

EVALUATION OF DECISION-MAKING PROCESSES WITH REFERENCE TO COST INFORMATION MANAGEMENT

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Abstract: The aim of the paper is the evaluation of the decision-making process based on the analysis of cost information in production supporting processes in the chemical company. The first part of the paper presents the importance of information in the area of enterprise management. Furthermore, the role of the information system in the enterprise is discussed in the aspect of decision-making. The final part of the paper presents the results of empirical studies in the area of information flow in production supporting processes in the enterprise of chemical industry. The applied research method is the literature study and the analysis of linear correlation and the comparative analysis of cost information of production supporting processes of the examined enterprise.

Keywords: decision-making, enterprise information system.

Introduction

Information represents an intangible and unmeasurable value of the enterprise, whereas management of information flow should consist of materialization, analysis and verification of information. In this context, decision-making can be viewed as transformation of information into a managerial decision (Porter, 1981; Rausch and Anderson, 2011; Wanielista, 1998). Therefore, the adjustment of information technologies to business strategies in the enterprise is a substantial decision-related problem (Amit and Zott, 2012; Jelonek, 2008, Reeves et al., 2012; Lis et al., 2014). While making decisions in a turbulent environment, managers have to consider information (Markoczy et al., 2013; Santos and Eisenhardt, 2005; Turek, 2011) and activities to implement decisions since they cause a feedback which does not allow for verification of accuracy and efficiency of decisions in the light of current expenditures (Davenport et al., 2006; Drucker, 1994; Stevenson and Jarillo, 1990).

In the context of management of production supporting processes, decisions concern the efficiency of the enterprise management system. Organization of information flow in supporting production processes determines the operating result of the enterprise. Effectiveness of production supporting processes plays the primary role in the achievement of the assumed effectiveness of the production process, though; these processes generate high costs, which may have significant impact on the economic and financial situation of enterprises. Appropriate management of the available machinery stock requires possessing cost information essential for decision-making, which brings about an increase in productivity of the possessed machines and equipment.

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The paper aims at the evaluation of the decision-making process based on the analysis of the cost information flow in the area of operation of technical objects in the chemical companies. To achieve the aim of the paper, there have been applied the literature study and the analysis of the costs of general overhauls in correlation with the costs of elimination of breakdowns. The problem of information flow in production supporting processes is important and up-to-date due to its impact on decision-making processes in the company.

Importance of information in the area of enterprise management

Information in the system of managing the enterprise can be viewed from many standpoints. Z. Martyniak emphasizes that information can be approached as a product or as a process that leads to obtaining this product (Martyniak, 2000). Information as a product represents "content with specific importance about something, for somebody and due to something, expressed by means of lingual or non-lingual symbols" (*Zarządzanie informacją...*, 2000; Gros, 1989). According to J. Czekaj, information can be viewed as a process which is "an ordered set of consecutive and interrelated statuses of data and output information that occurs affected by a series of activities performed by the employees that participate in the process and function of the technical means, aimed at obtaining of a "product" in the form of information that meets the needs of a user" (Czekaj, 2000).

Management of information in enterprises is aimed at supporting decision-making processes through solving all the problems. In practice, management of information encompasses activities connected with three fundamental elements in the enterprise: information resources, enterprise's staff and technical means of information processing (Pawełszek, 2004; Chan Kim and Mauborgne, 2005; Magretta, 2002). Efficiency of information largely depends on integration and synergy between the above factors.

Information systems in enterprises

The role of information systems in management of enterprises is a very wide concept. The literature distinguishes between two aspects of perception of the role of information systems: structural and functional. With respect to the first aspect, the information system is considered literally as the information system and performs all the functions assumed according to the following characterization: "information system represents a quite obvious form of organizational memory. This concept encompasses the whole richness of computer database and knowledge bases which store expert knowledge from different domains and make it available to employees. The basic characteristic of these records is the fact that they remain available in the enterprise" (Panasiewicz, 2010). The information system in this case relates to a broadly understood management of information. With respect to the functional aspect, the information system represents a tool that facilitates performance of the function of enterprise and the function of management system.

The information system affects function of other organizational processes in the enterprise (Broumi and Smarandache, 2015).

According to R. Krupski, information system in the enterprise oriented to management should provide information necessary to make decisions and perform activities that form situation in the enterprise and ensure the synergy between the management system and the executive system. The task of the information system is to ensure efficient communication between the members of the organization and quickly respond to changes in the enterprise and its environment as well as to take corrective measures. Information system in the enterprise should take into consideration research and development processes and contribute to development of the resources of organizational knowledge as a key resource in the enterprise (Krupski, 2003; Dziwulski and Skowron, 2000; Zott and Amit, 2010).

It should be emphasized that the information system in the enterprise is a complex system composed of many information subsystems which interfere with each other. Among the information subsystem, one can distinguish the management information system (MIS) i.e. a part of information system in the enterprise which is responsible for decision-making processes" (Zygała, 2007). The management information system is defined as "a network of internally connected components used for collecting, searching, processing and storing information and making it available for planning, control and decision-making in the organization" (Sroka, 1999). The principal aim of MIS is "to provide users, as fast as possible, with complex and reliable information which is honest, credible (verified with actual status or reasonable assumptions) and proper in terms of both form and contents and which represents a response to the problems users have at a particular moment" (Flakiewicz, 2002). According to A. Nowicki, the basic functions of the information system include:

- collecting data, which is achieved through recording of the data concerning economic events which occur in the enterprise and its environment and affect its operation,
- data processing, which consists in performance of a variety of operations (arithmetic, logic, indexing or sorting) on initial data in order to achieve output information,
- data warehousing, which is aimed at storing data that allows for using them in the future and storage of a copy in case of damage or loss of the original; additionally, the data are stored in read-only data storage devices,
- data transfer, which includes information and communication processes which occur between a sender and recipient of the data, among which there are the processes of ordering, transformation and adaptation of data to proper information channel,
- searching for and presentation of data: this function consists in reading users' queries concerning performance of a specific task, collecting necessary data for the formulation of answers to the question and presentation of this answer (*Wstęp do systemów...*, 2002).

Efficiency of the information system depends on the methods of performance of tasks it is supposed to perform. The functions of the information system performed while maintaining the highest quality contribute to the improved decision-making in the enterprise and, consequently, to maintaining better market position.

The discussion of the information system in the enterprise should also concern the strategic information system (SIS), which is "an information system that collects information necessary for making repeatable decisions i.e. the decisions which are made in the enterprise at least once a year and concern the creation or implementation of its strategy" (*Informacja zarządcza...*, 2003). SIS is a complex tool that involves a broad scope of information, aimed at making decisions at the highest and middle level of management. It contains strategic information, thus it is addressed to the users that make such decisions in the enterprise. Due to high level of detail of the information contained in this system and high costs of maintenance of this system, it seems reasonable to implement SIS in large enterprises where the organizational structure and scope of the portfolio of activities are much extended. The decision-making process in such enterprises is very difficult and involves a high risk. Therefore, using additional tools has substantial effect on the decision-making process. One disadvantage of SIS is high costs of implementation. The benefits of using this system include making decisions based on a detailed database which is characterized by high quality and is constantly updated, which offers greater chances for a success of the enterprise.

The process of design of SIS represents the basis for creation of information bases depending on the type of the repeatable decisions made (Ciecierski, 2004; Romanowska and Gierszewska, 2003; Mainkar et al., 2006). There are two types of repeatable decisions in the enterprise. The first one refers to portfolio decisions concerning creation and management of portfolio of activities, which are made by the top and medium-level managers. The other one refers to functional decisions, which relate to the decisions connected with individual functions of the enterprise. In order to facilitate making the repeatable decisions, two sets of information are created. The first set contains information used in the process of making the portfolio decision, whereas the other is used in the process of making functional decisions.

Management of information flow in production supporting processes in the examined enterprise

The empirical studies have been conducted in the enterprise of the chemical industry belonging to one of the largest chemical concerns in the world. The flow of information on production supporting processes of the enterprise is one of the basic elements which determine the efficiency of the production process of the examined enterprise. The fundamental issue in "the proper operation of both an individual object (machine, device) and the technological system, for the decision-making unit, is to dispose the complete and current information on the behavior of a specified object/system when in use" (Kaźmierczak, 2000) – the cited quote

constitutes the grounds for taking the subject connected with the role of information flow in the operation of supporting processes. It is of great significance for the area of operation of technical objects and the citation is the reason for the analysis of the role of information flow in supporting processes.

The range of the empirical data, included in the study, refers to cost information, having impact on the decisions connected with optimization of production supporting processes and, particularly, the maintenance. The analysis has been based on two types of costs generated by the department of maintenance of technical objects of the examined enterprise. The subject of the analysis has been the costs of general overhauls in the plant (Figure 1) and the costs of elimination of breakdowns and their consequences (Figure 2). The empirical data are shown as the percentage for which the base is the maintenance budget. To examine the strength and direction of linear relation between the costs of general overhauls of the plant and the costs of elimination of breakdowns in the examined enterprise, there has been calculated the Pearson correlation coefficient. Pearson correlation coefficient values are in the range of $-1, 1 >$. A strong correlation occurs when the value of the coefficient fluctuates around 1 or -1, a weak correlation occurs when the value of the coefficient moves closer to 0. The sign of the coefficient indicates the direction of relationships between the variables under consideration.

General overhauls are performed once a year and concern the machinery in the whole enterprise. The analysis proves that the costs of general overhaul of the technological line in 2009 amounted to 57% of the general maintenance costs. The decline (by 12%) in expenditure on general overhaul was observed in 2010, compared to 2009.

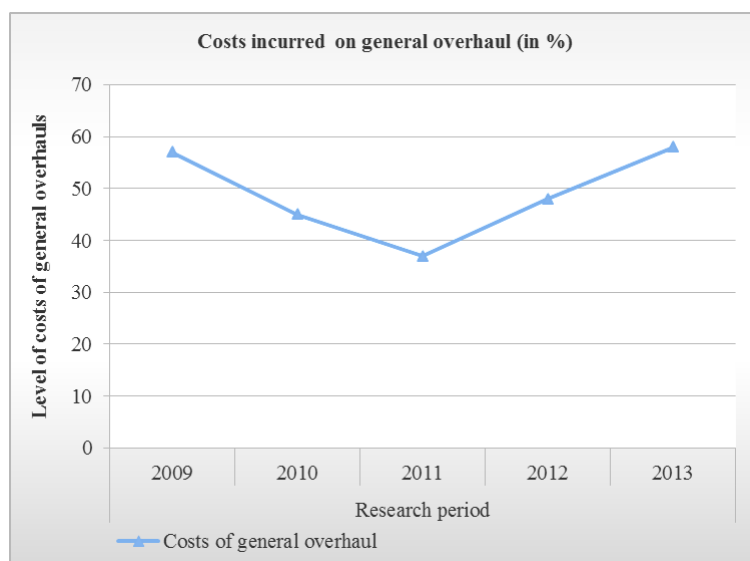


Figure 1. Level of costs of general overhauls

The year 2011 saw further decline in expenditure on the general overhaul of the technological line by another 8% with respect to 2010. In 2012 and 2013, an increase in the contribution of general overhauls was recorded (by 11% and 10%, respectively), reaching, in 2013, the level of expenses comparable to the year 2009. Considering the share of the costs of breakdowns compared to the general costs of maintenance (Figure 2), it should be noted that the share of the costs of breakdowns in the first year of the research period remained at the level of 4% of the general costs of maintaining the machinery. In another year, a noticeable increase was observed in the costs of elimination of consequences of breakdowns by ca. 7% compared to 2009. The year 2011 brought another increase in costs of elimination of consequences of breakdowns by another percentage point. A decrease in the costs of breakdowns with respect to the maintenance costs was observed in 2012 – 2013 (by 6% and 3%, respectively).

The analysis of the level of costs of elimination of consequences of breakdowns (Figure 2) and costs of general overhaul of the technological line (Figure 2) shows that the costs of general overhauls are reversely proportional to the costs of breakdowns.

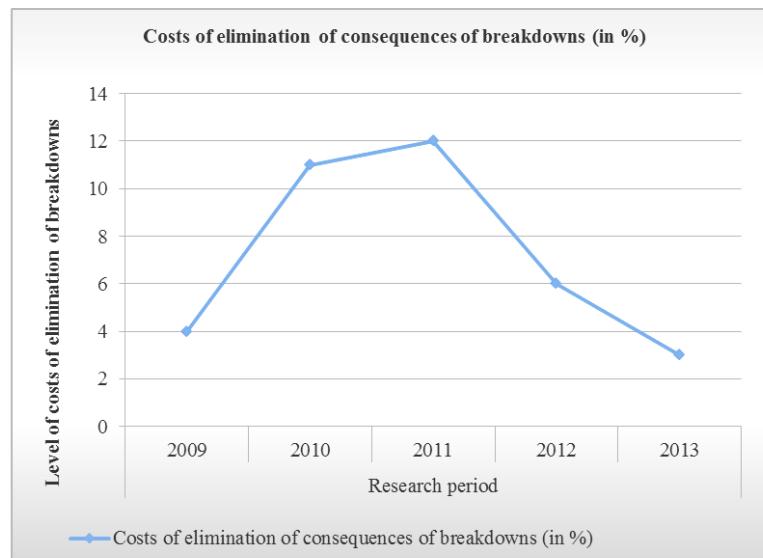


Figure 2. Level of costs in breakdown mode

On the basis of the value of Pearson linear correlation coefficient, calculated for the examined enterprise, it is possible to note strong negative relationship between the level of costs of general overhaul and the level of costs of elimination of consequences of breakdowns. In case of reduction in costs of general overhaul, the costs borne to eliminate breakdowns and their consequences rise. Analogically, when the costs of general overhaul increase, there is a decline in the costs of

breakdowns. The amount of costs of general overhaul at the level of more than 50% of the total costs designed for the maintenance of the examined enterprise annually allows for the minimization of costs connected with the occurrence of breakdowns and elimination of their consequences. This allows for the conclusion that the on-going control of the maintenance costs as well as verification of cost information allows for appropriate managerial decision-making in terms of expenditures on general overhaul of the technological line.

The main aim of maintenance is to reach top effectiveness and reliability of machines, network and installations in production and to reduce time necessary for removing problems with the most important machines and devices. Proper overviews and prognoses should guarantee the continuation of the technological lines and eliminate emergency situations. Each unplanned stoppage of the production line increases the costs of operation. Therefore, one should select proper instruments in order to allow for quantification and verification of the flow of information through the analysis and comparison to the goals.

Summary

The aim of the paper has been to assess the process of decision-making based on the analysis of cost information in production supporting processes. The empirical studies have been conducted on the basis of literature studies and the analysis of the impact of the possessed information on decisions connected with optimization of production supporting processes, with the consideration of the maintenance of the technological line. The subject of the study was two types of costs generated by the maintenance department: the costs of general overhauls in the plant and the costs of elimination of breakdowns and their consequences.

The conducted considerations brought about the verification of cost information, allowing for taking appropriate managerial decisions in the field of expenditures on general overhaul of technical objects of the analyzed enterprise and the assessment of effectiveness of management of information flow. Lack of sufficient cost information on production supporting processes is the main reason for the occurrence of breakdowns in the examined enterprise. Information management process is an important production factor, essential for appropriate organization of modern production supporting processes.

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OCENA PROCESÓW PODEJMOWANIA DECYZJI W ASPEKTCIE ZARZĄDZANIA INFORMACJĄ KOSZTOWĄ

Streszczenie: Celem referatu jest była ocena procesu podejmowania decyzji w oparciu o analizę informacji kosztowych w procesach pomocniczych produkcji w przedsiębiorstwie przemysłu chemicznego. W pierwszej części referatu przedstawiono znaczenie informacji w obszarze zarządzania przedsiębiorstwem. Następnie przybliżono rolę systemu informacyjnego przedsiębiorstwa w aspekcie podejmowania decyzji. Końcowa część referatu jest prezentacją wyników badań empirycznych w obszarze przepływu informacji w procesach pomocniczych produkcji przedsiębiorstwa przemysłu chemicznego. Zastosowaną metodą badawczą są studia literaturowe oraz analiza korelacji liniowej i analiza porównawcza informacji kosztowych procesów pomocniczych produkcji badanego przedsiębiorstwa.

Słowa kluczowe: podejmowanie decyzji, system informacyjny przedsiębiorstwa.

处理信息流根据决策过程生产

摘要：本文的目的是介绍在生产化工行业的企业管理的进程的问题。在本文的第一部分显示的信息中的业务管理领域的重要性。然后，在决策方面更接近角色的企业信息系统。纸张的最后部分是实证研究中在生产化学工业辅助企业的过程中的信息流的区域中的结果的呈现。采用的测试方法是文学研究和生产的企业管理的辅助工序的比较分析

关键词：决策，企业的信息系统