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Digital transformation of business entities in competitive environment

INTRODUCTION

Information and Communication Technologies (ICTs) are a development platform for many companies today. They, generally, enable them to acquire resources and develop a business relationship network with other entities. ICTs, supporting knowledge management processes and innovative processes, can contribute to improving the enterprises' competitiveness. The scale and scope of ICTs implementation is subject to the age and size of the business and the industry in which it operates. These factors influence the level of investment in ICTs as well as the level of needs and requirements of the enterprises themselves. ICTs, as a catalyst for management and business processes, determine the ability of a company to adapt to changes in a broadly understood environment. Different types of enterprises respond differently to the implementation of ICT, and the development of these technologies is different in different organizational environments. It is worth emphasizing, however, that ICTs should be implemented on the basis of a thorough analysis of the internal and external environment, rather than merely opinions and financial possibilities.

Digital transformation – the use of technology to radically improve performance or reach of enterprises – is a hot topic for organizations across the globe. Executives in all industries are using digital advances such as analytics, mobility, social media and smart embedded devices as well as improving their use of traditional technologies such as ERP to change customer relationships, internal processes and value propositions. Other executives, seeing how fast digital technolo-

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gy disrupted media industries in the past decade, know they need to pay attention to changes in their industries now.

This article is aimed at presenting the latest condition of digitalization and development tendencies in supporting the SME sector with SMAC solutions (Social, Mobility, Analytics, and Cloud), which is a *sine qua non* condition of enterprises from this sector to operate in a modern way and to take part in the process of digital transformation. According to research by Cisco Global Cloud Index, half of the global population will have access to the Internet in 2018, and more than 53% of them will use tools for storing data in the cloud (Cisco, 2016). ICT implementation in every organization depends on numerous factors, mostly organizational, human, and technical, but also on the needs of the management, which can be more or less conscious. Unlike large organizations, where the implementation of advanced SMAC is perceived positively, it seems that an opposite approach can occur to this trend in the SME sector. 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 fulfil the objective, the following research hypotheses have been formulated:

- elements of SMAC solutions are used on an increasing scale in SMEs,
- SME management pay growing attention to the implementation of SMAC systems.

The analyses are illustrated with survey results and direct observations of the author from 2014–2017 in selected 120 SMEs from Mazowieckie and Wielkopolskie provinces, Poland, with reference to the general development trends in the studied area.

INTELLIGENT ORGANIZATIONS IN TURBULENT ECONOMY

The dynamics of market changes and the high level of turbulence in business environment make modern economic organizations face the challenge of continuous improvement in their operational methods and development. In practice, it implies the necessity to use modern ICT solutions in knowledge management, which enable to support business processes within the acquisition and reinforcement of business's competitive advantages. Within the evolution of the information society towards the knowledge society, it boils down to the treatment of modern organizations as intelligent organizations. A intelligent organization is one whose business philosophy is based on knowledge management (Beckford, 2016; Waltz, 2003). This term became popular in the 1990s owing to the growing ICT development, the dynamically changing economic environment, and the increasing market competitiveness. An intelligent organization is one that learns and has the capacity to create, acquire, organise, and share knowledge and use it in order to raise the efficiency of its operation and increase competitiveness on the global market. The idea of such an organization is based on the systemic approach to organization, i.e.

its treatment as a complex organism founded on existing structures and executed processes, focusing on the role of knowledge. In that approach, which is called ‘the fifth discipline’ by P. Senge, owing to knowledge and suitable tools all elements of an organization and its personnel can collaborate in order to achieve set objectives (Senge, 2002). Thanks to that, the whole organization operates as an intelligent and successful organism in the competitive environment. This explains the mutual relationships between methods of fulfilling targets, their understanding, methods of solving problems as well as internal and external communication.

The most important characteristics of a intelligent organization include, among other (Beckford, 2016; Grösser, 2012):

- fast and flexible operation,
- the ability to monitor the environment,
- the capacity to diagnose early market signals and to react to changes in the environment, and
- the ability to implement new knowledge-based solutions and achieve economic benefits therefrom.

The growing volume of information used in a intelligent organization is accompanied by its increasing importance. Peter Drucker indicated already that traditional factors of production, such as growth, labour, and capital, are losing their importance in favour of a key resource, namely knowledge applied in the creative operation of an organization. It constitutes intangible resources that are related to human actions, whose use may be the basis for gaining a competitive advantage (Schwaninger, 2010). Knowledge has to be treated as information embedded in the context of an organization and a skill to use it effectively in the organizational activity. It means that knowledge resources are data about its customers, products, processes, environment, etc. in a formalised form (documents, databases) and in non-codified forms (knowledge of staff).

In the practical dimension, the effective collaboration of such elements means the necessity to use advanced ICT solutions. Technical, technological, and organizational innovations, which have appeared in recent years, are all utilised. They encompass almost all areas of a modern organization operation, starting from means of transport and equipment, through organization and material and raw material flow management, to the development of system structures that implement business processes, i.e. within logistics systems that are the essence of modern management based on e-logistics (Adamczewski, 2017; Beckford, 2016).

TRENDS OF ICT SOLUTIONS ON INTELLIGENT ORGANIZATIONS

Digital business blurs the physical and virtual worlds in a way that transforms business designs, industries, markets and organizations. The continuing digital business evolution exploits emerging and strategic technologies to integrate the physical

and digital worlds, and create entirely new business models. The future will be defined by smart devices delivering increasingly insightful digital services everywhere. We call this mesh of interconnected people, devices, content and services the *intelligent digital mesh*. It's enabled by digital business platforms delivering a rich intelligent set of services to support digital business (Gartner, 2018; Lechman, 2018):

- Artificial intelligence (AI) delivers value to every industry, enabling new business models. It does so by supporting key initiatives such as customer engagement, digital production, smart cities, self-driving cars, risk management, computer vision and speech recognition;
- As people, places, processes and “things” become increasingly digitalized, they will be represented by digital twins. This will provide fertile ground for new event-driven business processes and digitally enabled business models and ecosystems;
- The way we interact with technology will undergo a radical transformation over the next 5 to 10 years. Conversational platforms, augmented reality, virtual reality and mixed reality will provide more natural and immersive interactions with the digital world;
- A digital business is event-centric, which means it must be continuously sensing and adapting. The same applies to the security and risk infrastructure that supports it, which must focus on deceiving potential intruders and predicting security events.

Enterprise architecture (EA) and technology innovation leaders using EA to master emerging and strategic trends must:

- Devise new business scenarios using AI as the enabler for new business designs. Do so by engaging, educating and ideating with senior business leaders about their strategically relevant priorities.
- Create a more natural and immersive user experience by deploying, where effective, conversational platforms and virtual, augmented and mixed reality.
- Support Internet of Things (IoT) initiatives by developing and prioritizing targeted, high-value business cases to build digital twins and exploit cloud and edge computing synergistically.
- Adopt a strategic approach for security and risk that continuously adapts based on risk and trust. Do so by communicating requirements to developers, achieving a DevSecOps environment.

As an enterprise architecture or technology innovation leader seeking to exploit the intelligent digital mesh, you must respond to the disruptive technology trends driving this future. Top 10 strategic technology trends include three groupings of complementary trends (Gartner, 2018):

- The intelligent theme explores how AI is seeping into virtually every existing technology and creating entirely new technology categories,
- The digital theme focuses on blending the digital and physical worlds to create a natural and immersive, digitally enhanced experience. As the amount of data that things produce increases exponentially, compute power shifts to the edge to

process stream data and send summary data to central systems. Digital trends, along with opportunities enabled by AI, are driving the next generation of digital business and the creation of digital business ecosystems.

- The mesh theme refers to exploiting connections between an expanding set of people and businesses – as well as devices, content and services – to deliver digital business outcomes. The mesh demands new capabilities that reduce friction, provide in-depth security and respond to events across these connections.

Top 10 list highlights strategic trends that aren't yet widely recognized but have broad industry impact and significant potential for disruption. Through 2022, technologies related to these trends will reach a level of maturity that crosses a critical tipping point. And they'll experience significant changes (Gartner, 2018):

Trend No. 1: AI Foundation — Interest in AI is growing, as shown by an increase of more than 500% in the number of inquiry calls from Gartner clients about topics related to AI in the past year. A 2017 Gartner survey found that 59% of organizations are still gathering information to build their AI strategies, while the rest have already made progress in piloting or adopting AI solutions. Furthermore, the market indicates strong investment in startups selling AI technologies. Creating systems that learn, adapt and potentially act autonomously will be a major battleground for technology vendors through at least 2020. The ability to use AI to enhance decision making, reinvent business models and ecosystems, and remake the customer experience will drive the payoff for digital initiatives through 2025. The AI foundation consists of numerous technologies and techniques that have grown over many years. These include expert systems, decision trees, linear regression and neural networks.

Trend No. 2: Intelligent Apps and Analytics — Organizations are applying AI techniques to create new app categories (such as virtual customer assistants [VCAs]) and improve traditional applications (such as worker performance analysis, sales and marketing, and security). Intelligent apps have the potential to transform the nature of work and the structure of the workplace. When building or buying an AI-powered app, consider where its AI impact will be.

Trend No. 3: Intelligent Things – Intelligent things are physical things that go beyond the execution of rigid programming models and exploit AI to deliver advanced behaviors that interact more naturally with their surroundings and with people. AI is driving advances for new intelligent things, such as autonomous vehicles, robots and drones, and delivering enhanced capability to many existing things, such as IoT-connected consumer and industrial systems. Intelligent things are either semiautonomous or fully autonomous. The word “autonomous” when used to describe intelligent things, is subject to interpretation.

Trend No. 4: Digital Twins – A digital twin is a digital representation of a real-world entity or system. The implementation of a digital twin is an encapsulated software object or model that mirrors a unique physical object. Data from multiple digital twins can be aggregated for a composite view across a number of

real-world entities. The notion of a digital representation of real-world entities or systems is not new. You can argue that this was a central notion in the ICT industry with the creation of computer-aided design representations of physical assets or profiles of individual customers.

Trend No. 5: Cloud to the Edge – Edge computing describes a computing topology in which information processing and content collection and delivery are placed closer to the sources and sinks of this information. Edge computing draws from the concepts of mesh networking and distributed processing. It tries to keep the traffic and processing local, with the goal being to reduce traffic and latency. As such, the notion of edge content delivery has existed for many years.

Trend No. 6: Conversational Platforms – Conversational platforms will drive the next big paradigm shift in how humans interact with the digital world. They will shift the model from technology-literate people to people-literate technology. The burden of translating intent will move from the user to the computer. The system takes a question or command from the user in natural language. It responds by executing a function, presenting content or asking for additional input.

Trend No. 7: Immersive Experience – While conversational platforms are changing the way in which people *interact* with the digital world, virtual reality (VR), augmented reality (AR) and mixed reality (MR) are changing the way in which people *perceive* the digital world. This combined shift in perception and interaction models leads to the future immersive user experience.

Trend No. 8: Blockchain – Blockchain is evolving from a digital currency infrastructure into a platform for digital transformation. Blockchain and other distributed-ledger technologies provide trust in untrusted environments, eliminating the need for a trusted central authority. In this research, we use the term “blockchain” as a generic term for all distributed-ledger technologies. Blockchain technologies offer a radical departure from current centralized transaction and record-keeping mechanisms. They can serve as a foundation of disruptive digital business for both established enterprises and startups. Blockchain will transform the exchange of value, much as http/html transformed the exchange of web-based information.

Trend No. 9: Event-Driven Model – Business is always sensing, and ready to exploit, new digital business moments. This is central to digital business. Business events reflect the discovery of notable states or state changes, such as the completion of a purchase order. Some business events, or combinations of events, constitute business moments – detected situations that call for specific business actions. The most significant business moments have implications for multiple parties (for example, separate applications, lines of business or partners).

Trend No. 10: Continuous Adaptive Risk and Trust – The intelligent digital mesh and related digital technology platforms and application architectures create an ever-more-complex world for security. The continuing evolution of the “hacker industry” and its use of increasingly sophisticated tools – including the same advanced

technologies available to enterprises – significantly raise the threat potential. Relying on perimeter defense and static rule-based security is inadequate and outdated. This is especially so as organizations exploit more mobile devices, cloud-based services, and open APIs for customers and partners to create business ecosystems.

ICT ECOSYSTEM IN AN INTELLIGENT ORGANIZATION

An intelligent organization, as an economic system that uses advanced ICT infrastructure in its internal organization and communication, including external communication, constitutes the essence of information society operation in business areas at present. In practice, it means that ICT supports basic organizational structures and the application of the now economy concept in the on-line mode with (McConnell, 2017):

- the level of technical infrastructure (hardware),
- the level of system-communication infrastructure,
- the level of application software, and
- the level of integrating business processes with external counterparties.

The dynamic development of ICT has led to the development of a new technological standard, namely SMAC systems, which enable to introduce new business models. They are based on four pillars:

1. Social – social networks are breaking barriers in information flow among people and are becoming platforms where the fast exchange of knowledge is becoming increasingly effective. Communication within social platforms is strongly replacing telephone or e-mail communication. This phenomenon is taking place in businesses as well, where the fast information exchange is of great importance. The use of social networks makes it possible to obtain a better customer interaction and, as a consequence, it becomes possible to react faster to problems and build a knowledge base according to preferences and behaviour of users.
2. Mobile – mobile devices, such as smartphones, tablets, and notebooks, have become a basic working tool of a modern worker. They have also enhanced the opportunities to reach customers who use mobile phones and have become accustomed to e-shopping and using different types of services and applications anytime and anywhere. The growing popularity of mobile shopping has also forced enterprises to develop their online marketing and to provide customers with mobile channels. In such conditions, the presentation of an offer on mobile devices is the first step in achieving and maintaining a high position on the market.
3. Analytics – understanding the behaviour and preferences of customers is one of the greatest advantages of using analytics. By using collected data that is analysed with advanced algorithms, entrepreneurs can deduce how to earn

loyalty from their customers, improve marketing campaigns, enhance product development processes, and render services that meet the preferences and requirements of customers. By learning tastes of their users, entrepreneurs can present content according to their expectations. The ultimate aim in using analytics in business is, therefore, taking right decisions based on updated and segregated information.

4. Cloud – the technology of a computing cloud offers tools that enable to collect and process data on network services effectively, which contributes to the efficient organization management. By using tools available in a cloud, it is possible to reduce operating costs of ICT systems, break down geographic barriers, and obtain access to data at any time and place. A cloud is a factor that puts other elements of the SMAC solution together.

There are numerous examples in the business practice proving that expectations and actual benefits from using ICT solutions do not tally. The cause of such an effect may be the shortage of the sufficient integration between implemented systems. A key to success in using the SMAC technology is to combine the four above-mentioned technologies, which communicate among themselves, and to enable a synergy effect. None of the four technologies alone can give a full effect. Only synergy generated 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 using social media in business by creating independent, usually unintegrated solutions. Their combination within the third ICT platform allows to create new revenue-generating services, deepen relationships with customers, and improve the efficiency of organizational operation (Adamczewski, 2018).

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, 2016). Research carried out by the author shows that the popularity of ICT support in management processes in SMEs can be presented as follows (percentage of analysed enterprises) – the research was conducted in 2014–2017 on a selected sample of 120 enterprises from the SME sector in Mazowieckie and Wielkopolskie provinces. 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:

- 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 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
- 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 reflect the general global trend in this respect, i.e. (Choi, 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 is supplemented with the following declared initiatives (Corcoran, 2016; Gajewski, 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 (Brunswick, 2015).

The growing demands of intelligent organizations within the ICT support for knowledge management result in general from their operation in real-time (RTE – *Real Time Enterprise*). Therefore, SMAC systems enable to raise the efficiency of management to a higher level by:

- reaching customers more effectively with mobile solutions,
- understanding customer needs better by using advanced analytics,
- communicating with customers more effectively via social media, and
- reducing data processing costs with cloud computing solutions.

CONCLUSIONS

Statistics from the last years unequivocally confirm growing indicators of ICT solutions implementation in the sector of SMEs, which gives fair promise to Polish enterprises for their operations on global markets. 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 to keep 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, paradoxically 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.

According to the above analysis, the conditions of effective knowledge management in intelligent organizations have to be treated in a complementary way, so that ICT aspects, although very important, do not dominate the preparatory work or the operation of solutions in this respect. Equally important are so-called ‘soft’ conditions, which concern the strategy of organization’s development, its organizational culture, and qualifications and motivation of personnel. One thing seems certain already – the period of digital transformation poses new challenges for Polish intelligent organizations in the area of knowledge management. If they rise to them, they can compete on global markets more effectively. Modern ICT solutions of knowledge management 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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Summary

The global economy evolves into a “knowledge-based economy”, where market success of enterprises more and more depends on efficient knowledge management, that is on acquisition, generation, distribution and application of knowledge within organizations. The strategically important nature of knowledge results firstly from the fact that it is harder to imitate and substitute when compared with material resources, and secondly from the fact that it is more flexible, i.e. more useful for the creation or improvement of various elements of the enterprise’s offer. This applies in particular to the issues of knowledge management in economic organizations, which can be analysed in the area of organizational structures, business processes, personnel, organizational structure as well as ICT that supports management. 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 2014–2017 in selected SMEs from Mazowieckie and Wielkopolskie provinces.

Keywords: ICT, intelligent organization, SMAC, knowledge management, SME.

Transformacja cyfrowa podmiotów gospodarczych w konkurencyjnym środowisku

Streszczenie

Rosnący poziom turbulencji otoczenia wymusza na organizacjach gospodarczych stosowanie nowych metod zarządzania. Jednym ze sposobów jest pełniejsze wykorzystanie nowych modeli funkcjonowania opierających się na zaawansowanych rozwiązaniach teleinformatycznych ICT (*Information and Communication Technology*). Rozwiązania te rewolucjonizują modele i przebiegi procesów biznesowych. Ewolucja technologii teleinformatycznych doprowadziła do upowszechnienia się tzw. III platformy ICT, określanej mianem SMAC (*Social, Mobile, Analytics, Cloud*), tworzącej swoisty ekosystem rozwiązań informatycznych. Pozwala on organizacjom rozwijać swoją działalność przy mniejszych nakładach finansowych i maksymalnym zasięgu oddziaływania, przez co tworzy się nowy model biznesu oparty na informacjach generowanych przez środowisko gospodarcze. Celem artykułu jest przeanalizowanie roli organizacji inteligentnych w rozwoju gospodarki okresu transformacji, w którym wysoko przetworzona informacja w określonym kontekście organizacyjnym, czyli wiedza, urasta do strategicznego zasobu, a zarządzanie nią stanowi wyróżnik nowoczesnego i efektywnego funkcjonowania organizacji. Rozważania są ilustrowane wynikami badań autora przeprowadzonymi w okresie 2014–2017 w wybranych 120 przedsiębiorstwach sektora MSP województw mazowieckiego i wielkopolskiego z odniesieniami do ogólnych tendencji rozwojowych w zakresie globalnej transformacji cyfrowej.

Słowa kluczowe: ICT, MSP, organizacja inteligentna, SMAC, zarządzanie wiedzą.

JEL: B21, M15, O12.