

## MODELING OF BUSINESS PROCESSES

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The article is devoted to the issues of business process modeling. The article describes the plan of business process methodology. It provides a brief analysis of the modern methodologies of modeling business processes, such as SADT, IDEF family of standards and algorithmic languages. The article describes the main types of methodologies for modeling and analysis of business processes, the steps and categories business processes, the concept of the business model and objectives of business processes' modeling. It shows key indicators for assessing the effectiveness of business processes. The article describes integration means of various simulation methods on the example of the software – ARIS, and also powerful and flexible means of visual modeling are described, which supports the full life cycle of software systems using the unified modeling language UML – Enterprise Architect.

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Methodology of business processes description. In any business company there are a certain number of business processes that employees perform. These include the purchase and sale, management and productive processes, records management, and others. Automation of existing processes improves the increase of the efficiency [8].

Any activity of the company is made up of specific work performed by the employees. Each work consists of a set of steps. And if at the stage of a young business every employee performs work – the formalization implies that the main action of the employee is described and he performs it according to this description. Of course, it is a question of describing business processes. The task is –to create regular management at first. And you can use a variety of tools and methodologies, from simple block diagram of the process to IDEF0 and ARIS, training which takes more than one week. Optimization may be carried out with the processes description [1].

Modeling and automation of business processes are the key to the successful operation of the company. Professional modeling of business processes depends on the success of the enterprise. Description of business processes optimizes all enterprise segments, excluding internal disturbances and the human factor. Model of business processes based on UML for business process automation optimizes all enterprise segments. Using UML allows to model business processes and system design and to display organizational structure of the enterprise.

Business process – is the series of works, the hierarchy of interrelated functional activities whose ultimate goal is the production of a product or its components. Business process is characterized by the

implementation of its technology, its place within the overall business system, as well as providing the process: automation tools, equipment, machinery, etc [3].

Business process – a logical, sequential, interrelated set of activities that consume resources, creates value and displays the result. The international standard ISO 9000: 2000 adopted the term “process”, but at the moment these terms may be considered as synonyms. Modeling of business processes – is an effective means of finding ways to optimize the activity of the company, which allows to determine how the company works in general and how to organize activities at each workplace.

Methodologies for the description of business processes – is a set of ways in which the objects of the real world (the activity of the organization) and the relationships between them are represented as models.

Any methodology (method) consists of three main components:

1. Theoretical basis.
2. Description of the steps required to obtain the desired result.
3. Recommendations for the use either alone or as part of a group of techniques.

Description of business processes carried out for the purpose of further analysis and restructuring. The aim of the reorganization may be the introduction of information systems, reducing costs, improving customer service, the creation of job and work instructions, etc., and a detailed description of the process itself is of no value. Business process reengineering – it is the fundamental rethinking and radical redesign of business processes to achieve maximum efficiency of production, financial and economic activities, the appropriate organizational and administrative and regulatory documents. Business engineering includes

modeling of business processes (design model, its analysis, the development model), and the development and implementation of the plan of transition to the “as it is supposed to”.

The basis of many modern methodologies for business process modeling composed methodology of SADT (Structured Analysis and Design Technique – a method of structural analysis and design), a family of IDEF standards (Icam DEFinition, where Icam – is Integrated Computer-Aided Manufacturing) and algorithmic languages.

The main types of business process modeling and methodologies analysis:

1. Business Process Modeling. The most widely used methodology for describing of business processes – IDEF0 standard. Models in IDEF0 notation designed for high-level description of the company’s business in the functional aspect.

2. Work Flow Modeling description. IDEF3 standard is intended to describe the work flow and is close to the algorithmic methods of constructing block diagrams.

3. Data Flow Modeling description. Notation DFD (Data Flow Diagramming) allows you to reflect the sequence of works carried out during the process, and the flow of information circulating between these works.

4. Following classes may be marked with respect to the preparation of product added value and services or processes.

5. Basic business processes (such as marketing, production, delivery and after-sales service products).

6. Supporting business processes do not add value to the product, but increase its value (financial support for activities, staffing, legal support, administration, security, delivery of components, repair and maintenance, etc.).

7. Business process management.

Business model – is a formalized (graphical, tabular, text, character) description of business processes. The main field of application of business models – is the re-engineering of business processes.

Modeling aims of business processes are generally formulated as follows:

1. To provide understanding of the organization structure and dynamics of the processes occurring in it.

2. To provide understanding of current challenges of organization and opportunities to solve them.

3. To make sure that customers, users and developers understand the organization’s goals and objectives.

4. To establish a base for the formation of software requirements that automates business

processes of the organization (software requirements are formed on the basis of the business model).

An important element of business process models are the business rules or the rules of the subject area. Typical business rules are corporate policy and state laws. Business rules are usually formulated in a separate document and can be reflected in the models.

Decomposition in a general sense – is a method to replace the solution of a great problem solving a series of smaller tasks, splitting the object into its component parts under fixed criterion.

Almost decomposition is used for detailing of business models.

Stages of business processes description:

1. Determining the purpose of description.

2. Description of the environment, the definition of the inputs and outputs of a business processes, the construction of IDEF0-diagrams.

3. Description of the functional structure (process steps), IDEF3-construction diagrams.

4. Description of flows (material, information, financial) process, DFD-construction diagrams.

5. The construction process of the organizational structure (departments, participants, responsible).

There are following categories of business – processes:

- 1) processes to ensure product release;
- 2) planning and management processes;
- 3) resource processes;
- 4) conversion processes.

The main indicators of the effectiveness evaluation of business-processes include:

- 1) the number of a given quality produced and paid for products for a certain period of time;

- 2) the number of consumer products;

- 3) the number of common operations that must be performed in the production process for a certain period of time;

- 4) the cost of production costs;

- 5) the length of a typical operations;

- 6) investment in product manufacture.

The methodology (notation) creating a model (description) business processes means a series of ways in which real-world objects and the relationships between them, which are represented as models. For each object and relationships are characterized by a number of parameters, or attributes that reflect the characteristics direct of real object (object number, title, description, duration of implementation (for functions, cost, etc.).

Method IDEF3 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.

DFD. The purpose of this article – is to show how each process converts its inputs into outputs. It may reflect not only information but also the material flow. The main components of data flow diagrams are:

1) external entities (material object or individual is a source or receiver of information, such as customers, employees, suppliers, customers, locations);

2) system and subsystem (subsystem for work with physical persons);

3) processes (converting input data into output streams in accordance with a certain algorithm, physically it may be, for example, division organization (department), performs input processing and issuing documents reporting program implemented in hardware logic device, etc.);

4) data storage media (abstract storage devices);

5) data streams (in the diagram-arrows).

The first step in constructing the hierarchy of DFD is to build context diagrams. Usually in the design relatively simple system built only context diagram with a star topology, the center of which is the so-called main process, coupled with the receivers and sources of information. Each process in the DFD can be detailed using DFD, or (if the process elementary) specification. Specifications are the descriptions of the tasks of algorithms, which execute the process. Specification languages can range from a structured natural language or pseudocode to visual modeling languages.

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 such tool is a software product, called ARIS (Architecture of Integrated Information Systems), developed by the German company IDS Scheer. To construct these models' types both own ARIS modeling methods are used, and various well-known methods and languages of modeling, in particular UML.

UML contains the extension mechanisms for adaptation specific modeling language to the specific requirements of the developer without having to modify the metamodel. The presence of mechanisms to expand dis-

tinguishes 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 [4].

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. To get the information about the actual duration of the processes it is necessary to use other description tools, for example, MS Project.

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.

The main objects of eEPC notation:

1. Function. It is used to describe the functions (procedures, work) performed by departments / employees of the company. Each function must be initiated by the event and must be terminated by an event; each function cannot include more than one arrow, “triggering” the function and leave more than one direction, describing the completion of the function.

2. Event. It is used to describe real events that affect the performance of functions.

3. Organizational unit. For example, management or department.

4. Document. It reflects the real media, such as paper documents.

5. The application system.

6. Information cluster. Characterized by a set of entities and relationships between them.

7. Communication between objects. The type of relationship between objects, for example, activation of the function some event.

8. Logical operator. The operator “AND”, “OR” or exclusive “OR” allows us to describe the process of branching.

If you create a model in eEPC it indicates only the sequence of procedures, and does not care about the reflection control documents and obtained information, models will have a low value in terms of analysis and future reference.

To store the models in ARIS an object database is used, and for each project you create a new database. There are various functions for database administration, for example, access control. The database consists of a hierarchical storage models. ARIS supports methodological filter mechanism, allowing the user to use only a certain set of schemas and objects. The development of such agreements requires considerable time and highly skilled professionals. If the project with used ARIS starts without a detailed study of such agreements, the probability of creating business process models is very high, which is not respond to these questions.

The main types of business processes' modeling and analysis of methodologies:

1. Business Process Modeling. The most widely used methodology for describing business processes – IDEF0 standard. Models in IDEF0 notation designed for high-level description of the company's business in the functional aspect.

2. Description of work flow (Work Flow Modeling). IDEF3 standard is intended to describe the workflow and is close to the algorithmic methods of constructing block diagrams.

3. Description of data streams (Data Flow Modeling). Notation DFD (Data Flow Diagramming), allows you to reflect the sequence of works carried out during the process, and the flow of information circulating between these works.

4. Other methodology [5, 6, 7].

Practice has shown that the standard IDEF0 should be used in projects for the description and optimization of local business processes, in small projects experts are more involved and make decisions, and top-level executives involved for decision making in a minimum.

The steps for development of automated systems (AS) include the formation of the AU to the requirements of the development of AC concept, requirements specification, preliminary design, technical design, working documentation commissioning, and support for the AU.

Models can be linked between each others. In UML this relationship is called a trace and can be used in any software project, without regard for the subject area, the area of decisions, etc. UML class diagram allows you to denote rela-

tionships between classes and their instances. They are needed, for example, to simulate the application area. This small study is trying to answer this question – show this relationship in the code. Unified Modeling Language (UML) is a visual modeling language designed for the development of domain models and software systems of different classes. UML can be used in any development process, at all stages of the development of software systems. UML is used to create models in all subject areas. For the construction of the main stages of activity diagram UML can be used by the business process.

There is a powerful and flexible means of visual modeling that supports the full life cycle of software systems using the Unified Modeling Language (UML) – Enterprise Architect (EA) – is a product of the Australian company Sparx Systems. EA is also called visual modeling platform.

Enterprise Architect (EA) allows you to:

1. To create UML model elements.
2. To place these items on the charts.
3. To define relationships between elements.
4. To document by the model and the elements.
5. To generate the code for the software being developed.
6. To import codes in various languages, including VB, Java, C++, etc. (More than 10 languages).
7. To create different templates and domain system models.
8. To support the tracing of domain models to system models.

Distribution of EA comes as an executable file (easetupfull.exe). Files created in EA projects have EAP extension. Together with EA comes demo EAExample.EAP, and empty EANew.eap project.

There are different versions of EA (<http://www.sparxsystems.com/>), for example: Corporate, Professional, and Desktop.

Today there are quite a lot of optimization methods of business processes – from simple to complex. The main condition for the success of technological optimization – is the existence of a model or process scheme. When optimizing the organization it is recommended to use the formula proven by the experience, including strict sequence of the following steps:

1. The description of the organization model “as is”.
2. The analysis of the “as is” model.
3. The development of a “getting all right” model.
4. Development of a migration plan from the state “as is” in a state of “getting all right”.

5. The introduction of changes and building of a model organization “just right”.

To build a better business processes and organizational structure a developed strategy is required. In modern management to analyze and optimize the activities it is recommended to use business processes’ models that schematically represent them [9].

Business Processes’ Modeling is performed by the following methods:

Flow Chart Diagram (work flow diagram) – a graphical representation of a method in which the process operation data, process equipment, etc. are represented by special symbols. The method is used to display the logical process work flows. The main advantage of this method is its flexibility. The process can be represented in many ways.

Data Flow Diagram – data flow diagram or DFD is used to transmit display information (data) from one operation to another process. DFD describes the relationship of operations at the expense of information and data. This method is the basis of structural analysis processes as It allows us to decompose the process into logical levels. Each process can be broken down into subprocesses with higher levels of detail. The use of DFD reflect only allows the flow of information, but not the materials flow. Data flow diagram shows how the information in and out of the process steps which change the information, where the information is stored in the process and so forth.

Role Activity Diagram (role diagram) is used to simulate the process from the perspective of individual roles, roles, groups, and roles in the process of interaction. The role is an abstract element of the process that performs any organizational function. The diagram shows the roles of the degree of “responsibility” for the process and its operation, as well as the roles of the interaction.

IDEF (Integrated Definition for Function Modeling) – is a set of methods for describing different aspects of business process (IDEF0, IDEF1, IDEF1X, IDEF2, IDEF3, IDEF4, IDEF5). These methods are based on the methodology SADT (Structured Analysis and Design Technique). For business processes’ modeling most commonly is used IDEF0 and IDEF3 methods [2].

In conclusion, the article is written about the applicability to carry out the analysis and optimization of the activity for organization using the models of business processes and business process modeling. We provided a brief analysis of the modern methodologies of modeling business processes, such as SADT, IDEF family of standards and algorithmic languages. The article describes the main types of methodologies for modeling and analysis of business processes, the steps and categories business processes, the concept of the business model and objectives of business processes’ modeling are very actual nowadays. We also mentioned about the integration means of various simulation methods on the example of the software – ARIS, and also powerful and flexible means of visual modeling are described, which supports the full life cycle of software systems using the unified modeling language UML – Enterprise Architect.

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