Economics and Organization of Logistics
5 (1), 2020, 29–40

DOI: 10.22630/EIOL.2020.5.1.3

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The role of IT systems in strategic management and building competitive advantage of companies in the logistics industry

Rola systemów informatycznych w zarządzaniu strategicznym i budowaniu przewagi konkurencyjnej przedsiębiorstw w branży logistycznej

Abstract. The rapid development of the IT industry is a fact. Digitalization covers practically all areas of enterprises and the full spectrum of their processes. IT systems are usually treated as a tool to achieve a specific goal, relatively rarely is there any talk of implementing IT systems as an element of strategic management. However, it should be borne in mind that, given the key impact on organisations, the implementation of an IT system should be treated as an important element of strategic planning. The literature on this subject is relatively modest, and the author target of this science work and publication has aimed to analyse to what extent the implementation of an IT system (and why) should be treated as part of strategic management. The research problem presented in the paper was solved, among others, by a critical analysis of the literature concerning the area in question, in selected elements supported by an analysis of available statistical data.

Key words: strategic management, information technologies, IT solutions

Synopsis. Gwałtowny rozwój branży informatycznej jest faktem. Digitalizacja obejmuje praktycznie wszystkie obszary działania przedsiębiorstw i pełne spektrum realizowanych przez nie procesów. Systemy informatyczne traktowane są zwykle jako narzędzie do realizacji konkretnego celu, relatywnie rzadko mówi się o wdrożeniu systemów informatycznych jako o elemencie zarządzania strategicznego. Należy jednak mieć na uwadze, że z uwagi na kluczowy wpływ na organizacje wdrożenie systemu informatycznego potraktować należy jako ważny element planowania strategicznego. Literatura na ten temat jest stosunkowo skromna, a celem pracy badawczej autora w niniejszej publikacji było przeanalizowanie, w jakim stopniu wdrożenie systemu IT (i dlaczego) powinno być traktowane właśnie jako element zarządzania strategicznego. Problem badawczy przedstawiony w pracy rozwiązywany był m.in. krytyczną analizę piśmiennictwa dotyczącego omawianego obszaru, w wybranych elementach wspartą analizą dostępnych danych statystycznych.

Słowa kluczowe: zarządzanie strategiczne, technologie informacyjne, systemy informatyczne

Introduction

Among the many definitions of strategic management, one can indicate, among others that it is "a set of management decisions and actions that determine the long-term results and fate of the organization" (Wheelen and Hunger) or that it is "a process of defining and redefining objectives and strategies in the context of changes in the environment in a reactive and anticipating or triggering manner" (Urbanowska-Sojkin) [Lozano Platonoff and Gadomska-Lila 2018].

Regardless of the definition adopted, it should be considered that elements of strategic management are those elements of an organization's operations which influence its basic shape or way of functioning, in terms of its long-term market presence. Therefore, there is a space for key decisions concerning the way the company is organized (e.g. organizational structure), the way its presence on the market is shaped (therefore, key decisions concerning activity on selected markets, price and product strategy, the way sales activities are implemented, etc.). One of the elements of building a competitive advantage has also become the appropriate management of logistics activities – hence the shape of logistics processes is increasingly taken into account also in the area of strategic activities. In recent years, more and more attention has been paid to build the right shape of IT infrastructure by company. Should infrastructure therefore be considered as part of strategic activities? Is the creation of a certain organizational culture in the area of IT and a certain vision of development and shape of these systems also a strategic activity? The purpose of this article is to try to answer the question: whether and to what extent the implementation of IT systems can (and should) be part of strategic management.

IT systems in strategic management

"The main goal of the organization is to produce products and services that meet customer requirements" [Waters 2001]. Following this path, areas that directly or indirectly influence the shape of these goods and services should be considered as strategic elements of the organization's activities. Is this also the IT infrastructure? The role and task of IT systems is, among others optimizing processes and improving quality in the field of information management. To this extent, appropriate IT tools definitely influence the shape and quality of products or services offered. They also directly affect the ability to provide information on these products and services and are therefore an important element in determining an undertaking's proper communication with the market. As Griffin explains, a well-thought-out organizational strategy is one that focuses on three basic areas: outstanding skills, but also the reach and distribution of the organization's resources [Griffin 2017].

Logistics is nowadays put forward as one of the areas in which companies can seek a competitive advantage. "Getting a competitive advantage nowadays is not an easy matter. Good organization of business processes in a company is no longer enough. It is necessary not only to analyze and search for trends in the possessed data sets, but also in various sources that are often located outside the company (social networking

sites, external, publicly accessible databases). The amount of information that arises every day inside and around the company is enormous" [Gontar 2019]. IT systems, as they have a key impact on the efficiency of information management, have a critical impact on the conduct of an appropriate information policy by the company. Increasingly, their task is to filter information properly in order to extract the most important ones for the company.

The multitude of decisions made within the framework of the broadly understood management of an organization makes it necessary to ask the question: which of these decisions are important for the development of an enterprise and building its competitive advantage? "Some decisions are very important for the organization and have several years of consequences. Others are less important, their consequences are limited to a few days or several hours. We can divide decisions according to their importance into strategic, tactical and operational. Strategic decisions are taken by the board of directors, have long-term effects, involve many resources and are associated with high risk. Tactical decisions are taken by mid-level staff, their time span is medium, they involve fewer resources and are associated with less risk. Operational decisions are taken by bottom-up management; they are short-term, involve fewer resources and are low risk" [Waters 2001].

In this case, the question can be asked: which decisions concerning IT systems have a long-term impact in the organization? The fact of choosing a particular type of IT system (e.g. WMS – Warehouse Management System) is therefore seen here as a strategic decision – it has a long-term impact on the company and its processes. Selecting a specific supplier – may be a strategic or tactical activity. The selection of the appropriate technology or functional scope should also be considered as such.

About the role that data management plays in the organization it was already written many years ago, even when globally operating IT systems were still in their infancy. We are talking about ERP (Enterprise Resource Planning) systems, commonly used today by medium and large enterprises. By covering them with one coherent IT system, they become an excellent example of the global impact of IT infrastructure on a broad spectrum of international and global companies.

An important element of strategic management is to define the vision of the company's development and its place on the market. Therefore, if building an IT infrastructure is to be an element of strategic management, then also shaping IT infrastructure development becomes an element of strategic management. As early as 2003, Galliers and Newell were already discussing the concept and foundations of IT systems development in the new millennium, wondering what the "fashion" will be and which way IT systems development will go. Is this still supposed to be information management? Or rather they will become tools of knowledge management in the organization (they even pointed out the term "wisdom management" for this purpose). Credibility and the truth of information becomes the source of the company's strength, which brought some small disagreement, but was not objectively discussed. And the new context of information management directly related to decision-making has become a reality [Galliers and Newell 2003]. Later in the article, the author's aim was to find links between the IT system and knowledge management.

IT system as an element of knowledge management in an organization

In a knowledge-based economy, an information is the basic capital accumulated by a company and which determines its effectiveness. "The acquisition, creation, distribution (transfer, transfer), storage, monitoring and evaluation of knowledge can be considered as basic tasks in the field of knowledge management" [Perechuda 2005]. All these elements are inseparable from the processing of information. Processing, for which it is definitely best to use IT tools.

The process of knowledge and information management itself should be treated as a continuous process, constantly influencing the way a company operates and develops. Thus, the company's IT facilities also become a resource participating in its development on a continuous basis. "Knowledge management in the process sense is a normative and disposable procedure, aimed at creating an appropriate environment that enables the efficient performance of operational functions, i.e. the implementation of organizational systems with the right structure, optimizing the main processes related to knowledge, the client and the organizational culture, which will direct people to develop knowledge, use it properly, etc." [Perechuda 2005].

Issues related to IT infrastructure planning at the strategic level are relatively new and relatively rarely discussed in the literature. For many years, IT systems were usually treated as a tool and not an element of strategic management. Therefore, the number of publications concerning the analyzed issues is relatively small. The problem of strategic planning of IT tools was raised by Harris [1991]. It draw attention to the fact that such an approach is not only possible, but above all crucial for IT analysis. It mentions, for example, the role that strategic planning tools (including IT) play in achieving the organization's goals.

IT systems have also become now an important element in the creation and development of Logistics 4.0 – often referred to as the direction of changes in logistics management, supply chains and networks. Winkelhaus and Grosse [2019] point out that among the key six aspects that make up the multidimensional understanding of the concept of Logistics 4.0, there are, among others information, and its role cannot be overestimated – which is indicated, among others, by the test results. "Information is at the center of all technologies examined in this study. The technologies can thus be grouped into three subcategories [Winkelhaus and Grosse 2019]:

- technologies to generate information,
- technologies to handle information,
- technologies to use information.

Authors point out that Logistics 4.0 as a new concept is not intended to replace other concepts in the area of management (such as for example lean logistics), but it supports and complements them, also in terms of information management and management in general.

This approach allows to combine requirements related to the implementation of IT systems with the challenges of management science. It emphasizes the role of information in the implementation of logistics processes, also in line with the latest trends. It is impossible to talk about IT systems without the context of the information they manage.

Modern technical solutions for logistics usually mean the management of large data sets, which in turn would not be possible without adequate IT support. And the role and goals of Logistics 4.0 fits perfectly with the requirements of modern logistics and the needs of modern business.

Modern organizations are based on modern technologies. Intelligent production and logistics management are based on concepts such as cloud computing, big data analytics, Industry 4.0, Internet of Things or artificial intelligence. And all this combined with Web 2.0 technologies [Liu et al. 2019].

It is worth to mention here the Web 2.0 idea. The concept of Web 2.0 has been present on the Internet for several years and basically refers to all services, in the creation (and management of content) of which the users themselves participate. Linking the Web 2.0 concept with the planning of IT infrastructure development at the strategic level allows to put forward the thesis that the future of IT is also those tools that allow to interact with the environment. An interaction, which of course can take various forms, is always based on direct contact with the outside world. Such an approach is most consistent with the trends in modern logistics, where it is increasingly assumed to build partnership relationships in supply chains, interactions in many dimensions or tightening of these relationships.

Criteria for selecting IT systems

Having already known the element determining the strategic management and knowledge management in an organization, it is necessary to consider the benefits of implementing IT systems and, more often than not, the criteria determining the choice of IT system. As a strategic decision with a long-term impact on the company, the choice of the IT system should be made at the highest decision-making level of the organization. In practice, this is not always the case, and the choice of the right tool for logistics is primarily determined by the logistics manager and IT manager.

The research conducted within the Panel of Polish Logistics Managers shows that in 35% of cases the choice of product and IT supplier is the responsibility of the manager of logistics (assuming that he is not a member of the board). In 34% of cases – the company's Management Board is responsible. In 17% of cases, the owner of the company or the Supervisory Board is responsible for the decision, in 7% – the head of IT [Logisys 2014]. The results confirm that in more than half of the cases (51%), it is not managers specializing in logistics who are responsible for the decision concerning the choice of product and IT supplier. It should be noted that regardless of their managerial competence, they usually do not have specialist knowledge of logistics. Choosing an IT solution provider for specific business processes requires such knowledge. In such a situation, there is therefore a risk that it is not merotic arguments that are critical in making these decisions, but others (financial, management, etc.). It should be noted that other actors – heads of IT departments, external advisors and consultants and others – play a relatively minor role in decision making.

The authors of the survey also indicate both in the case of persons responsible for IT and logistics in the company, these persons evaluate their influence on the decision to choose the

system in most cases positively. Almost 1/3 of IT bosses (29%) think it has an entirely sufficient influence on the decision to choose the system, 52% think it is sufficient, only 20% of IT bosses think it has an insufficient influence on the choice of the system. Similarly, in the case of heads of logistics – 76% believe that it has a sufficient (or entirely sufficient) impact on the choice of the system, 24% indicate one of the three answers (slightly less than sufficient, insufficient, definitely insufficient) [Logisys 2014].

These results can be analyzed from several perspectives. It should be noted that there is a situation where the decision-maker manager is able to make a decision: logistics is an important position in the organizational structure of the company and he is a member of the management board. Then the situation is as close to perfect as possible – such a person can make a decision taking into account both the business needs of the logistics department and the global conditions of the entire company. In many cases the decision to choose an IT solution is a joint decision – the department responsible for the implementation of logistics processes and the company's management board (when the company's management board treats the opinion of the logistics department as crucial for making a decision). This allows for a smooth decision-making process and the right decision for the organization.

An interesting alternative in the decision-making process is to make decisions in conditions of non-compliance, with a positive decision of the management board and a negative decision of the logistics and/or IT department or vice versa. The choice of an IT system is, after all, a multi-faced decision, which includes, among others selection of technology, scope of functionality, evaluation of the selected solution in terms of compatibility with other elements of the company's IT infrastructure. It is also a cost analysis, concerning the costs of implementation and maintenance of the system, and the choice of the appropriate technology also translates into these costs. It should therefore be borne in mind that since decisions of a strategic nature are usually the responsibility of the company's board of directors, the choice of IT tools should also be decided by the top management as a key element in the development of the company.

Szymonik [2011] points out that computerization of an enterprise is an extremely difficult investment – both due to the complexity of the process itself and the amount of expenditure. In order to ensure proper efficiency here, it is necessary for the management to overcome difficulties in four areas: financial, technological and hardware, organizational and psychological. "Logistics can properly function and participate in the achievement of company objectives if the following systems are properly defined, designed, organized and operated: information, IT, IT management, logistic information system and logistic information system" [Szymonik 2011]. Treating the IT system as one of the key elements of the area of activity is a clear sign that without sustainable development of the IT infrastructure there is no long-term development of the company today and building a competitive advantage on the market. And taking into account the dynamics of changes in the modern economy – the lack of development in the area of information systems not only does not allow the company to build an advantage on the market, but even makes it lose distance to market leaders. The development of the IT infrastructure is therefore becoming necessary in order to maintain an appropriate position in the market, and not only to strengthen it.

Functions and strategic role of IT systems

Depending on the specifics of the implemented logistic processes, the company's logistic infrastructure may consist of various groups of IT tools. It can basically be divided into two basic groups – tools supporting the entire process management in the company, as well as tools dedicated primarily to the implementation of logistics processes.

An important area affecting the strategic role of IT system decisions is both financial value. The labor market lacks IT specialists. This is one of the reasons why services in the IT industry are relatively expensive today, and therefore the value of all investments in IT systems is increasing. Given the constant increase in demand for this type of services, this trend is not expected to reverse in the coming years.

According to Allied Market Research, companies employing approx. 100 employees have a budget of more than USD 300,000 [Mejssner 2018]. On the other hand, Software Connect data show that in the case of companies with more than 500 employees, the average budget for WMS implementation is over USD 372,000, and over 1000 employees – over USD 401,000 [Mejssner 2018]. The budgets for implementation of IT systems in combination with accompanying technologies (automatic identification systems, picking systems, warehouse automation equipment) may of course be many times higher than this average.

The strategic role of IT infrastructure is an effect of, among others the effect of computerization processes covering all areas of the organization's operations. "In recent decades, software has transformed the way in which organizations and businesses coordinate and work, even going so far as to transform people's everyday lives. Software is used in notebooks and mobile devices; it is embedded actively and passively to steer cars, organize households, and label and control groceries. Enterprises rely on software systems to organize their workforce, bill their customers, and manage innovations. Software is ever-present and has become an important part of our society" [Bertram 2016]. Strategic management covers key areas from the point of view of the company's financial economy. And the functions and budgets of IT systems are an area of strategic decisions.

IT systems are a strategic tool for the development of large enterprises and are increasingly becoming a strategic development tool for small and medium enterprises (SMEs). Drechsler and Weißschädel [2018] point out that the literature on this subject is very incomplete and needs to be sorted out: „The majority of papers with an immediate relevance to IT strategy in SMEs take a conceptual or explanatory stance, providing voluntary or involuntary IT managers in SMEs with comparably little actionable advice. Many papers on IT strategy in SMEs limit their analyses to specific industry sectors or countries. In addition, many frequently cited papers are between 10 and 15 years old, sometimes even older, and do not necessarily reflect current IT management practices in SMEs, or the current state of IT management and IT strategy research" [Drechsler and Weißschädel 2018]. In Drechsler and Weißschädel`s opinion [2018], it is now becoming clear that a lack of involvement in the development of IT strategies and the related strategic process planning can cause clear losses in terms of attractiveness and competitiveness.

The strategic role of IT systems is also demonstrated by the examples mentioned in the literature. Although more and more is being written about the strategic role of IT systems, there is still a certain lack of satisfaction in the literature. The number of publications relat-

ing to practical considerations (concerning the impact of IT on the strategic area of the organization) is still not large. In publications on IT system implementations, the authors usually refer to the benefits resulting from system implementation or technical aspects. It is important to treat IT systems as tools for solving operational or tactical problems, less frequently treated as an element of building the entire organization and its strategy.

Rusu and El Mekawy [2009] point to the strategic role of IT on the basis of two retail companies from the Swedish market described by them. They point to a certain strategic triangle in the area of IT, which combines the three vertices "organizational strategy", "business strategy" and "information strategy". They thus indicate that these are the three critical elements necessary to build a company in a coherent way at the strategic level. In their research, the Swedish researchers focused on trying to answer the questions: How does IT support the business and organizational strategies? And how IT and business strategies are aligned? [Rusu and El Mekawy 2009]. The conclusions they have reached are interesting: to achieve success within the three elements mentioned above, it is necessary to integrate IT with business in order to achieve full management of information. The IT infrastructure (department) cannot exist "next to" business departments, and IT managers should be strongly committed to business [Rusu and El Mekawy 2009].

Studies conducted in the conditions of a developed Western European economy confirm that although an IT system is often treated only as a tool for achieving business objectives, it is only the full cooperation of both areas that leads to synergies and long-term benefits in both areas. However, in order for this full cooperation to be implemented, it is necessary to treat these two areas together already at the level of setting long-term goals of the organization, i.e. strategic management. The presented fragment of the article describes the criteria determining the role of IT in building and developing the organization, what are summarized in Figure 1.

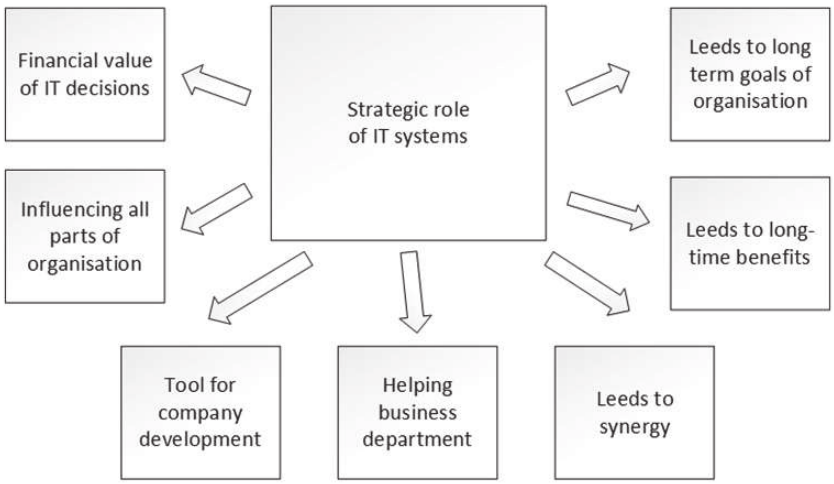

Figure 1. Strategic role of IT systems
Rysunek 1. Strategiczna rola systemów IT
Source: based at own work.

IT systems as a basis for technology development in logistics

An important, but often missed area of IT systems implementation remains role if IT in building the whole company information's culture. In today's highly technological world, the implementation of an IT system remains one of the key elements of implementing modern technologies in a company. Thus, the implementation of IT systems should be analyzed in a wider context – not only the individual implementation of an IT tool, but the construction of the entire IT and technological infrastructure of the enterprise. This can be seen, for example, in the logistics industry, where an IT system is very often a tool that links various other tools and technologies, such as warehouse automation, picking support systems, automatic identification systems, fleet management and process monitoring tools.

Thus, the IT system becomes a universal platform for technology management in an organization. All other contemporary concepts of management and technology implementation should be looked at in a similar way. Therefore, the IT system performs three basic functions in the organization, becoming: a technology base, a base combining all management concepts, and also a base for process management and development. And the IT base is increasingly being put up as part of future management.

Naturally, strong importance is attributed to IT infrastructure wherever management itself is by definition highly computerized, e.g. in the area of e-business. "Information technology (IT) plays an important role in e-business management. It enables the development of e-business IT systems and affects the way of how the e-business is conducted. To support e-business based organizations in achieving excellence and the competitive edge, IT for future e-business management must rise to new challenges by providing tools to analyze large volumes of data from various sources and support decision making, generating models for investigating factors in fast growing e-commerce sectors, and developing mechanisms for improving the efficiency of processes, etc." [Fei and Chung 2015]. As Fei and Chung explain, the horizon for the implementation of information technology for e-business companies is clearly marked here, especially in the area of data analysis and information management. The authors point out, among others for contemporary challenges in the field of modern process management models, increasing process efficiency, flexible service delivery or challenges related to the digitalization of customer relationship process management.

Statistics on the impact of digitization on the economy can provide evidence of the importance of computerization. The indicator of the level of digitization may be one of the indicators for the evaluation of the issue under examination. McKinsey's experts in the report "Digital Poland" indicate that in terms of demand for digital resources Poland is only strangely away from Western Europe – the Digitalization Index for Western European countries is 13, and for Poland 11 – the difference is therefore 16%. However, the comparison of digital content supply is much worse – for Western Europe this indicator is 12, for Poland – 7, so the difference is as much as 44%. The average size of the gap in the Digitalisation Index is –34% for Poland, the highest level of this gap is recorded in the simple industrial production (–78%) and transport (–63%) sectors [McKinsey&Company and Forbes Polska 2016].

Computerization is also clearly visible in the public sector. From the data of the report on the value of IT projects implemented by the public sector in the years 2004–2015 amounted to PLN 8069.22 million, of which PLN 5972.83 million was financed by EU funds [Institute of Communications 2016]. It should be noted that the money invested in digitization pays off. According to the Keralla Research Institute (based on the calculations of the Civic Development Forum analysts), the funds of PLN 180 billion invested in digitization in the national economy in the years 1993–2016 translated into 10–15% economic growth. IT companies produce approx. 4% of GDP, and more than 70% of this development is provided by those companies for which IT is not their core business but invests in innovative IT solutions [Keralla Research 2018]. Polish IT market increased its value from USD 1.2 billion in 1995 to USD 15.7 billion in 2015 – so about thirteen times [Rokicki 2017].

Modern technologies have a strong impact on companies. An example of such an impact is the impact of the Garner Hype Cycle methodology on the organisation. According to the Garner Hype Cycle methodology, expectations of modern technologies change with time. The first element, in the innovation phase, is the peak of expectations, followed by a clear drop in expectations. And only in the next stage, the "slope of enlightenment" leads to a phase of stabilization and "plateau of productivity" [Gartner n.d.]. This methodology is reflected, among others, in in the logistics industry. The implementation of an IT system is often accompanied by "euphoria" and a violent discussion about functional possibilities, the potential resulting from the implementation or numerous business benefits. This is the case, for example, with the implementation of WMS class systems, where stabilization in terms of productivity only appears after a certain time. The concept presented by Garner assumes, among others a certain life cycle of technology. The afore-

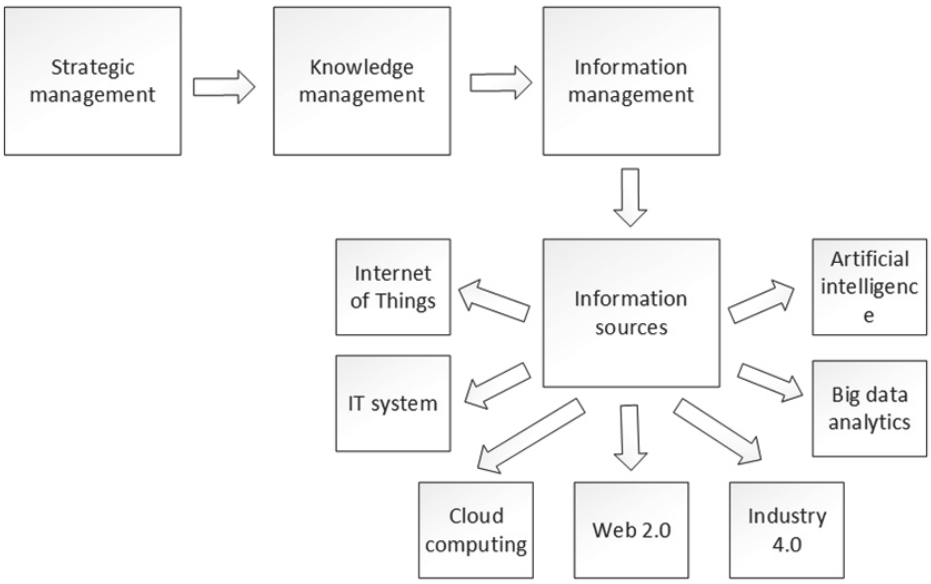

Figure 2. From strategic management to IT system – way of delivering information
Rysunek 2. Od zarządzania strategicznego do systemu informatycznego – sposób dostarczania informacji

Source: based at own work.

mentioned phases of the technology life cycle are directly related to its commercialization. And the awareness of these cycles allows, among others for reducing the risks of investing in technology [Gartner n.d.].

Conclusions

Based on the analysis presented, the following conclusions can be reached. Information management is seen as one of the basic elements of building an enterprise in a knowledge-based economy and, more broadly, modern and tailored to the market requirements of strategic management. The element that manages information is its sources, and among them – IT systems other modern technologies used in the logistics industry (as can be seen at Figure 2). The advantage of organizations implementing IT systems results from skillful information management and building competitive advantage on its basis. The indicator of the level of digitization may be one of the indicators for the evaluation of the studied issue – and attempts to determine this indicator may determine the directions of further research in this area. In addition, an interesting area of research is being developed in connection with the coronavirus epidemic – as a result of remote work, access to modern IT tools has become even more important.

The author's aim was to indicate the key areas of the company's activity in the area of strategic management and their reference to the role that IT systems play in modern organizations. The role of modern IT systems today is not only to manage information, but to create a stable basis for managing the entire organization processes. The aim of the work has been achieved, which is confirmed by the graphics in Figure 2 and the presented conclusions. Today, an IT system is not only an operational tool, but it is becoming an element of building an organization's competitive advantage, an element of strategic management in the organization and a strategic area from the point of view of decisions made.

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