Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of System Engineering

Bachelor Thesis

Analysis of processes in a selected company

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Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Daniil Snihyr, BA

Business Administration

Thesis title

Analysis of processes in a selected company

Objectives of thesis

The goal of the research in the bachelor's thesis is to analyze business processes in an organization and develop recommendations for their improvement.
I would also like to determine additional goals that will be solved in the process:
- to investigate the main directions of optimization of the company's business processes;
- to analyze the company's business processes;
- to develop recommendations for optimizing the company's business processes.

Methodology

Methodology for writing the bachelor's thesis.

1) At the beginning of my work I will state the purpose of my work and methodology.

2) Then an introduction to the topic will be given

3) The next stage will be the theoretical part – work with scientific literature.

In the first chapter, the general principles of the process approach in the organization's activities will be briefly described, and the specifics of the formation of business processes will also be determined. In addition, methods of automating business processes, as well as the impact of information technology in informatization will be considered.

A special feature of the research of the bachelor's thesis is the information system of information and technical support for employees of LLC LISTIFY. First, a description of the activities of LLC LISTIFY will be given, and its organizational structure will be presented. Next, we will describe the existing business process for processing applications and identify its shortcomings. The model of the automated business process of processing applications is developed and the requirements for the designed information system by types of support are formulated.

The implementation of the principles of business process automation is considered in the research of such scientists as Yvonne Antonucci, Marlon Dumas, David Fred, Michael Rosemann, Raja Krishnamoorthi.

The proposed extent of the thesis

30 – 40 stran

Keywords

Process Management, business process, process analysis, process redesign

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Recommended information sources

ANTONUCCI, Yvonne. (2015). Business Process Management Curriculum. In J. vom Brocke & M. Rosemann (Eds.), Handbook on Business Process Management II (pp. 547-572). Springer Berlin Heidelberg.

DUMAS, Marlon, Marsello LA ROSA, Jan MENDLING and H. A. REIJERS. Fundamentals of business process management. Second edition. Berlin: Springer, 2018. xxxii, 527. ISBN 9783662565087.

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KRISHNAMOORTHI, Raja. A First Course in Quality Engineering: Integrating Statistical and Management Methods to Quality. Third edition. Boca Raton: Taylor & Francis, CRC Press, 2018. ISBN 978-1-4987-6420-9.

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Declaration

I declare that I have worked on my bachelor thesis titled "Analysis of processes in a selected company" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 15.03.2023　　　　　　　　_____

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I would like to thank Ing. Petr Burdych. and all other persons, for their advice and support during my work on this thesis.

Analysis of processes in a selected company

Abstract:

The document discusses the development of an information system for LISTIFY's Technical Support Department to record and process maintenance requests. The system is designed to eliminate existing shortcomings in the recording process and increase the speed and quality of processing requests, as well as to make the work of company employees more transparent. The proposed technology involves exchanging graphical material, monitoring the status of requests, viewing information about the status of the computer and the software installed on it, and changing login and password settings.

The document includes data flow diagrams for the "Preparing the employee's workplace" operation, the "Creating a maintenance request" process, and the "Processing of a request" process according to the proposed technology. Technical support staff can access current information about the status of the computer and software of the user who sent the request, and the system provides current information on the status of the company's technical equipment storage. The developed software product is affordable and easy to use, and the economic assessment concluded that the development is economically feasible.

The report also includes an evaluation of the changed business process and the proposed technology for recording maintenance requests in the Technical Support Department of Listify. Data flow diagrams were used to illustrate the changes in the processes, including the preparation of the employee workplace, the creation of maintenance requests, and the processing of requests.

Keywords: Process Management, business process, process analysis, process redesign

Analýza procesů ve vybrané společnosti

Abstrakt:

Dokument pojednává o vývoji informačního systému pro Oddělení technické podpory společnosti LISTIFY k záznamu a zpracování požadavků na údržbu. Systém je navržen k eliminaci stávajících nedostatků v procesu záznamu a zvýšení rychlosti a kvality zpracování požadavků a také k zefektivnění práce zaměstnanců společnosti. Navrhovaná technologie zahrnuje výměnu grafického materiálu, sledování stavu požadavků, zobrazení informací o stavu počítače a instalovaném softwaru a změnu nastavení přihlašování a hesel.

V dokumentu jsou uvedeny data flow diagramy pro operaci "Příprava pracovního místa zaměstnance", proces "Vytváření požadavku na údržbu" a proces "Zpracování požadavku" podle navrhované technologie. Zaměstnanci technické podpory mohou získat aktuální informace o stavu počítače a softwaru uživatele, který odeslal požadavek, a systém poskytuje aktuální informace o stavu skladování technického vybavení společnosti. Vyvinutý softwarový produkt je cenově dostupný a snadno použitelný, a ekonomické posouzení dospělo k závěru, že vývoj je ekonomicky proveditelný.

Zpráva také zahrnuje hodnocení změněného obchodního procesu a navrhované technologie pro zaznamenávání požadavků na údržbu v Oddělení technické podpory společnosti Listify. Data flow diagramy byly použity k ilustraci změn v procesech, včetně přípravy pracovního místa zaměstnance, vytváření požadavků na údržbu a zpracování požadavků.

Klíčová slova: Správa procesů, obchodní proces, analýza procesu, přepracování procesu.

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 IT (Information Technology)

ERP (Enterprise Resource Planning)

BPMN (Business Process Modeling Notation)

CPN (Color Petri Nets)

LLC (Limited Liability Company)

1 Introduction

Business process analysis is very widespread today and is carried out in every organization that wants to improve the efficiency of its work. Well-done optimization or reengineering of business processes helps organizations to solve all kinds of problems that are urgent for them.

As a part of this thesis, I am going to analyze the business process in a particular company and, if possible, suggest ways to improve it. In my opinion, the optimization of business processes in the modern world goes, first of all, in the direction of information technology. It is in this segment that my future bachelor's thesis will be analyzed. Information technology is the main tool for creating competitive advantages, it allows you to manage projects, efficiency and risks. Any company striving for growth and a strong position in the market tries to introduce information technologies and create its own information system. The concept of an information system is closely related to business processes.

A special feature of the research of the bachelor's thesis is the information system of information and technical support for employees of LLC LISTIFY. First, a description of the activities of LLC LISTIFY will be given, and its organizational structure will be presented. Next, we will describe the existing business process for processing applications and identify its shortcomings. The model of the automated business process of processing applications is developed and the requirements for the designed information system by types of support are formulated.

Today, it seems that companies have to be ready to quickly adapt to the ongoing changes in the markets in the context of the dynamics of the modern world, to innovate, introduce new technologies and approaches in their work, and compete with other companies. In this case, it is necessary to complement the functional approach to considering the company with a process approach.

Almost every organisation has employees who have high professional skills and broad knowledge in their subject area, but who have difficulties in mastering and using computer hardware and software. This is a serious disadvantage in IT companies, as an

employee's untimely completion of a task (due to errors in code or a query) can prolong project deadlines.

A high level of automation of business processes in the company leads to more effective support for the activities of employees and managers, maintains the elements of the technological chain at the required level of reliability, and increases the productivity of business processes.

The purpose of the research in the bachelor's thesis is to analyze business processes in an organization and develop recommendations for their improvement.

I would also like to determine additional goals that will be solved in the process:

- to investigate the main directions of optimization of the company's business processes;

- to analyze the company's business processes;

- to develop recommendations for optimizing the company's business processes.

In the first chapter, the general principles of the process approach in the organization's activities will be briefly described, and the specifics of the formation of business processes will also be determined. In addition, methods of automating business processes, as well as the impact of information technology in informatization will be considered.

In the practical part, the first step will be a description of the organization's activities. Further, the analysis of the selected business processes will be carried out and their weak points will be identified. Based on the analysis, I will try to give possible directions for automating business processes.The implementation of the principles of business process automation is considered in the research of such scientists as Yvonne Antonucci, Marlon Dumas, David Fred, Michael Rosemann, Raja Krishnamoorthi.

2 Objectives and Methodology

2.1. Objectives

The objective of this study is to propose and evaluate a new information system for the

Technical Support Department of LISTIFY that will automate and optimize the process of handling maintenance requests for computer and software issues.

2.2 Methodology

The study used a combination of qualitative and quantitative research methods. The initial stage involved analyzing the existing system and identifying its weaknesses and limitations. This was followed by proposing a new information system that addressed these weaknesses and limitations. The proposed system was evaluated using a data flow diagram and decomposition of key processes. The economic feasibility of the proposed system was also assessed. The research also involved conducting a review of relevant literature to identify best practices in information system design and implementation. Interviews and surveys were conducted with key stakeholders, including technical support staff and end-users, to gather their feedback and insights on the proposed system. The results of these analyses were used to refine the proposed system and ensure that it met the needs of all stakeholders.

1 Business process

A process is a 'core' element of the process environment. Some technical definitions explaining the concept of a business process are given below. Each of them highlights different aspects of business process, but some common features of processes can be seen.

1.1 Process definition

A process is an action that is carried out in a particular order to achieve a desired result. Most fully, a process is defined as a complete sequence of connected activities that transform inputs into outputs. Each individual process must have a supplier and a consumer.

A business process is usually defined as an objectively logical sequence of activities aimed at achieving a desired goal under objectively given conditions.[1]

A process is a series of logically connected activities or tasks carried out sequentially to produce a predetermined set of results.[2]

This process consists of a number of individual activities that are carried out both manually and automatically using IT resources. Each type of activity is carried out according to the conditions and rules of its assignment. These activities, together with the rules for their performance, form the basis for managing an interconnected and interdependent chain of workflow activities.[3]

A process is a set of interlinked or interacting activities that transform inputs into outputs. (ISO_9000:2000)

Organisations have business processes that are part of process management. These processes are used by many companies. They are a sequence of activities that interact with each other to create a flow of work that moves from one person to another and thus creates value. Each process has inputs and outputs. In between these steps it consumes resources.[4]

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[1] ŘEPA, Václav. Procesně řízená organizace. Praha: Grada Publishing, a.s., 2012. ISBN 978-80-247-4128-4.
[2] SVOZILOVÁ, Alena. Zlepšování podnikových procesů. Praha: Grada Publishing, a.s., 2011. ISBN 978-80-247-3938-0.
[3] CARDA, Antonín a Renáta KUNSTOVÁ. Workflow: Nástroj manažera pro řízení podnikových procesů. Praha: Grada Publishing, a.s., 2003. ISBN 80-247- 0666-0.
[4] FIŠER, Roman. Procesní řízení pro manažery: jak zařídit, aby lidé věděli, chtěli, uměli i mohli. Praha: Grada, 2014. Manažer. ISBN 9788024750385.

The traditional approach to managing an organisation is to view it as a set of different units. At the same time, it is correct to view the enterprise as a set of business processes. The reasons for this are:

- each process has a consumer, and focusing on each process leads to the best possible customer satisfaction;

- value creation in relation to the final product;

- setting the boundaries of the process under study will ensure better interaction and understanding of customer demands and requirements that need to be met;

- by assigning process owners/responsibles, it is possible to avoid the fragmentation of responsibility, which often occurs in specialised enterprises;

- proper process management enables a favourable time management environment to be created.[5]

Further, the concept of a business process should be considered. A business process is an action that receives one or more resources as input, which is handled according to rules by company staff, computers or other tools, resulting in an output that creates the product that the consumer needs. Business processes help to make a business run more efficiently because they focus on the needs of consumers. This is why it is important to raise the importance of the business process as much as possible in order to connect its many functions with it.

1.2 Types of processes

All work is considered as a specific set of processes (each consisting of one or more simple operations). To formalise and standardise this approach, the following process categories are accepted (classification occurs in relation to the added value of the product):

- management - those who set goals and objectives for units and specific performers. They are marked last in the organisation, because they are carried out by senior management and therefore do not bring profit to the company. An example of a managing, sometimes also leading, process is planning or strategy development.

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[5] GARDNER, Robert. The process-focused organization: a transition strategy for success. Milwaukee, Wis.: ASQ Quality Press, 2004. ISBN 0873896270.

- operational – those through which the enterprise generates income: production, marketing, supplies. The company earns money from the client for the result. The firm refers to this income as operating profit. Operational processes are the reason for existence of every business, although they vary greatly depending on the sector or industry. For example, a bank provides financial services to its clients, whereas the purpose of a doctor is to provide medical aid. Operational processes also include all processes involved in handling customer requirements - business processes, customer service or communication with customers, especially in organisations in the service sector.[6]

- supporting – those that provide production with resources but do not add value to the final product: training and recruitment of personnel, financial support, legal protection, etc. Supporting business processes should be considered human resource management, technical service and support, accounting, administration and business activities.[7]

In addition to the previously mentioned independence from the human factor and the simplified adaptation of new employees, the description of business processes makes it possible to manage the firm's operating expenses more efficiently.

Classification of business processes: [8]

1) By performing the role:

Functional - directly forming the content of the business system and performing its functions:

- market and buyer awareness;

- mission and strategy development;

- product and service development;

- promotion and sales;

- products and services production;

- invoicing.

Structural - aimed at maintaining and developing the infrastructure of the business system to ensure its existence:

- development and management;

[6] GARDNER, Robert. The process-focused organization: a transition strategy for success. Milwaukee, Wis.: ASQ Quality Press, 2004. ISBN 0873896270.
[7] JESTON, John. Business Process Management: Practical Guidelines to Successful Implementations 4th Edition. Publisher: Routledge. 2018. ISBN 978-1138738409
[8] PANAGACOS, Theodore. The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Publisher: CreateSpace Independent Publishing Platform. 2012. ISBN 978-1477486139

- information management;

- financial and physical resource management;

- implementation of programme-based environmental impact management;

- external resource management;

- organisational development management.

3) On the response boundaries:

External - a process that has an input or output outside the organisation.

Internal - inputs and outputs that are entirely within the organisation.

2 Process analysis

The efficiency of the company's activities directly depends on the level of enterprise management. Business process analysis is considered to be the basis of productive control. Based on the results of the study, the strengths and weaknesses of the company are identified, and decisions are made to eliminate shortcomings.[9]

2.1 Using process analysis

Business process analysis is a set of methods and techniques aimed at collecting and systematizing information about the company, during which the advantages and disadvantages of the company are uncovered.

The main objective of the study is to control the activities of the enterprise, as well as increase the efficiency of its business and competitiveness.

Business process analysis is usually carried out regularly, once a year. However, if there are errors in the activities of the firm, the implementation of the study will be required outside the plan. An assessment may be needed in the following cases:[10]

• The company makes large expenditures on production, storage and transportation, as well as on the introduction of new processes.

[9] ŠMIDA, Filip. Zavádění a rozvoj procesního řízení ve firmě. Praha: Grada, 2007. ISBN 9788024716794.
[10] ŘEPA, Václav. Procesně řízená organizace. Praha: Grada, 2012. ISBN 9788024741284.

• Relatively short period of product creation and long delivery of goods to the end consumer.

• Violation of contractual terms.

• Large assortment of goods, violation of the ratio of output types of products.

• Decreased quality of manufactured goods.

• Increase in the cost of production.

• Growth of time costs.

• Other factors indicating the need for a study.

During the analysis of business processes, analysts examine the financial statements and internal documentation of the company, study the production process, identify the real profitability and level of costs from the implementation of business processes. After the assessment is completed, a plan is developed containing ways to improve the efficiency of ongoing business processes.[11]

• **Quantitative analysis consists in evaluating the indicators of business processes.** The analysis is carried out by grouping existing factors into 3 large groups**:[12]**

• Structural - indicators reflecting the scheme of the process itself.

• Relative, calculated in relation to the business process product.

• Coefficient - values showing the quality of products and the level of customer satisfaction.

The first group of indicators is found by dividing some results of the activities of the enterprise by others, for example, profit by total income.

Relative factors are also determined by finding the ratio. Only in this case, not the results of the work, but the processes are divided. For example, the volume of products produced by the number of hours spent on its manufacture.

The coefficients are found using special economic formulas. In total, more than 200 different indicators can be examined during the analysis of the company. Often, values are determined that characterize:

• execution time of one or another option;

• process technology used in the course of the company's work, equipment, software;

[11] ŘEPA, Václav. Procesně řízená organizace. Praha: Grada, 2012. ISBN 9788024741284.
[12] GRASSEOVÁ, Monika a kol. Procesní řízení ve veřejném i soukromém sektoru. Brno: ComputerPress, 2008. ISBN 978-80-251-1987-7.

• the cost of the implementation of the process, which is found by calculating the costs;

• quality of the object of labor;

• the end result of the firm's activities.

It is worth noting that the final value of the company's work is understood as its profitability, profitability and liquidity. It is these indicators that are primarily in the quantitative analysis. This type of research allows not only to visually assess the activities of the enterprise, but also to present business processes in the form of mathematical values.[13]

2.2 Procedure for process analysis

Qualitative analysis of business processes can be carried out by one or more methods. In practice, the following methods are distinguished:

• SWOT-study;

• schematic representation of problems;

• distribution and evaluation of business processes;

• assessment of compliance of actual indicators with standards or plan;

• identification of problems based on the visualization of business processes.

A **SWOT study** is a type of qualitative business process analysis that identifies strengths and weaknesses, as well as potential opportunities and existing threats. The evaluation is carried out in four stages:

1. A survey of employees of the enterprise, members of the management and administration is carried out.

2. Poll results are being processed. Strengths and weaknesses of business processes, hidden and unused opportunities, as well as existing threats are identified.

3. At the next stage, a SWOT table is built and divided into 4 parts.

4. The final stage is related to the evaluation of the results and the development of recommendations to increase the efficiency of business processes.

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[13] GRASSEOVÁ, Monika a kol. Procesní řízení ve veřejném i soukromém sektoru. Brno: ComputerPress, 2008. ISBN 978-80-251-1987-7.

Table 1 - SWOT table

Strengths	Weaknesses
Company Opportunities	Threats to the company's activities

SWOT-research is one of the simplest methods of qualitative analysis of the company's activities and is used in conjunction with other techniques.

Problem Mapping

Problem mapping is the primary analysis of business processes. In retrospect, the company should conduct a deeper study based on the built structure of functions, performers and main shortcomings.

Distribution and evaluation of business processes

The distribution and evaluation of business processes is the ranking of activities in terms of importance and effectiveness. Based on this analysis, you can understand which operations need to be improved right now, and which options can be improved until later. Usually, analysis based on the distribution and evaluation of business processes is implemented at the stage of planning the company's activities.

Study for compliance with standardization indicators

The study for compliance with standardization indicators is a complex and multifaceted analysis, which includes:

• collection of basic information through questionnaires;

• grouping of company functions;

• classification of management functions;

• detection of deviations;

• development of proposals to eliminate shortcomings.[14]

At the first stage, a questionnaire is created that helps to identify the correspondence between the actual values of the indicators and the standardized or planned values.

Next, it is important to define the functions of planning, analyzing and improving business processes. For clarity, a table can be drawn up.

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[14] GRASSEOVÁ, Monika a kol. Procesní řízení ve veřejném i soukromém sektoru. Brno: ComputerPress, 2008. ISBN 978-80-251-1987-7.

It is also necessary to evaluate the management functions of such groups as planning, performing work, accounting, monitoring activities and making administrative decisions. The analysis reveals which indicators do not meet accepted standards or a previously developed plan. If necessary, proposals are developed to improve the productivity of business processes.

Visualization of business processes and identification of problems

Visualization of business processes is the drawing up of a workflow diagram and the functions performed by the company. To conduct a reliable assessment, the analyst must have high knowledge in the implementation of the object under study. For example, if paper turnover is being evaluated, the researcher must know which papers enter and exit at each stage of the process.[15]

3 Process modeling

The success of a company in the market is determined by its ability to isolate business processes and organize their execution with the least amount of time and resources.

Documenting the activities of the organization should be done in a clear and understandable format that highlights and organizes important information and excludes details that are not essential for understanding the big picture. Action and business process models allow you to achieve your goal, both through their syntax and through strict formalized rules for their construction.

3.1 Process modeling methods

Business process modeling is one of the methods to improve the quality and efficiency of the organization. This method is based on the description of the process through various elements (actions, data, events, materials, etc.) inherent in the process. As a rule, business process modeling describes the logical relationship of all process elements

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[15] ŘEPA, Václav. Procesně řízená organizace. Praha: Grada, 2012. ISBN 9788024741284.

from its inception to completion within an organization. In more complex situations, modeling may involve processes or systems external to the organization.

Business process modeling allows you to understand the work and analyze the organization. This is achieved due to the fact that models can be compiled for various aspects and levels of management. In large organizations, business process modeling is more detailed and multifaceted than in small ones, which is associated with a large number of cross-functional relationships.[16]

Goals of business modeling:

• Through simulation, you can monitor processes from start to finish. Modeling allows you to get an "outside" view of the processes and identify improvements that will increase their efficiency.

• Rationing of processes. Business process modeling sets the rules for the execution of processes, i.e. how they should be done.

• Business process modeling establishes a clear relationship between processes and the requirements they must fulfill.

ARIS (an acronym for Architecture of Integrated Information Systems) is a methodology and replicable software product for modeling business processes of organizations. The product and methodology are owned by the German company Software AG as a result of the takeover of IDS Scheer by the author of the methodology, August-Wilhelm Scheer.

The implementation of the methodology is supposed to involve a specialized software product that provides joint work on descriptions and diagrams.[17]

The ARIS product is used in various projects for reengineering and optimization of business processes, IT projects such as the implementation and operation of ERP systems, in particular, there is a well-developed integration solution for SAP R / 3.

One of the illustrations of the ARIS structured approach to a reengineering project.

[16] HUČKA, Miroslav. Modely podnikových procesů. V Praze: C.H. Beck, 2017. ISBN 978-80 - 7400-468 -1.
[17] ŠIMONOVÁ, Stanislava. Modelování procesů a dat pro zvyšování kvality. Pardubice: Univerzita Pardubice, Fakulta ekonomicko-správní, 2009. ISBN 9788073952051.
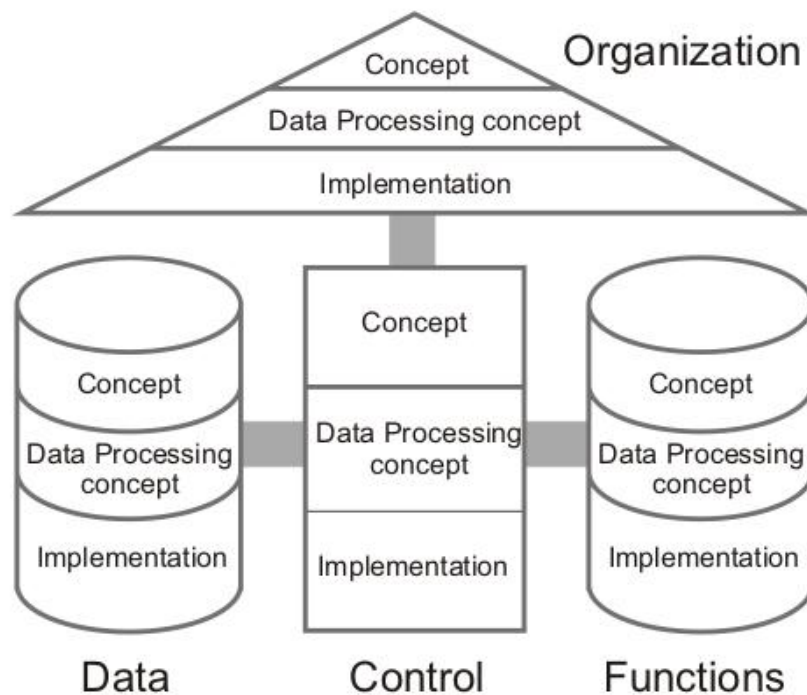
Figure 1-ARIS structured approach to a reengineering project

ARIS software forms the basis of Oracle's Business Process Analysis Suite. Technically, the ARIS toolkit is quite simple to learn and has an intuitive interface. Models are copied and pasted into document files (for example, Microsoft Word format) as pictures.

ARIS products provide the ability to create scenarios for automating the compilation of various analytical reports, regulatory documents, and new models. Each script is a subroutine that runs in ARIS Business Architect (or Toolset - earlier version) or directly on the ARIS server. Scripts are written in a special programming language - SAX Basic. For the automated generation of a particular report in ARIS, scripts operate on data from the model database, isolating specific objects and models from it.[18]

BPMN (business process modeling notation (BPMN 2.0))

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[18] ŠIMONOVÁ, Stanislava. Modelování procesů a dat pro zvyšování kvality. Pardubice: Univerzita Pardubice, Fakulta ekonomicko-správní, 2009. ISBN 9788073952051.
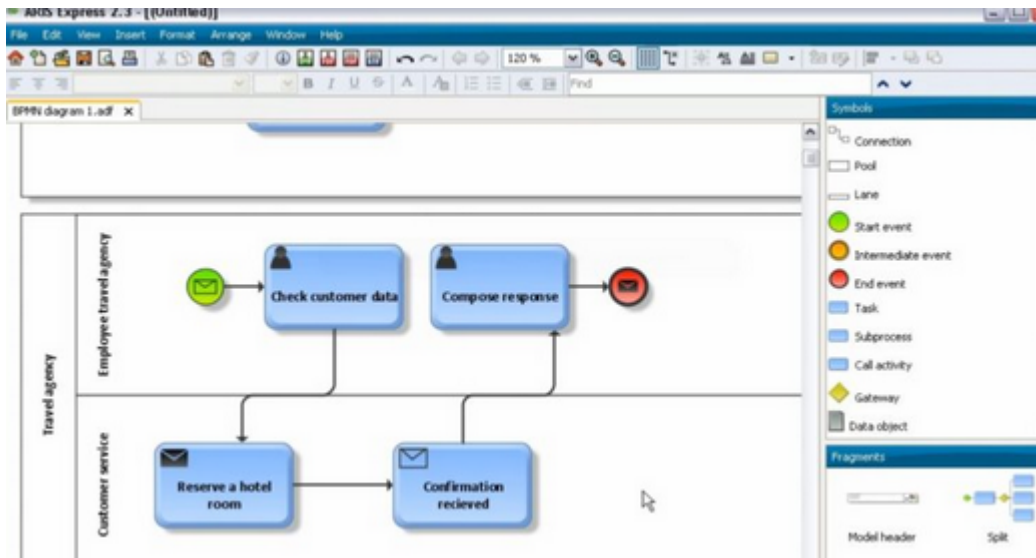
Figure 2-Business process modeling notation

Source: own elaboration

The BPMN notation describes the conventions for displaying business processes in the form of business process diagrams. BPMN is aimed at both technical professionals and business users. To do this, the language uses a basic set of intuitive elements that allow you to define complex semantic constructs. In addition, the BPMN specification defines how diagrams describing a business process can be transformed into executable models in the BPEL language. The BPMN 2.0 specification is also executable and portable (that is, a process drawn in one editor from one manufacturer can be executed on a business process engine from a completely different manufacturer, provided that they support BPMN 2.0).

3.2 Process modelling standards

The concept of "business process modeling" came into the life of most analysts simultaneously with the appearance on the market of complex software products designed for complex automation of enterprise management. Such systems always imply a deep pre-project survey of the company's activities. The result of this survey is an expert opinion, in which recommendations are made in separate paragraphs to eliminate "bottlenecks" in the management of activities. Based on this conclusion, immediately before the implementation of the automation system, the so-called reorganization of business processes is carried out, sometimes quite serious and painful for the company. This is, of course, a team that has developed over the years is always difficult to make "think in a new

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way." Such comprehensive surveys of enterprises are always complex and differ significantly from case to case. There are well-established methodologies and standards for solving such problems of modeling complex systems.[19] These standards include the IDEF family of methodologies. With their help, you can effectively display and analyze the activity models of a wide range of complex systems in various sections. At the same time, the breadth and depth of the examination of processes in the system is determined by the developer himself, which allows not overloading the created model with unnecessary data. Currently, the following standards can be attributed to the IDEF family:

• IDEF0 - functional modeling methodology. With the help of a visual graphical language IDEF0, the system under study appears to developers and analysts as a set of interrelated functions (functional blocks - in terms of IDEF0). Typically, IDEF0 modeling is the first step in learning any system;

• IDEF1 – a methodology for modeling information flows within a system that allows displaying and analyzing their structure and relationships;

• IDEF1X (IDEF1 Extended) – a methodology for building relational structures. IDEF1X belongs to the type of Entity-Relationship (ER) methodologies and is usually used to model relational databases relevant to the system under consideration;

• IDEF2 - methodology for dynamic modeling of systems evolution. In connection with the very serious difficulties in the analysis of dynamical systems, this standard was practically abandoned, and its development was suspended at the very initial stage. However, at present there are algorithms and their computer implementations that allow turning a set of IDEF0 static diagrams into dynamic models built on the basis of "colored Petri nets" (CPN – Color Petri Nets);

• IDEF3 is a methodology for documenting the processes occurring in the system, which is used, for example, in the study of technological processes in enterprises. IDEF3 describes the scenario and sequence of operations for each process. IDEF3 has a direct relationship with the IDEF0 methodology - each function (functional block) can be represented as a separate process using IDEF3 tools;

• IDEF4 - methodology for building object-oriented systems. IDEF4 tools allow you to visually display the structure of objects and the underlying principles of their

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[19] HUČKA, Miroslav. Modely podnikových procesů. V Praze: C.H. Beck, 2017. ISBN 978-80 - 7400-468 -1.

interaction, thereby allowing you to analyze and optimize complex object-oriented systems;

• IDEF5 – methodology for ontological research of complex systems. Using the IDEF5 methodology, the ontology of a system can be described using a certain vocabulary of terms and rules, on the basis of which reliable statements about the state of the system under consideration at some point in time can be formed. Based on these statements, conclusions are drawn about the further development of the system and its optimization is carried out.

Within the framework of this work, the most commonly used IDEF0 functional modeling methodology will be considered.

The IDEF0 graphical language is remarkably simple and harmonious. The methodology is based on four main concepts:

The first of these is the **concept of an Activity Box**.

The functional block is graphically depicted as a rectangle (see Fig. 1) and represents a certain specific function within the system under consideration. According to the requirements of the standard, the name of each functional block must be formulated in the verbal mood (for example, "to produce services", and not "to produce services").

Each of the four sides of the functional block has its own specific meaning (role), while:[20]

• The top side is set to "Control";

• The left side is set to "Input";

• The right side is set to "Output";

• The bottom side is 'Mechanism'.

Each functional unit within the single system under consideration must have its own unique identification number.

[20] PANAGACOS, Theodore. The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Publisher: CreateSpace Independent Publishing Platform. 2012. ISBN 978-1477486139
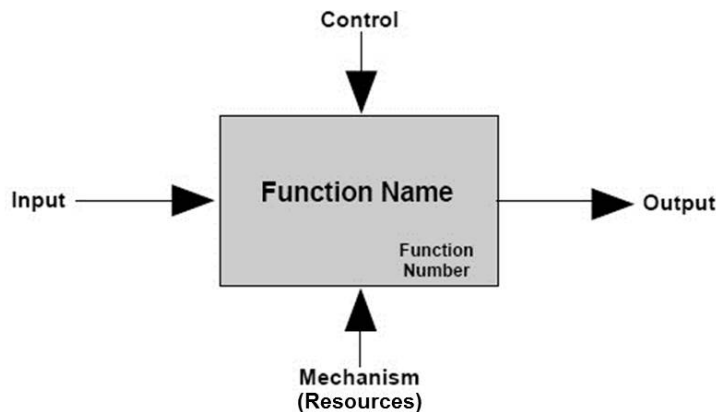
Figure 3-Function block IDEF0

Source: own elaboration

The second "whale" of the IDEF0 methodology is the concept of an **interface arc (Arrow)**. Also, interface arcs are often called flows or arrows. An interface arc represents a system element that is processed by a function block or otherwise affects the function displayed by this function block.

The graphical display of the interface arc is a one-way arrow. Each interface arc must have its own unique name (Arrow Label). According to the standard, the name must be a turnover of a noun.

With the help of interface arcs, various objects are displayed that, to one degree or another, determine the processes occurring in the system. Such objects can be elements of the real world (parts, wagons, employees, etc.) or data and information flows (documents, data, instructions, etc.).

Depending on which side the given interface arc approaches, it is called "incoming", "outgoing" or "controlling". In addition, the "source" (beginning) and "receiver" (end) of each functional arc can only be functional blocks, while the "source" can only be the output side of the block, and the "receiver" can be any of the three remaining.[21]

It should be noted that any functional block, according to the requirements of the standard, must have at least one control interface arc and one outgoing one. This is understandable - each process must occur according to some rules (displayed by the

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[21] ŠIMONOVÁ, Stanislava. Modelování procesů a dat pro zvyšování kvality. Pardubice: Univerzita Pardubice, Fakulta ekonomicko-správní, 2009. ISBN 9788073952051.

control arc) and must produce some result (outgoing arc), otherwise its consideration does not make any sense.

EPC notation

It uses much more elements - multi-colored figures.

• Pink shapes - events.

• Green - functions (actions).

• Yellow - performers.

• Gray - resources.

• Orange - information systems.

The model unfolds from top to bottom, higher elements precede lower ones.

As connecting elements, in addition to the arrows, the separators "and", "or", "exclusive or" are used. This makes EPC better suited for branching business processes.

To build a scheme, first the starting / final event is determined, then the intermediate events, the performers necessary for them, the resources.

The advantage of EPC is its ease of perception. Multi-colored elements make the model more "alive", pleasing to the eye, and this is important if you need to draw a diagram for employees or make a presentation.

Unlike the previous notation, this one allows you to build complex forks and long parallel series of events. Each element can be decomposed into smaller elements by building a separate circuit for it.

The main disadvantage of EPC is that its structural unit is an event, so you have to create events for any, even the most insignificant stages. EPC is rightly criticized for the abundance of tautological elements: the task "to determine the executors" - the event "the executors are determined", the task "to agree on the contract" - the event "the contract is agreed". If the scheme is long and complex, such elements overload it, as well as numerous arrows from "performers" to ""events", especially if one performer is responsible for many events, or several employees are assigned to one event.

BPMN notation

Its center is precisely the business process, and it is used to show the algorithm for passing it.

Main elements of BPMN:[22]

• Task (rectangle).

• Event (circle).

• Gateway, fork (rhombus).

• Flow, move (arrow).

• Databases, documents.

• Footnotes.

• Pools.

Basic notation of BPMN includes no more than 10 types of icons and helps to describe the algorithm in a form that will be understandable to a business user who has not received special training. Extended BPMN contains about 100 icons and allows you to make the regulations machine-readable, and without allowing discrepancies.

The main advantage of BPMN is that it is best suited if you need to describe exactly the business process, making it understandable even for ordinary employees. Today, BPMN is popular: most vendors are offering BPM systems, provide for work with BPMN: the scheme created with its help can be made executable by connecting the capabilities of the information system.

The disadvantage of BPMN is that it is focused on business processes and is not well suited for describing the structure of an enterprise or a tree of goals. When using the extended version, the scheme becomes more complicated, and it will be difficult for a person without special skills to understand it.

In general, BPMN is the most widespread today, it is she who enjoys the greatest respect in the international Association of BPM Professionals (ABPMP). The choice of notation for a particular case depends on what exactly will be described using it, as well as on the information systems that are planned to be used.

4 Process management

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[22] PANAGACOS, Theodore. The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Publisher: CreateSpace Independent Publishing Platform. 2012. ISBN 978-1477486139

Process management is one of the most important management tools in a modern company. In the future, the role of process management will only increase. In order to ensure the stable functioning of companies in modern conditions, it is important to choose a single system and mechanism for process management at all stages of the company's life cycle. Therefore, the process should meet the modern requirements of the market economy, resulting in a stable income for the enterprise and further development.[23]

A modern company presents a complex system of effective management, which requires a variety of applied methods aimed primarily at achieving specific goals and objectives at the lowest possible cost.

Nowadays, process management enables managers to define their processes, organise their performance, and drastically improve quality, efficiency, by setting up each process in such a way that its results lead to the achievement of business objectives through technological flexibility and integration.

Modern company management methods borrow increasingly foreign methodologies and techniques. One such methodology breaks down all routine work into elementary components and then describes each obtained business process in detail. It is time-consuming, but the resulting scheme makes it possible to find weak points, overblown functional responsibilities and unclear tasks. Once the time has been spent, management can transfer some of their responsibility down the hierarchy, freeing up time for strategic planning.[24]

Every process has to be measured by something. This is necessary primarily to assess the effectiveness of the entire enterprise's activities. Most often, experts recommend testing business processes according to four indicators: time, costs, quality, quantity.

However, business process models are dynamic and varied. Therefore, it is often not enough to assess just the speed at which the work gets done; working conditions and the company's infrastructure must also be taken into account. In addition, almost all sectors cannot exist without suppliers, finances, logistics and partners. These are also measurable indicators. And, of course, information and the human factor should not be forgotten. The

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[23] SPRINGER, Mitchell. Process Management—Evolution and Definition. In Project and Program Management: A Competency-Based Approach, Third Edition, 17–28. Purdue University Press, 2016.
[24] PANAGACOS, Theodore. The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Publisher: CreateSpace Independent Publishing Platform. 2012. ISBN 978-1477486139

more trained a specialist is, the less time they will need to learn about instructions and incoming information.[25]

The existence and development of an enterprise is affected by factors in its internal and external environment. Factors of the enterprise's external environment are factors that the enterprise has no influence on, or this influence is limited. They include political factors, socio-cultural factors, economy, technology, legal factors, competitors, scientific and technological progress, etc. Factors of the internal environment of the enterprise arise from the activities of the enterprise itself. These include production, personnel, capital assets, marketing, management organisation, finance and accounting. However, factors within the organisation strengthen or weaken the influence of external factors on the operations of the enterprise.

More and more companies are trying to automate business process management.

Most modelling methodologies are now based on Structured Analysis and Design Technique (SADT) principles as well as some algorithmic languages. There are several basic business process analysis models[26]:

- Business Process Modeling – modelling itself - revealing the functional side of the firm's existence.

- Work Flow Modeling – describes work flows and is similar to making flowcharts.

- Data Flow Modeling – in contrast to the previous one, describes the flow of data (information); it is designed to draw up a sequence of operations.

It is recommended that major business processes be described in a separate document called a "Regulation of work". Anything that is less significant or consists of a small number of simple operations is usually described in work instructions.

When preparing the regulations, the conditions of the continuous improvement cycle of the enterprise must be taken into account (the Schuchart-Deming model). It claims that optimisation and improvement are endless processes. In other words, there is a closed cycle in enterprise management consisting of the following management decisions: planning, performance, control, adjustment.

[25] SPRINGER, Mitchell. Process Management—Evolution and Definition. In Project and Program Management: A Competency-Based Approach, Third Edition, 17–28. Purdue University Press, 2016.
[26] DUMAS, Marlon, LA ROSA, Marcello, MENDLING, Jan, REIJERS, Hajo A. Fundamentals of Business Process Management 2nd ed. Publisher: Springer. 2018. ISBN 978-3662565087

The development of the model should be carried out in accordance with the business rules. The generally accepted rules are the regulatory and legal framework of the state in which the company operates. The second basis for the model is the company's corporate policy. When introducing a quality management system, it is necessary to develop and unify business processes.

It is the task of senior management to inform every employee of the importance of creating an effective business process model. After all, a well-established and thoroughly developed system will not only make it easier for a company to obtain certificates of conformity to international quality standards ISO 9001:2008, but it will also significantly increase the efficiency of each employee. Both of these factors make a company more competitive on the market, which in turn has a positive impact on investors and customers as well[27].

Process management is achieved through the fulfilment of four conditions that are closely interlinked. These are planning, organising, motivating and controlling.

Thus, with the planning function, tasks are solved that define the goals of the business entity and how its employees should act in order to achieve these goals. Planning as a process management function should cover three main aspects[28]:

- managers' assessment of the organisation's different sides (strengths and weaknesses) in areas such as marketing, finance, production, human resources and scientific research. All activities should focus on the reality of achieving the organisation's objectives.

- when assessing the capability of the organisation and the threat in the form of competition, the solvency of customers, current legislation, economic conditions and political factors are examined.

- making a decision by the manager with a specific allocation of responsibilities among the employees of the enterprise to achieve the stated objectives.

In performing process management, the manager seeks to determine the main directions of effort in order to decide how to ensure that the objectives of all members of the entity are met. In other words, planning is one of the ways in which management provides a unified direction to the members of the organisation.

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[27] DUMAS, Marlon, LA ROSA, Marcello, MENDLING, Jan, REIJERS, Hajo A. Fundamentals of Business Process Management 2nd ed. Publisher: Springer. 2018. ISBN 978-3662565087
[28] PANAGACOS, Theodore. The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Publisher: CreateSpace Independent Publishing Platform. 2012. ISBN 978-1477486139

When considering a management process function such as organisation, the following should be clarified. To organise means to create some structure. It may be noted that there are many elements that need to be structured in order for the organisation to perform its tasks optimally and to achieve its goal. The elements of an organisation are usually considered to be work and people[29].

Business process management is impossible without motivation. To put it another way, even with the best plans and the perfect organisational structure, all this is meaningless if there is no actual work to be done. Therefore, the main task of motivation is for members of the organisation to do the work based on their delegated responsibilities and in accordance with the approved plan.

Of course, process management would not be considered in its complete form without examining a function such as control, which is carried out in the company. The management plans to achieve the goal for a particular day, month or year. In order to avoid the occurrence of certain risks and unfavourable events, the manager of the business entity must prevent them in time and take appropriate measures. The reasons for the occurrence of such risks may be the following: employees' refusal to perform the planned activities, changes in legislation.

5 Process reengineering

In modern business conditions, more and more companies are deciding to carry out projects to describe and optimise their business processes in order to improve operating performance. However, such projects, like any other improvement activity, can lead to both positive and negative results. The global experience of enterprises progressive development has many positive examples of the application of a toolkit to improve business operations - business process reengineering. The success of applying this toolkit

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[29] BROCKE VOM, Jan, ROSEMANN, Michael. Handbook on business process management l: introduction, methods, and information systems. New York: Springer, 2014. ISBN 978-3642-451-003.

in the practical activities of an enterprise will be characterized by improvements in the indicators system describing the efficiency and effectiveness of business processes.[30]

In most enterprises today, management pays more attention to the elements of a business process separately, e.g. people, technical and technological issues, and enterprise structures. While an enterprise is a complex organisational system, like a living organism, in which all elements are interconnected and affect each other and there is also a synergistic effect (when two different properties interact, a third one emerges). This means that all processes in an enterprise should be considered in a complex (system), expressed through a system of business processes.

To start with, there will be a description of the complexity and reasons for the business process reengineering failures in Russian companies. Then the principles of effective business process reengineering will be revealed to avoid mistakes at the initial stage of reengineering.

The correct assignment and planning of the business process reengineering path is the key to success and reaching the goal when introducing an innovation. Experience shows that it is not always possible to successfully carry out business process reengineering and often it is not possible to bring it to an end. This is due to a number of factors and the failure to meet the basic requirements for reengineering implementation.

Factors affecting business process reengineering include:[31]

a) Management interest. Management must be involved in the process, or delegate authority to lead the reengineering project, otherwise there is a high probability of failure due to the fact that the head may not know the nuances of the project because of their lack of involvement and may subsequently reject it.

b) Incorrect goal setting. This often leads to the working group being asked to achieve results that either lack the time, resources or interest of the management team.

c) Technological support. Availability of methodologies, technologies that are necessary to achieve results.

d) Staff. Willingness to take part in the project, otherwise they will be a burden, give false information, sabotage.

e) Communications to ensure uninterrupted, accurate information and feedback.

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[30] JOHNSTON, Giles. Business Process Re-engineering: A Simple Process Improvement Approach to Improve Business Performance. Publisher: Independently published. 2017. ISBN 978-1520300115
[31] PANAGACOS, Theodore. The Ultimate Guide to Business Process Management: Everything you need to know and how to apply it to your organization. Publisher: CreateSpace Independent Publishing Platform. 2012. ISBN 978-1477486139

f) Financing.

The main requirements for the implementation of business process reengineering are the following steps, that regulate the sequence of activities:

a) The Preparation Stage. The main objective is to create a team of managers and employees of the organisation who are motivated by the project philosophy, understand the purpose of the project and the sequence of steps to achieve it. An approved corporate methodology for business process modelling is present.

b) Modeling and analysis of business processes "AS IS". The aim of the stage is to obtain business process models and data from the analysis of these models, which are then used in the development of regulations and business process reengineering.

c) Business process modelling "TO BE". This step gives a predictive indicators of the business processes after reengineering.

d) Preparation and implementation of business process changes. Step 3 and step 4 are combined into one timeframe, the point is that when modelling "TO BE" a working model cannot be obtained immediately, this is due to the multifactor influences and synergy effects of these influences on the end result. Afterwards, it is necessary to adjust the original "as it should be" model in order to get the expected result. At the end of the project implementation, business processes should become as efficient as possible; there should be documents regulating business processes; an organisational structure relevant to business processes.[32]

Existing reengineering approaches have a narrow subject and problem orientation and have disadvantages:[33]

- Regulate the business process reengineering at a common sense level.

- There is no system of indicators and criteria describing the business process as a dynamic system of elements that need to be changed when introducing innovative technologies.

- There are no clear methods for analysing, assessing and carrying out business process reengineering when introducing innovative technology.

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[32] JOHNSTON, Giles. Business Process Re-engineering: A Simple Process Improvement Approach to Improve Business Performance. Publisher: Independently published. 2017. ISBN 978-1520300115
[33] DUMAS, Marlon, LA ROSA, Marcello, MENDLING, Jan, REIJERS, Hajo A. Fundamentals of Business Process Management 2nd ed. Publisher: Springer. 2018. ISBN 978-3662565087

Practical part

6 Company description

The IT market is evolving rapidly: Competition between developers is increasing, and customers demand even more, both in terms of the quality of developed product and its cost.

The main activities of LISTIFY LLC are:

– computer software development, consulting services in this area, as well as other related services;

– activities related to the use of computers and information technology;

– data processing activities, provision of hosting services, etc.

The staff at LISTIFY LLC are thoroughly examining the software market, identifying "gaps" in it and trying to close them with their own unique solutions.

Nearly every month, the LISTIFY staff prepare an update that takes into account customers' wishes, improves existing features and adds new ones. The intense work of the company's employees has enabled LISTIFY to gain a firm position in the market. Currently, every fourth small and medium-sized business that has automated its business processes with cloud technology uses LISTIFY.

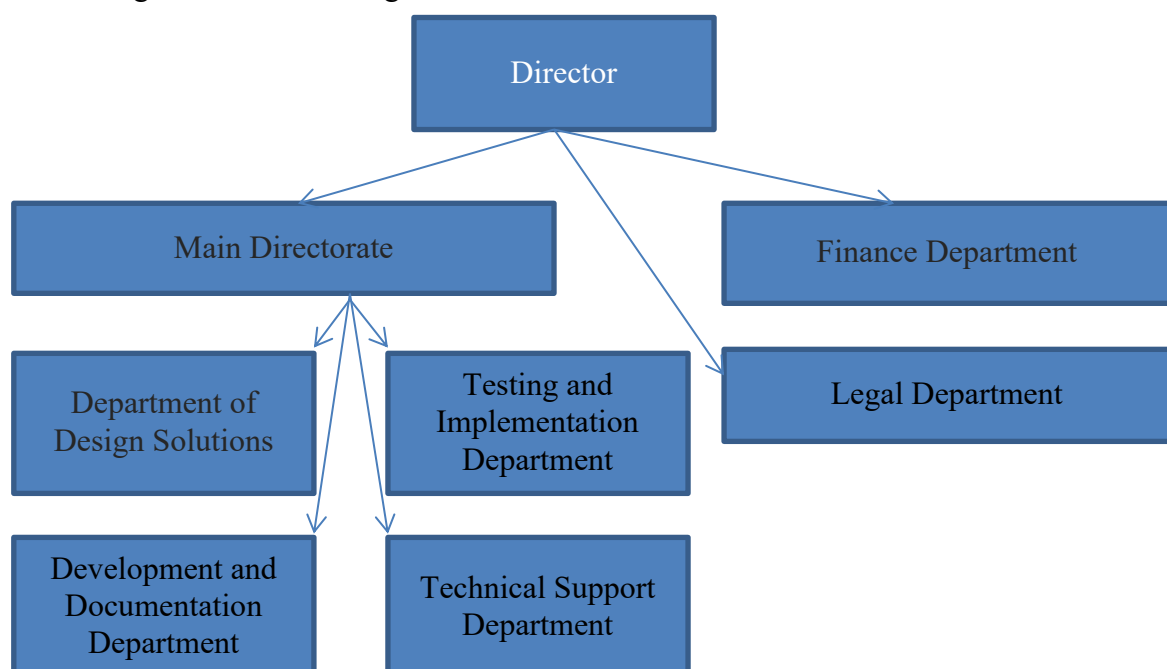Figure 4 shows the organisational structure of LISTIFY LLC.

Figure 4- Organisational structure of LISTIFY LLC

The company is managed by a general director. In the general director's absence, the deputy director performs the duties of the general director.

The lawyers are responsible for providing legal support for the company's services and contracts.

The financial and economic department: selects personnel, manages staff numbers and composition; pays salaries; accounts for all business transactions carried out within the organisation, etc.

6.1 A brief description of the technical support department and its activities

"The Head Office" is an important link in the company structure, through which the interaction between employees and customers takes place. The main tasks of the Head Office are: software requirements definition; software design; software and database development; software testing and documentation; technical support to the company's employees. The Head Office structure is represented by divisions, the names of which correspond to the list of tasks mentioned above.

"Design Solutions Department" - develops database structure, creates programme layouts, etc.

The "Development and Documentation Department" includes programmers who write the software code, i.e. they are directly involved in developing the software and writing the user manuals.

The "Testing and Implementation Department" prepares test data sets for each developed product, checks them and searches for errors. The errors and defects found during testing are sent to the "Development and Documentation Department" to be corrected.

After successful testing of the software product, the "Development and Documentation Department" staff develop user manuals and prepare the project documentation.

The "Technical Support Department" performs the following types of work:

- provides technical support to the employees of LISTIFY LLC;

- monitors the condition of computer equipment in the company;

- updates anti-virus and other software tools used by the company's employees to perform their tasks.

Due to the growing interest of enterprises and organisations in the company's products and the increasing number of orders, the management of LISTIFY LLC decided to expand the company's staff and attract young employees who could bring new ideas and suggestions to the company. During their probation period it became clear that the new employees of the company face many problems in the process of mastering hardware and software, working with databases and program code. These problems are solved by technical support, which answers questions and trains the "newcomers".

Considering the increased workload of the technical support department, as well as the current tasks and challenges they face on a daily basis, it was decided to optimise the work of the technical support department by implementing an information system.

7 Company process analysis

7.1 Conceptual modelling of the maintenance request recording process

In order to describe the existing technology "Recording of maintenance requests" in LISTIFY LLC, we will build a structural-functional diagram of the studied process according to the SADT (Structured Analyses and Design Technique) methodology. Among many CASE tools suitable for the implementation of such diagrams, the preference was given to BPwin, a product of Computer Associates. Functional models will be designed based on the IDEF0 standard.

The context diagram of the "Recording of maintenance requests" process at LISTIFY LLC is shown in figure 5.
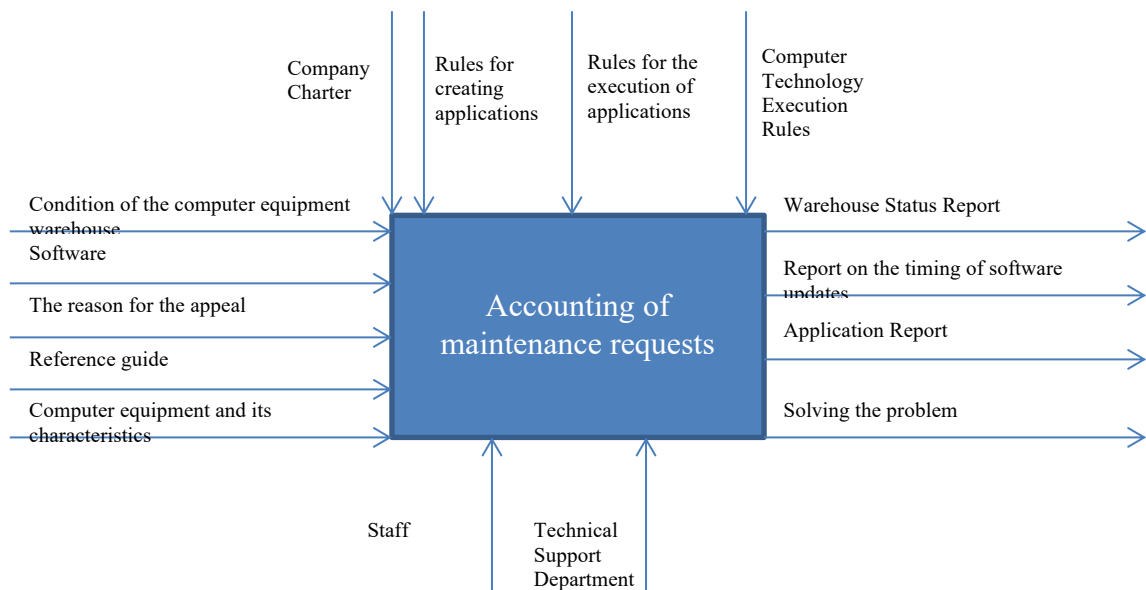
Figure 5-- Context diagram of the process "Recording of maintenance requests" at LISTIFY LLC. AS-IS model

The diagram gives an overview of the process under study. The decomposition of this process is shown in Figure 6. Figure 6 shows that the operations of recording maintenance requests can be broken down into three blocks, which are interlinked with each other:

– preparing the employee's workplace;

– creating a maintenance request;

 – processing of the request.

There are three reports created during the studied process: "Report on the state of the storage", "Report on software update dates" and "Report on requests".
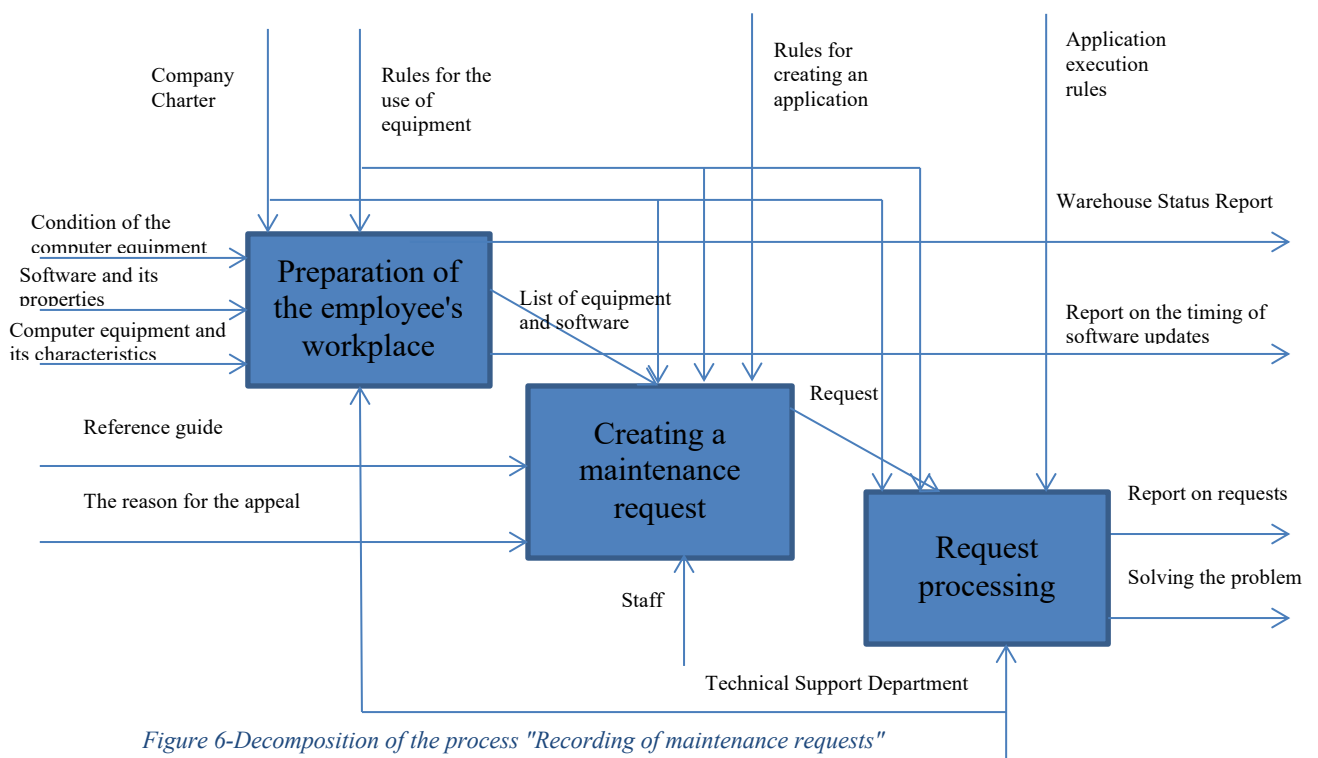
Figure 6-Decomposition of the process "Recording of maintenance requests" in LISTIFY LLC. AS-IS model

Consider each block individually. For this purpose, decompose the "Preparing employee's workplace" process shown in Figure 7. All operations within the "Preparing employee's workplace" process are carried out by employees of the Technical Support Department, who:

– assess the state of the storage in order to find the necessary equipment;

– select a computer and equipment corresponding to the employee's duties on the basis of the performed analysis;

– prepare the employee's workplace by installing software (operating system, antivirus software, office programms and other special software).

Figure 7-Decomposition of the "Preparing the employee's workplace" process. AS-IS model

Company Charter

Rules for the use of computer technology

Condition of the computer equipment warehouse

Analysis of the condition of the equipment warehouse

Required equipment

Warehouse Status Report

List of equipment and its characteristics

Computer equipment and its characteristics

Allocation of a computer and component equipment to an employee

List of equipment and software

Software and its properties

Installing and configuring the necessary programs on the employee's computer

Report on the timing of software updates

Technical Support Department

Moving on to the "Creating a maintenance request" block, a decomposition of which is shown in Figure 8.

Company Charter

Rules for the use of equipment

Rules for creating an application

Reference guide

List of equipment and software

The reason for the appeal

Preparing a problem report

Message text

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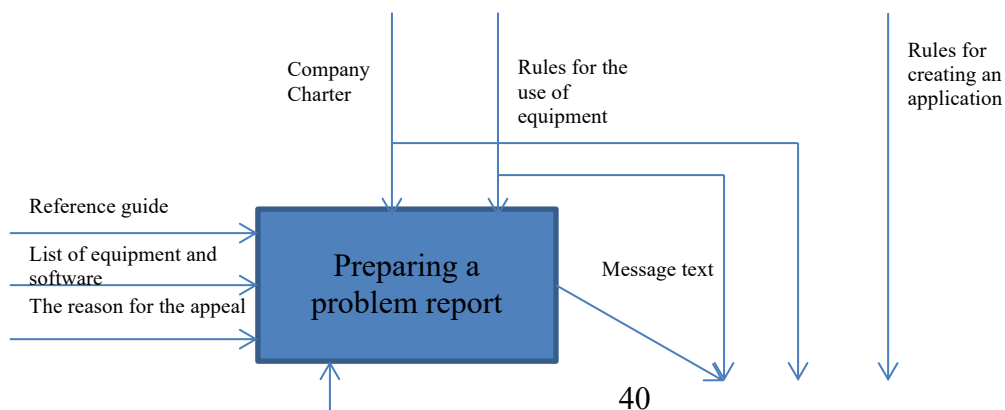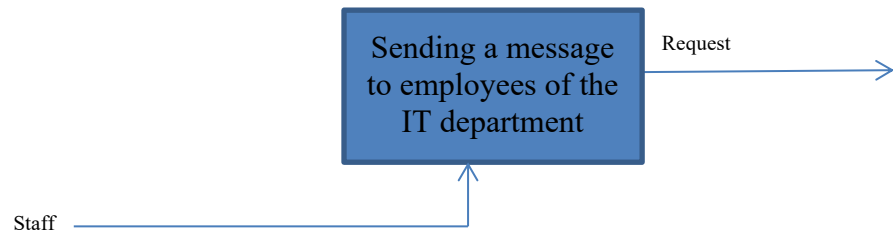*Figure 8- - Decomposition of the process "Creating a maintenance request". AS-IS model*

If an issue arises, that is within the competence of the technical support department employees, the company's employees should prepare a text message containing the essence of the problem and send it to the technical support department. Exchange of messages in this case takes place in the company's corporate chat. Figure 9 shows the decomposition of the "Processing of request" process.
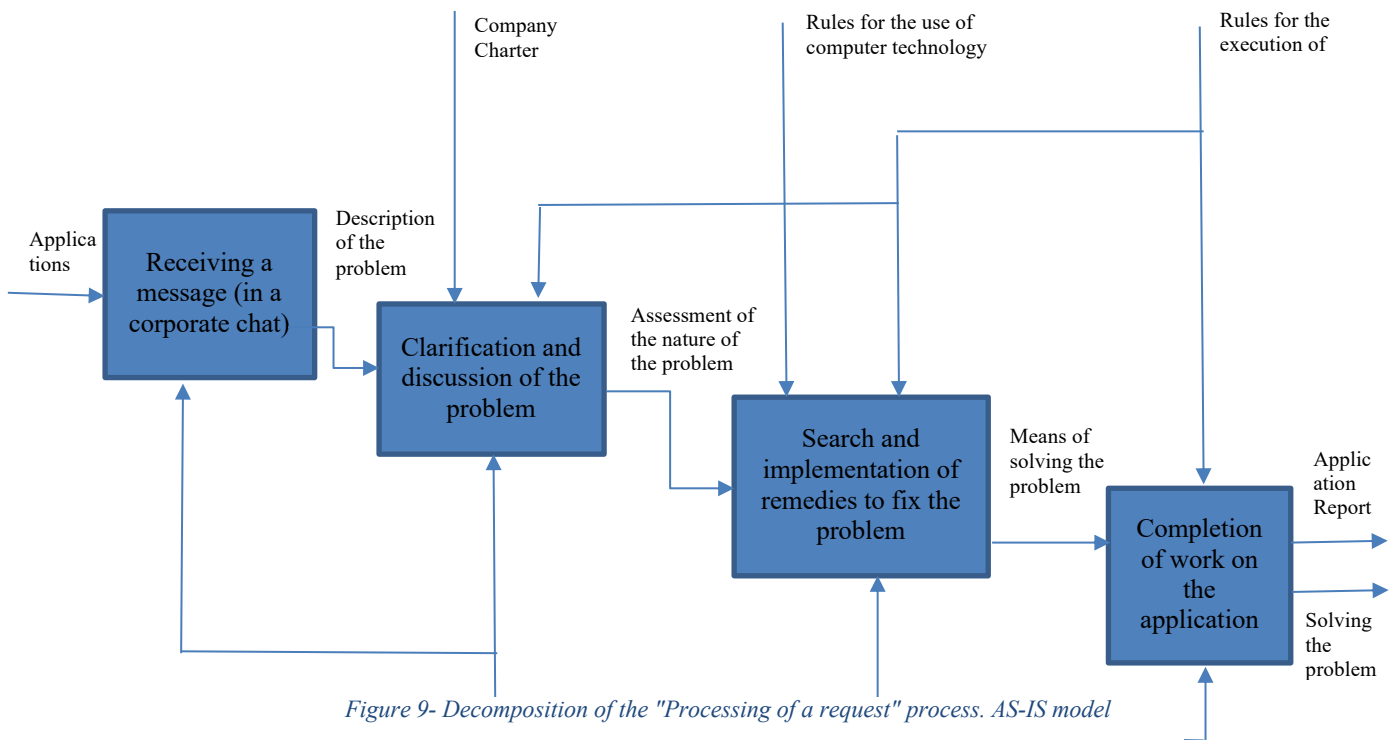

Figure 9- Decomposition of the "Processing of a request" process. AS-IS model

As Figure 9 shows, when a maintenance request (in the form of a message) is received, a member of the Technical Support Department takes the following steps:

- clarifies the essence of the problem;

- searches for a solution to the problem;

- informs the employee who made the request about the solution of the problem.

If the employee is satisfied with the solution proposed by the technical support team, the request can be considered completed. According to the built model, the existing technology for recording maintenance requests has many disadvantages:

– employees of the technical support department do not have access to current information about the state of the computer and software of the user who sent the request, as a result the process of discussing the request becomes quite time-consuming;

– most of the working time of the technical support staff is spent running around the structural divisions of the company, where employees cannot continue their work without the assistance of an IT specialist;

– the low speed of processing requests leads to stagnation in the work of all divisions of the company, and consequently this has an impact on the performance of the company itself;

– when creating the text of the request, employees incorrectly specify the names of programs, which decreases the process of perception of the issue presented in the request;

– if there are questions, solutions of which were previously proposed by technical support department, employees have to search for them in the corporate chat for a long time, which is not always possible, because requests do not have such parameters as "Subject of request", "Software name", etc. The search is more difficult if the messages have been deleted;

– due to the fact that employees delete the messages sent in the corporate chat, then if a similar problem occurs again, the technical support has to solve it once again;

– when an employee asks about the possibility of changing a piece of equipment (keyboard or mouse), the technical support department can not give a definite answer, because they do not have access to current information about the status of the equipment storage;

– difficulty in controlling the status of users' software - often computers are left unprotected because the antivirus software was not updated or renewed in time;

– difficulty in assessing the results of the technical support service;

– the company's management does not have a mechanism for controlling the activities of technical support employees;

– absence of mechanisms that could control the timing of requests;

– absence of common standards for collecting and recording information, leading to duplication or loss of data on requests;

– inaccurate results presented in the reports.

Therefore, the company needs an information system that can eliminate existing recording problems and improve the quality and speed of processing maintenance requests.

7.2 Analysis of existing developments and reasons for the choice of information system design technology

The current software market offers many solutions for enterprises to automate the recording of maintenance requests. The most popular among them are such systems as "Aptien", "IBM Runbook Automation", "1C: ServiseDesk" and "Konica Minolta". These systems are freely available and have a minimum set of features.

To assess the features of the listed software products and their compliance with the requirements presented by LISTIFY LLC, a comparative analysis of the aforementioned systems will be made (Table 2).

Table 2-- Comparison of software products for automation of maintenance request recording

Functional capabilities	Konica Minolta	ServiseDesk	Aptien	IBM Runbook Automation
Receiving, processing and fulfilling requests	+	+	+	+
Preparing the employee's workplace	-	-	+	+
Employee recording	+	+	+	+
Recording the equipment used and its characteristics	-	-	+	+
Recording the software installed on each computer	-	-	+	-
Monitoring the condition of the technical equipment storage	-	-	-	-
Generating and printing reports	+	+	+	+

Searching and filtering records	+	+	+	+
Registering, editing and deleting applications	+	+	+	+
Exchanging messages and graphics	+	+	-	+
Monitoring the status of requests	+	-	+	+
Displaying information about the status of the computer and the software installed on it	-	-	-	+
Changing login and password	+	+	+	+
Multiuser mode of operation	+	+	+	+

Analysis of the data in the table shows that all the systems listed have the minimum functions required to automate the recording of maintenance requests, but each system has disadvantages.

Consider which of the programmes studied best meets the price-quality requirement.

The "Konica Minolta" software product from "Konica Minolta" does not meet all the functionality requirements, but it is low cost. For example, a system for 5 users is provided for free. If more workstations are required, it will cost 350 CZK per user per month.

The "1C" product "ServiseDesk" has no basic set of functions required for full recording of requests. The interface of the program has a complicated and confusing structure. To implement such a system, the company will have to hire a 1C programmer and modify the project to meet the needs of the company. Considering that the basic version of the programme is free, the cost will be formed from the programmer's salary (approximately from 5,600 to 17,000 CZK).

"Aptien" from "Aptien" is a serious solution with a wide range of features. Its cost depends on the number of licences required. The 10-license version of the software will cost 20,000 CZK per month. The demo version of the software is free.

The "IBM Runbook Automation" program from "IBM" is another worthy software product for recording maintenance requests from company personnel. The cost of the solution will be from 5 to 25 thousand CZK per month, depending on the number of users and requests to be registered.

The analysis shows that the "IBM Runbook Automation" and "Aptien" information systems meet the requirements of LISTIFY LLC more than others. Each of these systems will bring significant benefits to the company after its implementation, but it should be

remembered that ready-made solutions do not take into account the specifics of a particular organisation, and therefore they are not always possible to adjust to its business processes.

There are usually two ways out of such situations: the first is to adjust the business processes of the company to the system requirements; the second is to modify the implemented system to the needs of the company. Both the first and the second cases have their disadvantages. For example, changes in business processes are often accompanied by a negative attitude of employees who do not want to change their usual way of working. As for the second option, there are two problems arising from one another. The first one is that the developer company may refuse to modify the project and offer to use the system as it is. The second problem is the high financial costs needed to modify the system. In addition, there is a risk that even after the project modification, ready-made solution will not bring the desired result due to growing demands of business - new ideas, tasks, functions will appear, which the company would like to see in the used system. In addition, implementing ready-made solutions does not guarantee data security because they are stored on a third-party server.

The results of the analysis of existing software products on the market for the automation of maintenance request recording prove that the most rational solution for LISTIFY LLC is the development of its own information system, specifically oriented to its business processes.

8. Optimising the selected process

8.1 Task statement for the development of an information system to record maintenance requests

Based on the fact that all employees of the company and the IT department are involved in the process of recording maintenance requests, the information system to be designed should consist of two modules: "System Administrator" and "User". Only registered users who have been identified by their login and password should be able to log into the system. The login and password are set by the system administrator and, if

necessary, are changed by the user in "My Account". This principle of system operation will ensure data protection from detractors.

The main functions of the "System Administrator" module should be:

– receiving, processing and fulfilling requests;

– preparing the employee's workplace;

– employee recording;

– adding new users to the system;

– keeping directories;

– recording of equipment in use and its characteristics;

– recording of the software installed on each computer;

– monitoring the status of the technical equipment storage;

– automatic generation and printing of reports;

– searching and filtering of records.

The "Receive request" function means that when a new request is created in the system via the "User" module, the technical support staff should immediately see it in their interface. As there is more than one employee in the IT department, there is an option to "Accept a request". After this action is made, the status of the request changes from "New" to "In progress", and in the "Performer" field the name of the employee who accepted the request is written. Thus, the user who has sent the request will be able to see that the request is already handled by a certain employee.

"Processing and fulfilling the request" means that once the employee has accepted the request for work, the system should allow an exchange of messages to clarify the essence of the problem encountered and to suggest measures to solve it. Any exchange of information relating to the process of fulfilling the request must be done exclusively in the system, whether it is an exchange of messages or graphics.

The "Prepare the employee's workplace" function should allow storing in the system:

– a list of the equipment provided to the employee (system unit, monitor, manipulator, keyboard, headphones, etc.) and their characteristics (colour, manufacturer, model, etc.);

– a list of the software installed on the computer and their features (installation date, last update date and next update date, which should be calculated automatically).

The employee recording function should be implemented through the "Employees" directory, which will store the following information about the company's employees: full name, position, date of birth, address, phone number, e-mail, notes. This directory should also contain logins and passwords for entering the system.

Adding new users to the system means that only the system administrator should have access to this function, to avoid unauthorised access to data by registering to the system by ourselves.

Each of the directories provided in the system should speed up each employee's work by several times, through entering a prepared set of values in the directories.

The "Recording of equipment in use and its characteristics" function should make it possible to see information about the characteristics of the user's computer when a new request is received. Quick access to information of this type speeds up the process of fulfilling requests by several times.

The "Recording of software installed on each computer" function is needed to view information about the user's software (software name, software version) so that, without asking the user for more information, a solution can be proposed to solve the problem.

The "Monitoring the status of the technical equipment storage" function should make it possible to automatically calculate the amount of equipment of each type, both remaining in storage and in the use of the staff.

The records search feature will reduce the time it takes for the user to find the information they need, while the filtering feature will save the user from unnecessary information on the screen. The filtering function is especially useful when generating reports.

The automatic generation and printing of reports implies that the system should automatically generate the following types of reports, based on the previously completed directories and the registered data by the system users:

– "Report on the state of the storage";

– "Report on software update dates";

– "Report on requests".

These reports will make it possible to quickly analyse the performance of the company's IT department for current and past periods. The following functions should be available to employees working in the system by using the "User" module:

– registration, editing and deleting requests;

– exchanging graphical materials;

– monitoring the status of requests;

– viewing information about the status of the computer and the software installed on it;

– changing login and password.

Registration of applications involves creating a record with the following details:

– the number and date of the request (determined automatically);

– name and department of the employee (determined automatically);

– the subject of the application;

– the category and name of the software for which the question occurred;

– request status (determined automatically), etc.

All requests registered in the system should have a certain status reflecting their progress. It is reasonable to use a system of 4 statuses: "New", "In Progress", "Completed", "Cancelled".

The "New" status is automatically assigned to new requests. Requests that are in the process by a certain employee of technical support must have the status "In progress". If the work on the request is completed, it is given the status "Completed". Requests cancelled by the user for any reason have the "Cancelled" status.

"Exchanging graphical material" means that when creating a request, the user should be able to attach a file containing, for example, a screenshot of the encountered error. A member of the technical support team will be able to view the file.

Monitoring the status of requests means that the user should be able to see in their interface the status of the request. The usage of the status system will also allow the differentiation of user access rights.

The "Viewing information about the status of the computer and the software installed on it" function should give the user access to the characteristics of the hardware they are using, the list of programs installed at their workplace and their features.

The "Changing login and password" function involves changing the login settings.

8.2 Evaluation of the changed business process

Figure 10 shows the data flow diagram for the "Preparing the employee workplace" operation according to the proposed technology, i.e. after the implementation of the information system.
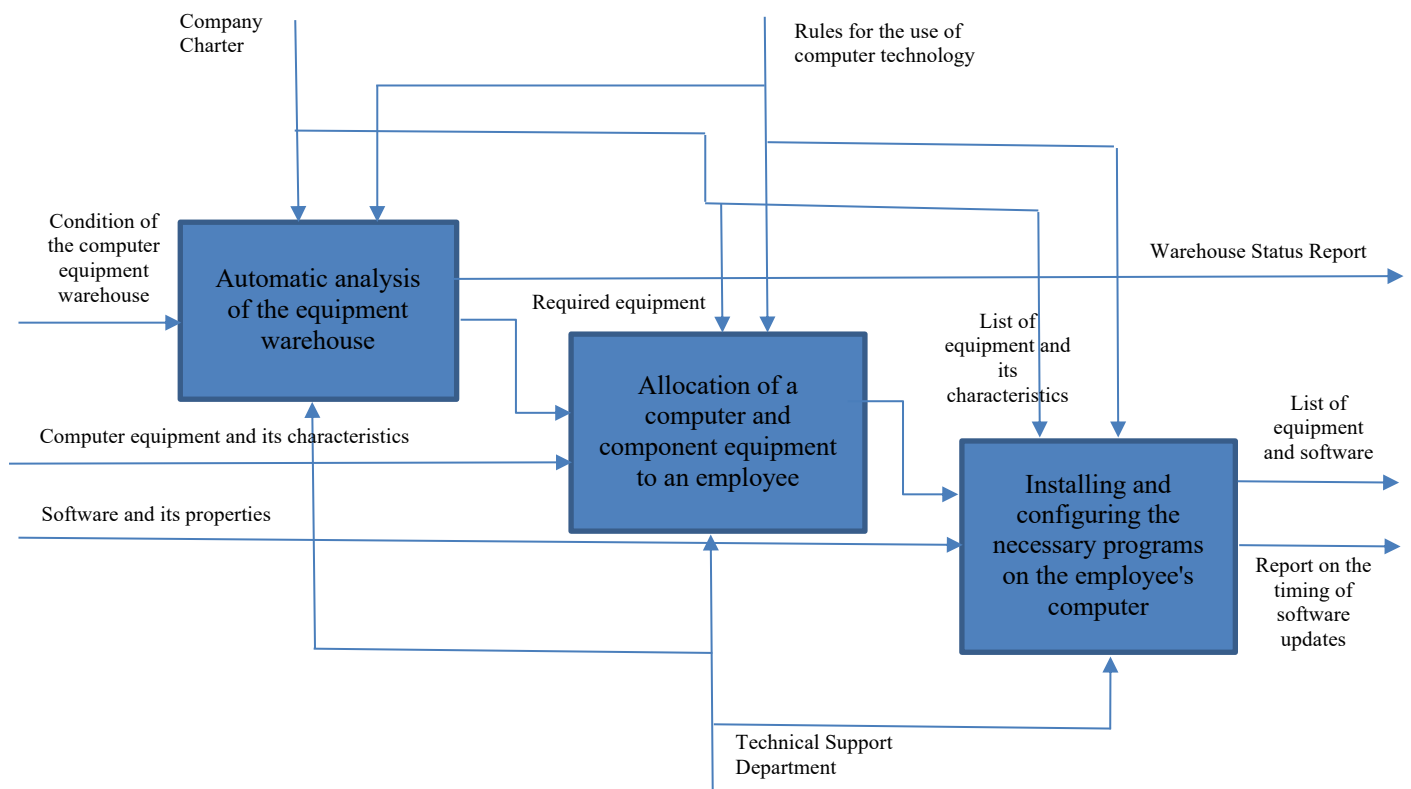

Figure 10-- Decomposition of the process "Preparing the employee's workplace". TO-BE model

With the proposed technology, the staff no longer have to analyse the status of the storage area themselves in order to provide an employee with a computer and equipment - all they need to do is open an appropriate form, and the system will automatically display the latest information on the status of the company's IT-equipment storage area.

The process of generating the following reports is also simplified: "Report on storage status"; "Report on software update dates". The system will generate them

automatically based on user requirements. Figure 11 shows the decomposition of the "Creating a maintenance request" process.
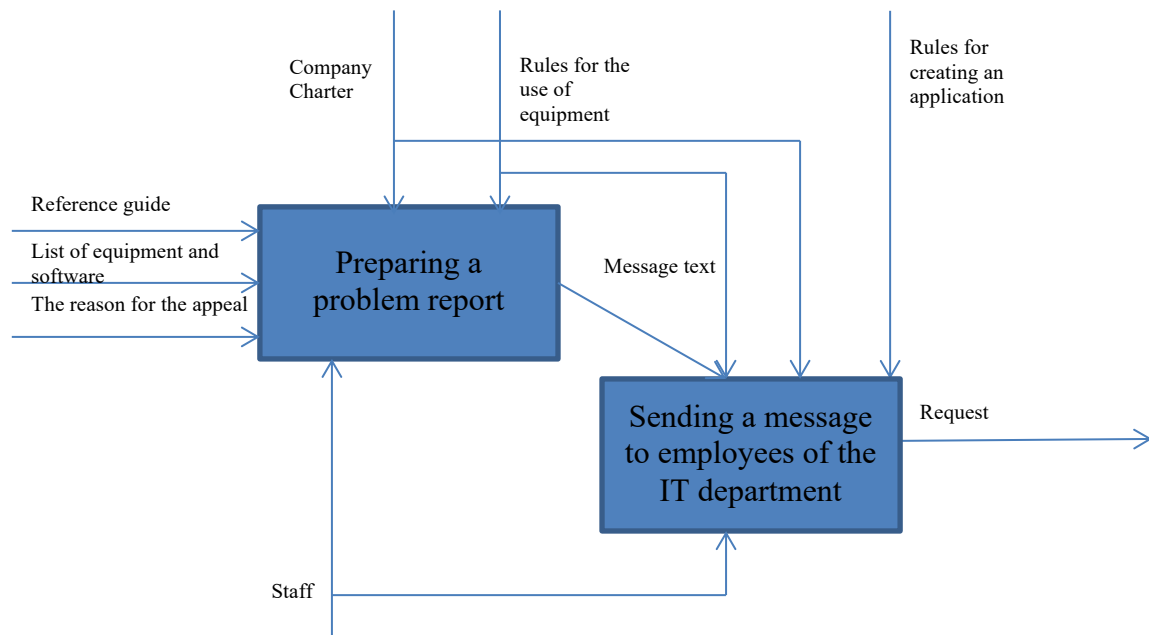

Figure 11- Decomposition of the process "Creating a maintenance request". Model TO-BE

Figure 11 shows, that according to the proposed technology, all applications should be registered and stored in the designed system rather than in the corporate chats of the company, as it was before. This will reduce the time required to generate a request by several times due to: automatic identification by the system of values of some fields; filling in a number of fields by selecting values from a list.

Figure 12 shows the decomposition of the "Processing of a request".
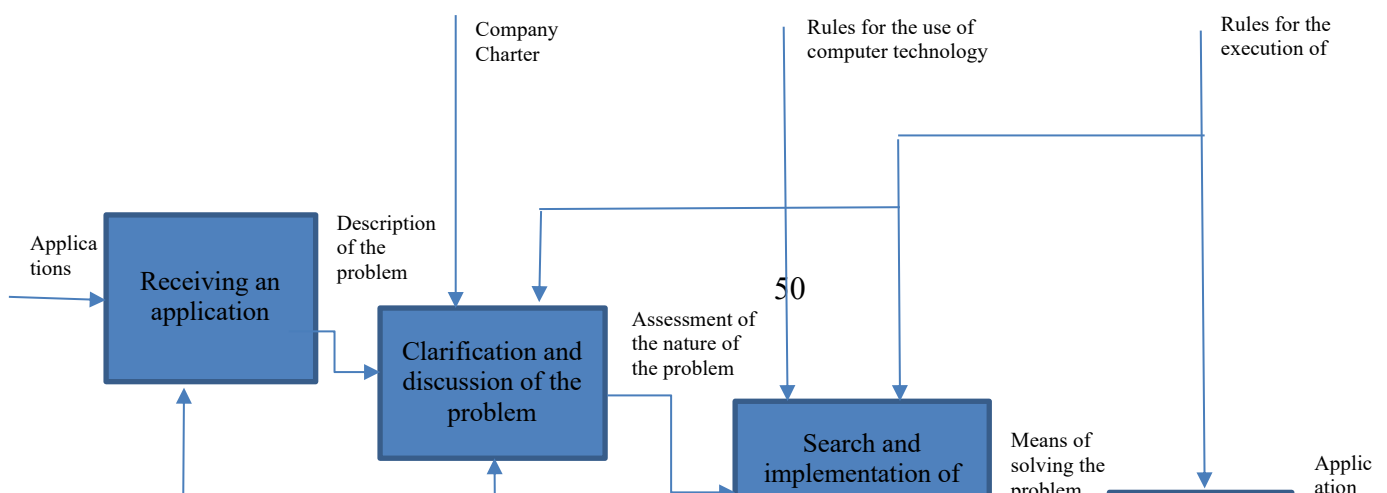

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Figure 12 - Decomposition of the "Processing of a request" process. TO-BE model

According to the new technology, technical support employees receive requests not through messages in corporate chat, but in the form of a full request with a number, date of creation, employee's name and department, subject of the request and the name of the software for which the problem occurred, etc.

Based on the information about the requests registered in the system, the program will automatically generate a "Report on requests" for any period.

The proposed technology for the studied business processes will allow: to eliminate existing shortcomings in recording; to increase the speed and quality of processing requests; to eliminate errors related to the human factor; to make the work of company employees more transparent, etc.

8.3 Assessing the economic feasibility of developing the information system

The economic feasibility of developing a maintenance request recording system for LISTIFY's Technical Support Department is the following:

The developed software product fully meets the customer's requirements and has prospects for further development. The created unique solutions are based on modern

information technologies, which have higher performance of this type of software product compared to the existing analogues.

By using the system, the technical support staff can access current information about the status of the computer and software of the user who sent the request, thus increasing the speed of processing requests. The system provides current information on the status of the company's technical equipment storage.

The technical support staff receives requests not through messages in the corporate chat, but in the form of a full request with the number, date of creation, employee name and department, subject of the request and the name of the software in which the problem occurred, etc. It will allow reducing the time for fulfilment of requests by several times. Based on the information about the requests registered in the system, the software automatically generates reports.

The subsystem ensures a significant saving in time, labour and materials when processing and storing information. This increases the speed of work compared to manual data entry, and increases the efficiency and accessibility of the information.

The developed software product is rather affordable and easy to use. The economic assessment made it possible to evaluate the compliance of resources spent on this development and the income received by the enterprise, which allowed making a positive conclusion about the economic feasibility of the work. The choice of programming and organisational-technological design solutions ensured minimization of financial, material and labour costs. The development is economically feasible.

Conclusion

For successful and profitable operation of any modern company in conditions of growing competition and business requirements for quality and speed of computer operations, it is necessary to implement information systems for automated recording of maintenance requests. In the practical part the analysis of LISTIFY LLC activities was performed. It was revealed that one of the important subdivisions of the company is the "Technical support department", whose main task is to provide technical support to the employees of the organisation while working with computer hardware and software.

The description of the existing technology for request recording revealed a number of shortcomings associated with the lack of an automated accounting system for the activities of the "Technical Support Department" in the company. To eliminate existing shortcomings of requests recording, a new technology of information and technical support of the organisation's employees was developed, the main essence of which is the implementation of information system of requests recording. Existing analogues do not meet the requirements of LISTIFY LLC, therefore, it was decided to create their own software product.

The developed system consists of two modules: "System Administrator" and "User". Each module can be accessed by entering a login and password.

The program provides the following tasks: registering, editing and deleting requests; receiving, processing and fulfilling requests; exchanging messages and graphics; preparing the employee's workplace; employee recording; adding new users to the system; recording the used equipment and its characteristics; recording the software installed on each computer; monitoring the technical equipment storage status; generating and printing reports; changing the login and password.

The developed software product is rather affordable and easy to use. Thus, the tasks have been fulfilled and the objective of this thesis has been achieved.

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