, *Materials Today: Proceedings*, <https://doi.org/10.1016/j.matpr.2021.07.321>.
- [39] Probst, G., Raub, S. and Romhardt, K., 2002. *Zarządzanie wiedzą w organizacji (przekład)*. Kraków: Oficyna Ekonomiczna.
- [40] Singh, K., S., Gupta, S., Busso, D., Kamboj, Sh., 2021. Top management knowledge value, knowledge sharing practices, open innovation and organizational performance, *Journal of Business Research*, 128, 788-798, <https://doi.org/10.1016/j.jbusres.2019.04.040>.
- [41] Skrzypek, E., 2011. *Gospodarka oparta na wiedzy i jej wyznaczniki, [in:] Nierówności społeczne a wzrost gospodarczy*. Rzeszów: Uniwersytet Rzeszowski.
- [42] Sopińska, A. and Wachowiak, P., 2006. Modele zarządzania wiedzą w przedsiębiorstwie, *e-mentor*, 1(14), 55-59.
- [43] Sunassee, N.N. and Sewry, D.A., 2002. A Theoretical Framework for Knowledge Management Implementation, [in:] *ACM International Conference Proceeding Series*. Port Elizabeth: South African Institute for Computer Scientists and Information Technologists.
- [44] Sveiby, K.E. and Simons, R., 2002. Collaborative climate and effectiveness of knowledge work—an empirical study, *Journal of Knowledge Management*, 6(5), 420–433.
- [45] Tabaszewska, E., 2012. *Wprowadzenie i funkcjonowanie systemów zarządzania wiedzą w przedsiębiorstwach*. Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.
- [46] Tiwana, A., 2003. *Przewodnik po zarządzaniu wiedzą. E-biznes i zastosowania CRM*. Warszawa: Placet.
- [47] Urbaniak, B., 2014. Zarządzanie różnorodnością zasobów ludzkich w organizacji”, *Zarządzanie zasobami ludzkimi*, 3-4, wersja elektroniczna.
- [48] Ross, J., Ross, G., Dragonetti, N.C., 1997. *Intellectual Capital – Navigating in the New Business Landscape*, Macmillian Press.
- [49] Walczak, W., 2010. *Zarządzanie wiedzą w organizacji, e-mentor*, 2.
- [50] Wiig, K., 1997. Knowledge management: where did it come from and where will it go?, *Expert Systems with Applications*, 13(1).
- [51] Wyrozebski, P., Pawlak, R., 2021. The role and meaning of lessons learned in project knowledge management in organizations in Poland, *Procedia Computer Science*, 192, 2396-2405, <https://doi.org/10.1016/j.procs.2021.09.008>.