DEVELOPMENT OF INFORMATION TECHNOLOGY AND ITS IMPACT ON THE FORM OF INFORMATION SERVICES

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Abstract: The article studies the development and complexity of information technology (IT). The dependence of modern businesses on the extent and efficiency of applying IT is argued. On this basis, attention is brought to problems related to the orientation of information services (IS) towards the provision of services. Grounds are given that it is based on and is determined by the achievements of IT service management (ITSM). Different approaches to improving IS are presented and the trend towards transforming current IS divisions into ones offering services is outlined.

Keywords: information technology (IT), information services (IS), IT service, IT service management (ITSM).

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Introduction

Modern information technology (IT) is becoming the main driving force behind the development of all spheres of society and entirely transforms the way in which all organizations operate and are managed, as well as the way they interact with each other and with their customers.

An increasing dependence between information systems and their business opportunities exists in modern organizations. What an organization

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would like to do in many cases often depends on what its information system will permit it to do (Laudon, 2013).

Conclusion can be drawn that the dependence of businesses, citizens and society on IT is constantly increasing with the increase in the scope and level of automation of all activities.

A key point in the statements above is the concept of 'dependence'. Several different aspects can be distinguished when revealing its content, namely:

- quality or necessity of something or someone;
- something or someone needed for support;
- state of reliance, dependence or of control that one object has over another.

All these aspects manifest themselves simultaneously at the current stage of using IT:

- **First**, businesses today cannot function without using IT and its effectiveness is directly dependent on the extent of its use, i.e. businesses **need** information technology and its **support**;

- **Second**, in order to achieve their goals and realize competitive advantages, businesses **rely** on modern IT;

- **Third**, business processes in many organizations are not only implemented with the help of IT but are also **controlled** by it.

A growing direct relation exists between organizations' capacity to use information technology and the implementation of corporate strategies in order to achieve business goals. The practical realization of all this leads to a massive investment in IT systems for:

- improving and optimizing operations;
- reducing costs and improving the quality of products and services provided;
- implementing new products, services and business models;
- improving interaction with customers, suppliers and partners;
- improving the development and adoption of solutions;
- achieving competitive advantages, successful differentiation from competitors, and market survival.

The so-called 'third platform' information technologies (a term introduced by IDC) – cloud computing, mobility, big data, artificial

intelligence, social networks, etc. not only provide organizations with broad opportunities to introduce new business models but also transform the way they operate and are managed.

The increasing business dependence on fast-growing IT provides organizations with various challenges such as: a need to transform the way businesses operate and are managed; quick response to changing customer terms and requirements; solving problems related to overcoming the various imbalances arising due to the high dynamics of IT development.

The article aims to reveal the problems arising due to the increasing dependence of businesses on IT and to offer adequate solutions related to changing the way in which IT services are managed.

1. Development of information technology and related processes

The development of information technology is an objective and highly dynamic process accompanied by a constant growth in its complexity. This is mainly due to the following factors (Hanseth et al., 2007):

- growth in computing power that enables the development and use of much more complex software;
- development of communication technologies that enable the integration of complex software systems running on different electronic devices;
- increased integration between IT components, organizations and practices using the technologies.

The view that integration as a rational technical and organizational form is not only a source of increased complexity, but also a way to reduce and manage it, is constantly gaining ground. On the one hand, integration between systems increases the number of interconnections between them, hence their complexity. On the other hand, it enables these different systems to interact and function as one.

Another aspect of complexity is based on the system behaviour. From this point of view, complexity is seen as the ability to switch between

different types of system behaviour when changing its external conditions (Nicolis, G., Prigogine, I., 1990, p.252).

Expanding the scope of information technology and automating more and more business processes above all reflects the increase in the complexity of organizational systems. This is due not only to the large number of components these systems consist of, but also to the number and type of interconnections between them, the speed of change and the complexity of their behaviour and management.

With regard to the operation of information systems, interests of a wide range of stakeholders (managers, suppliers, partners, manufacturers, customers and consumers) need to be taken into account and addressed at the same time. Human participation as a component is also a significant factor in increasing their complexity.

Different approaches are used to overcome the complexity of individual information systems conditioned by IT development. They are based on the following principles:

- decomposition of complex systems and their subsequent integration;
- specialization and subsequent cooperation;
- unification and standardization;
- rationalization and optimization.

It has to be concluded that an automated system can replace people in a particular process by overcoming their limited abilities and achieving greater speed, more precision and productivity, and higher quality production. At the same time, however, creating such a system requires the construction of special architecture, the implementation of complex functionality, adequate management and most importantly, the availability of highly qualified specialists for its introduction and operation.

The discrepancy in the speed of development between IT and information systems used by businesses, taking into account their limited opportunities for continuous investment to modernize them, leads to uneven development of individual information and business systems.

Table 1 gives examples of discrepancies and ways to overcome them.

Table 1
Discrepancies and ways to overcome them

Discrepancy (disproportion)	Ways to overcome it
between various functional units focused on implementing their functions and tasks	Implementing a process approach to business and IT management by creating and managing processes that overcome the boundaries between functional units. Project management – managing the implementation of a wide range of changes such as projects involving teams from different units.
Between IT divisions and other functional units of an organization: - discrepancy between business objectives and IT goals; - detaching IT from the problems businesses face; - IT lacks understanding regarding business needs; - businesses lack understanding regarding IT problems and needs; - businesses lack knowledge of the IT potential; - lack of a common language for communication between IT and businesses.	Introduction of IT service management (ITSM): - managing the creation, provision, maintenance and use of quality IT services that meet business needs; - developing IT strategy based on the business strategy; - correspondence between strategic and operational IT plans and business plans; - orienting IT to delivering services that meet customer needs; - IT knowledge management. Increasing overall computer literacy; - Using ITSM terms as a common language between IT and businesses.
Between governance and management, in case governing bodies are not directly involved in the preparation of strategies, policies and procedures imposed by the senior management. Examples of a similar discrepancy are: a discrepancy between strategies, policies and procedures and their implementation (no practical implementation of strategic plans); senior management not being involved in real business issues, etc.	A holistic approach to governance and management where the implementation of all common management functions at its different levels (strategic, tactical and operational) is seen as one. Implementing the recursive management principle in which objectives are decomposed to sub-objectives and tasks by considering each of the general management functions as a separate management object. Participation of heads of different levels of management in the development of strategies, policies and procedures.
Between areas created by the different large and complex systems (ERP, CRM, SCM, HR, etc.)	Integration between large information systems: - Suitable programme interfaces; - Web services; - Data Warehouse; - Service-oriented architecture (SOA).

Between the various stages of information systems' life cycle: design, creation, testing, development, maintenance and progress (if implemented by different subcontractors).	DevOps trend in the use of information technology aiming to overcome the gap between Development and Operations and to accelerate the development of information systems. A holistic approach to information systems' lifecycle management, treating it as a whole process.
Between business management and IT management.	Applying business management methods (system approach, process approach, project management, total quality management, service-oriented approach, risk management, Kanban, etc.) to IT management. Implementation of the ITSM approach, integrating approaches used by businesses and oriented to processes, services and quality. The Kanban method, used in manufacturing processes to implement the 'just in time' principle, is also used as a framework for implementing agile software development.

The examples above show that the key to overcoming problems and discrepancies arising from the uneven development of IT and organizational systems is to improve management by using appropriate approaches, methods and models. Their introduction and use is also characterized by high complexity. Therefore, it can be concluded that the complexity of an information system is not likely to be totally removed, although it is possible and necessary to manage it. Information and business systems complexity management is related to its reduction, transformation and redistribution between their components, functions, processes, subsystems and systems.

Information technology development and the increasing complexity are prerequisites for transforming organizations and the forms of IS, i.e. IT improvement is necessarily followed by profound changes in IS. They are based on new models and approaches corresponding to the dynamics, complexity and role of IT in organizational development.

2. Impact of IT on information services

IS management improvement follows the development of business management models. IS management models are based on them and are associated with adopted principles, approaches, and management technologies. The evolution of these models can be studied through the analysis of the evolution of management concepts. Depending on the focus of management improvement, the following basic approaches to business management can be distinguished:

- *Functional approach,* focusing on the functional structure of an organization. With this approach, management improvement is related to the functions individual divisions perform.
- *Resource approach,* focusing on improving individual resource management.
- *Project approach,* related to managing activities for the creation of new products and services or to introducing significant changes in the way an organization operates. With the project approach, activities intended to achieve the target result are presented as a sequence of interrelated activities coordinated in time and resource availability.
- *Quality management approach*. It is based on the idea that enhancing organizational efficiency is related to the production and provision of quality products and services. For this purpose, it is necessary to carry out strict control over the quality of all processes and all stages of their implementation. The implementation of this approach is impossible without increasing customer satisfaction with the products and services provided.
- Process approach, closely related to the quality management approach. The process approach is based on the idea that in order to overcome problems related to the interaction between divisions and resulting from their specialization it is necessary to organize activities in the form of processes.
- *Service oriented approach*. It is based on the business orientation towards providing services aiming to better meet customer needs. Undoubtedly, the service oriented approach cannot be considered to be a new one, but the application of knowledge, experience and technologies accumulated while using it in IT (web-services, service-oriented architecture (SOA)) is innovative. Reorganization of business processes based on

business services, building service-oriented infrastructure and server-based business architecture provide opportunities for transforming organizations into service-oriented enterprises (SOE) (Khoshafian S., 2007).

It is important to note that these business management approaches do not contradict each other and are not mutually exclusive. Rather, they may exist simultaneously, complementing each other by providing agile and effective organizational management.

For instance, if an organization decides to reorganize its activity on the basis of the process approach, it can set up a separate functional unit to create and maintain the current state of the organizational process model. Using the quality assessment and control system, one can study the quality of the implemented project and assess whether the reorganization has achieved its goals and provided the desired benefits.

Thus, a synergistic effect can be practically achieved by using different approaches to improving management. In turn, the efficient and simultaneous use of these approaches is logically considered a higher degree of organizational maturity.

The approaches to improving business management are also applicable to improving IS management, whether it is an IT division, an IT department of an organization, or an independent company providing IT services.

It should be noted that IS management generally evolves together with the organization itself. In their lifecycle, IT divisions undergo the same improvement steps. At the same time, however, their development is affected by a great number of additional factors such as:

• scale of IT activity (depends on the scale of the organization being serviced and the degree to which it is automated;

• information technology development; level of information technologies introduced and used in the organization being serviced;

• external pressure from companies providing IT products and services, including outsourcing as well;

• IT division self-development capacity, etc.

An inverse relationship also exists where the presence of a strong and mature IT division in an organization has a positive effect on its

performance and efficiency. Moreover, it impacts on the ability to quickly adapt to market needs and competitiveness.

In our studies in the field of IT services, a thesis gains ground that one of the most effective approaches to improving and developing IS is to orient it towards providing services. The introduction of such a system transforms IT divisions from IT resource and technology providers into IT service providers.

The basis for similar transformation is provided by the theory and practice of IT Service Management (IT Service Management, ITSM).

3. Transformation of information services into provision of services

Transformation of IS is a long and complex process requiring very good management, mainly – proper determination of the IT strategy and development priorities. In this regard, first and foremost a proper orientation of IS development and improvement towards modern world practices is needed.

A leading trend in the contemporary development of IS divisions is defined as the implementation of IS as a Service management model. This model incorporates much wider content than what is invested in cloud services creating the 'Everything as a service phenomenon; it is based on the understanding that not only results from IS activities can be presented as services, but also the entire IS can be presented as a service in line with ITSM requirements.

The trend to transform IS into IS as a service is determined by the following main factors:
- The process of **servicification** of the economy;
- Increasing importance of **ITSM**;
- Use of **cloud services**;
- Developing the concept of **service-oriented architecture (SOA)**

3.1. The process of servicification of the economy

Services embodied in manufactured products and traded as a package is referred to as servicification. This trend creates new challenges

for the categorization of 'goods' and 'services'. A direct corollary of this phenomenon is the breaking down of services into modular components that are subsequently improved by the use of new technologies. The recombination of all these modules results in a new, more efficient business model (ISO Strategy for services, 2016, p.7).

Transformation of products to services affects IT business as well. It becomes an additional accelerator for a business providing IT services, adding solid economic arguments to the thesis of the necessity and usefulness of improving IS.

3.2. Increasing importance of ITSM

The idea of improving IT management through orientation to services is not a new idea. New are the changing concepts of the nature and management of service delivery and the additional challenges and opportunities modern information and communication technologies provide.

Currently, innovative IT organizations aim their efforts to service delivery and focus on customer needs. These organizations adopt a service-oriented approach to managing IT applications, infrastructure, and processes. With this approach, solutions to business problems and support for business models, strategies and operations are increasingly in the form of services (ITIL Service Strategy, 2011, p.15).

IS focuses on providing value to its customers in the form of services. This helps IS to start thinking about services in the context of creating value rather than components, technologies, and organization.

In our opinion, ITSM should not be considered an implementation of the service-oriented approach only; it should rather be viewed as an integration of the approach with a process-oriented approach and the quality management approach.

The term 'IT services management' was widely used in the mid-1990s with the growing popularity of the IT Infrastructure Library (ITIL). Although ITIL evolves and undergoes profound changes, it retains its fundamental concepts of these leading practices and remains the most well-known ITSM framework in the world.

This is the result of a summary of the knowledge and experience of IT organizations' activities in implementing a service-oriented approach to the use of information technology (applications, information, infrastructure, processes). In our opinion, 'IT service management' should be viewed as the application of the general theory of management and cybernetics to IT service lifecycle management (a concept of services, design, creation, deployment, operation, maintenance and development). Thus, the door to cyberneticization in this area is widely open.

As the ITSM concept evolves, the business attitude to IT is changing – from a resource helping organizations to deliver their products to customers, through a business-friendly service, to a strategic asset considered to be an investment.

The role of IT divisions in organizations is also changing – from resource and technology providers – to business solutions providers. Current development of ITSM related to cloud computing development and service oriented architecture (SOA) determine a new role for IS divisions – the role of brokers and service integrators.

Modern trends in information technology development, such as cloud computing, artificial intelligence, the Internet of Things, etc. provide great opportunities to develop and deploy IT services, although at the same time they represent big challenges for service management.

3.3. Use of cloud services

Cloud computing, as a major component of the third-platform technologies, remains one of the promising technologies determining strategic business priorities over the coming decades.

Cloud computing is based on the information technology development in recent decades and is currently one of its most advanced trends. Nowadays, cloud computing concepts are implemented in specific technologies as well as in cloud services shaping the cloud technology market.

The National Institute of Standards and Technology (NIST) defines the following essential characteristics of cloud computing (Mell P. et al., 2011): on-demand self-service; broad, ubiquitous and convenient network

access, a pool of resources borrowed or released according to customer needs, rapid elasticity, and measured services. An important advantage of cloud services is the ability to plan related costs more accurately and pay for consumption only.

There are various service models outlining different boundaries of interaction, responsibilities and management between providers and customers. We believe that the rapid development of cloud services creates the 'as a Service' phenomenon, which significantly extends the boundaries of cloud services from software as a service to Everything as a Service.

A great number of cloud services exist within this wide range such as: 'desktop as a service', 'print as a service', 'database as a service', 'storage as a service', 'monitoring as a service', 'network as a service', 'IT as a service', etc. Against this background, cloud services offer great opportunities for IS divisions. Moreover, their impact can lead to different trends causing radical changes and outcomes.

On the one hand, cloud services provided by external providers are a form of outsourcing involving usurping IS divisions' functions and reducing their role in organizations as direct business value creators (in this case, IS may operate as a support unit maintaining the existing ICT infrastructure). On the other hand, cloud services such as 'platform as a service' and 'infrastructure as a service' can provide opportunities for IS to reduce their IT costs and use the most modern technologies with significantly less resources (financial, personnel, time).

By using cloud technologies, IS divisions can develop and provide their own products and services (e.g. by developing their own applications on cloud platforms or by assembling cloud applications and services). IT divisions can also improve their role of integrators and providers of IT services to businesses and of direct value creators. In this case, the role of IS departments can grow to an extent that they become major divisions providing strategic advantages to organizations.

Therefore, IS can simultaneously perform several different functions: integrators, differentiators and accelerators.

Integrator when providing IT services by creating own or cloud services and integrating them with existing information systems into existing business processes.

Differentiator – by giving organizations a strategic advantage over their competitors as organizations with strong, efficient and effective IS implementing and managing the most up-to-date information technologies.

Accelerator – in the context of rapidly introducing and assimilating the most modern information systems, accelerating the provision and implementation of IT services that enable the provision of relevant business services, accelerating business responsiveness and adapting to changing conditions, and accelerating return on investment in information technologies.

Along with the provision of a wide range of cloud services, large IT companies offer complete solutions to cloud IT service management for sophisticated information systems. For example, IBM offers IBM Cloud Managed Services solution to managing cloud ERP, CRM and financial applications to the most popular SAP and Oracle providers. IBM Cloud Managed Services is compatible with the ITIL solution to Critical Application Management of organizations (IBM Cloud Managed Services, 2016).

This is not only an opportunity to provide the three types of cloud services (software, platform and infrastructure as a service), but also a solution to their overall management by IBM experts. The idea is to cover the entire lifecycle – from analysing the existing organizational infrastructure, identifying the most appropriate cloud applications and IT processes, to developing an effective strategy for migration, deployment and maintenance of cloud services.

This example clearly illustrates the cloud service development trend – from single cloud services, through a fully managed service in a certain area, to a complete IT management service.

3.4 Developing the concept of service-oriented architecture (SOA)

Service-oriented approaches to IT management emerge to overcome problems related to the increasing dependence of businesses on IT and the complexity of information and business systems.

A highly evolving approach in recent years is the deployment of Service Oriented Architecture (SOA).

The 'Advanced Open Standards for the Information Society', OASIS consortium has developed a standard OASIS Reference Model for Service Oriented Architecture 1.0 (2006). The purpose of this model is to define the essence of service-oriented architecture and to develop vocabulary and common understanding of the SOA.

The benefits for organizations deploying SOA are related to achieving greater adaptability, agility, co-operation, and a faster response to the changing business environment.

The major benefit of SOA is that it provides business agility by enabling rapid development and modification of the software supporting business processes. The advantages of the approach, especially those related to organizational agility, are the most frequently mentioned reasons for the adoption of SOA. It is the key to achieving the Open Group vision of an infinite flow of information that imposes the principle of permeable boundaries between divisions, organizational levels, and nations aiming to deliver productivity and enterprise agility (The SOA source book).

From a dynamic point of view, there are three main concepts essential for services: visibility between service providers and consumers, interaction between them and the real effect of this interaction.

To meet the growing business demand for deploying SOA, large IT companies are beginning to offer powerful tools for its physical implementation.

One such tool was developed by Oracle Corporation – Oracle SOA Suite (Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite). It helps IS organizations and units get the opportunity to create and manage full SOA environment for developing corporate applications such as modular business web services that can be easily integrated and reused, thus creating agile and adaptable IT infrastructure.

The adoption of the SOA concepts and their practical implementation leads to the emergence of the Service-Oriented Enterprise (SOE) concept. Each participant in SOE sees themselves as a service provider as well as a consumer. The service architecture of the organization consists of three individual but interrelated layers: enterprise performance management, business process management, and service-oriented IT architecture. (Khoshafian, S., 2007, p.4).

Therefore, the road to a service-oriented organization (SOO) goes through a service-oriented IS because it is the division that will build and maintain the service-oriented architecture of the IT infrastructure.

The main trends mentioned so far are the major driving factors for transforming IS – as a service-oriented division managed by the IS as a service model integrating some of the most significant and effective management approaches.

We need to mention that this transformation should not be regarded as a single act but as a long and complex process, determined by an objective necessity.

Conclusion

Modern information technology provides enterprises with unprecedented opportunities to introduce new business models for their operation and management. Thus, it creates not only a prerequisite, but also a need for business transformation.

At the same time, they pose a number of challenges to organizations related to overcoming contradictions and problems arising from the growing dependence of businesses on IT, the increasing complexity of information and business systems, and the high dynamics of technology and business environment development. The key to addressing these issues is the effective IT management and the activities of IS divisions.

A key trend in this respect is the trend towards transforming IS into an 'IS as a service' management model, which should be taken into account when developing the IT strategies of modern organizations.

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