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Research paper



Methodological Approaches to Managing Business Processes in Pharmacies Using Information Technologies

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Abstract

The authors substantiate the need to develop a scientific and methodical approach to modernizing business processes of a pharmacy using information technologies. IK FARM LLC pharmacy has been chosen as a model object of the study. The IDEF0 (Integrated Definition Function Modeling) method adopted as a state standard in the US and recommendations of the State Standard of Russia R 50.1.028-2001 have been used for the analysis, systematization and reorganization of business processes. The article offers methodology for optimizing the pharmacy's activities, which includes the building of two models for managing business processes – before and after modernization (AS-IS and AS-WILL). The structure of the AS-WILL model includes new functions: "Plan the pharmacy's activities" (set the goals and objectives of the organization, plan target sales for the next period) and "Monitor the pharmacy's activities" (control the compliance with the rules of drugs' storage and layout, sanitary regime, and rules of property operation). The complex automation of the pharmacy's trading activities ensures these functions through the Magister software. Estimated efficiency of business processes' modernization based on the net present value has indicated that automation of processes will increase net unreduced profit.

Keywords: *optimization of the pharmacy's management, modernization of business processes, pharmacy's automation.*

1. Introduction

Electronic automation of the pharmacy's activities is now widely used in economically developed countries. In this case, the main efforts are aimed at optimizing the information flow management, inter alia, through the use of modern software.

The results of the local practice analysis indicate that most of the Russian pharmacies have some difficulties in choosing the efficient information technologies (IT) [1]. The introduction of electronic business systems in Russia is currently based not on scientific analysis and application of the modern achievements in management, but mainly on intuition and experience [2]. This necessitates to form scientific approaches to the IT modernization of business processes.

The goal of this study is to develop methodical foundation of managing business processes of a pharmacy using IT.

2. Materials and Methods

To determine the **object of the study**, a pilot sociological survey of 32 heads of Moscow pharmacies with various forms of incorporation was conducted. As a result, the authors chose the IK FARM LLC pharmacy with the following distinguishing features: readiness to modernize management activities, ability to raise external investments for the IT introduction, easily trained personnel, as well as an unorganized system for managing major processes.

Our SWOT analysis of the external and internal environment of the IK FARM LLC activities allowed to identify the need to modernize business processes using the modern IT.

The IDEF0 (Integrated Definition Function Modeling) method adopted as a state standard in the US and recommendations of the State Standard of Russia R 50.1.028-2001 were used for the detailed analysis of the pharmacy's activities [3]. This standard allowed for an "information cut", where business processes had been represented as system elements that interacted with each other, exchanging information and material flows. IDEF0 was used for functional description of the pharmacy's business processes. CASE (Computer-Aided Software/System Engineering) tool ERwin Process Modeler r7.3 from Computer Associates was chosen as the tool for analysis [4].

The net present value (NPV) was used to evaluate the efficiency of modernizing the pharmacy's processes. This is a standard method, which is widely used in the investment, financial, and analytical practice and allows to evaluate the investment efficiency, taking the different cost of money at the present time into account.

NPV is the difference between all the cash inflows and outflows that are reduced to the current time (the time of the investment project evaluation).

$$NPV = \sum_{t=0}^{N} \frac{CF_t}{(1+i)^t} = -IC + \sum_{t=1}^{N} \frac{CF_t}{(1+i)^t} \quad (1)$$

where CF (Cash Flow) is the cash flow; CF_t is the payment in t years (t=1, …, N); IC (Invested Capital) is the initial capital of $IC = -CF_0$; i is the discount rate.

3. Results and discussion

For efficient modernization of business processes, the authors have developed methodological foundations of the business process management system for a pharmacy, which consist of 3 interrelated stages:

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1. Building the AS-IS model using the IDEF0 standard. The model reflects business processes of a pharmacy before modernization (at present).
2. Building the AS-WILL model using the IDEF0 standard. The AS-WILL model is a "perfect" model of business processes implemented after systematization and modernization.
3. Estimating the efficiency of business processes' modernization by the NPV.

At the first stage, the AS-IS model of managing the processes was built based on the functional analysis of the IK FARM LLC pharmacy's activity.

The "first information cut" was made using the IDEF0 methodology, where a business process "Manage the pharmacy's activities" was presented as a set of elements interacting with each other through human resources and other factors.

When building the chart of the pharmacy's functions, special attention was paid to improving the efficiency of certain business processes in the "Manage the pharmacy's activities" block (Figure 1).

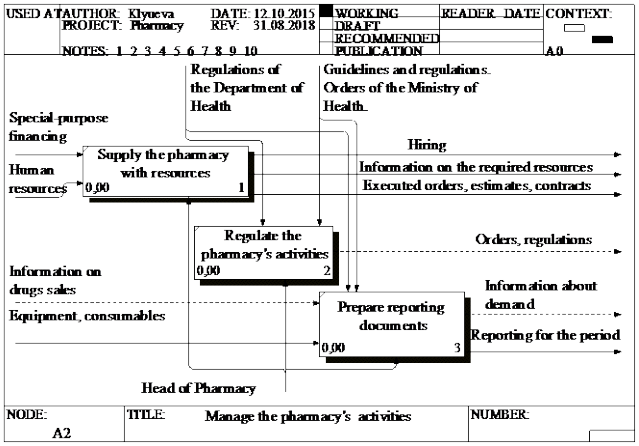


Fig. 1: Chart of functions in the "Manage the pharmacy's activity" block of business processes in the AS-IS model of pharmacy

As can be seen from Figure 1, this block includes information on supplying the pharmacy with resources, regulating this activity, and compiling the reporting documents.

Inflows in this block are financing, human resources, consumables, etc.

The Head of Pharmacy is responsible for organizational and managerial functions associated with the provision of regulations, hiring professionally trained personnel, and the provision of pharmacy with the appropriate technical equipment.

The built AS-IS model of the IK FARM LLC pharmacy gives an idea of the lack of mandatory processes for efficient management, such as "Plan the pharmacy's activities" and "Monitor the pharmacy's activities."

At the second stage, the method of functional and informative description was used to redesign business processes and build a "perfect" AS-WILL model, which resulted in the following:

- previously allocated business processes and their interrelationships were decomposed;
- more efficient business processes were identified and defined;
- data and information flows, control actions, and executors of new business processes were defined;
- functional and informative description of business processes in the pharmacy was provided using the IDEF0 method; and
- interaction of management structures was modeled.

New functions were introduced into the structure of the "perfect" model: "Plan the pharmacy's activities" (such as defining goals and objectives of the organization and planning sales for the next period) and "Monitor the pharmacy's activities" (controlling compliance with the rules for drugs' storage and layout, sanitary regime, and rules of property operation). The relationship between the modernized functions is shown in the chart of the business process "Manage the pharmacy's activities" in the AS-WILL model of pharmacy (Figure 2).

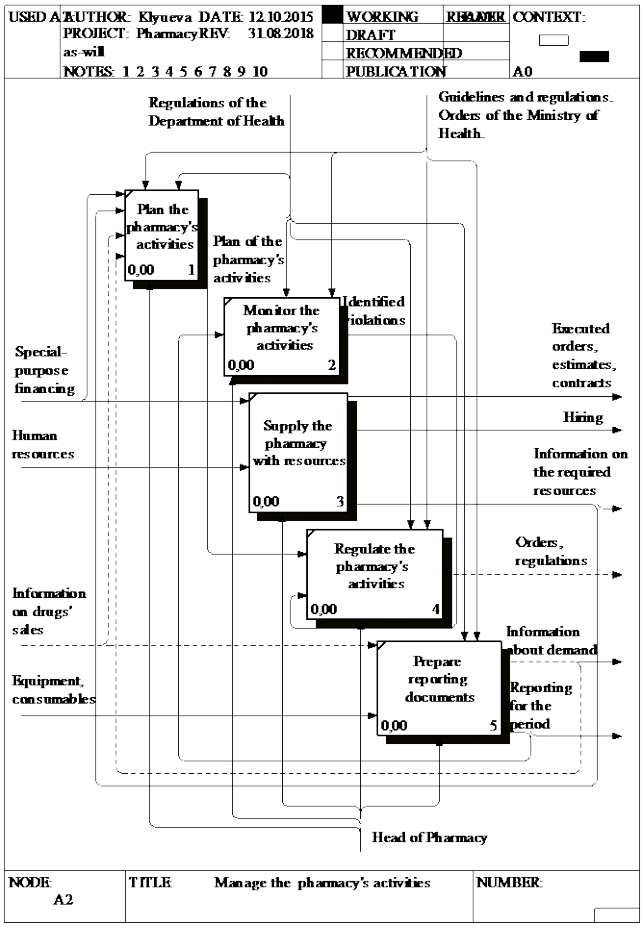


Fig. 2: Chart of functions in the "Manage the pharmacy's activities" block of business processes in the AS-WILL model of pharmacy

This model assumes an increase in the time required to plan and control the pharmacy's activities performed by the head. The introduction of information technologies in a pharmacy allows to speed up and simplify processes without going beyond the working time. The complex automation of the pharmacy's trading activities is ensured through the *Magister* software package to perform the control and planning functions.

This system includes the following blocks: "pharmacy", "first desk", "application", "order", "settlements with a supplier", "information desk", "statistics", and "1C". The statistical data block is used to plan the pharmacy's activities (profitability, margin, volume of sales, average check value, number of customers and load per one cash desk, time for servicing one buyer, and intensity of customer flow), which the software forms by months, weeks or days. Control over the pharmacy's activities allows to implement an information block of the software that includes data on the current balances of goods, revenue by cash registers, number of issued receipts, and the average check value.

Magister automatically exchanges information with the 1C accounting software, thus forming a comprehensive system for automating business processes.

The NPV was calculated **at the third stage** of the method to evaluate the efficiency of a long-term investment project for the installation of the *Magister* software.

The discount rate was found using the cumulative method and the following formula [5]:

$$i = BR + Rc + Ri + Ril, \quad (2)$$

where i was the discount rate; BR was the base rate of the Central Bank established for state loan bonds; Rc was the risk defined for the given country; Ri was the risk that was inherent in activities for this industry (manufacture, trade, services); and Ril was the risk of possible illiquidity (low cost) of the future project.

The discount rate was defined using the data from the Central Bank website and the calculation for investment according to the special literature [5]. The following risk values were defined:

- base rate of the Central Bank (as of 01.02.18) – 7.75%;
- risk of investment in Russia – 7%;
- risk inherent in operation within this industry and associated with the source of financing and the structure of assets – 3%; and
- risk of possible illiquidity (forecast errors) – 2%.

As such, the total discount rate (i) would amount to 19.75%.

Increase in the discount value reduced the projected cash inflow.

The authors used Microsoft Excel to calculate the NPV indicator for the introduction of Magister, an automated management system. A table was prepared for this purpose, where the data used cash flows in the period from February 1, 2018 to January 31, 2022 (Table 1). The table was based on information about the initial investment (*IC*) and the total flow of payments over the year (*CF*).

Initial investment (*IC*) included the cost of the *Magister* licensed software, its installation and payment for technical support for one year. According to the developer, the price of the software for two workplaces was 58,000 rubles.

The total flow of payments over the year (*CF*) was obtained through finding the difference between the net profit from the introduction of the *Magister* software and the annual costs for its maintenance and update.

The annual costs for the software update and telephone consultations were 19,200 rubles, technical support was 15,600 rubles. In total, the annual costs were 34,800 rubles.

The net profit of pharmacies that introduced ERP software grew by 30% on average, according to local developers and providers of ERP systems. This was due to an increase in turnover (15%) and a decrease in costs (15%) [6]. As such, if the net profit of the IK FARM LLC pharmacy under study was 360,000 rubles per year, the process automation would have increased it by 108,000 rubles.

The total flow of payments over the year was equal to the difference between the net profit from the software use and the annual costs: 108,000–34,800 = 73,200 rubles.

Table 1: Calculation of NPV for investment in installing the *Magister* software at the IK FARM LLC pharmacy for 3 years

Year	Total flow of payments over the year (CF), rubles	Discounted NPV over the year, rubles	Initial investment (IC), rubles	NPV total, rubles
1	73,200	61,127.34	58,000	96,800.12
2	73,200	51,045.80		
3	73,200	42,626.98		

$$NPV = -IC + \frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \frac{CF_2}{(1+i)^3} =$$

$$= -5800 + \frac{73200}{(1+0.1975)^1} + \frac{73200}{(1+0.1975)^2} + \frac{73200}{(1+0.1975)^3} =$$

$$= 96{,}800.12 \ \textit{rubles}.$$

Since the NPV value obtained in this case was greater than 0, the investment in installing the *Magister* software was recognized as cost-effective. As such, the return on investing in the software purchase and support was justified.

4. Conclusion

The study defines and explores management functions in a pharmacy and develops the "perfect" model that includes new functions: "Plan the pharmacy's activities" and "Monitor the pharmacy's activities." It is shown that the use of the automated control system is cost-effective for introduction in pharmacies.

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