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METHODS OF MODELING AND OPTIMIZATION OF BUSINESS PROCESSES

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It is really important to understand the way of building and improving of business process in nowadays situation of globalization of production. Appropriate knowledge and minimizing are the main things to make the system work. Analyzing methods of functional modeling were researched and involved in the created system. The analyzed and the improved systems were compared.

Business process modelling represents an important part of information system development and evolution within organisations. This is primarily due to the need of organisations to be able to readily and flexibly adapt their processes to change induced by both internal and external factors [1].

A business process is a collection of linked tasks which find their end in the delivery of a service or product to a client. A business process has also been defined as a set of activities and tasks that, once completed, will accomplish an organizational goal.

For modeling business processes several different methods are used. They are based on structural and object-oriented approaches to modeling. However, the division of the methods into structural and object is rather arbitrary, since the most developed methods use elements of both approaches. The most common methods include:

– method of functional modeling SADT (IDEF0);
– IDEF3 process modeling method;
– DFD data flow modeling;
– ARIS method;

Method of functional modeling SADT (IDEF0);

The basis of many modern methodologies for business process modeling includes methodology of SADT. It is a set of rules and procedures designed to build a functional model of an object of any subject area. The functional model SADT displays the functional structure of the object, i.e. the actions it performs and the links between these actions. The main elements of this method are based on the following concepts:

– Graphic representation of block modeling.
– Strictness and accuracy.
– Separating the organization from the function, i.e. exclusion of the influence of the administrative structure of the organization on the functional model [2].

IDEF3 process modeling method

Method IDEF3 was designed to simulate the performance of a sequence of actions and the relationship between them in the process. IDEF3 models can be used to drill IDEF0 functional blocks without decomposition diagrams. IDEF3 method allows to decompose the effect several times, to provide documentation of the alternative process streams in a single model.

IDEF3 is a way of describing processes using a structured method that allows an expert in the subject domain to present a state of affairs as an ordered sequence of events while simultaneously describing objects of direct relevance to the process.

IDEF3 is a technology well suited for collecting data required for structural analysis of a system.

Unlike most business process modeling technologies, IDEF3 has no hard syntactic or semantic restrictions, which make inconvenient description of incomplete or non-integral systems. In addition, the author of the model (system analyst) does not need to mix his own assumptions about the functioning of the system with expert statements in order to fill gaps in the description of the subject area.

IDEF3 can also be used as a business process design method. IDEF3 modeling organically complements traditional modeling using the IDEF0 standard methodology. Currently, it is becoming increasingly common as a completely viable way of constructing models of designed systems for further analysis by imitation methods. [3]

DFD. Data flow modeling

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be

used to analyze an existing system or model a new one. Like all the best diagrams and charts, a DFD can often visually "say" things that would be hard to explain in words, and they work for both technical and nontechnical audiences, from developer to CEO. That's why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems.

ARIS method

ARIS. The current trend is the integration of a variety of modeling techniques, which manifests itself in the form of the creation of integrated modeling tools. One of such tools is a software product called ARIS (Architecture of Integrated Information Systems), which was developed by the German company IDS Scheer. To construct these models types both ARIS modeling methods are used along with various well-known methods and languages of modeling, in particular UML.

UML contains the extension mechanisms for adaptation of specific modeling language to the specific requirements of the developer without having to modify the metamodel. The presence of mechanisms to expand distinguishes of UML modeling tools from such as IDEF0, IDEF1X, IDEF3, DFD, because arbitrary interpretation of the semantics of model elements is not allowed. UML language is also used in the method of business process modeling; technology is part of Rational Unified Process (RUP) of IBM Rational Software Company. This method is aimed primarily at creating a basis for the formation of the software requirements, provides the construction of two basic models: a business process model (Business Use Case Model) and Business Analysis Model.

Modeling process can begin with any of models' types. The basic business model ARIS – eEPC (extended Event-driven Process Chain, is an extended chain of model processes). ARIS eEPC notation is an extension of IDEF3notation. Business process in the notation of eEPC is a stream of consistent performed work (procedures, functions), arranged in order of their performance. The actual duration of the procedures in eEPC is not visually recognized. It is necessary to use other description tools, such as MS Project, to get the information about the actual duration of the processes.

The models in ARIS are diagrams, elements of which are a variety of objects – "function", "events", "structural units", "documents", etc. Connections of certain types can be made between certain types of objects ("perform", "make a decision", "should be informed about the results", etc.). Each object corresponds to a specific set of attributes that allow you to enter additional information about a particular object. [4]

There are many approaches to modeling business processes. Each of which is suitable for certain situations and conditions. In our research, we used the IDEF0 process modeling method.

This is a list of the most common methods of analysis and optimization of business processes.

- SWOT analysis (analysis of the strengths and weaknesses of the business process);
- The method of analysis of cause-effect (Ishikawa diagram - Cause and Effect Diagram);
- Benchmarking;
- Crowdsourcing;
- Reengineering
- Analysis and optimization of the business logic of the process;
- The method of functional cost analysis (FSA analysis);
- Simulation (dynamic) modeling method;
- Calculation and analysis of the complexity and duration of the business process, the calculation of the optimal number of staff in the business process;
- Analysis and optimization of business processes based on KPI indicators, statistical methods.

Based on last year's research [5], where business processes were reengineered on the "Belmagistralavtotrans", evaluate the effectiveness of reengineering by the method of calculating the financial stability. This method is usually used to evaluate competing enterprises. In this work, we evaluate the variants of the working day model, using the models "AS IS" and "TO BE" instead of competing enterprises.

Application of the method:

- you can give each business process a weight, according to the importance of the operation, so that the sum of the weights for the employee is one;
- estimate from 1 to 10 each business process in the studied models, according to the effectiveness of its implementation;
- sum up the indicators for all processes performed during the day;
- evaluate the result.

The results of the analysis are presented in table 1.

Table 1. – Complaining systems AS IS and TO BE

Results of the Analysis	Weight	AS IS	TO BE
Searching for the loading	0,2	9/1,8	9/1,8
Comparison of cargo parameters and documentation for cargo	0,05	6/0,3	7/0,35
Adapting of freight rates for a new route	0,1	6/0,6	7/0,7
Communication with the shipper	0,2	5/0,1	7/1,4
Search and conformation of the rolling stock	0,1	5/0,5	6/0,6
Conformation of the application	0,05	4/0,2	6/0,3
Verification of transportation data and issuance of waybills			
Control by calling the driver	0,1	9/0,9	9/0,9
Checking and drawing up the acts of done work	0,05	4/0,2	5/0,25
Providing acts of done work to the customer to pay	0,05	4/0,2	5/0,25
Sum of weights	1		
Total sum		5,2	7,05

When analyzing the business processes, the advantage of the TO BE model (by 35%) becomes obvious, which shows the effectiveness of the reengineering of business processes in the enterprise. When switching to an online platform, the average time will be reduced by 29 minutes, as the time spent searching for cargo and confirming rolling stock is reduced, which further improves the efficiency of the processes.

REFERENCES

1. Weske M. Business Process Management: Concepts, Languages, Architectures / M. Weske // Springer Berlin Heidelberg. – Berlin, 2012. – 404 p.
2. Всяких, Е. Практика и проблематика моделирования бизнес-процессов / Е. Всяких. - М. : ДМК Пресс, 2008. – 264 с.
3. Замятина, О.М. Моделирование и комплексный анализ бизнес-процессов предприятия : автореф. дис. ... канд. техн. наук / О.М. Замятина. – Томск : ООО «РауШ мбХ», 2004. - 19 с.
4. Кириллов, К.В. Моделирование бизнес-процессов средствами ARIS / К.В. Кириллов // Молодой ученый. – 2012. – №6. – С. 160–166.
5. Prachkina, O.I. The business processes modelling of the transport organization / E.S. Naruta, O.I. Prachkina, P.I. Lapkovskaya // European and national dimension in research. Economics = Европейский и национальный контексты в научных исследованиях : Electronic collected materials of X Junior Researchers' Conference, Novopolotsk, May 10-11, 2018 / Polotsk State University ; ed. D. Lazouski [et al.]. – Novopolotsk, 2018. – 195 p.