Construction of Decision Support System in Business Design Based on Integration of Information Technology

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***Abstract*—In an increasingly competitive environment the successful functioning of any business requires continuous improvement of services, expanding the range of products and range of services, standardization, and implementation of new busines ideas, establishment and dissemination of innovative solutions on the market. The implementation of such measures were carried out in a well-developed business projects. Automating business processes often requires the organization of various programs, which creates a problem of integration. The paper attempts to organizations handling business processes through the integration of various software tools. One of the major component due implementing business projects is the automation of business processes. At the same time, as a result of the automation of business processes significantly increases the efficiency of decision support systems in the enterprise management system.**

***Index Terms*—Decision Support Systems, Data-Mining, Data Integration, Enterprise, Enterprise Resource Planning, Information Systems, Supply Chain Management.**

I. Introduction

The planning of any business project envisages expert analysis of practical activities, techniques, material and financial flows, as well as research of full life cycle of the proposed project. One of the most important issues in the effective management of business processes is the efficiency of processing management information and statistical data analysis. For example, in almost all widespread ERP- systems are present functionality forecasting using a variety of statistical methods. The proposed method is based on the principle of sharing of compatible technology design, simulation and analysis software tools. According to this technology for the effective management of business structures of three stages of data operations are discussed: collection, analysis and decision making. At each of these stages, various software and technological tools are used. Thus, the modern concept of design business structures provides the integration of heterogeneous information technologies into a single information and objective space. Proceeding from the above, for the construction of an information system for managing business processes the technological means necessary to perform the following functions are used:

- Notation business process modeling;
- Etymological means of implementing business processes;
- Document management system;
- Intelligent technology for managing business resources;
- Specific software and information technology support tools above (BPMN, BPEL, JavaNetBeans, MS SQL Server, MS Excel-Solver).

II. The problem statement and solution

Automation of business processes is allowing the control over all phases of the business, internal and external document flow, the timely introduction of the control system necessary adjustments. The main objectives of automation are:

- improving the quality of goods or services;
- quick adaptation to solutions of the problems when conditions are change (for example, the situation in the market);
- ensuring coordinated work of all departments;
- protection from potential failure associated with the human factor;
- strong control of material resources;
- monitoring of the production process;
- simplification of informing regulatory authorities (both external and internal).

The business process automation contains the following positive developments for enterprises:

- increasing the speed of information processing,
- increasing business technologies,
- approval of personnel actions,
- control of the amount of information,
- automation of manual work,
- reducing of errors,
- access control and distribution of user rights,
- the expansion of the customer data,
- increase customer loyalty,
- high-quality reporting,
- automatic restocking.

For the management of the enterprise interest are the following possibilities:

- rich data for analysis, including various analytical reports, and tables,

- powerful tool for business management and decision-making.

Software applications of automated processing of business processes are widely used in the business[3]. Obviously, the natural language poorly adapted to clear formalization of business processes, therefore special language (notation) that provide more information on the formal fixation occurring in the companies business processes are developed. Nowadays, for these purposes different methodologies (SADT, ARIS, RUP, etc..) and a variety of software tools that support them are used, ranging from popular Microsoft Visio to complex software systems such as ARIS.

Business Process Automation offers great opportunities for building effective information systems that perform useful functions in the management of enterprises. One class of such systems are decision support systems (DSS). DSS is information and analysis system, which is solve the problem of information and intellectual support of the man, who make the decision (MMD).

The main feature of information technology to support decision-making is a new way of organizing human-computer cooperation. Decision-making, which is the main purpose of this technology is the result of an iterative process (Fig. 1), where are involves:

- decision support system as a computing unit and the control object;
- people as a control unit that specifies the input and evaluate the result of calculations on a computer.

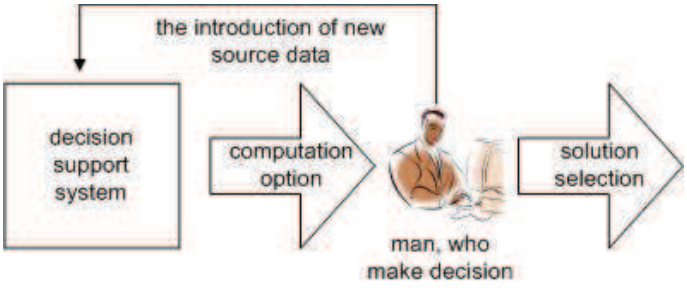

Fig. 1. The iterative process of information technology to support decision-making.

The main function is the derivation of recommendations based on the study of historical and current status of the object of study and compare them with the information stored in the knowledge data of the system. A list of the main functions of the DSS are follows:

- Extraction of knowledge;
- Verification of knowledge;
- Output of recommendations;
- Explanation of recommendations.

All this allows you to draw a very generalized functional architecture of the DSS in the following form (Fig. 2). Modern DSS - is the result of many studies, such as:

- Data Base and Data Knowledge;
- Artificial Intelligence;
- Interactive computer systems;
- Simulation modeling methods.

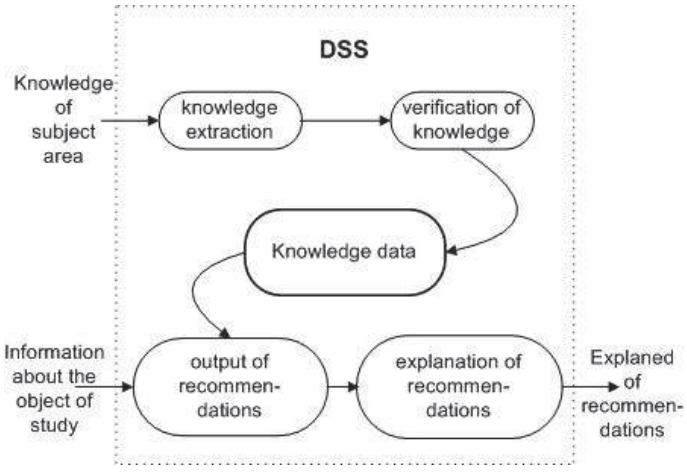

Fig. 2. Generalized functional architecture of DSS.

As a result, the DSS appeared by the merger of management information systems (MIS) and database management systems (DBMS). The database plays in the information technology decision support (DSS) has an important role[5]. These may be used directly by the user for the calculations using mathematical models. Consider the data sources and their characteristics:

1. Part of the data received from the information system of the operational level. To use them effectively, the data must be pre-processed. For this there are two possibilities:

- used for data on the operations of the company database management system that is part of a decision support system;
- make handling outside the decision support system, created for this special database. This option is preferable for firms producing a large number of commercial transactions. The processed data on the operations of the company form make the files to improve the reliability and speed of access are stored outside of a decision support system.

2. In addition to data on the operations of the company for the functioning of a decision support system is required, and other internal data, such as data on the movement of personnel, engineering data, etc., which must be promptly collected, introduced and supported.

3. Important, especially to support decision-making at the top levels of management have data from external sources. The number of external data should indicate the data about competitors, national and world economy. Unlike internal, external data are usually purchased from specialized organizations in their collection.

4. Now widely studied issue of inclusion in the database of another data source - documents containing records, letters, contracts, orders etc. If the content of these documents will be stored in memory and then processed by a few key characteristics (suppliers, customers, dates, and other types

of services.), the system will get a new powerful source of information.

The data management system (DBMS) must have the following capabilities:

- composing data patterns derived from different sources through the use of aggregation and filtration procedures;
- quick addition or deletion of a particular data source;
- building a logical data structure in terms of the user;
- the using and manipulation of unofficial data for the experimental verification of working alternatives to the user;
- ensuring full logical independence of the database from other operational databases, operating within the company.

BPMN allows to build as a model of the individual business processes of the system and to describe the workflow and workflow processes [1], [8].

BPMN is standard for business process modeling, describes graphical notation to display business processes in the form of diagrams of business processes, similar to activity diagrams (Activity Diagrams) from UML (Fig. 3). BPMN is focused both on technical specialists and business users. For this purpose, the language uses a base set of intuitive elements that allow you to define complex semantic structure.

The notation to describe business process models, to the forefront side comes of the graphic elements of visual description of the models and the compatibility charts.

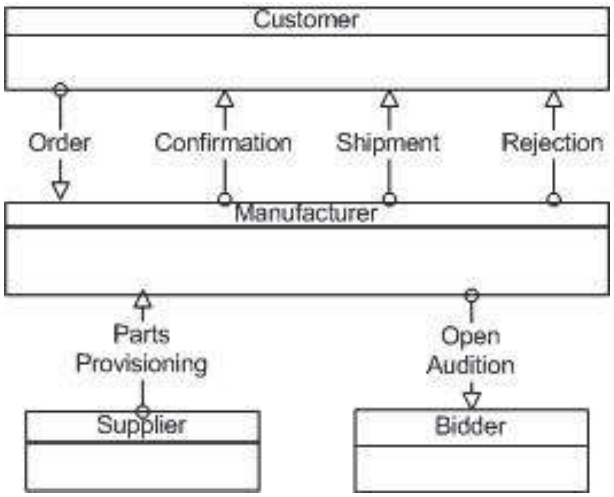

Fig. 3. An example of the graphical display of the business process.

There are four main categories of elements:

- Events, activities and logical operators (gateways);
- Connecting objects: sequence flow, Message Flow and Association;
- Swimlanes: Pools and Lanes;
- Artifacts: Data, Group and text Annotation.

The basis for ensuring the compatibility of the rules are language modeling and execution of business processes BPML and BPEL [2]. BPEL is built on XML and is the language is represent of the graphical representation of business processes and the formal description of their interaction protocols (Fig. 4) [9]. BPEL defines the behavior of business processes based on Web-services. BPEL provides a function of exports and imports, using only Web-services interfaces. BPEL fits into the architecture of the main Web-services built on top of UDDI, WSDL, XML and XML Schema[4], [6]. BPEL defines the structure needed to compile a set of services for business processes related to joint operations and transactions. BPEL defines how to send XML-messages to remote services, how to manage XML data structures and asynchronously receive XML-messages from remote services. With the help BPEL business processes can be described as a feasible modeling the actual behavior of the participant business interactions, and as business records, using the description of the process. Description of business protocols are called abstract processes. BPEL models the behavior of both executable and abstract processes. BPEL can be considered as a programming language that "is in the middle" between declarative and procedural programming. As in any programming language, in BPEL are defined reserved words that are listed below:

Call operations using Web-based service (<invoke>).

- Wait for external messages (<receive>).
- Generate response to input / output data (<reply>).
- Wait for some time (<wait>).
- Copying data between positions (<assign>).
- Display of error or error condition (<throw>).
- Stopping the implementation of the whole service (<terminate>).
- No action (<empty>).
- Identify the sequence of activities (<sequence>).
- Branching with operator selection (<switch>).
- Cycle determining (<while>).
- Perform one of several alternative routes (<pick>).
- Indication that the step should be executed in parallelly (<flow>).
- Display of incorrect machining logic using <throw>and <catch>.

On the basis of the proposed scheme, the integration of technology in the analysis of business processes can be implemented, for example, the optimization model alternatives and select the best from a variety of offers, using the methodology of decision support. The method of expert estimations for the formation of the decision is as follows. All the experts cannot communicate. Feedback between them is missing. A possible solution is based on mathematical rules:

$$\varphi\Big(x_1, ..., x_n\Big) = \frac{\sum_{i=1}^{N} x_i \alpha_i}{\sum_{i=1}^{N} \alpha_i} \tag{1}$$

where $\alpha_i\Big(i = \overline{1, N}\Big)$ is weight of experts.

To further solve problems of choice is necessary to form the initial set of alternatives A. To further optimize the selection and effective solutions from a common set A_y select a certain range of possible alternatives A_ϱ, i,e.

$$A_\varrho = C_{on}(A_y) \tag{2}$$

where C_{on} is a function of selection, establishing a belonging to a variety of possible alternatives.

Search for the best values of key parameters is carried out using a tool MS Excel Solver. Add-in Solver is part of a set of commands that are sometimes referred to as a means of analyzing "what if". With this add-in, you can find the best value (high or low) the formula contained in a single cell, called a target, taking into account the restrictions on the values in other cells with formulas in the worksheet. Solver works with a group of cells called cells variables used in the calculation formulas in target cells and cells restrictions. Solver Add-in changes the values of the decision variables in the cells according to their limits and displays the result in the target cell.

On the basis of the implementation language of business processes creates visualized documentation describing organizational processes, taking into account their communication support within a Web service and service-oriented approach.

As a rule, the development of business processes requires an examination of the functioning of various departments and structural units of the company in their interaction. Thus, for a system of documents flow the information tools different technological orientation are required. The essence of the service-oriented approach is to ensure the of unimpeded interaction of software applications in the various functionality and scale information systems as at present and in the future. Description of the sequence of calls intended for the execution of the service business-processes, is carried out by means of language execution of business processes. This language is also used to coordinate and logic synthesis work flow and data flow. From the viewpoint of technological application of this method of transmission defines XML-messages towards remote services. From this standpoint, an integrated development environment Java NetBeans is quite flexible and convenient tool and in turn, contains and makes it possible to use a wide range of software tools [7].

Based on these considerations related to system parameters such as the amount and timing of interest include the project as an intellectual and analytical tools, with further elaboration of the adoption of the recommended solutions, add-in program MS Excel Solver.

III. Conclusions

Results presented in this paper clearly shows how accessible and affordable DSS software resources can be built. This result is achieved through the integration of these capabilities to identify non-uniform software. It is also possible to conclude about the important role of XML, which takes over the function of a bridge to report a variety of applications in their required format. From the Figure 4 follow, that the intelligent application of decision-making Solver - MS Excel due to of his ability interacts directly with MS SQL Server (Fig. 5), as with other technologies - via XML.

Fig. 4. Description of business processes and their interaction protocol.

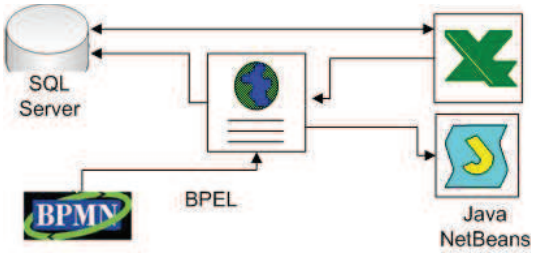

Fig. 5. Scheme of business process management.

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