



Data & Information Management In Decision Making Processes In An Intelligent Enterprise

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ABSTRACT

The purpose of this article is to present the results of research conducted in Poland that concerns conditions of decision-making process in companies that aspire to the category of intelligent organizations. Research shows what factors, tools and approach is used by these companies in decision-making processes. Moreover, attention was paid to the nature and impact of data and information management on the effectiveness of undertaking decisions in these organizations.

Key words: Intelligent Enterprise, Data and Information Management, Decision Making

1. INTRODUCTION

Contemporary market conditions incline organizations to generate a lot of information and to take decisions quickly. In these circumstances, the market requires from organizations to be 'intelligent focused' that develop the ability of integration "what's going on out there" with "how we do things around here", "present time" with "future time" using a power of knowledge and the intellectual capital supported by integrated tools based on ICT [1].

While being flexible, adaptive and innovative, in able to cope with high complexity, an enormous amount of information and a high variety of requested services even though it has to execute all its activities with great precision to achieve an outstanding overall execution effectiveness. This requires abilities to sense unbalances, perturbations and threats, react and adapt quickly, anticipate or even predict developments and last but not least actively influence or form the environment [2].

When compared to traditionally managed companies, intelligent enterprises are aware of the fact that despite the omnipresent insecurity, spontaneity of decisions made and high dynamics of changes, the process of undertaking decisions always requires proper selection of data and information and their analysis, therefore, intelligent enterprises put a greater

effort in ensuring that these two aspects are integrated into the management system.

The purpose of this article is to present the results of research on the determinants of decision making process in companies that aspire to the category of intelligent organizations. Studies show what factors, tools and approaches are used by these companies during this process. In addition, attention was paid to the nature and impact of data and information management on the effectiveness of undertaking decisions in these organizations. The article consists of six parts. The first part is an introduction to the problem. The second part deals with data and information management by intelligent enterprises. The third part contains the characteristics of the decision-making process in an intelligent enterprise in the light of literature. The fourth and fifth part of this article presents the research, and includes a discussion on the results of it. The last part is a general summary of problems discussed in this article.

The article is the continuation of scientific discussion devoted to an intelligent enterprise that the author has presented in the following papers: ICT Drivers of Intelligent Enterprises [3], The Role of ICT Solutions In the Intelligent Enterprise Business Activity [4], The Role of ICT Solutions in the Intelligent Enterprise Performance [1].

2. DATA AND INFORMATION MANAGEMENT IN AN INTELLIGENT ENTERPRISE

Intelligent enterprises realise the meaning of having access to data and know what to do to use them for the benefit of a company. Modern IT solutions serve as platforms, tools that enable the company to implement given processes more quickly. They do not determine the success of a company but are helpful in realizing certain goals. Human factor combined with smart IT solutions has the biggest influence on obtaining a certain position in the global world of business. Need for the collaboration and exploitation of synergies, critical thinking, writing and presentation skills facilitate the effective communication. Other factors that have a positive impact on effective information management include organizational culture, employees qualifications and motivation [5].

Accenture Technology stresses the fact that intelligent organisations compared to conventionally managed organizations, gain competitive advantage, among other things, by maximum use of data in decision-making processes by means of analytical tools. They operate on a deeply driven data model. Studies have shown that by using this approach, companies are able to achieve up to three times better financial performance compared to other companies. Intelligent enterprises realize that the use of data analytics in everyday practice and adoption of data-driven culture results in the achievement of economic success. Accenture Technology's research shows that 60% of corporations operating on a global scale is convinced that the effective management of Big Data has a positive impact on decision-making and competitiveness [6].

Intelligent enterprises are characterized by the ability to anticipate future. Some authors even claim that companies, regarded as intelligent, develop "sensors of the future" on the basis of knowledge that allows them to maintain a significant position on the market. They have adequate databases handling, complementing knowledge by employees, teaching them how to monitor trends, how to spot a direction of a certain change, where to focus, and what to do to improve resources results in an effective performance on all levels. Intelligent enterprises respond appropriately to customers, understand the changes and requirements of markets, create the best deliverables. It is not an easy task and it requires constant focusing, learning, engagement and creating such conditions that allow to respond to a short-term and long-term business perspective. Each solution, if not well managed, with little guidance, or with unfavorable business conditions can have negative side effects. An analysis in itself, isolated and separated from the organisational networks is of a little use [7].

Intelligent enterprises know how to manage data in order to create added value for processes to achieve organizational goals. Data-driven model is one possible solution in this aspect. It is based on several concepts: artificial intelligence, computational intelligence, soft computing, machine learning, data mining, intelligent data analysis [8]. This model is classified as a new approach in business management, in which a key role play decisions made based on data [9]. Companies that are able to manage data and use them in analytical processes better know their customers, competition and respond more quickly to market changes. They can also more rationally manage costs. Data-driven model in this context, means "transforming" data into action. The more a company acquires data, the more effective decisions it can make, because aforementioned software is able to learn and optimize on the basis of the information provided.

Studies of literature in this field show that these concepts of data management contributed to recent emergence of hybrid decision supporting systems understood as the result of the integration of decision supporting systems with intelligent technologies based on computational intelligence and soft computing [10].

Intelligent organizations are characterized by the ability to derive knowledge from expert solutions to creation of which advanced data processing algorithms are used. Data processing for intelligent companies does not end at the level of recording and reporting, but it means the transformation of data and information, from which corporate and individual knowledge arises as well as employees skills. Potential accumulated in this way is skilfully used by the management of commercial activities, building competitive advantage, creating products and services which respond to expectations of customers.

3. THEORETICAL BACKGROUND OF DECISION MAKING IN AN INTELLIGENT ENTERPRISE

Assuming that the decision is an act of conscious choice and a result of intellectual process [11], it can be concluded that in an intelligent enterprise the most important competence of the decision maker is the ability to think, not only covering in its scope the ability to recognize the decision problem, understood as a deviation between what should or could be, and what it really is [11], but above an ability to accurately identify the real causes of discrepancies. Observation and analysis of reality tend to suggest that in management of an intelligent organization also other factors than those described in the literature [12], [13] are significant.

T. Sowell points out that transforming ideas into valuable knowledge constitutes the basis for the direction of our mental processes during undertaking a decision [14]. On the other hand, J. Adair in the decision-making process identified three basic functions: analysis, synthesis and evaluation, and pointed to the role of the subconscious and emotions that affect the rational, analytical thinking play in it [15].

P. F. Drucker stated that an important role in the decision-making process plays a proper definition of the boundary conditions, which will clearly specify what procedures must be followed an indication of available and necessary means, resources and time to accomplish a project [16].

In these considerations it is also necessary to pay attention to the supporting role of a team and group decision making, which is a characteristic feature of an intelligent enterprise. This was confirmed by the results of research conducted by V. Vroom and P. Yetton in the 70s of the twentieth century [17], which have become the canvas for the Vroom - Yetton - Jago model [18]. The authors hypothesized that the situation, which has the right to dictate the correct decision-making style, is defined by a series of detailed questions related to the investigated problem. Decision-making should take into account the participation of subordinates in the process of solving a specific problem. The study also showed that different information is needed to solve a problem, it is better to make decisions in groups, or at least to consult it with the management, which is consistent with the characteristics of an intelligent organization.

It is also worth to pay attention to the concept of "fair decision-making process" because it concerns people. All business plans fail, if they are not accepted by employees.

"Honest" decision-making process is based on the human need for an intellectual and emotional recognition [19]. In relation to this an intelligent enterprise should ask the following questions: "Are we going to involve employees in decisions that affect them?", "Are we going to ask employees about their opinions and let them discuss the ideas of others?", "Are we going to explain why we have made certain decisions?", "Are we going to explain why we did not consider certain proposals, and why other proposals were accepted?". "Do we want to communicate the decision after it is undertaken to interested groups?" Certainly, the list of questions is much longer, but an intelligent company should have a positively answer to these questions, knowing that the effectiveness of the decision will be a derivative of obtaining intellectual and emotional commitment of employees.

4. RESEARCH RESULTS

This section presents the results of studies that are part of comprehensive studies on intelligent enterprises, which were carried out in 2016. The research sample covered 50 companies located in Poland, predisposing to the category of intelligent organizations. The following industries prevailed: IT, biotechnology, manufacturing and trade. 40% of all companies were small companies, 32% - large enterprises and 28% - of medium size. In terms of the capital ownership the majority of companies had a domestic capital (87.5%). The companies with foreign capital consisted 6.3% of the whole and with a mixed capital - 6.2%. The survey included a total of 35 questions, 11 of which were related to problems of data and information management and decision-making process in intelligent organizations. Other research areas included: the concept and nature of an intelligent organization, strategies in the creation of the value of an intelligent enterprise, the role of analytics in the intelligent company and IT systems used to manage intelligent enterprises.

Research results presented in the article show conditions of decision-making in these organizations. On the basis of research, factors, tools and approaches that affect the decision-making processes in intelligent enterprises have been identified. The first question concerned the features that best describe the decision-making process in the surveyed companies (Figure 1).

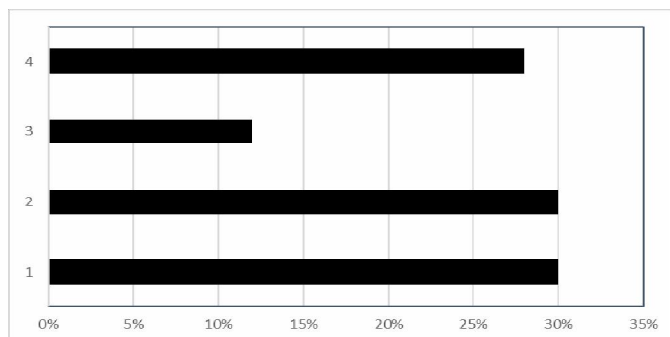


Figure 1: Features that best describe the decision-making process in intelligent companies

30% of companies claimed that decisions in their enterprise are made as quickly as possible and that it is done thanks to a well-designed organizational structure. Most decisions are made by the top management, after prior consultation with the low-level managers. The same number of companies claimed that the delegation of decision-making authority requires constant control over the decision-making process of low-level management. 28% of companies have adopted the principle of delegation of authority to make decisions and not to interfere in this process. The respondents stated that the effects of the activities are important to them and that the low-level managers are always assessed. In contrast, 12% of companies emphasized the fact that undertaking decisions is always problematic and that it always creates more problems. The burden of that decision rests on top management. Delegating authority does not work in daily practice.

Then, the respondents were asked to indicate what should be the destined state of efficiency of the decision making process in an intelligent enterprise (Figure 2).

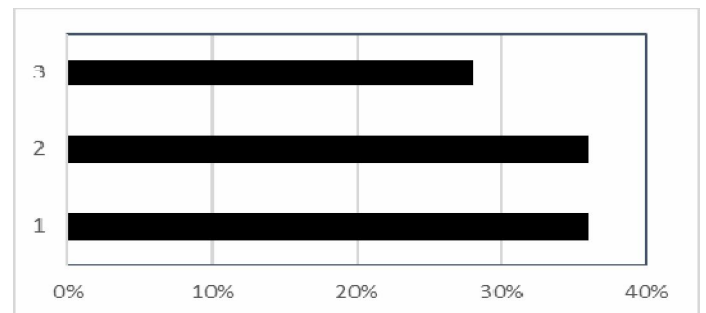


Figure 2: Destined state of efficiency of the decision making process in an intelligent enterprise

36% of respondents admitted that top management makes decisions quickly and decisively, after consulting the low-level managers. Reaction to unpredictable circumstances should be immediate. An intelligent company uses in decision-making process its human potential. Also, 36% of companies claimed that the following division of competencies should be adopted: the top management - strategic decisions, middle management - tactical decisions, low-level management - daily operating decisions. As long as the assumed goals are achieved, top management should only sporadically interfere in undertaking decisions by low-management. On the other hand, 28% of companies stated that in an intelligent enterprise the top management should control the decisions of low management as often as possible to make sure that the assumed goals are met.

The third question concerned indicating two most important people in the company who are responsible for the allocation of authority in taking decisions and improving the decision-making process (Figure 3).

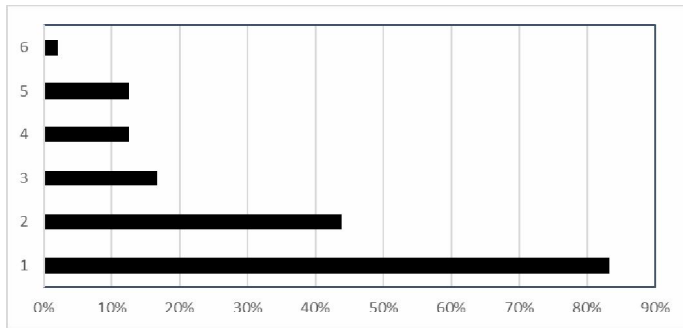


Figure 3: People who decide on allocation authority in taking decisions and improving the decision-making process

Just like in traditionally managed companies, in intelligent organizations the decision makers include: CEO (83.3%), operational directors (43.8%), CFO (16.7%), marketing director (12.5%), main accountant (2.1%) and other people (12.5%).

The fourth question concerned the use of ICT tools to support the decision-making process and opinion about impact of these tools on taking decisions (Figure 4).

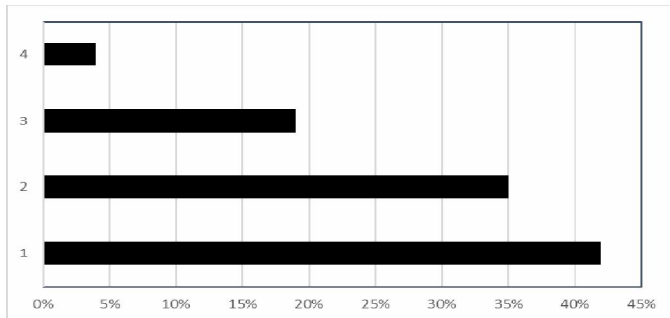


Figure 4: The use of ICT tools to support the decision-making process and opinion about impact of these tools on taking decisions in intelligent enterprises

Most companies (42%) admitted that they do not use and do not intend to use in next 12 months professional ICT tools to support decision-making process. 35% of companies currently do not apply such tools, but in the coming year plan to obtain them. 19% of respondents use ICT tools in decision-making process and positively evaluate their impact on the effectiveness of the decision. Only 4% of companies see none significant impact of ICT tools on decision-making process. None company claimed that the implemented tools had a negative impact on the efficiency of the decision-making process.

The fifth question addressed types of tools that support the decision-making process. It turned out that companies use very different solutions, including incomplete - integrated system that combines the older types of transactional systems, reporting system PMO, Business Intelligence system, Jira, LiveSpace, SAP, ERP, CRM, GALACTICA, or own platforms.

The next question summarized the nature the decision-making process in an intelligent enterprise (Figure 5).

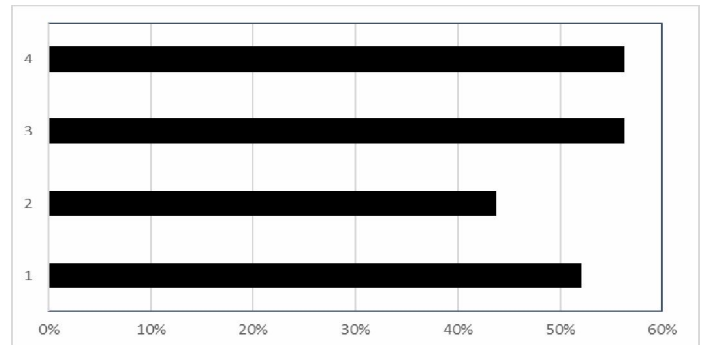


Figure 5: Assessment of the decision-making process in an intelligent enterprise

The companies did not agree with the following views:

- Intelligent enterprise should put more emphasis on the speed of undertaking a decision than on long analysis of its accuracy (52.1%)

- Intelligent enterprise tries, mainly, to take an accurate decision, the speed of undertaking decision is of secondary importance (43.8%)

- In case of contrary data, an intelligent enterprise uses intuition and experience of staff in order to choose which data is true (56.3%)

- In case of contrary data, an intelligent enterprise refers to IT and analytical tools in order to choose which data is true (56.3%).

Then respondents were asked about the situation that best describes the management of information in their enterprise (Figure 6).

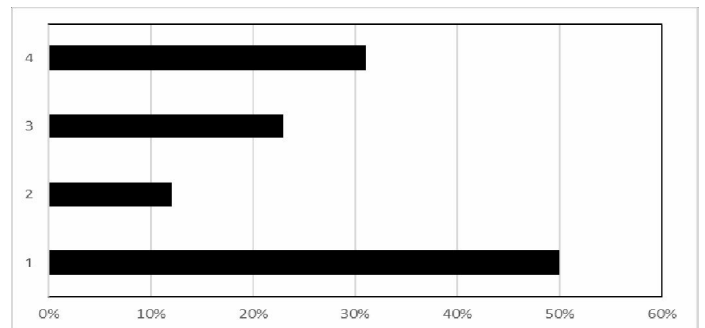


Figure 6: The management of information in intelligent enterprises

The organizations pointed to two of the four listed in the survey characteristic features of information management. On the first place (50%) there was the statement that “the responsibility for the management of information in companies is dispersed”. All cells participate in this process on the agreed terms. 23% companies indicated that they have a separate data and information distribution center for other organizational units. For data and confidential information management the board is responsible. In contrast, 12% of respondents pointed to situations when the information management is the responsibility of IT department.

Almost 1/3 of companies indicated that they have no formal regulations (e.g. procedures, instructions), which govern information management in company.

The companies, subsequently, were asked about criteria for assessing the quality of data on which intelligent enterprises undertake decisions. It turns out that enterprises value above all reliability of the data (58.3%), then, the comprehensibility of data (53.2%), detail and completeness of data (43.8%), data availability (41.7%), ease and speed of data acquisition (37.5%), and delivering data on time (36.2%).

In the ninth question surveyed companies were asked to evaluate the effectiveness of information management (Figure 7).

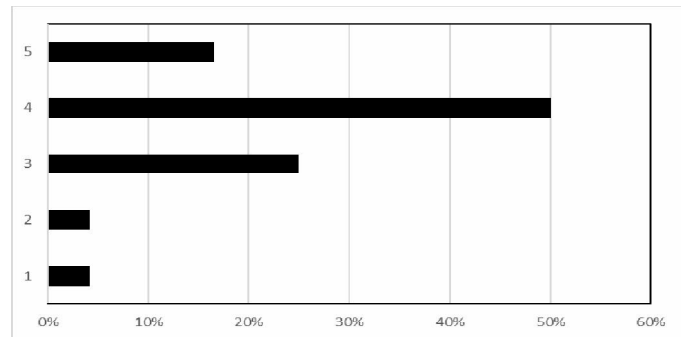


Figure 7: Assessment of the effectiveness of information management

It turns out that a big problem for companies (50%) is the unsatisfactory level of effectiveness of information management. 25% of organizations are not able to assess the effectiveness, 16.6% rate it as poor, and only 4.2% assess it very well or well.

The purpose of tenth question was to identify main barriers to effective information management in an intelligent enterprise. Respondents had to identify three key problems among several given answers (Figure 8).

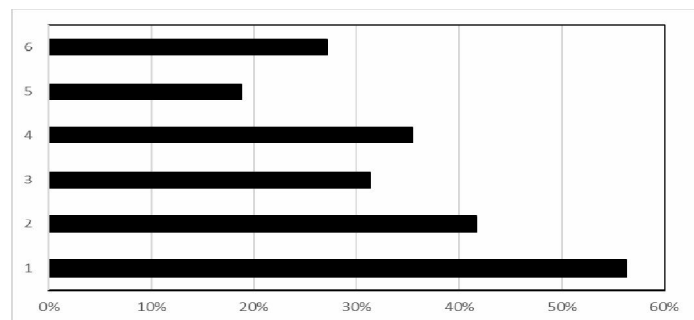


Figure 8: Barriers to effective information management in an intelligent enterprise

Research shows that the most common obstacle is the reluctance of employees of organizational units to exchange information (56.3%). Further barriers include: a hidden rivalry between organizational units (41.7%), inability to interpret data by employees (35.4%), inefficiency of IT systems and lack of their synchronization (31.3%), risk of leakage of large amounts of information outside the company (21.7%), and the reluctance

of managers to share information because they think that too many people will have access to the data (18.8%).

The last question concerned the assessment of the use of historical data in undertaking decision (Figure 9).

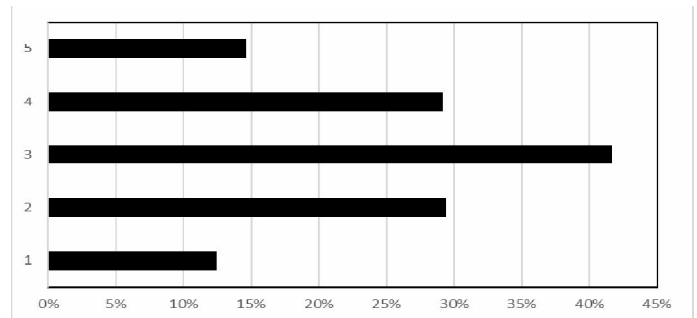


Figure 9: The use of historical data in decision-making processes in intelligent companies

Respondents pointed to two of the four possible scenarios relating to undertaking decisions based on historical data. In the first place (41.7%), companies indicated that taking strategic decisions is based on historical data and information generated by various organizational units. To do this, companies use supportive tools such as analysis, prediction, systems or IT applications. Thanks to IT solutions, information flow is continuous, which translates into the decision speed. 29.4% of respondents stated that while making decisions, they take into account hard historical data, from which they attempt to identify future trends. Slightly less companies (29.2%) indicated that they make decisions based, primarily on experience, intuition. They rarely use historical data. A statement that “the flow of information to make a decision is functional at the level of internal organizational units, but often there is a problem with the flow of information between the functional cells (branches, subsidiaries)” and that “companies are aware of the problem and plan to solve it in the next 12 months” was chosen by 14.6% of companies. 12.5% of the responses related to the situation when company in making decisions bases them on hard historical data, but rarely uses for this purpose supportive tools such as analysis, prediction, systems or IT applications.

5. DISCUSSION OF RESEARCH RESULTS

Generally, intelligent organizations point to the use of knowledge and potential of employees in decision-making process. As long as the top management does not identify problems with the efficiency in the implementation of tasks, it limits the intervention in the operational and tactical activities of a company. Almost 30% of companies declare that top managers should, as often as possible, control the decisions taken by low-level management to make sure that objectives will be achieved. This means that still many enterprises have a limited confidence in low level management.

It turns out that only 1/5 of the surveyed companies use IT tools in decision-making process and have a positive view of their impact on the effectiveness of the process. This means, that in this respect, companies in Poland still have a traditional

approach. The above conclusion was confirmed by the question concerning the assessment of the use of historical data in decision-making process. Enterprises undertake decisions based on analysis of facts and experience, with far less engagement of IT tools dedicated to this purpose. However, future plans of majority of companies should be positively assessed. More than 1/3 of companies indicated that they intend in the nearest future to make changes in decision-making process by implementing modern IT solutions. Companies that already have decision supportive systems or applications already integrate them with of various kinds other tools, mostly ERP systems which is a positive sign of progress in this respect.

Research shows that in 50% of the surveyed companies the responsibility for the information management is dispersed and takes place on the agreed terms. However, still many companies have no formal regulation in this respect, what translates in low efficiency of the management of information resources. Only 23% of companies indicated that they have a separate data and information distribution center for organizational units. Research have shown that the main problems in the management of data and information result from the human factor. Hidden rivalry between organizational units, the reluctance to share information, or the inability to interpret data belong to the most frequent problems. To a lesser extent, the problem stems from the lack of or too low-level of IT systems integration. The conclusion is that the companies that want to belong to intelligent organizations, still have much to do in terms of improving the efficiency of data and information management.

In terms of assessing the quality of data and information, research shows that intelligent companies value credibility, clarity and completeness of the data. Important is also their availability, ease and speed of acquisition and obtaining them on time.

In the opinion of enterprises, intelligent organizations should undertake decisions preceded by an analysis of data and information, which does not mean that the speed factor here matters. Accurate decisions require contextual rethinking, and finding correlations between factors that create decision-making environment. IT solutions are of an auxiliary, not a conclusive nature.

6. CONCLUSION

Results presented in the article show that companies operating in Poland are learning how to be intelligent. Data and information management and decision-making processes require improvement of efficiency. It turns out that the human factor is still the drawback, which generates interference in the flow of information, what negatively affects the efficiency of the decision-making processes. It is essential to use both the potential of IT tools and people at a strategic and operational level. Polish companies still have much to do in this respect.

Given current trends in the development of the Polish economy, oriented into an intelligent growth, changes in functioning of enterprises are inevitable. Currently influx of data and information generated by companies and the business

environment is so great that without "involvement" of intelligence in their management, companies make it difficult to reach competitive advantage.

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