Bożena GAJDZIK[1)], Klaudia PIASKOWSKA[2)]

[1)] Dr hab. Bożena Gajdzik, PhD.,
Professor the Silesian University of Technology
Faculty of Materials Science,
ul. Krasińskiego 8, 40-019 Katowice,
e-mail: bozena.gajdzik@polsl.pl

[2)] Eng. Klaudia Piaskowska, MSc.,
graduate of the Silesian University of Technology,
Faculty of Material Engineering (Katowice, September 2019)
e-mail Piaskowskaklaudia@gmail.com,

AUDIT OF THE CONTINUITY OF IT IMPROVEMENT IN MANUFACTURING ENTERPRISE – CASE STUDY

AUDYT CIĄGŁOŚCI DOSKONALENIA SYSTEMU INFORMATYCZNEGO W PRZEDSIĘBIORSTWIE PRODUKCYJNYM - CASE STUDY

Summary: The text of the present publication contains the problems of the range of auditing the computerised IT system of the enterprise management in the frames of the process and cross approach. The audit of the computer IT system, employed in the manufacturing enterprise is used for the improvement of the system that is functioning in the specified conditions. The IT computer systems in the enterprises integrate a given enterprise via linking of the particular operations which cross (horizontally or vertically) its organizational structure. In the situation of the permanent changes in the enterprise, the employed IT computer systems for service of the processes must also undergo changes. In the publication, the range of auditing the IT computer system with the aim to improve it, have been presented. The paper is focused on identification of narrow links of the system and the statement of the problems, occurring in the manufacturing plant. The work is a form of case study, developed on the grounds of the situation occurring in the enterprise. The currently employed IT computer systems in the company are as follows: ERP class system, the system for documentation management, the system for management of the requirements for the railway sector (IBM Rational DOORS), the system for management of the projects, the system for designing and scheduling the production, the system for tracing the circulation of the documents, the package of Business Intelligence class for data analysis and reporting and the solutions based upon the Excel sheet.

Key words: IT computer system, audit of IT computer systems, improvement oif IT systems in enterprise

Streszczenie: Na treść publikacji składa się problematyka zakresu audytowania komputerowego systemu informatycznego zarządzania przedsiębiorstwem w ramach podejścia procesowego i crossowego. Audyt komputerowego systemu informatycznego stosowanego w przedsiębiorstwie produkcyjnym jest stosowany dla ulepszania systemu, który funkcjonuje w konkretnych warunkach. Systemy informatyczno-komputerowe w przedsiębiorstwach scalają to przedsiębiorstwo przez łączenie poszczególnych czynności, które swym przebiegiem przecinają (poziomo lub pionowo) jego strukturę organizacyjną. W warunkach ciągłych zmian w przedsiębiorstwie, używane komputerowe systemy informatyczne do obsługi procesów muszą również podlegać zmianie. W publikacji przedstawiono zakres adytowania komputerowego systemu informatycznego w celu jego doskonalenia. W pracy skupiono się na identyfikacji wąskich stystemu i zestawienie problemów występujących w przedsiębiorstwie produkcyjnym. Praca jest formą case study powstałą na podstawie sytuacji występującej w przedsiębiorstwie. Aktualnie stosowane w przedsiębiorstwie systemy informatyczno-komputerowe to: system klasy ERP, system do zarządzania dokumentacją, system zarządzania wymaganiami dla sektora kolejowego (IBM Rational DOORS), system do zarządzania projektami, system do planowania i harmonogramowania produkcji, system do śledzenia obiegu dokumentów, pakiet klasy Business Intelligence do analizy danych i raportowania oraz rozwiązania oparte o arkusz Excel.

Słowa kluczowe: komputerowy system informatyczny, audyt systemów komputerowo-informatycznych, doskonalenie systemów infromatycznych w przedsiębiorstwie

Introduction

In management of the enterprise, the emphasis is placed on the integration of the elements of the process with the support of IT systems. The process approach as employed in management of IT systems integrates the parameters of evaluation of its functioning such as functionality and usability and the costs of operation and improvement of the system and also, the time period of its use and the developmental possibilities of the system. The development of IT technology enabled the control of the processes using computer IT systems in the enterprises in a form of package of different IT computer solutions (Kisielnicki and Sroka, 2001). In functioning of IT computer systems in the enterprises, the functional (usability)

gaps may, however appear; they are determined by different factors (including, inter alia, a lack of compatibility between the IT computer systems, employed inside the company). Many modern IT systems have the self-learning and/or self-improving options. However, in the process of improving the systems, the matter consists also in identification of their limitations (narrows links, barriers) with the participation of their direct users. The users of IT computer systems should identify the problems and participate in their solving by the internal team of the specialists for IT problems or with the participation of external companies (suppliers of IT computer systems). The introduction of the appropriate betterment operations is preceded by the performance of audit of the IT computer system

in the enterprise. The betterment of the IT system means the continuous adaptation of standard solutions of the enterprise systems to the new expectations of the system users what allows better performance of their IT role. In audit of the discussed IT system, it is important to identify two basic objects i.e.:

- User of the system − individual object that is created by the authorised worker of the company,
- Functions of the system − description of the operations which the worker using IT system may perform and obtain the data range to which he has an access.

The audit of IT system is employed (most frequently) in order to determine the degree of its compatibility with the binding or IT standard. This publication is limited to the presentation of audit of the users of the system in aspect of their expectations as regards the changes in the IT system in the range of its continuous improvement. Due to the range of the analysis, the said audit was defined as audit of the continuity of improving the IT computer system of the enterprise.

Abbreviated literature study on the audits of IT systems

„Audit of IT system is a process of collecting and evaluating the evidence in order to determine whether a given IT system and the related resources protect the property in a correct way, maintain the integrity of the data and supply the appropriate and reliable information, reach the aim of organization in effective manner utilize the resources sparingly and employ the mechanisms of internal control as to supply the reasonable assurance that the operating and control aims are reached and there is a protection against undesirable events or they are detected at time and their consequences corrected at time" (Liderman and Patkowski, 2003). Audit of IT system, employed in a given enterprise allows performing a review of the company's resources, indicating the gaps in the system and potential threats, and preparing the action plan in the case of critical situation. Owing to audit it is possible to plan better the expenses for the purchase of equipment and software. Audit of the continuity of improving the IT system the aim of which is to indicate the possibilities of the company for further development is a very measurable example. Audits of IT systems are implemented by the external companies of internal IT teams. It is preferable to implement audit − review with the co-participation of the direct users of particular IT computer system modules before the implementation of the audit procedure, performed by the external company. Audit of IT − computer system of the enterprise includes, inter alia, audit of infrastructure, audit of licence, audit of binding service procedures and audit of agreements on Maintenance and Support (M&S). Its aim is to collect information on IT systems, their co-acting and verification of business justification and justness of the possessed service for maintenance if IT infrastructure. The complex audit of IT − computer system is commenced from the establishment of the range and timetable of the study to be conducted what has a big influence on the time of implementation and effect of the whole task. The recommendations of remedial

action within the frames of the examined IT area, as contained in a final report, are the result of audit. Audit may be implemented according to the checklists based upon the selected standard, penetration tests and black box tests (checking the safety) (Liderman, 2012; Nowak and Scheffs, 2010; Galach, 2005) and other research forms: review, survey, observation, testing of the way of documents' obtaining, a review of the implemented procedures and other forms of collecting the evidence materials. When adopting PDCA model, the enterprises strive at the continuous improvement of IT systems. A dynamic development of IT technologies has significantly affected the competitiveness and effectiveness of the enterprises. Without the appropriate support of the IT systems, the contemporary enterprise is not able to function properly (Molski and Łacheta, 2007). Therefore, the enterprises implement, more and more frequently, internal audits in order to determine the "gaps" and problems of the users of the system, employed in a given enterprise. Audit may be classic, formal or substantial (Zalewski et al.). IT audit implemented by direct users of the system (employees of the particular departments of the enterprise) is treated as the classic model of audit; its aim is to understand the processes with the support of IT and to determine the problems connected with the application of the system by the direct users. Specialist consultations (aid of external companies) are not required on the stage of such audit. The discussed audit means individual approach of the particular users of the system to the problems connected with the use and service of IT system. When implementing the audit, we should apply the best practices, e.g. COBIT, used during construction and management of IT systems.

Case study: auditing of IT system in the enterprise

The example referred to the enterprise, equipped with a few packages, forming the IT system the enterprise has, inter alia, ERP class system, system for documentation management, the system for management of the requirements for railway sector (IBM Rational DOORS), the system for management of the projects, the system for planning and scheduling of production, the system for tracing of the documents' circulation, the package of Business Intelligence class for the data analysis and reporting, and the solutions based on the Excel sheet. The particular packages were introduced from 1999, obtaining the developed net of IT system in the enterprise in 2018. The following facts were considered as milestones of the while investment cycle: introduction of PDM interface, Business Object and bar code system. After 2018, the enterprise began to consider the application of a new IT system of SAP type. However, before a final decision on the purchase of the new system, the measures were undertaken in connection with the modification of the existing BAAN system. The mentioned measures were defined as audit of continuous improvement of the IT system. The map of the enterprise's processes in evaluation of functionality and usability of the employed IT computer system is created by two areas: the implementation of the engineering tasks and the implementation of the purchase. The configuration of the components of the map of the processes is given in Tab.1.

Tabela 1. The configuration of the components of the map of the processes

Task	Entrance	Exit
Implementation of engineering tasks	Calculation sheet of the project, range of the project, application-constructional documentation, date of the supply of the product, external receipt of material, service invoice, declaration of conformity (quality certificate), protocol, invoice specification (shipment evidence), data concerning assortment item.	Confirmation of purchase recommendation, internal order, shifting to the project from storage room or another project, invoice, liabilities, data for the need of the order, INTRASTAT (statistical system for the needs of trade of goods), data for the needs of GUS (the Main Statistical Office), data for the needs of Maximo (management of physical resources), data of assortment item, eBOM.
Implementation of purchase	Recommendation from the purchase (MRP, SIC), the „manually" reported needs – bar code systems, base of suppliers, data of assortment item, pricelists, control parameters (to storehouse) constructional documentation, data of assortment item, prognoses, supplier's offer, data concerning deliveries, data on the supplier (audits), claim protocol, external receipt of the product, invoice from the supplier, information on discrepancy.	Transfer of order to the supplier, timetable of deliveries, frame order, evaluation sent to the supplier, change of the status, confirmed by the supplier (Base of Suppliers), list of suppliers for audit, claim document to the supplier, changes in the order of the purchase, the order of purchase.

The range of auditing of IT computer system

In the analysed enterprise, the work on the improvement of IT system package (the applied IT solutions for the support of the enterprise management) was commenced from the recognition of the expectations of the IT computer system users and determination of the elements which disturb the functioning of the existing system. The aim of the implemented project, called the improvement of IT computer system in the enterprise was to determine the most important aspects of the functionality of the system: complexity and usability of the system, scheduling of the projects, *User-friendly*. The main area of the studies included the determination of barriers (limitations) of the particular components of UT computer system by their direct users. To this end, the following sheet of evaluation was developed (tab.2) where 1 – is the lowest score evaluation and 5 – is the highest score evaluation.

In evaluation of IT computer system, the deepened interview and observation were also employed. The questions directed to the users of the system were divided into several subject areas, depending on the implemented tasks and their functions in the enterprise.

The users of the audited IT computer system

Audit was carried out among the employees of the analysed enterprise: production manager, employees of manufacturing sector, logistics, workers of service, IT specialists, workers of administration department, workers of book-keeping and finances, the employees of planning and strategy, and the persons employed in sales and marketing sector. The employees, being situated higher in the organizational structure of the enterprise answered individually the questions (questionnaire of the interview) and the

Tab. 2. The sheet of the evaluation of functional parameters of IT computer system

	Parametry/kryteria oceny	1	2	3	4	5
1	Speed of operating (in respect of the tasks, to be performed by the employee)					
2	Quality of operating (subjective feeling of user)					
3	Rate of data processing for the needs of the enterprise (including reporting)					
4	Flexibility and easiness of developing the system, using Maintenance function					
5	Safety – guarantee of safety					
6	Possibility of obtaining the documents from different sources during the implementation of the tasks					
7	Integration with other systems and applications available in the enterprise					
8	Easy in operation (simple instructions)					
9	Stability (resistance to failures and protection from the network attacks)					
10	Functionality and readability of interface					

employees of the lower level of the organization answered the repeatable questions (a focused interview). The set of the common questions (identical) concerned functional and usable parameters of the studies IT computer system.

Identified limitations (barriers) of the employed IT system

During the procedure of auditing the IT system, its key limitations were identified. Parameter of functionality of the used IT system in the range of the possibilities of individual users to obtain the data from different sources within the different used IT systems was the greatest limitation. It means that the package of IT systems, employed in the enterprise, does not have a developed module which could enable and facilitate a quick obtaining of the data concerning particular operations (tasks) from one system in combination with other IT systems employed. The variety of IT packages, creating one IT system of the enterprise results also in slowing down the work of the system. In the opinion of IT specialists, the limitation of the speed of the system's functioning is a significant limitation in the process, oriented to compatibility of different IT systems, supporting the functioning of the enterprise. It results from the fact that the systems possess a small number of licences in relation to the number of the potential users. The more persons using the system at the same time, the longer is the time of data processing. The scores, obtained for the particular persons (audit participants) are given in Tab.3. The following symbols were used: Criteria of evaluation: K1 – readability of interface, K2 – stability (resistance to failures and protection from the network attack), K3 – easy in maintenance, K4 – integration with other systems and applications, K5 – the possibility of obtaining the documents from different sources, K6 – system safety, K7 – flexibility and easiness of development, K8 – speed of data processing, K9 – quality of functioning, K10 – speed of functioning. The employees: p1 – the employees of manufacturing line, P2 – the employees of logistics department, P3 – the employees of administration department, P4 – the employees of planning and strategy department, P5 – IT specialists, P6 – the employees of sales and marketing department, P7 – section of bookkeeping and finances.

During the interview, a detailed list of the limitations in the field of functionality of the particular IT systems used in the enterprise was established. The examples of answers are as follows (Piaskowska, 2019):

a) Frequent failures of the system, slowing down of the work of the system at the end of the month (deadline for many implemented tasks in the enterprise), sporadically – the problems with the equipment and network,

b) Difficulties in compiling the system for the needs of the implementation of the new functions (changes in the system performed in the test environment – time 1 month),

c) Supplementation of the system requires a consent of the enterprise management (user introduces the notification by e-mail or by phone to the base for notifications and IT specialists create a session in the test environment),

d) Updating of the system is implemented by the particular suppliers of the software (all updates are checked in the test environment and later on, are uploaded to the manufacturing environment), the user of the system (the company) has a bought package: maintenance; however, when he wants to develop the system by the additional services, the external company makes the additional pricing of the range of the rendered services which have not been considered in the basic agreement between the user of the system (the enterprise) and the supplier of the system. The external company establishes also the time of implementing the order, improving the functioning of the system. The cost of removal of the defects and development of the system and the time of the implementation of the order may be considered as the barriers to the development of the

Tab. 3. Evaluation of the parameters of functionality of IT computer system
Source: own elaboration on the grounds of the direct studies (Piaskowska, 2019).

P/K	P1	P2	P3	P4	P5	P6	P7
K1	3,5	3,3	4,7	3,2	3,7	3,9	3,3
K2	3,4	3,2	4,3	3,2	3,6	3,7	2,8
K3	3,3	3,2	3,3	3,0	3,4	2,7	3,1
K4	3,2	3,0	3,0	3,3	3,3	2,9	3,0
K5	3,1	3,0	2,0	2,7	3,1	3,1	3,1
K6	3,4	3,4	3,7	3,2	3,4	3,3	2,9
K7	3,5	3,4	3,3	3,3	3,5	3,0	3,3
K8	2,9	2,9	3,3	3,0	3,3	3,6	2,9
K9	3,2	3,2	3,7	3,3	3,5	3,1	3,1
K10	3,2	3,5	2,7	3,1	2,8	3,7	2,8

Fig. 1. The results of the scores for cooperation
Source: Piaskowska, 2019.
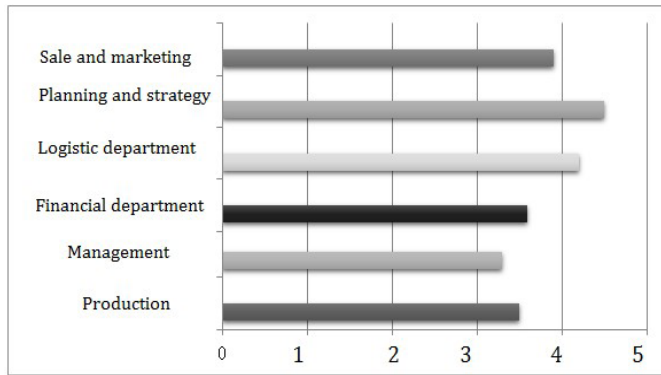
enterprise in IT area in relation to certain used systems (ageing of IT systems affects the increase of the costs of their updating).

The positive evaluations concerned, first of all, the function of visualisation of the run of the processes in IT system. The example of the answer is as follows:

e) The system allowed making the visualization of the process in order to indicate the "bottlenecks" in the implemented manufacturing process. In the used system, the employee/user has the possibility of checking the time of implementation of the particular operations and, additionally, the discussed system allows arranging the operations, duration of the manufacturing time and the date at which the products may be manufactures, referring to a real time.

The range of the evaluation covered also assistance/IT service, implemented by the external team of IT specialists. The results of the evaluation of cooperation of the employees/direct users and

OIT department in the enterprise is given in Fig.1. To measure the degree of cooperation, the scale 1 – 5 was employed. Number 5 means the highest evaluation score.

Based upon the results given in Fig.1 it was established that the planning and strategy department and the persons dealing with the logistics rate the highest cooperation with IT specialists and the lowest scores were given by the administration department and by the persons directly employed on the manufacturing lines. In the case of the administration employees, the justification for lower scores included the necessity to modify frequently the system in order to adapt the obtained information to the new guidelines of data protection (RODO). On the other hand, the employees of manufacturing lines expected greater competences in utilization of the system functions and development of the equipment for visualization of the manufacturing parameters, with the utilization of the newest techniques of transmitting the information.

Plan of the changes in the audited IT computer system

The proposals for the changes in the utilized IT system concerned the particular identified problems. The example of the sheet of the areas with the proposed changes is given in Table 4.

The following directions of the changes were outlined:
- Continuous improving of the system, and in particular, the current improvement of the elements concerning the quicker data processing and obtaining of the documents for the implementation of the processes (tasks) in the enterprise;
- Improvement of the system for communication between the employees of IT specialists and the external company,

Tab. 4. The example of the proposed changes in the utilized IT system
Source: own development on the grounds of direct studies

The employee/post in the enterprise	Identified problem	Solution of the problem
Head Manager	Lack of the possibility of generating the cross-section report in the system	Purchase of Business Objects – BO system, enabling the implementation of cross-section reporting on the level of Top Management
The employees of the logistics department	Lack of the possibility of developing the modifications of the system in the own range (as regards the problems, situated in the logistic proceees, implemented in the enterprise) Lack of the possibioity of comapring the logistic costs	Purchase of necessary modules (applications) of the system
The employees of the manufacturing line	Problems with the system errors	Notification of the system errors to the IT department of the enterprise (team of IUT specialists)
	Lack of the module of production scheduling	Purchase of the module for scheduling of production
IT specialists /IT department employees	Too small number of licences in relation to the number of users what causes the prolongation of the time of data processing in the system	Purchase of additional licences
	The limited possibility of obtaining the documents from different sources, using the system	Integration of the system with the documentation circulation systems
Other employees	Labour consumption during the introduction of the data (the system is supplied with the data introduced to the system by the employees – the situation refers to several work posts)	Automation of the process of the data introduction

responsible for the development of the particular modules of the system;

- Adaptation of the enterprise to the passage into the new It system due to the limited developmental potential of certain packages of IT solutions, employed in the enterprise (in the future, it is possible to consider the change of the present system by another, more functional one which would have more possibilities and facilitate the more effective management of the processes in the company).

The results of the audit were submitted to the managerial staff. The following strategies to be undertaken in the company in respect of IT computer systems were outlined as follows:

1. The adaptation of the selected IT systems to the new developmental areas of the enterprise. The strategic plan will be implemented up to the end of 2020.
2. The analysis of the market in respect of implementation offer for the new IT system (the following measures were undertaken: analysis and evaluation of the market offers of the suppliers of IT systems). At present, there is implemented the stage of the shipment of the offer inquiry to the key sellers of IT systems, in which the company is interested.
3. The organizational-preparatory procedure to implement the new IT system in the enterprise (the time of the project duration: since January 2020 until June 2020)
4. Introduction of the new IT system – the project named: Pilotage of the new OT system, implemented by the external company (period of the termination of the project: up to December 2020).
5. Closure of the utilized system (time of commencing the project: January 2020).
6. Full utilization of the new IT system (time of commencing the project: January 2020).

Summing up

The performed audit of the existing IT solutions in the analysed enterprise allowed establishing the directions of modification of the employed solutions and undertaking the decision on the purchase of the new (more developed) system in the future (the measures will be undertaken in parallel with the activity in respect of improving the existing system as to preserve the continuity of information transfer and support of IT system in the implemented processes. The aim of the audit was to identify the limitations of the employed IT system in the enterprise in order to obtain the arguments "pro" and "contra" as regards its replacement by another system. The planned activities of the replacement of IT system into the new one must be implemented fluently as to prevent the complications during the replacement of the existing system by the new one. The conducted audit of the continuous improving of IT system was, therefore, a tool for improvement of the system in order to maintain the correctness of the company's functioning during the transitory period before the passage to the new IT system.

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