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## ENTERPRISE APPLICATION SOFTWARE IMPLEMENTATION AT THE MANUFACTURING COMPANY: CASE STUDY

*Summary*

In this paper we describe case of automation of manufacturing enterprises as it is a complex multistage process and the management information system of suchlike enterprise should include a number of modules majoring in certain areas. It is clear that comprehensive and complex automation of production could be provided through implementation of ERP systems, but it has many peculiarities for small and medium enterprises going through hard times in Ukraine: the drop in consumer demand and the shortage of working capital are not conducive for the development of such companies. By this case research, we propose alternative approach of manufacturing small and medium enterprises` automation - the implementation of so-called scalable information systems-designers. Good examples of such systems are Accent 2 and 7.4. These systems are developed by Ukrainian IT-companies and enable complex automation of enterprises of any kind of activity.

*Keywords:* ERP, Manufacturing Enterprises, Enterprise Application Software, Accent 2.

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## ВПРОВАДЖЕННЯ ІНФОРМАЦІЙНИХ СИСТЕМ УПРАВЛІННЯ ВИРОБНИЧИМИ ПІДПРИЄМСТВАМИ: ПРИКЛАДНИЙ АНАЛІЗ

*Анотація*

У статті розглядається проблема автоматизації виробничих підприємств. Оскільки управління такими підприємствами є багатоетапним та складним процесом, то управлінські інформаційні системи, які автоматизують їхню діяльність, повинні містити велику кількість модулів. Зрозуміло, що автоматизація виробництва реалізується через впровадження так званих систем управління ресурсами підприємства ERP, які мають численні особливості для малого та середнього бізнесу в Україні. Зокрема, в статті наголошується на недоліках таких систем, насамперед високій вартості впровадження та володіння. В цьому дослідженні ми пропонуємо альтернативний підхід впровадження систем на виробничих підприємствах – використання так званих масштабованих систем-конструкторів, прикладами яких є Акцент 2 та Акцент 7.4. Ці системи розроблені українськими IT-компаніями і дозволяють здійснювати комплексну автоматизацію підприємств будь-якого виду діяльності.

*Ключові слова*: управління ресурсами підприємства, виробниче підприємство, управлінські інформаційні системи, Акцент 2.

### 1. Introduction and problem statement

Researches, investigating the implementation of so-called EAS (Enterprise Application Software) by Ukrainian enterprises, underline the important tasks of economic growth, increasing of competitiveness and becoming a member of the world market for them [1-2]. The solution of these tasks without the increase of the quality of management systems and IT-infrastructures is impossible. By this, we would like to underline the necessity of ERP (Enterprise Resource

Planning) implementation by Ukrainian enterprises, especially SMEs (Small and Medium Enterprises). However, making clear conclusion in this context, we ran in trouble. In 2015-2016, the Ukrainian market of Enterprise Application Software (EAS) decreased, according to analysts [2], by almost 40%. The whole IT market was affected by the general economic crisis and devaluation of the hryvnia. According to [2], the number of new ERP implementation projects in 2015-2016 can be counted "on fingers". Mainly, vendors and integrators have been profitable according to technical support of earlier implementations. Accordingly, there have been a slight redistribution of market shares: sales of SAP, MS Dynamics NAV etc. declined, consumers began to pay more attention to local products.

In 2017 the ERP market continued to decrease. The situation was somewhat saved by the ERP implementation at the state enterprises and authorities. From the other side the main customers have been wholesale trading firms and retail chains, enterprises belonging to large financial and industrial groups, pharmaceutical companies (both production and pharmacy chains). There was interest in ERP on the engineering and customization side, but there was no money in the budget.

Actually small and medium enterprises go through hard times nowadays in Ukraine: the drop in consumer demand and the shortage of working capital are not conducive for the development of such companies.

In this paper we would like pay our attention to automation of manufacturing enterprises as it is a complex multistage process and the management information system of suchlike enterprise should include a number of modules majoring in certain areas. It is clear that comprehensive and complex automation of production could be provided through implementation of ERP systems.

Market research of current trends in Ukrainian ERP market shows the dominance of SAP ERP and Microsoft Dynamics NAV [1]. These systems allow providing automation of complex industrial, financial and other business processes. But important drawbacks of these systems are their high cost and long implementation period, the lack of flexibility in automating information processes and information flows are needed to adapt to the requirements of the enterprise management. This approach significantly complicates implementation of information systems, as it requires full automation of all production processes and the related hardware.

By this case research, we propose alternative approach of above described automation the implementation of so-called scalable information systems-designers. Good examples of such systems are Accent 2 and 7.4. These systems are developed by Ukrainian IT-companies and enable complex automation of enterprises of any kind of activity. A typical set of functional requirements provides management and financial accounting, but open source framework allows coding modules for complex automation. Implementation of A2 and Accent systems is achievable in stages, progressively covering all areas of a company.

## 2. Literature review and market trends

Current trends on ICT technologies for enterprise information systems discovered by many researches. Authors of work [3] state that major contributions and research orientations of ICT technologies are elaborated based on selected key issues and lessons learned. First, the semantic mediator is proposed as a key enabler for dealing with semantic interoperability. Second, the context-aware infrastructures are proposed as a main solution for making efficient use of EIS to offer a high level of customization of delivered services and data. Third, the product avatar is proposed as a contribution to an evolutionary social, collaborative and product-centric and interaction metaphor with EIS. Fourth, human learning solutions are considered to develop individual competences in order to cope with new technological advances [3]. From the other side ERP systems had been implemented by many organization's accounting, scheduling, and production problems [4-7]. Enterprises that have successfully implemented ERP systems view them as one of the most important innovations that have lead to the realization of substantial

tangible and intangible improvements in a variety of areas [4, 8-10].

Investigating Ukrainian ERP market we`ve found out two important peculiarities. Firstly, protracted economic and political crisis, non-stability of running business and low positions of Ukraine in key international indices rankings [11] often result in the absence of real long-term strategy of the enterprise development that is a real problem for the implementation of management software solutions.

Secondly, the high cost of ERP system implementation is the major barrier for SME's in Ukraine. Thus according to Panorama consulting [12] as for 2015 the aver-age cost of the project of ERP system implementation is $ 6.1 million, and the aver-age duration of the project is 15.7 months. Surely, it is clear that ERP systems be-came popular with big companies but accessing SME segment, vendors resulted in new ways of delivering ERP software, such as Software as a Service (SaaS), Cloud and Web. As noticed in [13], some smaller vendors utilized a free distribution system (Free/Open Source ERP, FOS-ERP) for their source code, relying on various business models for corporate success. But our preliminary analysis revels the low popularity of noticed FOS-ERP at Ukrainian SMEs.

In the recent Panorama Cosulting Clash of the Titans 2017 report, Microsoft Dynamics has passed by Oracle to reach the second-from-the-top spot in the ERP market share rankings published by Panorama Consulting [14]. According to Panorama con-sulting [15] SAP remains leading at the global market with a share of 19% in implementa-tion of management software solutions, it is followed by solutions from Microsoft Dynamics (16% of the market) and Oracle (13%). There are also popular ERP solu-tions from Epicor and Infor.

### 3. Target formation and the relevance of the problem

We want to stress that there are no up-to-date data concerning Ukrainian ERP market, but the leaders in 2016, according to IDC research [16], were solutions from SAP (43.4%), IT-Enterprise (15.7%), 1C (13.9% ), Oracle (11.7%) and Microsoft Dynamics NAV (6.1%). In recent years, according to a number of experts` investigations, the impact of 1C solutions has significantly decreased at the Ukrainian market.

1C Company is under sanctions in Ukraine since May 2017. Such a situation ex-tremely influences market trends of management software solutions. In Ukraine there are about 500 companies which are dealers or franchisors of 1C solutions. With the introduction of sanctions, users of the system have logical questions about the usage company's products and the risks for using the program, if it is purchased and serviced by a company that did not get into the sanctions list [17-18].

Summarizing described above information about main ERP market trends we would like to present case study about the implementation of so-called scalable information systems-designers. Good examples of such systems are Accent 2 and 7.4 [19-20].

### 4. Main content: enterprise application software implementation at a manufacturing company

Automation of manufacturing factory is a complex multistage process. Management information system of suchlike enterprise should include a number of modules majoring certain areas. Comprehensive and complex automation of production could be provided through implementation of ERP systems.

An example of mentioned problem is automation of company providing furniture manufacture. Information flows of the company can be divided into several interconnected modules. Implementation of the system takes place in parallel in all areas of their subsequent integration. Automation modules can be divided into several key blocks in simplified form (see Fig. 1).

Each of the blocks has both incoming and outgoing information. The first step of automating is the accounting of raw materials. The production process starts with the reception of raw

materials that is one of the most important components of the manufacturing process. Typically, supplier ships raw materials providing the appropriate enclosed document with a complete list of materials specifying size and its volume.
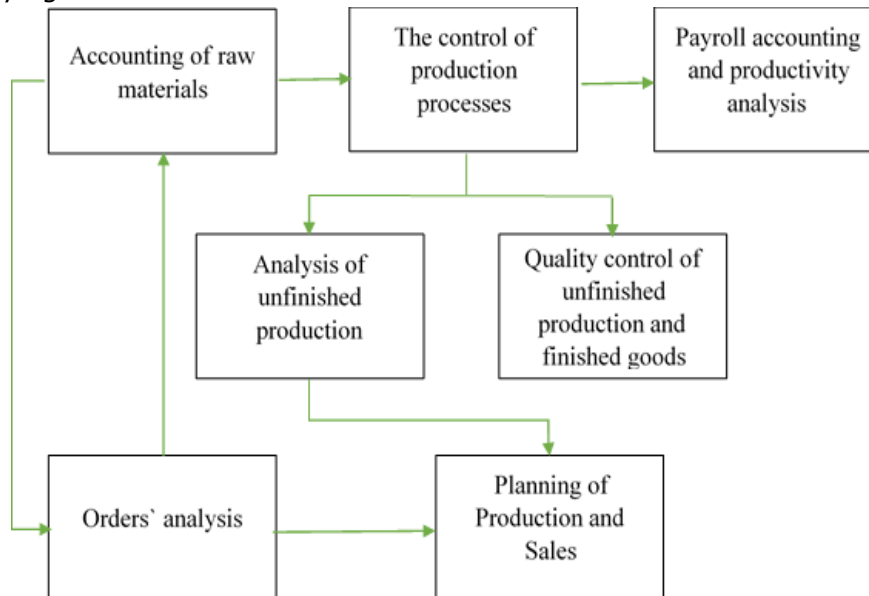


**Fig. 1. Modules of information system**

Responsible person performs the necessary measurements and marking of the timber party. This data is moving to the production department, which carries out a comparison of the information given in purchase order actual numbers. The next stage of the production process is the primary processing of wood. According to the established production plan, senior master production manager distributes raw materials as needed.

Primary wood processing involves a number of interrelated processes such as drying (if the raw materials come in raw form), longitudinal and transverse cutting (see Fig. 2 and Fig. 3).



**Fig. 2. Longitudinal board cutting**

The entire production process is displayed in the system by means of relevant documents that allows operational control of the production process. The final stage of primary wood processing is the formation of rough pieces and transfer them to areas of further processing.



**Fig. 3. Transverse board cutting**

The conversion process of transforming of rough-sawn stock into finished products is described in Fig. 4.
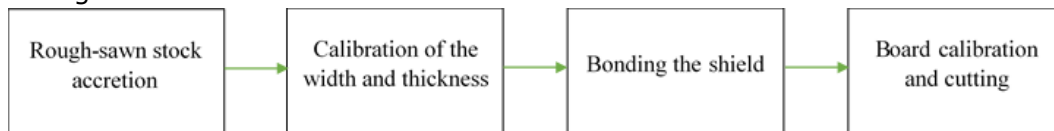


**Fig. 4. Assembling of the finished product**

Rough-sawn stock hits the seam line after initial treatment, where they to be formed as slats. The main feature of this process is the transition from one unit of measurement (for rough-sawn stocks there is only volume) to two  pieces and volume (for each lamella there is fixed length, width and thickness). Accretion operations are recorded in the journal and entered into the system in the form of relevant document (see Fig. 5).



**Fig. 5. Accretion accounting**

To eliminate irregularities and defects wich were formed during the seam, especially in the field of bonding, each adherent lamella is calibrated on the four-sided machines. Action of the machine is recorded in the journal and entered into the system (see Fig. 6).



**Fig. 6. Accounting of four-sided machine actions**

This document allows you to bring data about size and number of lamellas before and after machine processing. The account of these units is very important, since the passage of the described operations occurs most technological material loss after roughing. Both documents contain field "difference", which has information about the material loss in m3 at each position. This specification allows providing clear operational supervision of the units, identifying and eliminating variations in the equipment or workers. Incorrect settings of machines or failures of the results occur significant excess of process loss that causes the increase of the finished product cost.

The norms of technological losses of raw materials are established for the data processing sections. The norm for accretion line is up to 10% by volume of rough-sawn stocks in overhauls and for four-sided machine - up to 20%. Monitoring of compliance with these rules can be carried out either immediately, right when entering data of nodes to systems, or aggregated over time using appropriate information reporting system (see Fig. 7).



**Fig. 7. Analysis of technological losses in lamella accretion**

The system allows you to export reports to MS Excel for more detailed analysis and graphical display of results. Consolidated total analysis provides a more objective result, since the features of the process cause some uncertainty analysis for each position (presence of negative losses for some items).

A similar analysis can be performed on the action of four-sided machine (see Fig. 8).

Derived final assemblies have fair size and can be used for manufacturing furniture panels.



**Fig. 8. Analysis of technology losses in four-sided machine**

Manufacturing furniture panels is a starting point of production of the finished product. The rough piece must pass a certain number of manufacturing operations to get finish product. The list of such operations is recorded for each part in a special document "Process layout of rough-sawn stock" (see Fig. 9).



**Fig. 9. Process layout of rough-sawn stock**

This document contains a list of works performed by specifying stations (production sites), which will finish the rough piece. These stations are used to build reports and obtain data on traffic of assemblies and its balances at each site. At the end of the technological cycle, finished assembly comes into the "Stock of the product" for further processing or assembly.

Each operation of process cycle is characterized by a certain complexity and necessary set of skills and abilities of workers for its implementation, hence the cost is different for each cycle. Therefore, the technological map for each operation indicates normative number of the parts for 1 and 8 hours, respectively.

Typically, the manufacturing process involves many branches. This is because different parts of certain processing stages are identical to their passage and it is impossible to say exactly what kind of item is to be received. In addition, many parts reach the assembly of finished products not in its original form but with other assemblies, forming some combines. Regulation

(templates) of these transformations is set in the system by document "Specification of rough-sawn stock" (see Fig. 10).



**Fig. 10. Specification of rough-sawn stock**

This document defines which parts and how much of it should be deducted from a particular stock for posting new details (or combined assemblies) in a particular station (site) or warehouse. This document, as well as technological card is a template and does not reflect the actual movement of production.

At the end of the movement in the processing chain, finished assemblies are getting into assembly and finished product warehouses. The template for assembling the finished product is a document "The finished product specification".

This document is similar to "Specifications of rough-sawn stock" and determines which parts, semi-finished products, raw materials and work to be done to produce the finished products.

The above listed documents constitute the manufacturing process and are used as templates for creating documents that reflect manufacturing operations directly.

**5. Conclusion**

Market research of current trends in Ukrainian ERP market shows the dominance of SAP ERP and Microsoft Dynamics NAV. These systems allow providing automation of complex industrial, financial and other business processes. But important drawbacks of these systems are their high cost and long implementation period, the lack of flexibility in automating information processes and information flows at small and medium enterprises.

We have discovered automation of manufacturing enterprises as it is a complex multistage process and the management information system of suchlike enterprise should include a number of modules majoring in certain areas.

We have provided alternative approach of above described automation the implementation of so-called scalable information systems-designers. Good examples of such systems are Accent 2 and 7.4. These systems are developed by Ukrainian IT-companies and enable complex automation of enterprises of any kind of activity. A typical set of functional requirements provides management and financial accounting, but open source framework allows coding modules for complex automation. Implementation of A2 and Accent systems is achievable in stages, progressively covering all areas of a company. In addition, implementation of such systems at the enterprise of wood processing industry may decrease its pollutions and have good influence on ecology in the region.

**Selected bibliography:**

1. Grygorkiv V. Special aspects of Enterprise Resource Planning solutions in Ukraine / Grygorkiv V., Verstiak A., Grygorkiv M., Ishchenko S. // In Proceedings 4th International Conference on Application and Communication xTechnology and Statistics in Economy and Education (ICAICTSEE – 2014). – Sofia, Bulgaria. –2014. – Pp. 380-386.

2. Литвиненко С. Внедрение ERP–инвестиции или расходы [Электронный ресурс] / С. Литвиненко. – 2016. – Режим доступа : http://ko.com.ua/vnedrenie_erp_investiciya_ili_rashody_117367 (дата просмотра 2018/03/21).

3. Kadiri S. Current trends on ICT technologies for enterprise information systems / Kadiri S., Grabot B., Thoben K-D., Hribernik K., Emmanouilidis C., Cieminski G., Kiritsis D. // Computers in Industry. – 2016. – Vol. 79. – Pp. 14-33.

4. Nikookar G. Competitive advantage of enterprise resource planning vendors in Iran / Nikookar G., Yahya Safavi S., Hakim A., Homayoun A. // Information Systems. – 2010. – Vol. 35, Pp. 271-277.

5. Obermaisser R. Software Technologies for Embedded and Ubiquitous Systems / Obermaisser R., Nah Y., Puschner P. – Springer, London. – 2007. – 325 p.

6. Karakanian M. Choosing an ERP implementation strategy / Karakanian M. // Practitioner. – 1999. – Vol. 2 (7). – Pp. 1-6.

7. Davenport E. Putting the enterprise into the enterprise system / Davenport E. // Harvard Business Review. – 1998. – Pp. 121-131.

8. Gelogo Y.E. Mobile Integrated Enterprise Resource Planning. System Architecture / Gelogo Y.E., Kim H.K. // Int. J. Control Autom. – 2014. – Vol. 7 (3). – Pp. 379-388.

9. Davenport T. Mission Critical: Realizing the Promise of Enterprise Systems / Davenport T. – Harvard Business School Press, Boston, MA. – 2000. – 335 p.

10. Markus M.L. The enterprise system experience: from adoption to success / Markus M.L., Tanis C. – In R.W. Zmud (Ed.), Framing the Domains of IT Management: Projecting the Future through the Past, Pinnaflex Educational Resources Inc., Cincinnati. – 2000. – Pp. 173–207.

11. Ukraine in global rankings, 2017. Easy access to relevant data on the position of Ukraine in key international indices. Retrieved from: https://www.pravda.com.ua/cdn/graphics/ratings/eng.html (Accessed 2018/03/21).

12. Panorama Consulting Homepage, 2016. Retrieved from: https://www.panorama-consulting.com/ (Accessed 2018/01/03).

13. Olson D. Open source ERP business model framework / Olson D., Johansson B., Atem De Carvalho R. // Robotics and Computer-Integrated Manufacturing. – 2018. – Vol. 50. – Pp. 30-36.

14. Panorama Consulting Clash of the Titans, 2017. Retrieved from: http://www.naviworld.com.sg/panorma-consulting-ranked-microsoft-dynamics-number-2-spot-top-erp-market-share-ranking (Accessed 2018/02/21).

15. Top five takeaways from the 2017 Clash of the Titans Report. Available at: https://www.panorama-consulting.com/top-five-takeaways-2017-clash-titans-report (Accessed 2018/02/21).

16. IDC Homepage, 2017. Retrieved from: https://www.idc.com (Accessed 2018/01/03).

17. Ukraine imposes sanctions against 1C, Parus, ABBYY, Softline Group, Galatiki Center and other Russian IT companies, 2018. Retrieved from: http://en.interfax.com.ua/news/economic/421861.html (Accessed 2018/02/21).

18. Some dealers of 1C software in Ukraine placed on sanction list - SBU, 2018. Retrieved from: http://en.interfax.com.ua/news/general/418609.html (Accessed 2018/02/21).

19. Акцент [Электронный ресурс]. – 2018. – Режим доступа : http://www.accent.ua/ (дата просмотра 2018/02/21).

20. Акцент как альтернатива 1С [Электронный ресурс]. – 2018. – Режим доступа : http://www.accent.ua/index.php/pages/ob-aktsente/alternativa-1s (дата просмотра 2018/02/21).

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## ВНЕДРЕНИЕ ИНФОРМАЦИОННЫХ СИСТЕМ УПРАВЛЕНИЯ ПРОИЗВОДСТВЕННЫМИ ПРЕДПРИЯТИЯМИ: ПРИКЛАДНОЙ АНАЛИЗ

*Аннотация*

В статье рассматривается проблема автоматизации производственных предприятий. Поскольку управление такими предприятиями является многоэтапным и сложным процессом, то управленческие информационные системы, автоматизирующие их деятельность, должны содержать большое количество модулей. Понятно, что автоматизация производства реализуется через внедрение так называемых систем управления ресурсами

предприятия ERP, которые имеют многочисленные особенности для малого и среднего бизнеса в Украине. В частности, в статье отмечаются недостатки таких систем, в первую очередь высокая стоимость внедрения и владения. В этом исследовании мы предлагаем альтернативный подход внедрения систем на производственных предприятиях – использование так называемых масштабируемых систем-конструкторов, примерами которых являются Акцент 2 и Акцент 7.4. Эти системы разработаны украинскими ИТ-компаниями и позволяют осуществлять комплексную автоматизацию предприятий любого вида деятельности.

*Ключевые слова:* управление ресурсами предприятия, производственное предприятие, управленческие информационные системы, Акцент 2.

## References:

1. Grygorkiv, V., Verstiak, A., Grygorkiv, V., Ishchenko, S. (2014). *Special aspects of Enterprise Resource Planning solutions in Ukraine*. In Proceedings 4th International Conference on Application and Communication xTechnology and Statistics in Economy and Education (ICAICTSEE – 2014), Sofia, Bulgaria, pp. 380-386.

2. Litvinenko, S. (2016). *ERP-investment or costs?* Available at: http://ko.com.ua/vnedrenie_erp_investiciya_ili_rashody_117367 (Accessed 2018/03/21) (in Russ.).

3. Kadiri, S., Grabot, B., Thoben, K-D., Hribernik, K., Emmanouilidis, C., Cieminski, G., Kiritsis, D. (2016). Current trends on ICT technologies for enterprise information systems. *Computers in Industry*, vol. 79, pp. 14-33.

4. Nikookar, G., Yahya Safavi, S., Hakim, A., Homayoun, A. (2010). Competitive advantage of enterprise resource planning vendors in Iran. *Information Systems*, vol. 35, pp. 271–277.

5. Obermaisser, R., Nah, Y., Puschner, P. (2007). *Software Technologies for Embedded and Ubiquitous Systems*. Springer, London.

6. Karakanian, M. (1999). Choosing an ERP implementation strategy. *Practitioner*, vol. 2 (7), pp. 1-6.

7. Davenport, E. (1998). Putting the enterprise into the enterprise system. *Harvard Business Review*, pp. 121-131.

8. Gelogo, Y.E., Kim, H.K. (2014). Mobile Integrated Enterprise Resource Planning. System Architecture. *Int. J. Control Autom,* vol. 7 (3), pp. 379-388.

9. Davenport, T. (2000). *Mission Critical: Realizing the Promise of Enterprise Systems*. Harvard Business School Press, Boston, MA.

10. Markus, M.L., Tanis, C. (2000). *The enterprise system experience: from adoption to success*. In R.W. Zmud (Ed.), *Framing the Domains of IT Management: Projecting the Future through the Past,* Pinnaflex Educational Resources Inc., Cincinnati, pp. 173–207.

11. Ukraine in global rankings (2017). *Easy access to relevant data on the position of Ukraine in key international indices.* Available at: https://www.pravda.com.ua/cdn/graphics/ratings/eng.html (Accessed 2018/03/21) (in Eng).

12. Panorama Consulting Homepage (2016). Available at: https://www.panorama-consulting.com/ (accessed 2018/01/03).

13. Olson, D., Johansson, B, Atem De Carvalho, R. (2018). Open source ERP business model framework. *Robotics and Computer-Integrated Manufacturing*, vol. 50, pp. 30-36.

14. *Panorama Consulting Clash of the Titans* (2017). Available at: http://www.naviworld.com.sg/panorma-consulting-ranked-microsoft-dynamics-number-2-spot-top-erp-market-share-ranking (Accessed 2018/02/21).

15. *Top five takeaways from the 2017 Clash of the Titans Report* (2017). Available at: https://www.panorama-consulting.com/top-five-takeaways-2017-clash-titans-report (Accessed 2018/02/21).

16. *IDC Homepage* (2017). Available at: https://www.idc.com (Accessed 2018/01/03).

17. *Ukraine imposes sanctions against 1C, Parus, ABBYY, Softline Group, Galatiki Center and other Russian IT companies.* Available at: http://en.interfax.com.ua/news/economic/421861.html (Accessed 2018/02/21).

18. *Some dealers of 1C software in Ukraine placed on sanction list – SBU.* Available at: http://en.interfax.com.ua/news/general/418609.html (Accessed 2018/02/21).

19. *Accent mainpage* (2018). Available at: http://www.accent.ua/, (accessed 2018/02/21) (in Russ.).

20. *Accent as 1C alternative* (2018). Available at: http://www.accent.ua/index.php/pages/ob-aktsente/alternativa-1s (Accessed 2018/02/21) (in Russ.).