E-logistics as the ICT Support in Modern Polish Organizations

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A dynamic arrival of digital economy with its strongly transformative impact is indisputable and inevitable. The ability of organizations to stay competitive and leverage the potential is largely dependent on innovation stemming from the capabilities and size of their ICT teams as well as on properly adjusted corporate strategy. The aim of this paper is to give a presentation of the characteristics and implementation conditions of advanced e-logistics solutions based on state-of-the-art of Polish modern organizations. The objective of this article is to discuss organizational and technological aspects within the modern knowledge management using ICT called SMAC (Social, Mobility, Analytics, Cloud), being at present the canon of ICT support in this respect. The analysis has been illustrated with findings of research carried out by the author in 2014-2016 in selected Polish SMEs from Mazowieckie and Wielkopolskie provinces. Hence, the objective of the research has been defined to test the readiness of Polish SMEs to implement and use systems within the so-called 3rd ICT platform. In order to fulfill the objective, the following research hypotheses have been formulated: elements of SMAC solutions are used on an increasing scale in SMEs, and SME management pays growing attention to the implementation of SMAC systems. The analyses are illustrated with survey results and direct observations of the author from 2014-2016 in selected 120 SMEs from Mazowieckie and Wielkopolskie provinces, Poland, with reference to the general development trends in the studied area. The survey sample was made up of micro (9%), small (56%), and medium sized enterprises (35%). Surveyed companies represent a wide range of industries: retail and wholesale trade, discrete and process manufacturing, transport, HoReCa, utilities, finance, construction, telecommunication, and ICT.

Keywords: digital transformation, e-logistics, ERP, ICT, knowledge, SMAC, SME

Introduction

The globalization processes of the world economy create the necessity to take fast and effective measures to adapt the operations of a modern organization to new market conditions. Advanced ICT (Information and Communication Technology) solutions, which are the basic competitive factor of business organizations, are particularly open to the introduction of all types of innovation that may give a chance to increase the management efficiency. This fact contributes to financing subsequent research on new technologies and is the self-perpetuating mechanism of the search for innovative solutions. One of such areas includes the properly designed and applied logistics systems in modern organizations. Due to the use of modern ICT solutions within the application of advanced organizational-ICT solutions, they are called e-logistics (Grawe, 2009;
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Wieczerzycki, 2012). The term means the broad application of the state-of-the-art ICT technologies to support management of business processes in a modern organization, e.g. within production, warehouse management, and order services as well as the management support with its business environment (in particular, the supply and distribution chains).

Economic organizations face the challenges of civilization and of the growing complexity of economic process relationships; therefore, they have to search for ways to adapt. Market mechanisms are characterised by high dynamics of changes in the economic environment, which requires systemic improvements within their management systems. Their adaptation is measured by the capacity to build up the competitive advantage in modern organizations using elements such as knowledge and intellectual capital of personnel, which should enable them to implement their development strategies. The key role in this respect is played by advanced ICT-based solutions within the information and communication infrastructure. They support business processes of such modern organizations by using advanced organizational and ICT solutions (Schwaninger, 2010; Waltz, 2003). This implies the broad utilization of state-of-the-art ICT tools to support the management of business processes in an organization, e.g. in production, warehouse management or order services, as well as to assist in the management of its business environment (in particular the supply and distribution chains).

In the dimension of practical implementation, the applied ICT technologies are a mixture of hardware-software-organizational solutions, such as database and data wholesale technologies, communication technologies (wire, wireless, and hybrid), automatic identification methods (bar codes, RFID), computer aided manufacturing (CAM), supply chain management (SCM), enterprise resource planning systems (ERP), advanced planning systems (APS), customer relationship management systems (CRM), supplier relationship management systems (SRM), product life management systems (PLM), manufacturing execution systems (MES), warehouse management systems (WMS), satellite location systems (GPS, Galileo, Glonass), advanced business intelligence systems (BI), and the Internet of Things (IoT) (Vongsingthong & Smanchat, 2014; Wieczerzycki, 2012). All these systems are implemented in a suitable data processing model (classical one or in cloud computing). Such technologies constitute a unique IT ecosystem, which enables to operate and develop advanced ICT solutions as attributes of innovation in modern organizations in the knowledge economy.

Advanced ICT Systems in E-logistics

In practical terms the effective co-dependency of these elements means the necessity of the use of advanced ICT solutions within the framework of economic organization’s ICT system. It uses technical, technological, and organizational innovations appearing over the recent years. They comprise nearly all areas of logistic activity, from the development of the means of transport and equipment, through the organization and management of material and raw material flow to the development of structures of systems performing logistics processes. The area of their operation is the implementation of virtual processes in the environment of extensive ICT networks (most frequently the Internet is the technological platform) aimed at the coordination and integration of business partners in the supply chain (Graham, Manikas, & Folinas, 2013).

As a consequence of organizational development, logistics services rendered by specialist outsourced organizational units have started to be offered most often by independent suppliers in the SaaS model (Software as a Service). Thus, the outsourcing market has developed, where a manufacturer or a processor is not encumbered with the costs of creating, maintaining, or updating the functionalities of ICT applications, which
serve business relationships with partners in the whole logistics chain. In addition to compact services, modern solutions have appeared that combine a number of actions aimed at the coordination and integration of a network made of producers, wholesalers, retailers, distributors, transport, and forwarding firms. Suppliers of logistics services may organise the whole process of order fulfilment (from the time of its placing, through confirmation and delivery). In this case, they are called 4PL (Fourth Party Logistics) integrators. They may also operate as specific e-markets, which associate available services to meet the demands of suppliers and customers in a chain of market goods deliveries. 4PL integrators serve the B2B (Business-to-Business) market and B2C (Business-to-Customer) contacts. As regards e-markets, the possibility of associating demand and supply of logistics services in real time is crucial, using the platform of generally available Internet tools.

In the increasingly complex economic conditions, ICT systems that increase incomes and optimise costs are valued most. Therefore, ERP (Enterprise Resource Planning) systems have enjoyed major popularity for a long time, both to serve clients and in the back-office area, without affecting directly the processes of selling goods and services. A well-configured ERP system may be a source of savings for any organization; moreover, it enables to take decisions faster and in a more flexible manner. In the times of economic crisis, organizational changes that stem from the correct use of information gathered by an enterprise about business processes and resources may be the cheapest way of their development (Graham et al., 2013; Magnier-Watanabe & Senoo, 2009).

In the last few years, investments in ICT equipment have been growing dynamically, which means that great many economic organizations have already purchased suitable IT infrastructure that may operate efficiently in the next few years. At this point, therefore, they may focus on buying business software, such as ERP. The foundation for a success in an enterprise is the ability to plan and achieve business objectives consistently. The more difficult this task is, the faster an organization develops. ERP systems are ICT systems that integrate all aspects of a business operation. Advanced ERP systems enable to collect data concerning the on-going operation and, primarily, transfer it into knowledge necessary to take right business decisions. On the other hand, enterprises that already use an ERP system should invest in modules that will increase its functionalities. The most commonly recommended ones are the solutions designed for sale and purchase management processes, because they make it possible to standardise the buying process while using the economies of scale, which is especially important for organizations of distributed infrastructure. On the other hand, enterprises that decide to take brave competitive actions need to have tools that will make it possible for them to carry out detailed analyses of information coming from the market.

The application of Business Intelligence tools enables to understand preferences of customers better and to analyse sales results in order to eliminate less profitable products and activities (Graham et al., 2013; Koronios & Yeoh, 2010). Analyses conducted based on information aggregated by ERP systems often underlie most business initiatives in numerous enterprises. Even the simplest solutions may prove useful, as they enable to estimate operational risks and limit potential hazards that result from problems of organizations that are situated within a shared supply chain. The economic crisis will contribute to creating closer links between businesses that operate within supply chains, due to the necessary exchange of services and process integration. Additional benefits will follow within the synergy effect. The analysis of enterprise operations is the key element of strategic management. Having complete knowledge, an organization may take right decisions and, consequently, improve its competitive position. Owing to the immediate access to valid data, the management/directors have knowledge that enables them to raise the working efficiency of specific
departments in an enterprise. After all, in the situation of strong competition on a market, decisions taken in the area of management affect the market position most.

Enterprises that develop dynamically focus more on the flexible and modern ICT solutions with extended analytic functions. Analytic modules should provide fast access to current data, reporting and comparing results of the enterprise. It means that ERP systems have to be provided with standard reports but also with their easy generation for the needs of an end user. Access to contextual information important for different users, which should guarantee the coordination of daily business activities with the general strategy of an enterprise should also be an important functionality of a system. Considering the implementation of a modern ERP system, one has to take into account the changes an organization is subject to, for example those related to its development, employment, growing demands, and the extension of sale markets. Therefore, it is a good idea to choose flexible systems that enable the prompt modification and extension with new components facilitating the adaptation to individual user expectations. A well-thought-out decision concerning a selected ERP system will make it possible to gain substantial savings in the future, as the needs of the enterprise in this respect will increase. Therefore, a selected ERP system should be sufficiently scalable and flexible. It should be characterised by the maximally simplified service interface. Preferably, it should be accessible via any website browser. Finally, its implementation should be fast, while simple modifications should be available without the necessity to change a source code.

Other ICT technologies face new challenges, e.g. within the automatic identification, wireless connectivity, and satellite localization (Grösser & Zeier, 2012). The current fashion for SOA (Service Oriented Architecture), virtualization, and WEB 3.0 may turn out to be one of the development factors of investments that are well related to business processes. Already the 1990s showed clearly that without an ERP system there is no modern management in an enterprise. The recent years have revealed that the traditionally understood ERP systems are no longer sufficient. Their basic functionality has been enriched with the following modules: CRM (Customer Relationship Management), SRM (Supplier Relationship Management), SCM (Supply Chain Management), and PLM (Product Lifecycle Management) (Adamczewski, 2016; Magnier-Watanabe & Senoo, 2009). The last extension, in particular, has gained special importance. The management of product lifecycle management encompasses actions starting from the moment a concept of a product appears until its withdrawal from the market. It consists of the development of a design concept, the creation of production technology, manufacturing management, documentation management, and customer order management. An important element in the PLM system is the service of technical changes of products in production and supply processes. In case of high series manufacturing with a large number of variants, where a buyer may customize a product model and its fittings, it is important to apply a product configurator. It enables to create a product model, as-built documentation, material lists, and cost estimates. These objectives can be fulfilled owing to the collaboration with CAD/CAM packages (Computer Aided Designing/Computer Aided Manufacturing).

The latest ERP versions utilise fully the cutting-edge ICT solutions, including the above-mentioned SOA concept. This service is understood here as a separate functional model and treated as an element of an ICT solution that fulfils a specific task. The independence of such services makes their use possible within any system platform and programming language. It gives unprecedented possibilities within the flexibility of activities and the development of ICT solutions. Interrelated enterprises serve streams of materials and semi-materials, semi-finished products, and finished products as well as information associated with such processes within supply chains. To fulfil such objectives in an orderly and repeatable manner, workflow
systems are utilised. When supported with the SOA philosophy, they enable to put into practice the idea of an enterprise within the RTE (Real-Time Enterprise) convention. Objectives set for such solutions are as follows (Koronios & Yeoh, 2010; Schwaninger, 2010):

- management of transactions within a sectoral supply chain;
- just-in-time planning and delivery of supplies;
- the fulfilment of sectoral criteria of a supply chain (monitoring products during all phases of their manufacturing); and
- offering detailed profitability and customer service analyses including flexible reporting.

**SMAC-Systems in E-logistics**

The dynamic advancement of ICT has led to the development of a new technological standard, namely SMAC systems, which make it possible to implement new business models. They are based on four pillars (Vongsingthong & Smanchat, 2014):

**I. Social**—social media remove barriers in the information flow among people and become platforms that enable the fast exchange of knowledge, which is becoming more and more effective. Communication within social media is strongly displacing telephone and e-mail communication. This phenomenon is also taking place in business, where the fast exchange of information is essential. The use of social media makes it possible to gain better interaction with customers, which facilitates faster reactions to problems and building the knowledge base according to user preferences and behaviour. Employees may meet in the social media to exchange their experiences and interesting content much faster and quicker, thus accelerating the resolution of problems.

**II. Mobile**—mobile devices such as smartphones and tablets have become an indispensable part of our lives. They have also opened up new opportunities of reaching customers who use mobile devices and have become accustomed to shopping and using different types of services and applications regardless of time and place. The growing popularity of mobile services has also forced entrepreneurs to develop their e-marketing and to provide customers with mobile channels. In such conditions, the presentation of an offer of mobile devices is the foundation for gaining and maintaining a strong market position.

**III. Analytics**—the understanding of behaviour and preferences of customers is among the greatest advantages that come with using analytical tools. The collected data analysed with advanced algorithms can be used by entrepreneurs to understand how to earn loyalty of their customers, enhance marketing campaigns, improve product development processes, and render services that meet preferences and requirements of their customers. By learning preferences of users, entrepreneurs can present content that meets their expectations. Therefore, the key objective in using analytical tools in business is to take right decisions according to updated and aggregated information.

**IV. Cloud**—the cloud computing technology offers tools that enable to collect information effectively and manage a business efficiently. By using tools available in a cloud, organizations are able to reduce ICT costs, break geographic barriers, and gain access to data at any time and place. A cloud is a factor that puts other SMAC components together.

There have been numerous examples in recent years that show the discrepancy between expectations and the actual benefits that come from the use of ICT tools. The cause of this effect may be the lack of the adequate level of integration between implemented systems. The key to success with the SMAC technology is the
combination of the above-mentioned four technologies that communicate and thus provide the economies of scale. None of the four technologies alone can give a full effect. Only the synergy created by all SMAC elements working together makes it possible to create a competitive advantage. So far, organizations have invested in mobility, cloud, business analytics, and the use of social media in business by creating independent and usually incompatible solutions. Their combination within the third platform makes it possible to create new services that generate incomes, deepen relationships with customers, and improve the efficiency of organization operations.

Owing to the development of the computing cloud and the mobile technology, it has been possible to move from closed communication systems to social platforms (Magnier-Watanabe & Senoo, 2009). As a result, the work system and business communication have been changed deeply and permanently. Social channels make it possible to create and give access to content quickly, distribute information on a larger scale, and to cooperate and interact with customers better. Mobile technologies have given easier access to information with non-stop online connectivity. Data analyses are used to optimise customer relationship management and improve sales channel efficiency. A cloud, on the other hand, is the foundation of ICT systems in many enterprises, improving their flexibility, scalability, and cost savings of data processing. Organizations that want to maintain their position on a competitive market have to be ready to provide customers with tailor-made services. Owing to the SMAC development, ICT technologies are not only the support in business development, but in fact a turning point that gives an advantage to organizations and enables them to stand out against the competition. SMAC provides the required information on time, which makes it possible to take right decisions and cooperate effectively both inside and outside an organization, i.e. in the whole cooperation chain.

**Internet of Things in E-logistics**

New ICT technologies, e.g. in the scope of automatic identification, wireless communication, satellite localization, or Internet of Things are facing a new challenge. The Internet of Things is a concept according to which unambiguously identifiable items may indirectly or directly gather, process, or exchange data via a global network. Such items comprise, for example, household appliances, lighting and heating installations. The term was used for the very first time in 1999 by Kevin Ashton and since then it has undergone quite an evolution. It is sometimes applied interchangeably with a term “Internet of everything”, which describes a network of people, processes, data, and intelligent connection to the Internet. The term was created by CISCO Company and has been currently replaced by a term “Internet of Things” (Höller & Tsiatsis, 2014; Vongsingthong & Smach, 2014).

Over the last 50 years, ICT has been subjected to two key transformations. The first one took place in 1960s and 1970s together with the appearance of solutions supporting automatization of processes, designing (CAD) and manufacturing resource planning (MRP II). The second transformation was the result of the emergence of the Internet and associated solutions. It is assumed that the Internet of Things shall be a driving force of the third wave of changes.

The IoT is such a popular concept that it leaves much room for interpretation. The term can be used to describe any unambiguously identifiable thing able to—indirectly or directly—gather and process data. The number of such devices grows dramatically together with the number of possible applications. The IoT is closely associated with the big data area—as its largest benefit is the efficient gathering and processing of large amounts of information (Perera, Ranjan, Wang, Khan, & Zomaya, 2015). Three features distinguishing the
Internet of Things comprise context, ubiquity, and optimization. The first one refers to the possibility of advanced interaction between the item and its surroundings, immediate response to the changes, etc. Under this feature, the items provide information on, for example, location, physical, or weather conditions. Ubiquity corresponds to the fact that today there are more things of this kind (items, objects) than people connected to the network. In the near future they will communicate with each other on a large scale. Optimization stands for functionality of each thing (item, object).

The Internet of Things is a concept that is both fashionable and leaves large space for interpretation. This term can be used to describe in fact each and every explicitly identifiable object that is capable of, directly or indirectly, collecting and processing data. The number of such devices keeps growing dramatically, likewise the number of their potential uses. The big data area is closely related to this solution, as the effective collection and processing of large volumes of information are among the greatest benefits offered by IoT (Höller & Tsiatsis, 2014).

Three characteristics that distinguish the Internet of Things are context, omnipresence, and optimization. The first quality refers to the possibility of advanced interaction between a thing and the environment and its immediate reaction to changes, etc. Within this characteristic, things supply information, e.g. about localization, the physical status, or atmospheric conditions. The omnipresence reflects the fact that already today the number of things (objects) is greater than the number of people connected to the global network. In the near future, they will communicate on a large scale. Optimization is the expression of functionality that is brought by each and every thing (object). Owing to the spread of Internet of Things, such solutions are becoming an integral part of each and every product. Sensors, processors, and their specialist software are integrated into their functionality (they in fact become their *sine qua non* condition) and are combined with the advanced data analysis. This leads directly to the creation of new and improved products (services), which enables the visible jump in economic efficiency (Perera et al., 2015).

As regards the Internet of Things, the formulated expectations are still relatively modest, because such solutions are only beginning to reach Polish enterprises in the practical dimension and, as every novelty, are accompanied by information noise. However, there is a popular opinion that IoT may significantly define the logistics chains and affect their conduct substantially, both in temporal and cost terms.

Due to popularization of the Internet, such solutions become a standard, integral part of each product. Sensors, processors, and specialized software are incorporated into their functionality (and in fact become the condition *sine qua non*) and become combined with advanced data analytics. It leads directly to the creation of new and improved products (services), thus allowing for noticeable leap in economic efficiency. According to some forecasts, the third wave of economic transformation, fueled mainly by the ICT development, will be probably the most significant in history. It will entail even more intensive development of innovation and productivity as well as faster economic growth. The Internet of Things opens new perspectives, for example, within the scope of “instrumentalization” or use of smart devices to collect data, monitor and analyze products of both, a given organization and a business process. The appropriate use of sensors connected to network may provide each organization with large amounts of useful information by means of real-time reading of statuses of things (objects) used for better comprehension, analysis, and planning of operational activities (Höller & Tsiatsis, 2014).

According to ICT analysts, the nearest future holds a real increase in the popularity of solutions using the Internet of Things. The increase will be mainly generated by the consumer market, which is swamped with
more and more smart devices: such as wristbands assisting in training or smart, network-connected refrigerators, smart TVs, smart watches, smart utility meters, 3D printing of ready products at the customer/recipient, etc. The first devices meeting the requirements of the IoT were highly specialized and applied mainly in the industry. These were, above all, different types of sensors and readers, whose task was to collect data from production infrastructure and forward them to control systems. Currently, these requirements have been expanded with the possibility to connect to a global network via an individual IP address, e.g. information on technical condition of a car and communication with a service engineer or a manufacturer, and the possibility to automatically generate orders of shelf products by reading their minimum stock number with a sensor.

Research conducted in Report PMR shows that (Report PMR, 2015):
- nearly 90% of logistics and transport companies already implement or will implement the IoT solutions in the coming year,
- over half of respondents expect that the IoT will have positive impact on supply chains,
- 40% of respondents expect that IoT will help their companies to increase safety and cost effectiveness,
- it is assumed that the key technologies assisting the implementation of the IoT are Wi-Fi, safety detectors, and NFC (Near Field Communications),
- nearly 40% of respondents pointed out to privacy and security as the biggest obstacle in the implementation of IoT solutions,
- 38% pointed out to complexity of the said solutions and resulting risk associated with their implementation.

The aforementioned research results show how important the IoT is for logistics and transport companies. Such solutions provide operational data on location and monitoring of things (objects). Owing to that information it is possible to improve the quality of customer service by shortening logistics processes and their cost optimization.

**ICT Development in E-logistics**

The development of advanced ERP systems stimulates the demand for supporting the above-mentioned ICT analytic tools within business intelligence. Such solutions contribute to the effective support of decision processes. The so-called business analytics is becoming an increasingly common topic (Graham et al., 2013; Koronios & Yeoh, 2010). It covers tools and applications used to analyse, monitor, model, present, and report data that support decision taking. To this purpose, data wholesales, supply chain operational analyses, analytic CRM systems, in-depth financial analyses, and efficiency indicators of enterprises are utilised. Users of such solutions work on a strategic level of enterprises, based on certain data aggregates. This is related to the problem of data integration and synchronization. Data integration starts from the potential to use numerous data sources, both via dedicated interfaces and the use of standard ODBC mechanisms (Open Database Connectivity). Data may come from relational or hierarchical databases, structural files as well as from ERP systems. Therefore, such connections should make it possible not only to read data but also to record and process them. In case of most enterprises, there are numerous ICT environments and access mechanisms should make it possible to obtain data from different platforms (as far as possible without the use of intermediate files).

ERP/BI solutions are not subject to fast changes, but phenomena have developed that may affect this class of application software fundamentally. They include (Graham et al., 2013; Koronios & Yeoh, 2010; Perera et al., 2015):
the widespread use of network enterprise solutions,
the growing business importance of mobile solutions,
the increasing flexibility of ERP systems owing to the more and more flexible solutions with other applications and mobile devices, provided with functions known from social media,
the growing use of a cloud computing model in ERP systems, which is particularly important in case of the SME sector (costs lower by up to 20% are a main incentive),
the increasing interest in ERP sectoral systems (they shorten the time and cost of their implementation), within which the targeted solutions of a specific problem occur with the functionality limited to the service of a single business process (maximum a few processes), giving fast return on investment,
the general departure from functional models in favour of serving specific business processes, which in the ICT dimension constitute the reflection of information services, and

According to IDC forecasts, in the next two years 80% of global organizations will initiate projects of digital transformation in their knowledge management, to be based on SMAC systems, including as many as 50% of outlays spent on the 3rd ICT platform solutions (Report IDC, 2016). Research carried out by the author¹ shows that the popularity of IT support in management processes in SMEs can be presented as follows (percentage of analysed enterprises):

- finance and accounting—87%,
- human resources—75%,
- warehouse management—63%,
- production management—21%,
- customer relationship management—52%,
- office work support—96% (including e-mail 98%), and
- procurement and sale process service—64%.

The analysed enterprises use laptops and PCs in their day-to-day operations (99% of indications). On average, they hold about 15 computers. The vast majority use both land lines and smartphones. Tablets are used in every third enterprise (36%), with four tablets per firm on average. The above-mentioned statistics are supplemented with the 48% ratio of using online messenger systems and taking advantage of the support provided by ICT freelancers at 59%. SMEs usually do not use multi-layer data processing protections. Instead, they choose only basic anti-virus software (90%). Every second enterprise (53%) protects its data with a standardised policy of passwords that are set and managed by the management. On the other hand, less than half SMEs (48%) encode their e-mails. Only one out of three firms uses data backup (35%), including as many as 88% having that process automated. Interestingly, backup is used to secure company data more often by entities that do not consider their ICT security to be of essential importance for their business.

The readiness of the studied entities to face the challenges of digital transformation is as follows:
- 22% of respondents answered positively, confirming the implementation of such tasks,
- 12% of respondents answered that such actions would be taken soon,
- 20% of responses indicated that such actions would be taken in the near future, and

¹ The research was conducted in 2014-2016 on a selected sample of 120 enterprises from the Polish SME sector in Mazowieckie and Wielkopolskie provinces.
• according to 46% of respondents such actions were not being conducted and there were no such plans.

As regards the use of SMAC solutions, the statistics of the analysed entities reflects the general global trend in this respect, i.e. (Choi, Chan, & Yue, 2016; Gajewski, Paprocki, & Pieriegud, 2016; Report IDC, 2016):

• a cloud is used in 18% organizations (38% of analysed population plans to start using it),
• mobility is utilised in 29% of organizations (with 15% of analysed population planning to launch it),
• analytics is applied by 9% of organizations (while 16% of studied population have plans to start it), and
• social media are declared by as many as 45% of organizations already, and their use in the near future is declared by 55% of respondents.

The development trends of Polish intelligent organizations in the digital transformation are supplemented with the following declared initiatives (Corcoran & Datta, 2016; Gajewski et al., 2016):

• office digitalization—70%,
• modernization of ICT infrastructure—64%,
• consolidation in ICT and advanced analytics—49%,
• new mobile applications for personnel—49%,
• networking—49%, and
• mobile self-service applications for customers—30%.

The fact of placing a customer in the centre was confirmed by responses about catching up with the dynamically evolving needs of contemporary consumers. Moreover, half of the respondents indicated the necessity to follow the changing expectations of their customers, declaring it to be their top business priority. The continuous improvement of customer satisfaction level is possible mostly owing to investments in new ICT solutions. Only owing to them shopping can be comfortable, fast, and possible at any time and place, while customer service can be effective. It also means the new opportunities in acquiring knowledge about needs, behaviour, and opinions of customers.

In general, the above-mentioned study results show that Polish modern business organizations are becoming more confident in using advanced solutions of SMAC systems, to meet the challenges of digital transformation.

Conclusion

The accelerating technical and economic-social advancement and the growing dynamics of changes and the related uncertainty are becoming important conditionings for the operation of modern economic organizations. Such organizations, in order to counteract such uncertainty, have to exhibit considerable flexibility as the basic attribute of organizations in the integrated development. A decisive role in this respect is played by advanced ICT solutions of e-logistics.

The demand for advanced ICT of e-logistics solutions that support business processes in modern organizations will keep growing, because such organizations, due to the nature of economic activities, are interested in the optimum use of their resources in order to gain maximum benefits from the invested capital. The growing offer of ICT solutions available on the Polish market enables organizations to make a selection depending on their business needs and financial capacities, while ICT support of the whole chain of supplies is becoming not only a challenge of a competitive market but in fact the necessity to meet the growing demands of clients in the area of their effective service. When production and ICT technologies are similar, the sources
of competitive advantage are to be searched for in effectively designed and efficient advanced ICT solutions of modern organizations, which gain even more importance considering the growing demands of market mechanisms of the knowledge economy within integrated development.

The growing popularity of an integrated approach to economic development and holistic thinking should be promoted by the confrontation of theoretical inspirations with real needs and possibilities of stimulating integrated economic development in the globalization conditions and the inevitable transformation to knowledge economy. Hence, it is becoming necessary to look at such conditionings and dimensions of integrated development from the angle of challenges faced by modern organizations.

Conducted research has confirmed research hypotheses. It shows that SMAC solutions are more and more common among small and medium enterprises while company management of the surveyed enterprises pays more and more attention to applying knowledge management systems. This stems from the conviction that in the times of digital transformation information technologies which support effective knowledge management not only allow keeping up with the rising competition but are an indispensable condition of market survival.

Nevertheless, it has to be remembered that the creation and development of such smart technologies has one basic aim for businesses, namely to accelerate the development pace and improve the quality of offered products and services, while reducing operating costs. Although it seems apparently simple, paradoxical innovation of Polish business organizations from the SME sector is burdened with the concern about the unknown. SMEs are afraid of investing in solutions that are not popular yet. Nevertheless, the strategic vision of the management in such organizations will determine the directions and pace of popularising modern and effective solutions in knowledge management, which may contribute to the improvement of their competitiveness on the global market.

Modern ICT solutions of e-logistics using the so-called 3rd ICT platform, i.e. Mobility, Big Data, Cloud Computing, and Social Business (media) contribute directly to the increased efficiency of business processes, hence raising the competitiveness of organizations on the global market. Therefore, it is important that they should be analysed holistically, which will guarantee the final effect of synergy.

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