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Internal market knowledge sharing in medium-high-tech manufacturing company

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ABSTRACT

Objective: The goal of this study is to verify new research model among medium-high-tech manufacturing companies. First of all, the model assumes the influence of both the market knowledge base itself, and the efficiency of internal market knowledge sharing on the competitiveness of analysed entities. Second of all, it analyses the impact of market knowledge perception within business entities and the openness of technical staff on internal market knowledge sharing efficiency.

Research Design & Methods: The survey consisted of five latent variables (constructs). The research was conducted by telephone among managers of medium-high-tech manufacturing companies in Poland. The sample consisted of 130 firms. The data was analysed using the PLS-SEM technique.

Findings: The research findings proved that both, market knowledge and market knowledge sharing efficiency, had a strong and significant influence on the competitiveness of medium-high-tech manufacturing companies. The results also showed that market knowledge perception and openness of technical staff had statistically significant influence on knowledge sharing efficiency in such companies.

Implications & Recommendations: Above all, the study implies that it is not the possession of market knowledge alone, but also importance of sharing this kind of knowledge internally. The article suggests factors that are important for market knowledge sharing, e.g. through properly trained and competent knowledge brokers that enable the examined businesses to gain a competitive edge. The efficiency of market knowledge sharing may be strengthened by putting more attention to market knowledge perception in the company and openness of technical staff.

Contribution & Value Added: This study adds to the research on sharing a specific type of knowledge, i.e. market knowledge, within business enterprises and influence of this process on companies' competitiveness. Various factors important for efficient internal sharing of market knowledge have been proposed in the subject literature, however they have not been verified by quantitative research so far. Moreover, the study focuses on the oft-overlooked type of business entities, i.e. medium-high-tech manufacturing companies.

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INTRODUCTION

The notion of market knowledge and its direct influence on the competitiveness or the different processes tied to this factor, *e.g.* product innovation and product success, have been analysed in the subject literature, among others by Cillo (2005), De Luca and Atuahene-Gima (2007), Johnson, Piccolotto and Filippini (2009), Lin, Che, and Ting (2012). As a result, market knowledge is perceived as an important factor that directly or indirectly influences the competitiveness of a business.

However, each type of knowledge base must be adequately managed. One of the crucial and most challenging knowledge management factors is knowledge transfer, in particular knowledge sharing

among company employees (Riege, 2005; Du Plessis, 2007; Lee and Ahn, 2007; Smith, McKeen and Singh, 2010; Distanont *et al.*, 2012; Razmerita, Kirchner & Nielsen, 2016). The importance of knowledge sharing is tied to the fact that even if a business is in possession of a specific type of knowledge, the said knowledge must be relayed to a proper division to be properly used by that business and generate advantages to it such as increased innovativeness (Alavi & Leidner, 2001; Tsai, 2001; Oyemomi *et al.*, 2016; Saide *et al.*, 2019). Hence, knowledge sharing is vital for the success and efficiency of modern-day enterprises (Kane, Argote & Levine, 2005; Liao & Hu, 2007; Foss, Husted & Michailova, 2010; Rutten, Blaas-Franken & Martin, 2016).

The primary reason behind the research conducted as part of this study is the fact that market knowledge sharing has not been examined in detail in the subject literature. The most important issue is the fact that the great majority of articles analysing knowledge sharing in companies do not concentrate on a specific knowledge type (e.g. Razmerita, Kirchner & Nielsen, 2016; Farooq, 2018). Narrowing analysis to specific type of knowledge enables better understanding of the processes of sharing the discussed resource and their impact on the company's results. What is more, this study focuses on the specific type of enterprises, i.e. medium high-tech manufacturing entities, as specified in the typology proposed by Galindo-Rueda and Verger (2016). Narrowing the analysed businesses to this sector enables the research findings to be more specific. In the literature, we may find number of articles concentrating on high tech companies in terms of many aspects of their operation (e.g. Xia & Liu, 2017; Braja & Gemzik-Salwach, 2019; 2020). Authors also often analyse high- and medium-high-tech companies together (see e.g. Villamizar, Cobo & Rocha, 2017; Hu, Wang & Zhang, 2020). However, the analyses of medium-high-tech companies are rather rare. They represent industries that are very important for economies of many countries. The typical example might be motor vehicles manufacturers that are crucial element of German economy. What is more, in China, medium-high-tech companies are considered crucial for the country's competitive advantage in export (Lei & Zongsen, 2017). The goal of this study is to verify new research model among medium-high-tech manufacturing companies. Firstly, the model assumed the influence of both the market knowledge base itself, and the efficiency of internal market knowledge sharing on the competitiveness of analysed entities. Secondly, it analysed the impact of market knowledge perception within business entities and the openness of technical staff on internal market knowledge sharing efficiency.

This article is comprised of the following sections. The first section will focus on the theoretical background. The section includes a typology of medium high-technology manufacturing businesses, along with the main factors that make up the research model: market knowledge, market knowledge sharing, market knowledge perception, openness of technical staff. This is followed by the presentation of a research model comprised of the five aforementioned latent variables (LVs) or constructs. The subsequent section will delineate the methodology of quantitative empirical analysis. This is followed by the key section of the study, which details the obtained research results. The study will end with three sections devoted to the discussion, practical implications, limitations, and future research on the subject.

LITERATURE REVIEW

Medium-high-technology manufacturing companies

Hatzichronoglou (1997) is the author of the division of enterprises into four groups: low, medium-low, medium-high, and high technology. It is based on the share of research and development (R&D) expenses in the added value, and on the purchases of technologies characteristic of a given sector. Hatzichronoglou's concept focuses solely on manufacturing companies. Nineteen years later, the classification was updated by Galindo-Rueda and Verger (2016). Galindo-Rueda and Verger update focuses on the share of R&D in GVA. Moreover, it specifies five, rather than four, categories of businesses – low, medium-low, medium, medium-high, and high R&D intensity. The new classification is not limited to manufacturing businesses, but also includes non-manufacturing entities. As a result, there are minor changes as to the range of the respective manufacturing sectors in the specific categories when compared with the previous classification. In the subject literature, the Galindo-Rueda and Verger classification (2016) is often applied alongside the notion of the 'technological' level of businesses, see e.g.

Lampón and González-Benito (2019), Srhoj, Škrinjarić and Radas (2021), Carrillo-Carrillo and Alcalde-Heras (2020) or Culot *et al.* (2020). As the authors of the classification stress in their publication, the sectoral division is based solely on the level of R&D expenditure. However, the said division does not include such factors as technology purchases.

The scope of this study is limited to medium-high-tech manufacturing sector. It is an important part of economies of many countries. The largest industries (or subsectors) in the European Union by value added are manufacturing of machinery and equipment as well as motor vehicles and trailers (Eurostat, 2018). Medium-high-tech sector is also considered to be a critical area by China when it comes to its competitiveness in export (Lei & Zongsen, 2017). It must be underlined that this field has been understudied, as authors often concentrate on high tech companies (*e.g.* Xia & Liu, 2017; Braja & Gemzik-Salwach, 2019, 2020) or analyse high- and medium-high-tech industries together (see *e.g.* Ambrammal & Sharma, 2014; Sandu & Ciocanel, 2014; Villamizar, Cobo & Rocha, 2017; Hu, Wang & Zhang, 2020). Still, these clusters can differ in certain aspects, as evidenced by the considerable differences in R&D expenditure between these two groups – see Galindo-Rueda and Verger (2016, p. 10). One factor that ensures the competitiveness of manufacturing high tech industries is R&D. In medium-high-tech entities, the share of R&D expenditure is much lower, forcing these businesses to engage in other areas of market competition. One of these areas can involve effective market knowledge operations. The pharmaceutical sector (high tech) can serve as a case in point – its most burning need is no secret and involves the need development of an effective Covid-19 vaccine. For pharmaceutical companies, technical knowledge remains key, while market knowledge plays a far less significant role. For motor vehicles companies (medium-high tech) to produce a competitive car, they must not only possess advanced technological knowledge but also extensive market knowledge with regard to customer needs and preferences, which change over time, too.

Market knowledge

Market knowledge is often defined in the subject literature in line with Narver and Slater (1990), *i.e.* as the company's knowledge of its customers and competitors, *e.g.* by Li and Calantone (1998) or De Luca and Atuahene-Gima (2007). Nevertheless, it can be argued that the above definition needs to be extended by including the company's knowledge of market trends and economic phenomena significant for the company. It seems so because, according to Vicari and Cillo (2006), too much concentration on current customers and competitors may lead to the replication of old frameworks and lead to the loss of the company's competitiveness. Moreover, according to Schlegelmilch and Penz (2002, p. 5) 'the difference between competitive success and failure often only hinges on an early recognition of market trends.'

Market knowledge is important for companies because it is difficult to emulate it quickly, and because it is continuously updated, in particular in the high-tech sectors. This is why market knowledge-based products cannot be copied in short time frames. On the other hand, technologies can be copied by competitors through reverse engineering process (Slater, Olson, & Sørensen, 2012). Even if one disregards the difficulty of market knowledge imitation, it nonetheless is another entry barrier for competitors.

Market knowledge is also important with regard to the companies' innovation processes. In order to generate innovations, companies need to constantly acquire market knowledge (Schlegelmilch & Penz, 2002). Otherwise, entities with inferior market knowledge may take longer to identify new market opportunities than their competitors (Lichtenthaler, 2008). Let us look into this issue in more detail. Sorescu, Chandy, & Prabhu (2003) distinguished three types of innovation: technological breakthroughs, market breakthroughs and radical innovations; their division has been used by many other authors, *e.g.* Jin, Shu, and Zhou (2019), Osta and Maamari (2020), and Zhou, Yim, and Tse (2005).

Technological innovation (or technological breakthroughs) is often perceived as a major factor in the success of specific products or companies (Kock *et al.*, 2011). However, the research conducted by the aforementioned authors shows that technological innovation can affect the commercial success of

a product both positively and negatively (Kock *et al.*, 2011). This shows that a reliance on market innovation might be more conducive to the product and company competitiveness, which effectively overlaps with the main goal of every company.

Market knowledge sharing

Knowledge is a strategic resource for contemporary companies, but its management poses a number of challenges (Dasgupta & Gupta, 2009). Knowledge sharing processes pose a particular difficulty (Hendriks, 1999). This resource is not distributed evenly among people, industries or employees of organizations, however, knowledge of some individuals or groups can help solve the problems of others (Hargadon and Sutton, 1997). Hence, apart from creating market knowledge resources, companies must implement effective processes of their dissemination. Slater, Olson and Sørensen (2012) underline that market knowledge may contribute to company competitiveness in as much as it can be shared among company employees who in turn can use it in their work. According to Day (1991, p. 21), 'market knowledge is not fully captured in a usable form until the lessons and insights are transferred beyond those who gained the experience.' Unfortunately, knowledge sharing between employees is often impeded, as people are naturally predisposed to think that being knowledgeable increases their uniqueness, prestige, and power (Hendriks, 1999; Gray, 2001; Husted & Michailova, 2002; Lee & Al-Hawamdeh, 2002; Slater, Olson & Sørensen, 2012; Akhavan *et al.*, 2015). However, it should be stressed that at times effective knowledge sharing is not a matter of employees' intentions, but rather their capacities, since the root cause of the problem may *e.g.* be linked to infrastructure deficits (Lesser & Prusak, 2004).

Effective knowledge sharing lies at the root of many large companies such as Xerox (Liebowitz & Yan, 2004). Similarly, one of the critical elements of a famous manufacturing concept – just-in-time – are the rules by which market knowledge is first gathered and subsequently communicated. These rules enable the companies that introduce them to be agile and flexible (Zander & Kogut, 1995). By far, the most difficult among them is the transfer of the most complex, tacit knowledge. One of the solutions which may increase the efficiency of this process in a company involves creating specific positions, *i.e.* internal knowledge brokers. Such internal knowledge brokers are persons whose task is to manipulate and facilitate the delivery of market knowledge to the right people or groups. Knowledge brokers may deliver the necessary knowledge to the right places and strengthen the understanding between market experts and technology experts (Kramer & Cole, 2003; Cillo, 2005; Lichtenthaler & Lichtenthaler, 2010).

Market knowledge perception

Internal market knowledge perception among employees can significantly influence their actions with respect to this resource. Such a state of affairs has caused a number of authors such as Li and Calantone (1998), Hoe (2008), and Hoe and Shane (2010) to conduct research on this very problem. Research results demonstrate that the management's approach to market knowledge sharing or, by extension, to market-related issues, is absolutely vital (Jaworski & Kohli, 1993; Li & Calantone, 1998). According to Li and Calantone (1998), without recognizing and understanding the value of market knowledge by the management, the company is unlikely to undertake actions that result in the production of market knowledge. Hoe (2008) argues that the management should clearly articulate the crucial value of market knowledge to their enterprise, while also communicating their expectations towards the employees in this regard. Moreover, Hoe stresses that market knowledge perception matters because it shapes behaviours, among others with reference to market knowledge activities. This is corroborated by Li and Calantone (1998), whose research indicates that the more the top-level management appreciated market knowledge, the more their company intensified its processes with regard to customer and competition knowledge.

Openness of technical staff

In the analysis of market knowledge sharing, the study also concentrated on technical staff. These are all company's employees in technical positions such as R&D personnel that constitutes the spine of every medium-high-tech company. Such people often lack soft skills. The term 'soft skills' is most often used to

denote communicative skills, teamwork abilities, kindness, and other interpersonal skills. These skills are usually complementary to hard skills, which refer to the ability to perform specific tasks (Cimatti, 2016). Pierce and Steele (2016) contend that businesses can benefit from investing in soft skills. What's more, Shallock *et al.* (2018) argue that in an era of industry 4.0, the development of human resources is even more important than technology itself. Unfortunately, research demonstrates that soft skills are frequently overlooked in academic courses (Ghislieri, 2017). When looking for employees (including at technical positions), many modern-day employers focus on soft skills. According to Wheelahan and Moodie (2011), soft skills gain significance once the basic (*e.g.* technical) requirements are satisfied. Moreover, due to the fact that in a number of cases employers can choose between many candidates of equal technical ability, their decisions often lean on soft skills. What is more, some positions do not require any official qualifications aside from the indispensable soft skills (Lauder, Brown & Ashton, 2008). Unfortunately, the labour market often lacks in candidates with adequate soft skills. For instance, American employers have repeatedly signalled the need for the inclusion of soft skills courses, such as communication and problem solving, in university curricula (Javdekar *et al.*, 2016).

Purpose of the study and hypotheses development

The purpose of this study was to provide a model comprised of a range of factors related to market knowledge and the ways in which it is shared internally and examine how they impact the competitiveness of medium-high-technology manufacturers. Figure 1 shows the research model, which includes five latent variables: CO – competitiveness; MK – market knowledge; MKS – market knowledge sharing; MKP – market knowledge perception (in a company); OTS – openness of technical staff.

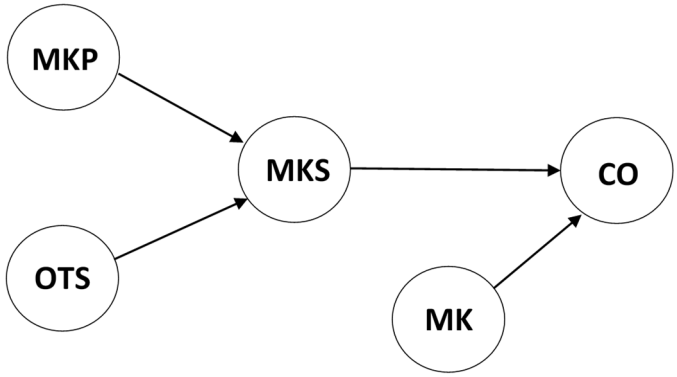

Figure 1. The research model
Source: own elaboration.

Li and Calantone (1998) corroborate that market knowledge perception among the company management, and its resulting perception among the employees influence the market knowledge competence at the company. On another note, Szulanski (1996) identifies the 'recipient's lack of absorptive capacity' as one of the chief problems in knowledge transfers. One may, therefore, expect that if a given company considers market knowledge as insignificant, market knowledge will not be appropriately shared or adequately absorbed, in particular by technical staff, which in turn shall render its transfer ineffective. Thus, it can be surmised that:

H1: Market knowledge perception within a business influences the effectiveness with which it is shared in medium-high-technology manufacturing companies.

In the USA, many managers bemoan the shortage of communication skills among their technical employees (Javdekar *et al.*, 2016). Such an approach among employers stems from the fact that, for a technical enterprise to be successful, it must think beyond a team of well-educated engineers. Nowadays, successful companies rely on a positive atmosphere and efficient teams that are capable of working together across departmental divides. The results generated by businesses rely primarily on the ability to act as a unit, which entails the human factor and the adequate use of soft skills (Cimatti, 2016). Therefore, it may be surmised that:

H2: The openness of technical staff translates into a greater efficiency of market knowledge sharing in medium-high-technology manufacturing businesses.

According to Slater, Olson, and Sørensen (2012) effective knowledge management needs taking good ideas originating from various functions and applying them in other areas of an enterprise. The importance of effective knowledge management, including the quick and efficient internal transfers of knowledge, is vital *e.g.* due to the ever-shorter life cycle of market products (Tseng, 2009). Knowledge transfers are particularly problematic at the cross-section of marketing and technology. As per Szulanski (1996), one of the most common problems in internal transfers of knowledge is that of the 'arduous relationship between the source and the recipient' (p. 27). Employees in the marketing and R&D departments operate in different environments and have different educational backgrounds and priorities. As a result, a proper organization of knowledge transfers across different departments is indispensable. By hiring a knowledge broker (as defined *e.g.* by Cillo, 2005), the company may facilitate the transfer of market knowledge to technical staff, thus effectively improving the company's competitiveness. Thus, it can be surmised that:

H3: The efficiency of market knowledge sharing in medium-high-technology manufacturing businesses has an influence on their competitiveness.

Slater, Olson, and Sørensen (2012) argue that market knowledge, in particular in high-tech markets which are particularly dynamic, is difficult to copy in short spans of time, as its durability is very short. What is more, the impact of market knowledge on performance or competitiveness of businesses, and on the factors that determine these aspects, has been well researched for different types of businesses (see Leskiewicz Sandvik & Sandvik, 2003; Hou & Chien, 2010; Lin, Che & Ting, 2012; Jin & Jung, 2016; Rakthin, Calantone & Wang, 2016; O'Connor & Kelly, 2017; Jin, Shu & Zhou, 2019; Scandura, 2019), however this impact has not yet been examined for medium-high-technology manufacturing companies. The results of the aforementioned studies, along with the high competitiveness of the markets in which the examined entities operate, seem to suggest that the results of analyses presented in this study will be similar to the aforementioned sources. Therefore, it may be surmised that:

H4: Market knowledge of a medium-high-technology manufacturing business has an impact on its competitiveness.

RESEARCH METHODOLOGY

Survey instrument

I delevoped the instrument based on the literature (Deshpande, Farley & Webster, 1993; Hooley *et al.*, 2000; Fonfara, 2009; Paliszkiewicz & Koohang, 2013) and qualitative research in which in-depth interviews were conducted across 16 companies. The qualitative study and instrument development constituted a part of wider research project concerning both medium-high and high tech firms. The sample was diversified in order to understand functioning both types of enterprises, among medium-high-tech manufacturing companies industries such as electrical equipment, medical and dental equipment or machinery and equipment n.e.c. were represented. Based on the research model, five constructs were created:

Market Knowledge Perception (MKP):

1. The company believes that creating a well-selling product requires a team with high level of technical and market knowledge.
2. The company perceives the employees responsible for marketing and the market as equally important to the technical employees.

Openness of Technical Staff (OTS):

1. The company's technical employees are open and willing to share knowledge within the company.
2. The company's technical employees are willing to accept comments/suggestions from customers or employees with market knowledge.
3. The employees working in technical areas are required to go outside their comfort zone and enter into a dialogue with people with market knowledge.

Market Knowledge Sharing (MKS):

1. When working on a product or service, the company usually delegates a person who constantly supervises the delivery of customer knowledge or market knowledge to technical employees, e.g. product owner, product manager or product director.
2. The competences of the person who coordinates the cooperation with clients or acquires market information are of key importance for the success of a given product or service.
3. In the company, the communication between people responsible for the technical development of products and services and the people responsible for marketing, the market, and customers is very intensive.

Market Knowledge (MK):

1. Our commitment to serving customer needs is closely monitored.
2. Salespeople share information about the company's competitors.
3. We devote significant resources to active market monitoring in order to search for trends and economic phenomena deemed important for the company.

Competitiveness (CO):

1. The company's speed of development compared to its closest competitors (in 2019).
2. The company's value of sales compared to closest competitors (in 2019).
3. The company's market share compared to closest competitors (in 2019).

The answers were provided on a 5-point Likert scale, using the following values: 1 – I completely disagree; 2 – I disagree; 3 – I neither disagree nor agree; 4 – I agree; 5 – I completely agree. Due to the fact that the competitiveness of the analysed companies was measured in comparison to their closest competitors, the descriptions of individual values were verbalized as follows: 1 – much lower; 2 – lower; 3 – comparable; 4 – higher; 5 – much higher.

Subjects and procedure

The anonymous, quantitative survey was conducted by the marketing company Indicator in April and May 2020 using the method of computer-assisted telephone interviewing (CATI). The Bisnode database served as the sampling frame. The entire survey focused on manufacturing and non-manufacturing companies operating in high and medium-high R&D intensity industries, according to Galindo-Rueda and Verger's (2016) classification. However, this study concentrated on companies from the medium-high-technology (or R&D intensity) manufacturing industries only. In the study, low-, mid-, and high-level managers were questioned. Nevertheless, this article concentrates on mid-level management. Such a choice is dictated by the fact that this group is considered by many as the best-informed personnel in companies (Floyd & Wooldridge, 1997). The final step involved an analysis of data from a total of 130 enterprises. The detailed industry division of the surveyed enterprises is presented in Table 1, the distribution of companies in the sample by the number of employees is presented in Table 2, and ownership structure of companies in the analysed sample is presented in Table 3.

Table 1. Distribution of companies in the sample by industry

Companies' industry	Number of companies in the sample	Share in the sample
Weapons and ammunition	2	1.5%
Motor vehicles, trailers and semi-trailers	16	12.3%
Medical and dental instruments	10	7.7%
Machinery and equipment n.e.c.	37	28.5%
Chemicals and chemical products	33	25.4%
Electrical equipment	14	10.8%
Railroad, military vehicles and transport n.e.c.	18	13.8%
Total:	130	100.0%

Source: own study.

Table 2. Distribution of companies in the sample by the number of employees

Number of employees	Number of companies in the sample	Share in the sample
1-9	21	16.2%
10-49	34	26.2%
50-249	30	23.1%
250 or more	45	34.6%
Total:	130	100.0%

Source: own study.

Table 3. Ownership structure of companies in the analysed sample

Dominant share in business ownership	Number of companies in the sample	Share in the sample
Polish private	88	67.7%
Property of the Polish State Treasury	4	3.1%
Foreign	38	29.2%
Total:	130	100.0%

Source: own study.

Data analysis

The data has been analysed with the use of PLS-SEM – partial least squares (PLS) path modelling, a variance-based structural equation modelling (SEM) with use of SmartPLS 3 software (Ringle, Wende & Becker, 2015). This method requires that several analyses be conducted before the testing of the actual hypotheses. The first analysis seeks to establish convergence validity, the second helps determine discriminant validity, while the last identifies the model goodness of fit (Hulland, 1999).

In order to establish convergence validity, several conditions must be met. The loadings of each indicator should be greater than 0.70. Nevertheless, values above 0.60 are also acceptable in the subject literature (*e.g.* Birkinshaw, Morrison & Hulland, 1995; Chin, 1998; Moores & Chang, 2006). The average variance extracted (AVE) should be greater than 0.50 for each latent variable (Fornell & Larcker, 1981). Composite reliability (CR) should be higher than 0.70 for each latent variable (Hair, Ringle & Sarstedt, 2013).

To establish discriminant validity, one needs to compare the AVE of every construct with the shared variance of the constructs. If the AVEs of every construct are greater than the shared variance of the other constructs, discriminant validity is confirmed (Fornell & Larcker, 1981).

Another issue that needs to be verified involves the R^2 values of the dependent variables. These determine the predictability of the model (Koohang, Paliszkiewicz & Goluchowski, 2017). According to Falk and Miller (1992) the values of R^2 need to amount to at least 10% in order to be considered meaningful.

The hypotheses may be tested once the aforementioned steps are successfully completed. Their acceptance or rejection is determined by the t-statistic. For the significance level of 5%, the critical value of t = ±1.96 (Hair, Ringle & Sarstedt, 2011; Koohang, Paliszkiewicz & Goluchowski, 2017).

RESULTS AND DISCUSSION

Establishing convergence validity

In order to establish convergence validity, the results of each latent value were checked, *i.e.* the indicators' loadings, the AVE, and composite reliability – see Table 4. The loadings of all indicators should be greater than 0.7. Almost all of them were, save for one of them, which value amounted to 0.685. Nevertheless, such exceptions – if minor and approximate to the appropriate values – are acceptable (Birkinshaw, Morrison & Hulland, 1995; Chin, 1998; Moores & Chang, 2006). Another issue involves the fact that all AVE values should be greater than 0.50 and all rho_A values need to be greater than 0.70. As we can see in Table 3, these two conditions were met. Similarly, the composite reliability index should be greater than 0.70 – a condition that was likewise fulfilled.

Table 4. Research model reliability and validity

Variables	*Loadings*	*AVE*	*rho_A*	*Composite Reliability*	*Cronbach 's alpha*
MKP (Market Knowledge Perception)	–	0.835	0.854	0.910	0.806
Creating a product requires market knowledge (MKP-1)	0.888	–	–	–	–
Market employees perceived as important (MKP-2)	0.939	–	–	–	–
OTS (Openness of Technical Staff)	–	0.702	0.793	0.874	0.778
Technical employees share their knowledge (OTS-1)	0.914	–	–	–	–
Members of technical staff accept comments/suggestions from customers or fellow employees (OTS-2)	0.896	–	–	–	–
Technical employees are required to go outside their comfort zone (OTS-3)	0.685	–	–	–	–
MKS (Market Knowledge Sharing)	–	0.800	0.879	0.923	0.875
Market knowledge broker position present in the company (MKS-1)	0.917	–	–	–	–
Competences of market knowledge broker (MKS-2)	0.915	–	–	–	–
Intensive communication between technical and market employees (MKS-3)	0.849	–	–	–	–
MK (Market Knowledge)	–	0.634	0.707	0.838	0.709
Commitment to customer satisfaction (MK-1)	0.866	–	–		–
Information about competitors (MK-2)	0.763	–	–	–	–
Significant resources allocated to active market monitoring (MK-3)	0.755	–	–	–	–
CO (Competitiveness)	–	0.830	0.903	0.936	0.898
Speed of development (CO-1)	0.872	–	–	–	–
Value of sales (CO-2)	0.923	–	–	–	–
Market share (CO-3)	0.937	–	–	–	–

Source: own study.

Establishing discriminant validity

To establish discriminant validity, first the Fornell-Larcker Criterion was used – see Table 5. As we can see, the square roots of the AVE values (in bold) in the diagonal are greater than the correlations between the latent variables. Table 6 presents the cross loadings. It is evident that the correlation of every indicator was at its highest in the case of the latent variable to which it has been assigned. We may conclude that a sufficient discriminant validity for the research model was established.

Table 5. Discriminant Validity – Fornell-Larcker Criterion

Construct	MKS	CO	MK	MKP	OTS
MKS	**0.8945**	–	–	–	–
CO	0.4833	**0.9113**	–	–	–
MK	0.2512	0.5182	**0.7961**	–	–
MKP	0.3003	0.1594	0.1044	**0.9162**	–
OTS	0.2468	0.2154	0.1942	0.0332	**0.8380**

Source: own study.

In the opinion of Henseler, Ringle, and Sarstedt (2015), the method establishing discriminant validity using the Fornell-Larcker criterion together with the assessment of cross-loadings has unacceptably low sensitivity. Another way of establishing discriminant validity is the HTMT criterion (heterotrait-monotrait ratio of correlations). The values of HTMT are computed 'based on the mean of the correlations of indicators across constructs measuring different constructs, relative to the average correlations of indicators within the same construct' (van de Wetering, 2018, p. 6). According to the most conservative criterion HTMT values need to be lower than 0.85. Table 7 shows that the values obtained were much smaller. This means that discriminant validity using the HTMT criterion has been established.

Table 6. Cross Loadings

Indicator	MKS	CO	MK	MKP	OTS
MKS-1	**0.9171**	0.4239	0.2378	0.2804	0.2733
MKS-2	**0.9155**	0.4584	0.2214	0.2587	0.2296
MKS-3	**0.8495**	0.4144	0.2148	0.2676	0.1526
OTS-1	0.2180	0.2184	0.2424	-0.0351	**0.9137**
OTS-2	0.2140	0.1482	0.1612	0.0069	**0.8956**
OTS-3	0.1857	0.1742	0.0716	0.1250	**0.6853**
MKP-1	0.2311	0.0461	0.0161	**0.8880**	-0.0089
MKP-2	0.3085	0.2211	0.1553	**0.9388**	0.0594
MK-1	0.1368	0.3858	**0.8660**	0.1671	0.1647
MK-2	0.2423	0.3889	**0.7626**	0.0902	-0.2076
MK-3	0.2151	0.4505	**0.7548**	0.0039	0.0984
CO-1	0.4128	**0.8723**	0.4296	0.1581	0.1579
CO-2	0.4350	**0.9230**	0.5042	0.1071	0.1983
CO-3	0.4717	**0.9372**	0.4799	0.1721	0.2293

Source: own study.

Table 7. Heterotrait-monotrait ratio of correlations (HTMT)

Indicator	CO	MKP	MKS	MK	OTS
CO	–	–	–	–	–
MKP	0.172	–	–	–	–
MKS	0.545	0.352	–	–	–
MK	0.642	0.161	0.316	–	–
OTS	0.258	0.113	0.297	0.260	–

Source: own study.

The structural model

The values of R^2 for the company's internal market knowledge sharing (MKS) and competitiveness (CO) amounted to 0.15 and 0.40, respectively. The MKS value is relatively low, however, according to Falk and Miller (1992) R^2 values of 0.10 or more can be deemed meaningful. Nevertheless, the R^2 for the most important value – CO – was quite high at 0.40.

Accepting/rejecting the hypotheses

Table 8 shows the standardized path coefficients results and the t-values that determine the acceptance or rejection of the proposed hypotheses. H1, which stated that 'market knowledge perception within a business influences the effectiveness with which it is shared in medium-high-technology manufacturing companies,' was accepted (β=0.292; t=3.508; p<0.001). H2, which stated that 'the openness of technical staff translates into a greater efficiency of market knowledge sharing in medium-high-technology manufacturing businesses,' was accepted (β=0.237; t=2.412; p<0.05). H3, which stated that 'the efficiency of market knowledge sharing in medium-high-technology manufacturing businesses has an influence on their competitiveness,' was accepted (β=0.377; t=5.605; p<0.001). H4, which stated that 'market knowledge of a medium-high-technology manufacturing business has an impact on its competitiveness,' was accepted (β=0.424; t=7.261; p<0.001).

Table 8. Acceptance/rejection of hypotheses

Variables	Path coefficient	t-value	p-value	Hypothesis – accepted or rejected
MKP -> MKS	0.292	3.508	0.001	Accepted
OTS -> MKS	0.237	2.412	<0.05	Accepted
MKS -> CO	0.377	5.605	0.001	Accepted
MK -> CO	0.424	7.261	0.001	Accepted

Source: own study.

CONCLUSIONS

The goal of the study was to create a research model that consisted of five latent variables (constructs) which included: market knowledge perception, openness of technical staff, market knowledge sharing, market knowledge, and competitiveness. Four hypotheses were tested in the course of the study. The first and the second concerned the factors influencing market knowledge sharing, *i.e.* market knowledge perception and the openness of technical staff. According to the third hypothesis, the efficiency of market knowledge sharing in medium-high-technology manufacturing businesses has an influence on their competitiveness. As per the fourth hypothesis, the level of market knowledge in a medium-high-technology manufacturing business influences its competitiveness. All hypotheses were tested with the use of PLS path modelling method.

The results showed that market knowledge perception in a company, along with the openness of its technical staff, significantly influenced market knowledge sharing in the examined type of companies, albeit not very strongly. More importantly, the following conclusions were made in the course of the study. The research findings indicated that market knowledge had a strong and significant influence on the competitiveness of the examined type of companies. In particular, the findings indicated that internal market knowledge sharing had an equally strong and significant impact on the competitiveness of the analysed business entities. The results obtained in the course of the study indicated that both market knowledge and its internal transfer were required across the examined group of businesses, since they had a comparable impact on the competitiveness of medium-high-technology manufacturing companies in the analysed sectors.

The research corroborated a range of hypotheses based on the publications of Hou and Chien (2010), and Slater, Olson, and Sørensen (2012) that for both the level of market knowledge (MK) and the processes of market knowledge sharing (MKS) have a significant impact on the competitiveness (CO) of medium-high-tech manufacturing companies. As for the successive hypotheses based, among others on Cimatti (2016), they proved to be less apposite. The research results showed that the openness of technical staff and market knowledge perception played a slightly less significant role than expected, yet their impact on internal market knowledge sharing was nonetheless noticeable and statistically significant. Above all, the study implied that it is not the possession of market knowledge alone, but also efficient sharing this knowledge internally – *e.g.* through properly trained and competent knowledge brokers, as suggested by Kramer and Cole (2003), Cillo (2005), Van den Berg *et al.* (2014) and Haas (2015) – that enable the examined businesses to gain a competitive edge. Research findings on the importance of knowledge sharing for company competitiveness were consistent with the literature (*e.g.* Eidizadeh, Salehzadeh & Esfahani, 2017; Farooq, 2018), however, they deepen our knowledge on this topic. It is, among other things, related to the fact that this article is the first to present the results of a quantitative analysis of knowledge sharing with respect to the importance of internal market knowledge brokers for business entities. To date, empirical research on this phenomenon has been conducted using qualitative methods, *e.g.* by Cillo (2005).

As a result, it can be concluded that an important contribution to the literature of this article is to prove the importance of the importance of sharing market knowledge inside medium-high-tech manufacturing companies. Most publications dealing with the topic of knowledge sharing do not focus on a specific type of knowledge (*e.g.* Razmerita, Kirchner & Nielsen, 2016; Farooq, 2018; Ouakouak & Ouedraogo, 2019), neither do many focus on entities in specific industries (*e.g.* Nguyen *et al.*, 2019). The approach used in this publication enabled a more detailed analysis of the importance of knowledge sharing and the factors that influence it. Narrowing the analysis to market knowledge and manufacturing companies in the medium-high-tech sector made it possible to explore, among other things, the importance of the role of the previously mentioned knowledge brokers. This would not be possible without using this approach. For example, Ouakouak & Ouedraogo (2019) consider more general factors influencing knowledge sharing in a company in their analyses, as they do not focus on a specific type of knowledge. As a result, their analyses are less detailed. An important contribution of this article lies also in proving the importance of

the market knowledge resource itself for the competitiveness of medium-high-tech manufacturing companies. However, for this resource to have a sufficiently strong impact on the competitiveness of medium-high-tech manufacturing companies it must be adequately disseminated.

Practical implications

In view of the presented findings, hiring a well-educated market knowledge broker, equipped with adequate technical knowledge, constitutes the main practical recommendation of this study. Granted, it would be considerably expensive. Still, given the presented research findings, such an investment would likely generate profits for the analysed businesses. Unfortunately, due to the current Covid-19 pandemic, enterprises are more inclined to cut down on their expenditure than pursue innovative solutions. However, it should be noted that the current time is particularly demanding in terms of market knowledge and its transfer to appropriate positions within a business, given the rapidly changing market demand and the resulting need to adapt to these changes by delivering desirable products. As research has proven that good relations between technical and market employees are important element of effective knowledge sharing in medium-high-tech manufacturing companies. That is why managers should try not let pandemic to cut ties between both groups. The research also showed that openness of technical staff constitutes support to market knowledge sharing in analysed group of enterprises. That is why it also proved the importance of the need signalled by American employers and mentioned by Javdekar *et al.* (2016) to include soft skills courses in university curricula. Such courses should among others educate students why it is worth sharing market knowledge in the enterprise and how to do it effectively. This issue is especially important for technical universities so that their graduates in the future in their professional life, appreciate the analysed issue.

Presented analyses and their practical implications may be beneficial to every medium-high-tech manufacturing company. Nevertheless, it may be useful mostly to independent ones that are not just manufacturing facilities. This is because this type of entities cannot rely on clear guidelines based on orders from other branches. They need to acquire and transfer market knowledge to the appropriate places and people in the company. This is especially difficult in case of large companies. The larger the enterprise, the more challenging this task will be. This is due to more complex structure of larger companies.

Limitations and future research

This article has several limitations. The collected data was procured by means of self-reporting, which may have produced a bias and limited the generalization of the obtained results. Moreover, empirical research was conducted in Poland only, and was limited to medium-high manufacturing business only. Future research could potentially seek to corroborate these results with enterprises based in other countries and sectors. The applied research model indicates a relatively low, yet statistically significant impact of market knowledge perception and the openness of technical staff to market knowledge sharing. Given the considerable significance of market knowledge sharing on the competitiveness of the examined enterprises, future research should focus on identifying other factors that have an impact on the effectiveness of internal knowledge sharing.

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