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The Importance of Information Management in the Context of Industry 4.0: Evidence from the Kuyavian-Pomeranian Forbes Diamonds

Agnieszka Kuś ^{1,*} and Paula Pyplacz ²

¹ Faculty of Economic Sciences and Management, Nicolaus Copernicus University in Toruń, Jurija Gagarina 11, 87-100 Toruń, Poland

² Faculty of Management, Czestochowa University of Technology, Generała Jana Henryka Dąbrowskiego 69, 42-201 Częstochowa, Poland; paula.pyplacz@wz.pcz.pl

* Correspondence: adk@umk.pl; Tel.: +48-56-611-46-35

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Abstract: Currently, the role of information and of the tools facilitating its acquisition and processing is so significant that, in the economic nomenclature, there are already such concepts as an information civilization or information society. The aftermath of this state of affairs is the commercial breakthrough consisting of the enterprise's success on the intellectual capital rather than the material one. This article aims to show the outline of the information management process and to determine how its components are used in companies. The first part of the paper is devoted to the description of information management concepts in enterprises and the functioning of organizational information systems. The second part of the study includes the results of original research carried out using the Computer-Assisted Web Interview (CAWI) method on the 70 Kuyavian-Pomeranian enterprises counted among the Forbes Diamonds 2018. An analysis of the obtained results indicates that the level of diversity of methods and frequencies of information channels used depends on the size of the entity, its capital structure, and the industry in which they operate. The primary sources of information for the surveyed companies are customers and competitors. The respondents agree that a well-functioning enterprise information system facilitates making decisions in the company and improves internal communication. The most frequently implemented development strategy in the analyzed companies is the market development strategy.

Keywords: information management; internal information system of enterprises; Forbes Diamonds 2018; Kuyavian-Pomeranian enterprises; Industry 4.0

1. Introduction

Modern business entities operating under conditions of high competition and feeling the consequences of globalization processes are paying more and more attention to increasing the attractiveness of the wares they offer and selecting the most optimal business model. In addition, the dynamics and scope of changes accompanying entrepreneurs on almost every level of activity require them to continuously observe and analyze the processes occurring around them, and thus to react and adapt quickly in the new economic reality. Maintaining a competitive position on the market is increasingly dependent on the information resources available and the skills needed to manage them. It has often been emphasized that information is the fourth,¹ and often the key, factor of production in the modern enterprise. This state of affairs results from the fact that information is a fundamental pillar in making the right decisions and carrying out comparative analyses in the company.

¹ After the human, material, and financial factors.

The main goal of the article is to present the concept of information management and to identify its main components based on the example of enterprises from the Kuyavian-Pomeranian Province and distinguished in the Forbes Diamonds Ranking 2018. Formulating the main goal in this way comes indirectly from the certain role that information plays in the context of the ongoing changes happening in Industry 4.0. The title of this study indicates three issues addressed in it, namely, the role of information in the modern economy, the enterprise information system, and the management of information in companies in light of the challenges related to Industry 4.0.

To understand the importance of information in the current economic realities, it is necessary to realize the fact that the 21st century society is a mass data community for which information is the most valuable asset and fundamental determinant for action. Having information extends access to other resources and allows people to take action to improve the current state. It is worth emphasizing that only people can create the added value of the information hidden in a significant amount. In addition, from the perspective of the organization, having the “right information” at the “right time” is much more valuable to its people than any large capital (Fraj 2011).

2. Information Management—Why Do Contemporary Enterprises Need It?

In the subject literature, there are several interpretations of the term information. There is no universally accepted definition that would correspond to the specificity of each field in which information applies. Generally, information can be defined as any message received in the process of its transmission, based on which decisions are made. In management science, information (in a broad sense) is understood as knowledge necessary to establish and perform tasks aimed at achieving goals set by the enterprise or more strictly (in a narrow sense) as a feature of a message or signal that reduces uncertainty in relation to the state to which the information relates (Gierszewska and Romanowska 1997). At this point, it is worthwhile to emphasize the fact that terms such as data, information, knowledge, and wisdom, which are repeatedly used interchangeably, have a different meaning. The interrelations between them are illustrated in Figure 1. The narrowest concept is data—representing raw numbers, facts, or events that have not yet been subjected to analysis. Only by interpreting the acquired data in a certain context are we able to create information based on them. The primary function of information is to change the perception of certain things by the recipient for the ordering of available data. Only formulated conclusions that are based on purified information and data in connection with the human element of intuition can be called knowledge. The broadest of these concepts is wisdom, which means the application of multifaceted knowledge in practice.

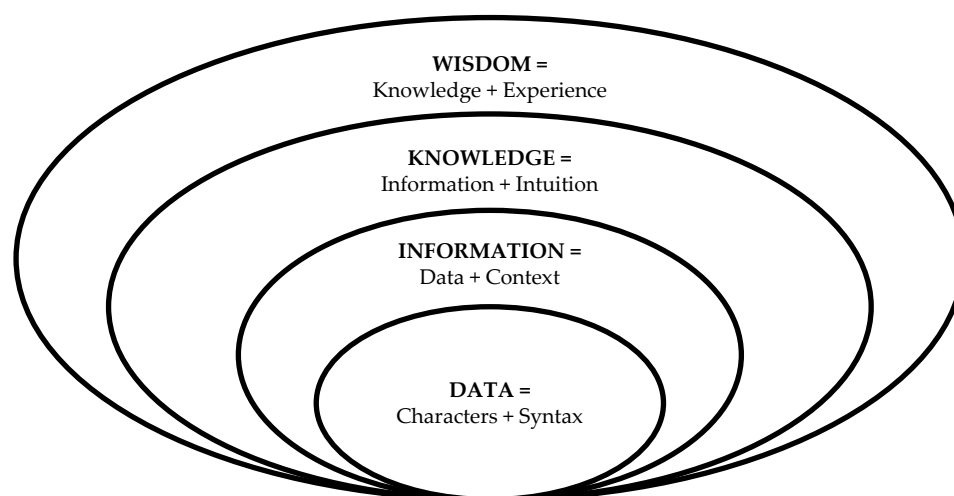


Figure 1. Dependencies occurring on the data–information–knowledge–wisdom line. Source: own study based on (Rowley 2007).

The need for information management in modern enterprises is a consequence of their functioning under the conditions of an information civilization, which possesses, produces, and requires significant amounts of information (Al-Emran et al. 2018). The information management process results from the enterprises' need to store powerful information resources, analyze them, and share them within the given organizational structures. Thanks to the circulation of information, both in the enterprise itself and with entities operating in the environment, it is possible for managers to obtain information consistent with their needs and key from the point of view of decisions to be made or existing problems to be solved. The timeliness and usefulness of information in the decision-making process are even more important, taking into account the occurrence of information overload (related to the growing supply of information while the ability of companies to reduce their capacity decreases—see Fazlagić 2014 for more detail) or several external stimuli that distort the logic of managerial decisions (including the institutional, sectoral, and individual nature of correctness—see Klineciewicz 2005 for more detail). The decision-making process in an enterprise should be a logical set of consecutive and related stages in which information, or actual knowledge resulting from information, is a reference point for the right settlements (see Figure 2). At every stage of the decision-making process, it is possible and even indicated to provide feedback and take into account the so-called “information noise” that makes it difficult to extract real and existing information.

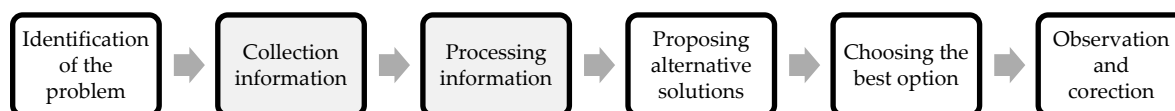


Figure 2. Model of the decision-making process. Source: own study based on (Peters 1999).

Information management in an enterprise is fully effective only if the company has a properly organized information system that distinguishes features such as individuality, comprehensiveness, availability, flexibility, precision, efficiency, innovation, up-to-dateness, and security (Czekaj 2012). The enterprise's information system should cover all areas of the enterprise's operations and efficiently provide the full-fledged information only to those who actually need it (Hwang et al. 2018). In addition, the information flow path should be as short as possible and properly secured so that sensitive data does not fall into the wrong hands. In many thematic studies, the authors present entire sets of elements and activities to facilitate the process of information management in the company. The most mentioned points are as follows: precise identification of the enterprise's information need; development of standards for preparing and publishing internal and external information; development of guidelines for handling information at every stage of its life cycle; selection of appropriate tools and information technologies to be used; integration of competent employees into the information management process; preparation of information security principles; and the work of ensuring the integrity of the information management process with the business management system (Pawłowska 2002).

For the purposes of this work, an enterprise information system is understood as “an integrated set of people, means, and methods for collecting, coding, decoding, storing, processing, finding, and communicating, as well as updating and using data needed by management to decide and manage the organization” (Pańkowska 2001). Information management in modern enterprises is becoming increasingly important in the face of technological and communication challenges, because of which the fact of having the right information, or actually the effectiveness of its use, translate directly into the survival and development of business entities (Hampel 2018). Most of the information collected by companies is of a marketing nature; therefore, besides the information system (of general application), it is recommended to operate a strictly marketing information system in enterprises. A more detailed discussion on the main assumptions of this concept is found in the works of Proctor (1991); Kotler (1999); or Daniel et al. (2003).

Regardless of the type of activity being conducted, the consequences of the digitalization of society and the economy are visible everywhere. It is a technological compass of changes in the automation of

production, quality of services, science, administration, logistics, and communication. According to Money.pl Analytics, there is no doubt that the new digital reality is based on closer information exchange and more complex cooperation than before (Money.pl 2019). The systematic deepening of knowledge and skills as well as the bilateral communication of information between entities are no longer a matter of choice or willingness on the part of entrepreneurs, as has been shown by Professor Witold Orłowski, but it is necessary that Polish companies join the global trends of the fourth-generation industry, so as not to become marginalized (Cieślak-Wróblewska 2018). The cyber-physical system is based on six design principles that are essential for the development of Industry 4.0, namely, interoperability, visualization, decentralization, real-time attribute, service orientation, and process modularity (see Hermann et al. 2015 for more detail). In each of the aforementioned design principles, the importance of knowledge and information is emphasized—their timeliness, their availability, the efficiency of circulation, or the diversity of diffusion channels.

3. Materials and Methods

The subject of the research covered Kuyavian-Pomeranian enterprises distinguished in the “Forbes Diamonds 2018” ranking. The research sample was determined in a targeted manner and contained the most dynamically developing enterprises in the selected province in recent years. For 11 years, Bisnode Poland together with the editors of Forbes have been preparing a list of so-called “Diamonds”, that is, enterprises that in the previous three years had most rapidly increased their value. While preparing the ranking, only companies that had met all of the following conditions were considered (Forbes.pl 2018):

1. submitted to the National Court Register financial statements for the previous financial year or published them in the pages of Polish Monitor B;
2. achieved positive financial results in the previous three years;
3. according to the Bisnode rating (based on the EBIT² and ROA³ indicators), had a risk factor lower than four.

The ranking did not take into account companies that were in bankruptcy or in the process of liquidation. Analysts from Bisnode Poland valued the enterprises using the Swiss method, which combines the property and income method (see Forbes.pl 2018 for more on the ranking’s methodology). In the current edition of Diamonds Forbes, a total of 2000 companies were awarded the ranking, the largest of which being in the Masovian, Greater Poland, Pomeranian, Kuyavian-Pomeranian, and Lower Silesia Voivodeships. The awarded enterprises were divided into three categories according to the size of sales revenue, namely, small (5–50 million PLN), medium (50–250 million PLN), and large (over 250 million PLN).

The authors’ study regarding the organizational information system was carried out in the second half of 2018 using the computer-assisted web interview method. The questionnaire in the electronic version was sent to all 174 distinguished enterprises from the Kuyavian-Pomeranian province. The target group was company owners or persons holding senior management positions. Despite a repeated request to complete the survey form, only 70 companies sent complete feedback, which means that the level of response is 40%. Subsequent query shipments did not increase the received maneuverability. The low rate of return is also related to the fact that the participation in the research was voluntary. Table 1 presents the structure of the surveyed companies by entity size, capital structure, type of business, dominating sales markets, and competitive advantage assessment of the organization.

² Earnings before deducting interest and taxes.

³ Return on Assets.

Table 1. Structure of surveyed business entities (n = 70).

Criterion	Percentage Share
Company size:	
Small	44.3
Medium-sized	42.8
Large	12.9
Capital structure:	
The company has only a national capital	81.4
The company has foreign shareholders	15.7
The company has shares in foreign companies	2.9
Sections by PKD:	
A—Agriculture, forestry, hunting and fishing	1.4
C—Industrial processing	32.9
E—Water supply; sewage and waste management and recruitment activities	2.9
F—Architecture	5.7
G—Wholesale and retail trade; repair of motor vehicles, including motorcycles	18.6
H—Transport and storage	17.1
I—Activity related to accommodation and catering service	5.7
J—Information and communication	2.9
K—Financial and insurance activities	1.4
M—Professional, scientific, and technical activity	5.7
N—Administration and support activities	1.4
Q—Health care and social welfare	2.9
S—Other service activities	1.4
Products constituting the main area of activity:	
Services	50.0
Products of a purchasing nature	15.7
Customized products made to special order	15.7
Consumer durables	10.0
Fast-moving consumer goods (FMCG)	8.6
Sales markets (possibility to choose several indications):	
Local	65.7
Regional	48.6
National	65.7
European Union	47.1
International (outside the UE)	18.6
Global	17.2
Position in the dominant market:	
Dominating—market leader	11.4
Strong—the first three	41.4
Average—we are competitive	47.2

Source: own study based on the research on the enterprises.

The adopted research sample is definitely dominated by enterprises belonging to the small and medium-sized enterprise (SME) sector, which together account for nearly 87% of the surveyed companies. The remaining 13% of the sample are large enterprises. Analyzing the capital structure of the surveyed companies, over 80% of them have only domestic capital, whereas 11 companies have foreign shareholders and 2 enterprises have foreign shares. Taking into account the next element of the sample characteristics, that is, the type of activity conducted according to the sections listed in the Polish Classification of Activities (PKD), the examined enterprises represented the majority of the possible areas of activity (13 out of 21 sections). The largest groups of respondents were entrepreneurs involved in industrial processing (section C: 23 entities), wholesale and retail trade

(section G: 13 entities), and transport and warehouse management (section H: 12 entities). For half of the surveyed companies, services are the main type of business. Every third entity offers supply products or products manufactured to special order. In turn, nearly every fifth company offers consumer products—both durable and those classified as the fast-moving consumer goods (FMCG) industry. Two-thirds of the analyzed Kuyavian-Pomeranian Forbes Diamonds sell from at least two outlets. Among the surveyed enterprises, the directions of sales dominate local and national markets (65% of responses) as well as regional and European Union (EU) markets (48% of responses). Less than 20% of the surveyed companies offer their products and services outside the borders of EU countries and on a global scale. The sample also included enterprises (6% of them) that sold on all listed markets. The last discussed element of the sample specifics is the analysis of the respondent's indications regarding the competitive position of the company, which it occupies in its dominant market. Over half of entrepreneurs fall into the first two categories: the market leader or being in the top three. Other companies define their competitive position as average (less than 48% of indications). It is worth emphasizing here that none of the surveyed respondents defined the competitive position of their company as weak or even bad, which prevents them from competing.

4. Results

In order to identify important elements used in the information management process, a questionnaire was created comprising five thematic issues—the importance of the enterprise information systems (EIS); methods used by the enterprise for getting selected information; the frequency of knowledge and information sources used; entities that are the dominant source of information; as well as the functioning of a market information system (MIS) along with the implemented strategy. In the first question, respondents were asked to rate five statements according to a 5-point ordinal scale, where 1—I totally disagree, 2—I disagree, 3—I have no opinion, 4—I agree, and 5—I totally agree. In order to analyze the obtained results from a sample of 70 entities, the median (M) and dominant (D) were used.

The distribution of answers presented in Table 2 shows the various impacts of EIS on particular areas of functioning of the surveyed enterprises. The most efficient flow of information in the company facilitates making strategic decisions, and also has a significant impact on internal communication channels—both horizontal (between employees) and vertical (appearing on the staff line and employees). From the point of view of the ubiquitous dynamics of change, perspectives are certainly indications of entrepreneurs who are aware that they must ensure regularity in the search, analysis, and interpretation of various data and information elements (both median and dominant are 4). On the other hand, it is worrying in the face of challenges related to Industry 4.0 that there is no clear perception of benefits from the exchange of information and knowledge between the company and external entities. This state of affairs may be related to the still too low level of cooperation undertaken by Polish small and medium-sized enterprises (SMEs) and the still too high level of distrust towards external entities identified in the Polish entrepreneur mentality. Most problems raised by the respondents were in their statement regarding the impact of the enterprise information system on the planning, implementation, and control of the company's strategy. Currently, managers are required to constantly take care of updating strategic assumptions and adapting the company's operations to changing conditions and client preferences, or the use of emerging market opportunities to strengthen the current competitive position.

The information overload occurring in the modern economic reality implies the need to classify the data and information received, as well as their proper interpretation and use in order to ensure enterprise development. However, economic entities, especially smaller ones, often face problems of obtaining a sufficient number of adequately trained employees in this area. That is why they sometimes use reports prepared by external institutions. In the second section of the questionnaire, the respondents were asked whether they are conducting internal analyses in a selected area of information or rather using outsourcing for that purpose. The answers presented in Table 3 show that most of the companies

internally analyze customer loyalty toward the brand (70% of entrepreneurs), customer needs and market position (about 60% of responses), and perception of the company's image (less than 52% of entities). On average, every third surveyed company in the case of image and every fourth surveyed company in the other three areas acquire information by commissioning external analyses. In the four areas of the first case, the percentage of managers (15–17% of indications) acquiring information based on internal reports and using the studies prepared by external entities are similar. The most even distribution of responses occurs in the case of acquiring information on the activity of competitors—the use of outsourcing is prevalent here, as well as the use by entrepreneurs of both methods to obtain the necessary data. This structure of indications shows the high awareness of the owners and managers about the usefulness of information from internal reports and the need to use a variety of external studies. Based on both information channels, it increases the prism of perceiving a specific issue and identifying more solutions, and can shorten the decision-making process in the company.

Table 2. Impact of the enterprise information system on selected areas (n = 70).

Rated Statements	M	D
EIS has a significant impact on the planning, implementation, and control of my company's strategy	3	3
EIS facilitates making strategic decisions in my company	5	5
EIS facilitates internal communication in my company	4	5
EIS facilitates communication with external entities	4	3
In my company, I see the need to ensure continuity and regularity in providing information	4	4

Source: own study based on the research on the enterprises.

Table 3. The type of information obtained by the company (n = 70).

Type of Information	Internal Analysis	External Analysis	Both Methods of Analysis
	Percentage Share (%)		
Customer needs	61.4	21.4	17.2
Buyer loyalty	70.0	15.7	14.3
Company image	51.4	32.9	15.7
Market position	57.1	25.7	17.2
Actions of the competition	30.0	34.3	35.7

Source: own study based on the research on the enterprises.

In addition to defining the direction of the information obtained for the needs of the enterprise, it seems equally important to determine the frequency with which managers reach for data from internal (including departmental reports, balance sheet, annual report) and external (including industry press, statistical studies, laws, and regulations) sources. As shown in Figure 3, most of the entrepreneurs use both methods of obtaining information several times a month. In turn, the smallest numbers of entrepreneurs use external sources of information with a frequency of once a week and internal sources of information once a year. The obtained answers show three dependencies:

- surveyed enterprises that analyze information from internal sources on a daily basis, several times a month, also use data from external sources;
- surveyed enterprises that analyze information from external sources on a daily basis, only use internal sources once a month;
- in surveyed enterprises, along with the increase in the frequency of information sources used, their direction of origin changes from those coming from outside the company to those generated inside the enterprise.

Another analyzed issue in the study was to determine which units provided enterprises with the most relevant information. Respondents were asked to select all entities that were a valuable source of

knowledge for them. Almost all entrepreneurs (see Figure 4) indicated customers as the basic group from which they got feedback in different areas. On average, three-quarters of the surveyed companies obtained significant data resources from their competitors and suppliers. An equally high percentage of respondents (almost two-thirds) indicated employees as a catalyst for the effective circulation of information in the company. Only every fourth enterprise exchanged the necessary information with entities belonging to the group of market regulators. It is worth noting that among the surveyed Forbes Diamonds enterprises, the vast majority (84% of them) obtained the crucial information from at least three different sources. Moreover, all economic entities in the examination sample, which had foreign shareholders or foreign shares, established bilateral and strong relations with all the mentioned entities. The emphasis on acquiring and exchanging information over such a wide range in these entities may indicate a higher level of information system development resulting from their expansion in international markets.

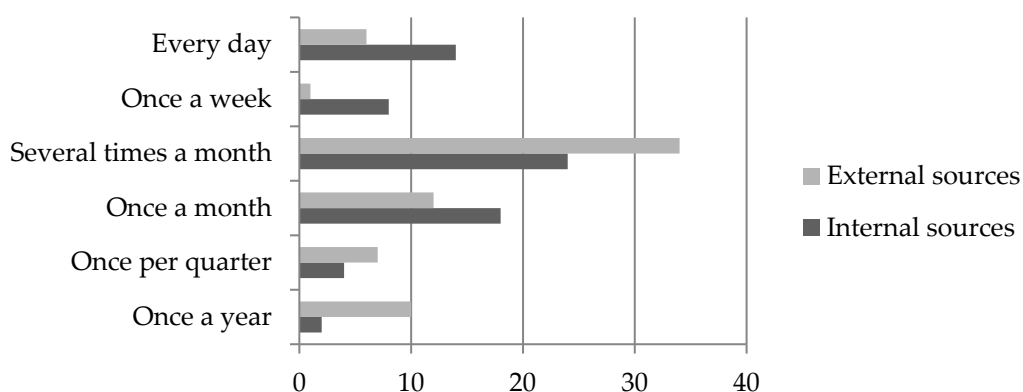


Figure 3. Frequency of used information sources (number of indications). Source: own study based on the research on the enterprises.

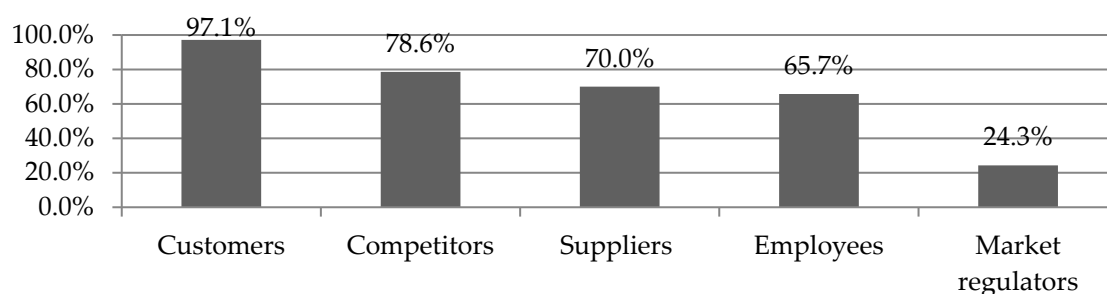


Figure 4. Sources of company information (percentage share—possibility to choose several answers). Source: own study based on the research on the enterprises.

The last issue discussed in this chapter is the existence of a marketing information system in enterprises and the identification of marketing strategies implemented by them. In two of the three surveyed companies, the functioning of MIS was confirmed (see Table 4). This system is present mainly in large and medium-sized enterprises involved in the production, trade, transport, and architecture industries. Organizing the inflow of marketing information from external sources and their appropriate connection with an internal team of people and procedures translates into broader possibilities and a wider scope of competition with the existing market leaders. In addition, enterprises with a MIS implement more advanced marketing strategies than the companies in which this system does not exist. A well-designed marketing strategy that is understood as a set of certain guidelines and rules of conduct should be the element that determines the company's making such a decision, and no other. Using the approach proposed by Ansoff (1957), respondents were asked to indicate which of the marketing strategies has been implemented by them. The author of the above concept assumes four possible business development strategies for two decision variables—product and market. This is

related to the fact that each company produces goods and distributes them on the market. According to the strategy's level of advancement, the following types are distinguished: market penetration, market development, product development, and diversification strategies. Of the surveyed companies, 75% indicated one specific type of strategy adopted in their company; however, the remaining 25% of the enterprises indicated a few (mainly two). The analyzed entities predominately implemented the market development strategy, which consists in generating new market segments or the geographical expansion of existing products. A similar percentage of respondents (over 30%) pointed to the implementation of a market penetration strategy (i.e., an increase in the share on the existing market) or a product development strategy (proposing new goods on the current market). Importantly, all companies who are implementing a diversification strategy (consisting in offering new products on a new market) are entities with foreign shareholders. Again, the capital structure of the surveyed companies differentiates the respondent's indication regarding the advancement of applied solutions. At this point, it is agreed that the marketing strategy does not strictly define the purpose of the company's activity, and should give an answer to the question of how to achieve it with the optimal use of resources while incurring the lowest possible costs.

Table 4. Marketing information system vs. applied marketing strategies (n = 70).

Functioning of the MIS in Enterprises (Percentage Share)	
YES	64.3
NO	35.7
The name of marketing strategy (Percentage Share—Possibility to Choose Several Answer)	
Market penetration	32.9
Market development	48.6
Product development	31.4
Diversification	15.7

Source: own study based on the research on the enterprises.

5. Discussion

The concept of Industry 4.0 first appeared in 2011 at the Hanover Fair as the name of a joint initiative of representatives of business, politics, and science promoting the strengthening of the German economic industry's competitiveness. The presented perception, however, is part of the idea of the fourth industrial revolution, the name which was disseminated by the World Economic Forum, and more specifically its founder Klaus Schwab (2018). Its main purpose is to connect devices within digital ecosystems and to deepen integration inside horizontal and vertical value chains (see more views in Liao et al. 2017). The growing popularity of the discussed concept is also evidenced by the growing number of publications in this area over the past years (Ślusarczyk 2018). The main reason for the coming of the next era of change is the increase in the amount of available data and the development of a company's analytical capabilities (Imran et al. 2019). Due to the appropriate accumulation and use of information, managers can better manage their resources and the entire production cycle. Using advanced data analysis tools, this change enables economic entities to better adapt the offer to the needs of consumers and to deepen the cooperation undertaken with suppliers (Mostafa et al. 2019). Implementing Industry 4.0 solutions consists of the process's automation of collecting and processing a wide range of information elements from a variety of sources—mainly from customers. In one of his interviews, Professor Kevin Werbach points to the three dimensions of the expanding fourth industrial revolution: the sharing economy (including access to resources on demand), the Internet of Things, and Big Data together with Data Analytics (Knowledge-Wharton 2017). The combination of these three planes leads to a situation in which the world becomes one vast network, where everything is a generator as well as a carrier of information. Moreover, as research shows, the essential element for the success of a number of changes related to Industry 4.0 may be at least the basic reorganizing of activities, regarding the current business model (Müller and Däschle 2018), the existing organizational structure

(Durana et al. 2019), or the level and form of a company's operation in social media (Kościelniak 2018). Attempting to find oneself in the upcoming digital reality is particularly difficult for smaller business entities which, with distance and uncertainty, approach bigger changes resulting from emerging trends (Sevinc et al. 2018). This is mainly related to the occurrence, as a rule, of the limited financial, organizational, and human resources for larger companies and a greater sense of possible mistakes and the adoption of inappropriate development directions.

At this point, it is worth quoting the main conclusions from the analyses carried out by PricewaterhouseCoopers (PwC 2017) and The Boston Consulting Group (BCG) (Dmowski et al. 2016) on challenges and opportunities for the Polish economy in implementing Industry 4.0 solutions. PwC carried out a study on a group of 2000 people from 26 different countries (of which 50 were from Poland) employed in 9 sectors of the economy. The research has confirmed that regardless of the country of origin, many enterprises now use solutions typical of digitalization, which improve the efficiency of their operation, enable measurable benefits at various levels, and deepen the existing relationships and connections with customers, suppliers, and business partners. As a key success factor, respondents have indicated human resources, and more specifically the aspect of employing suitably qualified staff who will be able to manage the internal information system and perform tasks related to the analysis of available data. The situation is different in the case of Polish respondents who, despite their optimism, approach the assumptions of digital transformation with reserve. In part, this may be because the previous three industrial revolutions in Poland were implemented with a long delay. The consequences of this state of affairs are the fact that most of today's companies are constantly struggling with the challenges of reality 3.0, and sometimes even 2.0. As analysts from BCG show, the use of opportunities by Poland that creates Industry 4.0 solutions requires entrepreneurs not only to implement new technologies actively but also to intensify innovative initiatives. When comparing the attitude of entrepreneurs from Poland, Germany, and the USA, there are significant differences, including the awareness of the spread of global trend solutions, the implementation level of hardware products, or the creation of modern organizational cultures employing data analytics specialists.

6. Conclusions

The brief theoretical background of the importance of information management in the company presented in this article, supplemented with the context of information challenges from the Industry 4.0 perspective and the results of scholarly empirical research carried out among business entities belonging to the Forbes Diamonds 2018 in the Kuyavian-Pomeranian province, allow for the formulation of several conclusions.

It could be perversely, but with full awareness, that this information rules the world. The vast amount of data transmitted between users on different channels every day confirms the above statement. The process of information management in the organization is of particular importance in the current economic realities. Thanks to the ability to obtain, process, and use information, it is possible to manage the company more efficiently, including making business decisions that are rational. In view of the above, a question arises: How do modern enterprises obtain and manage the necessary information resources and in which decision areas are the latter most often used by them? The research carried out by the authors indicates the awareness on the part of entrepreneurs in using internal information systems to make strategic decisions, improve communication within the organization, and deepen the relationship with external entities. It is worth emphasizing the fact that most of the entrepreneurs use a variety of sources of information (mainly customers) with the frequency of reaching for industry studies and internal reports at least several times a month. Unfortunately, the analyzed sample also identifies disturbing phenomena related to an even still high percentage of enterprises in which there is no marketing information system and a low use of outsourcing in the creation of reports on loyalty or customer needs. The level of advancement of the implemented strategy and the ways of getting information vary depending on the size of the company, its capital structure, and the area of activity. This may potentially stem from the issues of industry tournament (Coles et al. 2018) and relative

peer effects (Bizjak et al. 2018). Moreover, in various analyses the size of a company is a key variable affecting the results. It should be noted that no research fully covers the sensitivity of empirical results to different measures of firm size (Dang et al. 2018). Moreover, the authors are aware that the variables studied (i.e., information channels, company size, or capital structure) can also be determined by other factors, as the endogeneity issue speaks of (see Li 2016 for more detail). Polish enterprises should put more emphasis on the comprehensive use of intellectual capital, taking into account innovative technological solutions that are successfully used by their foreign competitors. In addition, it seems that on Polish soil, it is necessary to disseminate the idea of Industry 4.0 among companies and to present good practices implemented by domestic companies in this area. Perhaps, the factor motivating entrepreneurs to adapt more quickly to the reality of the fourth industrial age would be substantive, analytical, or financial support from government authorities.

The issues presented in this study, regarding the role of information in light of the challenges related to Industry 4.0, due to the high development dynamics in the Polish economy, require further in-depth research. The authors realize that the presented results have some limitations, if only because of the low response maneuverability, the selection of the sample of entrepreneurs from one voivodeship, or the difficulties in reaching a larger number of representatives of other sectors of activity. Future, in-depth research directions could concern at least the scale and scope of applied methods and tools typical of the fourth industrial revolution and the identification of national opportunities and barriers from the perception of entrepreneurs associated with the issues raised. They can also be a starting point for subsequent analyses using potential endogeneity.

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