2016
Vol.14 No.2

POLISH JOURNAL OF MANAGEMENT STUDIES
Kopishynska O., Utkin Y., Kalinichenko A., Jelonek D.

EFFICACY OF THE CLOUD COMPUTING TECHNOLOGY IN THE MANAGEMENT OF COMMUNICATION AND BUSINESS PROCESSES OF THE COMPANIES

Kopishynska O., Utkin Y., Kalinichenko A., Jelonek D.*

Abstract: Trends of development and application of different classes of information systems in management according to the types of business processes were investigated in this article. A brief overview of current state of the use of cloud technology in the world and Ukraine was represented. Advantages of using model of "SaaS - Software as a service" was explained on the example of innovation international project "Bitrix 24", where the main objectives of CRM systems were realized combining with wide opportunities of coordination of communicative and business processes of modern companies. The project was translated into the majority European languages and uses tools of the social Intranet environment.

Key words: business processes management, communications, ERP-systems, CRM-systems, cloud computing technologies, social Intranet

DOI: 10.17512/pjms.2016.14.2.10

Article's history:
Received September 4, 2016; *Revised* November 6, 2016; *Accepted* November 18, 2016

Introduction

The main purpose of any company can be regarded as achieving a particular desired state of the certain characteristics and indicators that are a focus of enterprise activity and the process of its management. Thus, the task of management is to ensure the profitability of the enterprise (company) by the rational organization of processes and the effective use of human resources while improving skills and creative activity (Kaplan and Norton, 2004, Jafari et al., 2015). Restructuring the control system influenced by the development of modern production caused a significant increase in the amount of information in all areas of management. The combination of modern enterprise information flows is increasing that makes the effective process more complicated by limiting biological capabilities of a human-manager, even taking into account the accumulation of the base of their knowledge and skills (Stracke, 2011; Wigand et al., 2003).

*__Olena Kopishynska__, Assoc. Professor PhD, Poltava State Agrarian Academy, Department of Economic Cybernetics and Information Technologies; __Yurii Utkin__, Assoc. Professor PhD, Poltava State Agrarian Academy, Department of Economic Cybernetics and Information Technologies; __Antonina Kalinichenko,__ Prof. Dr of Science, Opole University, Faculty of Natural Sciences and Technology; __Dorota Jelonek__, Assoc. Professor PhD, Czestochowa University of Technology, Faculty of Management
✉ Corresponding author: jelonek@zim.pcz.pl
✉elenkopy@mail.ru; 1008utkin@inbox.ru; akalinichenko@uni.opole.pl

In order to support management decisions and efficient management of information processes in a modern company of any applicable scope, the automated information systems (IS), which are based on the advanced technologies of information processing, are applied.

Nowadays, the role of information technology (IT) and ISs is constantly growing: their function is ceased to be a subsidiary as it has transformed into a crucial part of a product and production capacity. The higher management of the companies realizes the significance of the impact of information technology solutions on the business processes and the culture of the company, and is ready to delegate the performance of the majority of their duties that cover processing information by the automated IS. Due to the abovementioned arguments, the question of the choice of IS to be implemented in the company activity area raises.

There may be a lot of factors to be considered, but the choice of the information system concept, the expected cost-effectiveness of implementation, the ways of implementation as well as technical, psychological and professional readiness of the staff to apply to the new technologies of carrying out its duties is of special importance.

Analysis of Recent Studies and Publications, which Discuss the Problem

There is a significant range of proposals presented in the market of modern software. Companies that are designed to automate the management of production processes, business processes, personnel and other components of activities must, first of all, identify those areas that must be included by the selected information system. The computerization of business processes of most companies lies in two main areas: computerization of external relations of the company, which includes the models of the commercial interaction between the business entities with the ultimate consumers of all types (*front office*), and automation of its internal business processes (*back office*), starting from the procurement of the necessary materials and ending with the distribution of the final products or services.

Historically, the automation of the internal business processes took place at first; it started with the appearance of the concept of information MRP-systems (Material Requirements Planning) in 60-s, the essence of which was to minimize costs and ensure the availability of the required number of the necessary materials or components at any time within the terms of planning at the stock. Later, in the 80s, these systems have been transformed into the productive resources planning system MRPII (Manufacturing Resource Planning) (Gallego, 2004).

In the beginning of 90s, a Gartner Group analytic company has introduced a new concept for the systems of the MRPII class, integrated with the financial planning module FRP (Finance Resource Planning) called the system of the Enterprise Resource Planning (Ledford, 2016), which are based on the principle of creating a single repository of data which contain all the corporate business information. Postmodern ERP is a technology strategy that automates and links administrative and operational business capabilities such as finance, HR, purchasing (Kościelniak,

2014), manufacturing and distribution (Mesjasz–Lech, 2014; Tabor, 2015), with appropriate levels of integration that balance the benefits of vendor-delivered integration against business flexibility and agility. This definition highlights that there are two categories of ERP strategy: administrative and operational ones (Gartner, 2016). Since the beginning of 2000s, the emphasis in the ERP has gradually shifted to the support and the implementation of the management process of relations with customers, suppliers and e-business. The sales of ERP-systems for the areas of their traditional use began to decline, and the modules of users' support, formation and maintenance of the supply chain, automation of sales increased whereas the leaders were CRM-systems, namely, the control systems of the Customer Relationship Management (Brzozowska and Kasyca, 2015).

The development of electronic forms of enterprises external interaction with the foreign suppliers and customers as well as business transactions forced the developers to expand the basic structure of ERP-systems by means of CRM and other modules. Providing an overview of the opportunities for the use of Internet-technologies in the management of the majority of information processes in the companies, it can be stated that nowadays the global computer network Internet is considered as an organizational and a technological basis of economic structure of the information society, the start for the future comprehensive network system that will shape the new economy like the network of transport communications in terms of industrialization. These communication technologies can change the nature of business models that are the basic processes to create products and services for the manufacturers and provide them for their ultimate users (Dhar, 2012; Bhadra and Gayen, 2013)

Nowadays in Ukraine and in Poland, as elsewhere in the world, the information systems based on the cloud technologies are the most actively and rapidly developing and gaining popularity as they have numerous advantages over the traditional "boxed" versions of service. *Cloud* is a specialized data centre (server) or network servers that stores data and applications accessed by the users via the Internet. In general, cloud technologies are a paradigm that provides remote processing and storage of data (BSA, 2016; Shawish and Salama, 2014).

In the academic sources, it is often possible to see the synonymous terms *cloud technologies, cloud computing, cloud services, cloud solutions* that are applied equitably depending on the context of use (Bilgayan et al., 2014).

In the U.S.A, cloud technologies are studied by the National Institute of Standards and Technology (NIST). The abovementioned body is responsible for developing standards and regulations, including the minimum technical requirements for providing adequate information security of the information assets of the US government agencies. In its turn, NIST provides a definition of cloud computing as follows: *"Cloud computing is a model that provides a wide and easy network access to a common pool of managed computing resources and their services (for example, networks, servers, storage, applications and services) that can be*

quickly given or released with the minimal effort from the management system at the need for ensuring cooperation with the service provider" (NIST, 2011).

In September 2012, European Commission adopted a strategy of *"Unleashing the Potential of Cloud Computing in Europe"*, which sets out actions that will help to increase the amount of new European workplaces up to 2.5 million, and provide the annual economic growth of 160 billion Euros to the GDP of the European Union (EU about 1%) in 2020. This strategy is the result of the analysis of the political, economic, legal, regulatory and technological framework under the conditions of determining the ways to maximize the potential of a "cloud". Under this strategy, the following definition was introduced: "Cloud computing is storage, processing and use of data located on remote computers by accessing through the Internet" (EC, 2015).

According to ENISA (Agency of the EU for Network and Information Security) data, in order to provide administrative services, the cloud-state workflow solutions are used in Italy, Austria, Slovenia, Portugal and Turkey; these countries of ENISA are called innovators. The countries that not only use cloud technologies, but also adopted the strategy of cloud services are UK, Spain and France. Another 11 European countries have already adopted cloud strategies and implement them as using cloud technology enables states to save considerable sums on building and maintaining their own data centres (EC, 2013).

At the request of Microsoft independent company Ipsos examined the business environment in different countries and identified the penetration of cloud services in the modern business world. Ukraine was named the undisputed leader among European countries: 85% of Ukrainian companies use in their work even one of cloud services.

Corresponding to the forecasts of the IDC monitoring company, by 2018, a large number of small and medium businesses will have passed to cloud solutions, and in 2020, the volume of the world market cloud services will exceed the sales of the traditional IT services (InformationWeek, 2016). This trend is primarily predetermined by the fact that the transition to the "cloud" infrastructure does not require large financial costs, support or development of its IT infrastructure with additional staff of specialists.

Entrepreneurs who consider changing the traditional IT management model to cloud computing have concerns about the security and confidentiality of data, the integration of internal IT infrastructure with new solutions, insufficient availability of services through the Internet or the quality and efficiency of services (Jelonek et al., 2014b). They had to create a ranking of the five most serious barriers, the same barriers would have been indicated by both Polish SMEs and enterprises based in EU countries (only in a different order). Most serious barriers in the assessment of Polish SMEs are: "trust" (36%), "security and data protection" (35%) and "data access and portability" (34%). The lowest-rated barriers are as follows: "tax incentives" (15%) and the "local language" (20%) (Jelonek et al., 2014a).

According to the respondents of the EU enterprises the most serious barrier are "legal jurisdiction" (32%), "security and data protection" (31%), "trust" (25%) and "data access and portability" (25%) (Quantitative Estimates…, 2012).
Mental barriers, including lack of knowledge and lack of trust are the most serious barriers to the dissemination of the cloud computing model (Jelonek et al., 2014b).
Due to growing needs of a multi-activity society, a "cloud" has transformed from simple remote centres of data storage simple calculations into a universal platform that provides a wide range of services in terms of outsourcing, based on the detailed and the extensive worldwide network of data centres with the extra powerful capacity, communication and preserving clusters (Figure 1).

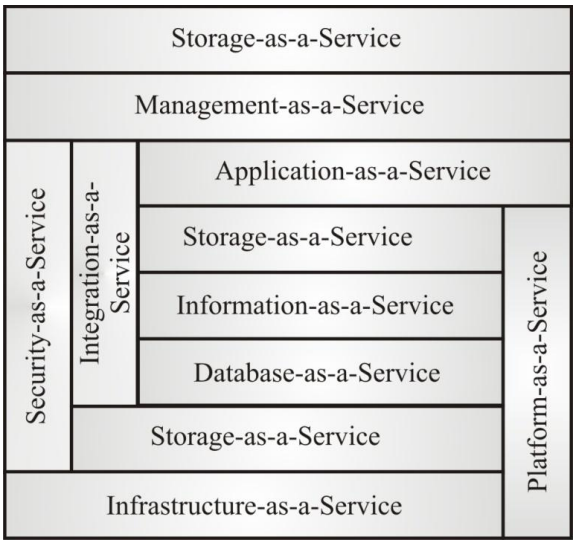

Figure 1. The range of cloud computing services

Therefore, for the cloud users, a common issue is uncertainty whether the facilities and the services of a "cloud" are able to meet their diverse needs in processing data.

The Aim of Research and Experimental Procedures

The analysis of the trends of IS and the intensive introduction of a "cloud" in different areas of the world community were necessary in order to determine the benefits of IS, which are designed on the cloud technologies, for the purpose of meeting the challenges of managing communications and business processes the most properly. The focus is on the research model of "SaaS - Software as a service" and the particular service in which it is implemented. The research is based on the analysis of numerous publications and surveys of analytical companies in the area of cloud computing.

Besides, the modeling method of a virtual enterprise, established in the environment of the cloud service "Bitrix 24" was applied.

In the process of fulfilment a set of tasks, the capabilities of an individual of the certain modules CRM, which belong to the "box" versions of ERP systems such as "Parus-Enterprise", "1C: Enterprise", "MS Project" and, finally, IS cloud service "Bitrix 24" were compared. The advantages of the latter of these systems account for the further detailed analysis of its functional features.

When using only ERP system, even with the module CRM, we cannot say how many calls were made, meetings held, what documents were signed, how much time spent in order to achieve that outcome. Acquaintance the customer in the accounting system begins only after fixing the sale. For the CRM system the fact of the sale - it is only an intermediate stage a long relationship with clients that include his involvement, interest, support and maintenance.

In October 2013, an international company "1C: Bitrix" announced the launch of the project "Bitrix 24", which has already gained high popularity, in the Ukrainian market. The originality of this project is based on a combination of technologies of cloud computing as well as social Intranet and ensures a collective work in a company with a high efficiency of different types of communications.

Social intranet software allows users to create, edit and collaborate on documents online, without having the MS Office suite installed on their personal computers. In addition to using Bitrix24 instant messenger for video and group chats, users now have access to video conferencing and screen sharing capabilities. E-mail connectors to MS Exchange, Outlook, Gmail, AOL, Yahoo, iCloud and other popular e-mail services have been added to enable access from Bitrix24 accounts (KMWorld, 2013). The combination of these components allows companies-users to get started with the IS quickly, without lengthy implementations and attracting extra specialists in IT technologies due to the fact that the system is based on a concept of social Intranet, which is quite common for the social networks participants.

In the process of monitoring IS market, unlike the others, the project has drawn attention by not only a comprehensive set of tools, but also an ability to get started for free for a small company with a number of business users up to 12 people (Package «Free»); it is not limited in its use term and occupies space up to 5 GB in the "cloud" (Bitrix 24, 2013). These conditions are sufficient for the effective personnel management and electronic document management with the opportunities for collaboration and control on the access to them. For the companies with a larger number of IS users, it is offered to sign an agreement with one of the dealers and to start working on a paid basis in the enlarged format ("Standard" or "Professional"), gaining access to a wide range of business applications, CRM-systems, regular updates, free education both online, and at the on-site workshops, the schedules of which are represented on the main Web-page of "1C: Bitrix".

This marketing approach leads to the attempts to verify the possibility of transferring business processes into cloud services and to ensure its effectiveness.

The first step to work in the system after inviting employees is creating a structure of the company in the "Bitrix 24" environment and the division of employees into departments and positions. It is ensured by using simple visual tools and has the further impact on the work preciseness of the whole staff and the division of authorities. It also allows following the principles of confidentiality with an open interface and free employees communication. In the process of studying and selecting the best forms of organization of the company operations in the "cloud", a scheme of the virtual platform "Bitrix 24" (Figure 2) has been prepared.

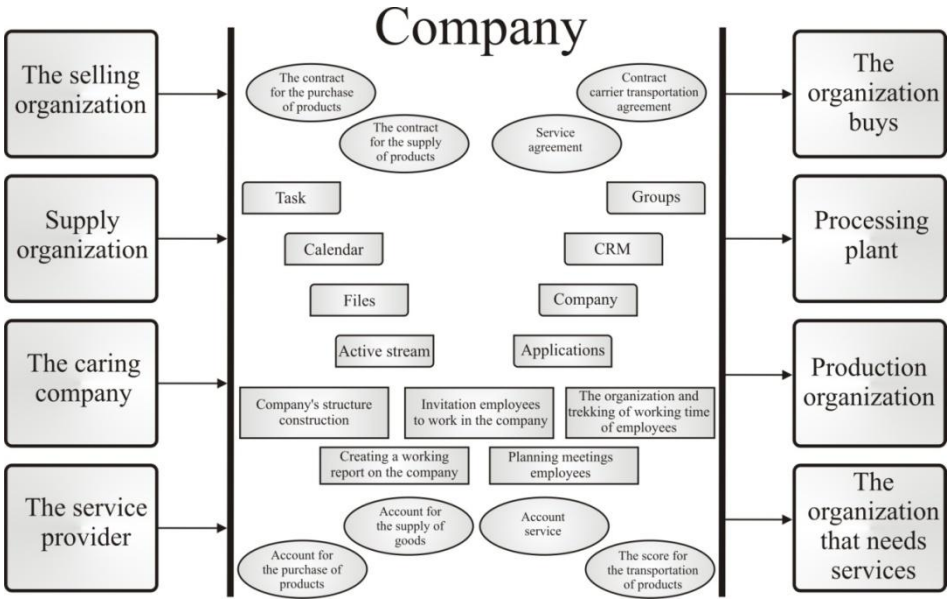

Figure 2.The scheme of functioning of a virtual company on a platform "Bitrix 24"

The main features and tools of a cloud service that distinguish it from other programs directed at the work with the company staff and clients have been determined.

1) Every employee is represented not only by a set of personal data, but has a profile that can be edited, filled in with personal details report information about preferences, achievements, hobbies and so on. This way, there is a combination of the social and the business aspects of each individual's activity.
2) Provides a simple and an effective tool for planning of working time by means of a calendar with adjustable alarms over mobile telephone and installing

applications directly on smart phones (iPhones) for the remote participation in the workflow.

3) Implements the possibility of setting tasks to the company employees that is ensured by a company administrator or a department head according to their duties. Tasks can be edited; their priorities and precise deadlines can be set; the executives can be assessed; and realized in the "My Tasks" section in the form of detailed tasks. The interface is very convenient and gives a positive attitude to work.
4) All employees have an opportunity to exchange information in a timely manner and communicate by means of the tool that is peculiar for the social networks – "Activity Stream" (Figure 3). The Bitrix24 Activity Stream has been enhanced with real-time updates, smart forwarding, notification options and companywide announcements, while an engagement analytics module has been added to provide real-time indicators for enterprise social network adoption, identify roadblocks and slow adopters, and show which intranet tools are currently being used and/or underused by employees. Such innovation has a considerable impact on the setting of positive relations between the employees of all departments as well as the management board. It is also possible to comment and look through the message history.

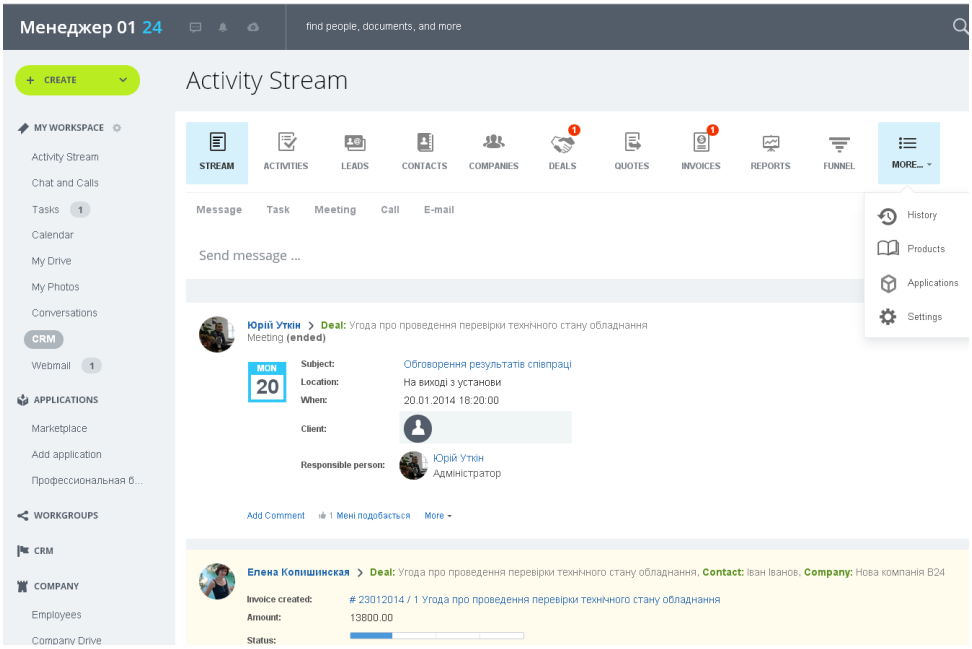

Figure 3. Image of the Window "Activity Stream"

5) The sections "Group" and "Photos" are additional "social" tools. By using them it is possible to chat after work and have a community of interest, making coexistence more meaningful.
6) Combined with the "social" features, this system has a number of tools to implement business objectives of the company by means of a special tool "CRM Line", which combines all the tools of interaction with business processes. Benefits of implementing CRM-system are consist of more accurate understanding of customer needs, reducing of costs and increasing of sales (10% per manager). Sales agents begin to work more efficiently, customer's satisfaction increase, the need for additional rebates reduces and financial returns increase (about 1 ... 3% per transaction).
7) Reducing administrative costs of sales after the introduction of the system is due to the automation of routine processes. Personalize of customer needs can more accurately determine the target market segments and focus on their company's products and services.

Conclusions

Experience of applying the software platform "1C: Bitrix" is interesting for implementation as it has demonstrated:

- the high efficiency in solving most business problems and establishing communications; the interface in the CRM is convenient and intuitive, and it includes a CRM-only "Activity stream";
- the suitability for the use in the companies of different scales, due to the presence of various packages taking into account the differences of such companies (Bitrix24 is 100 percent free to any company or organization with up to 12 employees);
- improving of the financial returns of company managers;
- convenience for training purposes in the process of in the preparation of students in management and marketing as it provides the ability to use the limited free package;
- the possibility of being taught in accordance with various programs for webinars and seminars, online courses.

The main disadvantages of IS cloud service that significantly constrain its development is the lack of legal guarantees for the information storage, the weakness of legislation in terms of the current needs of information and electronic business under the conditions of the post-industrial society that is rapidly developing, a psychological unpreparedness to work with remote repositories.

References

Bhadra S., Gayen T., 2013, *Computing Service A Distributed Service and Business Model for Providing Cloud*, "International Journal of Cloud Computing and Services Science", 2(2).

Bilgaiyan S., Sagnika S., Sahu S.S., 2014, *Cloud computing: Concept, terminologies, issues, recent technologies*, "Research Journal of Applied Sciences", 9(9).

Bitrix 24: Plans and pricing, https://www.bitrix24.eu/prices/index.php, Access on: 05.06.2016.

Brzozowska A., Kasyca K., 2015, *CRM as a Tool Enabling to Model Information in the Agency for Restructuring and Modernization of Agriculture*, [In:] Brzozowska A., Kalinichenko A.V. (Eds.) Transformation of economic at rural areas, Poltava State Agrarian Academy.

BSA, *The software alians, 2016, 2016 BSA Global Cloud Computing Scorecard*, [http://cloudscorecard.bsa.org/2016/, Access on: 22.06.2016].

Dhar S., 2012, *From outsourcing to Cloud computing: Evolution of IT services*, "Management Research Review", 35(8).

EC, 2013, (European Commission), *Analysis of cloud best practices and pilots for the public sector*, https://ec.europa.eu/digital-single-market/news/analysis-cloud-best-practices-and-pilots-public-sector, Access on: 22.06.2016.

EC, 2015, (European Commission), *Towards a European Cloud Computing Strategy*, http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/11/50, Access on: 22.06.2016.

Gallego G., 2004, *Material Requirements Planning*, IEOR 4000: Production Management, http://www.columbia.edu/~gmg2/4000/pdf/lect_06.pdf, Access on: 22.06.2016.

Gartner, 2016, IT Glossary, http://blogs.gartner.com/it-glossary/postmodern-erp/, Access on: 22.06.2016.

Information Week, 2016, *IDC: Public Cloud Spending to Double By 2019*, http://www.informationweek.com/cloud/infrastructure-as-a-service/idc-public-cloud-spending-to-double-by-2019/d/d-id/1324014, Access on: 21.06.2016.

Jafari Navimipour N., Habibizad Navin A., Rahmani A.M., Hosseinzadeh M., 2015, *Behavioral modelling and automated verification of a Cloud-based framework to share the knowledge and skills of human resources*, "Computers in Industry", 68.

Jelonek D., Stępniak C., Turek T., Ziora L., 2014a, *Identification of Mental Barriers in the Implementation of Cloud Computing in the SMEs in Poland*, [In:] Proceedings of the 2014 Federated Conference on Computer Science and Information Systems, September 7-10, Poland, "Annals of Computer Science and Information Systems", 2.

Jelonek D., Wysłocka E., 2014b, *Barriers to the Development of Cloud Computing Adoption and Usage in SMEs in Poland*, [In:] Advances in Information Science and Applications – Vol. I. Proceedings of the 18th International Conference on Computers (part of CSCC'14), July 17-21, Santorini Island, Greece.

Kaplan R.S., Norton D. P., 2004, *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*, Harvard Business School Publishing.

KMWorld, 2013, *Free enterprise social networking and collaboration*, http://www.kmworld.com/Articles/News/News/Free-enterprise-social-networking-and-collaboration-92240.aspx.

Kościelniak H., 2014, *An Improvement of Information Processes in Enterprises - the Analysis of Sales Profitability in the Manufacturing Company Using ERP Systems*, "Polish Journal of Management Studies", 10(2).

Ledford L., 2016, *MRP vs ERP: What Is the Difference?* http://www.tlcgroupinc.com/consulting-blog/mrp-vs-erp-what-is-the-difference, Access on: 22.06.2016.

Mesjasz–Lech A., 2014, *The Use of IT Systems Supporting the Realization of Business Processes in Enterprises and Supply Chains in Poland*, "Polish Journal of Management Studies", 10(2).

NIST, 2011, (National Institute of Standards and Technology), NIST SP 500-292 *Cloud Computing Reference Architecture*, Recommendations of the National Institute of Standards and Technology, http://www.nist.gov/customcf/get_pdf.cfm?pub_id =909505, Access on: 22.06.2016.

Quantitative Estimates of the Demand for Cloud Computing in Europe and the Likely Barriers to Up-take, 2012, IDC, http://cordis.europa.eu/fp7/ict/ssai/docs/study45-d2-interieport.pdf, Access on: 5.06.2016.

Shawish A., Salama M., 2014, *Cloud computing: Paradigms and technologies*, "Studies in Computational Intelligence", 495.

Stracke C.M., 2011, *Competences and skills in the digital age: Competence development, modelling, and standards for human resources development*, "Communications in Computer and Information Science", 240.

Tabor J., 2015, *Study on Use of Information Technologies in Manufacturing Processes*, "Applied Mechanics and Materials. IT Systems and Decisions in Business and Industry Practice", 795.

Wigand R.T., Mertens P., Bodendorf F., König W., Picot A., Schumann M., 2003, *Introduction to Business Information Systems*, Berlin – Heidelberg: Springer-Verlag.

SKUTECZNOŚĆ TECHNOLOGII CLOUD COMPUTING W ZARZĄDZANIU PROCESAMI BIZNESOWYMI I KOMUNIKACYJNYMI W PRZEDSIĘBIORSTWACH

Streszczenie: W artykule zbadano tendencje rozwoju i stosowania różnych klas systemów informatycznych w zarządzaniu w relacji do rodzajów procesów biznesowych. Zaprezentowano krótki przegląd aktualnego stanu wykorzystania technologii chmury obliczeniowej na świecie i na Ukrainie. Korzyści wynikające z zastosowania modelu "SaaS - Software as a Service" zostały wyjaśnione na przykładzie innowacji międzynarodowego projektu "Bitrix 24", w którym zrealizowane zostały główne cele systemów CRM w połączeniu z szerokimi możliwościami koordynacji procesów komunikacyjnych i biznesowych nowoczesnych firm. Projekt ten został przetłumaczony na większość języków Europejskich i wykorzystuje narzędzia społecznego środowiska Intranetu.
Słowa kluczowe: zarządzanie procesami biznesowymi, komunikacja, systemy ERP, systemy CRM, technologie chmury obliczeniowej, społeczny Intranet

雲計算技術在管理公司的通信和業務流程方面的效能

摘要：本文研究了不同類型的信息系統在管理中根據業務流程類型的發展趨勢和應用趨勢。簡要概述了當前使用雲技術在世界和烏克蘭的狀態。
在創新國際項目“Bitrix 24”的例子中解釋了使用“SaaS. 軟件即服務”模型的優點，其中實現了CRM系統的主要目標，並結合了現代司的交際和業務流程協調的廣泛機會。該項目被翻譯成大多數歐洲語言，並使用社交Intranet環境的工具。
關鍵詞：業務流程管理，通信，ERP系統，CRM系統，雲計算技術，社會內聯網