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MODELLING OF BUSINESS PROCESSES BY COMPUTER IMITATION

1. Introduction

In a crisis an ability to react flexibly on critical changes of the market environment is vital, because the crisis calls the prompt reaction. On the other hand decisions should remain effective. Efficiency in decision-making is provided with constant monitoring of dynamics for business processes, efficiency – with an estimation of decisions by means of computer modelling for possible variants.

In Ukrainian economy the amount of small and medium-sized enterprises is significant. For them typical are budget limits to use qualified economists, mathematicians, experts on information technologies. These reasons have caused increase of interest in modern technologies of computer imitating business-modelling which are rather inexpensive, accessible to the personnel of average qualification and can work on the equipment existing in the company. Duplicating of typical business decisions as box variants is recommended in Ukraine [Buravleva 2008].

According to the theory of business process management (BPM), creation of business decisions consists of several stages: stage of modelling and imitation of business processes, stage of development and testing of business processes applications, stage of accommodation and start of applications, stage of monitoring of applications and formation of key parameters of efficiency, stage of import of estimated parameters and completion of initial model of processes [Wahli et al. 2007].

The aim was to research company activity efficiency by using imitating modelling of business tasks on processing orders.

In models the methods of creation composite business processes as sets of business-services of repeated application with weak connections were used. Models were realized on the basis of service component architecture which enables to convert virtual models into really working processes.

2. Statement of a task

Criteria of efficiency for a company always were the main priority for definition of its market competitiveness. There are various mathematical methods for modelling behaviours of economic objects in various real situations for an estimation of influence factors on the efficiency of a company.

Other problem is necessity of formulation of the task for model in mathematical terms. They can essentially vary from economic terms. Mathematical language and business language have different abstractions, various subject domains.

For daily application the opportunity of use of natural human language for management of mathematical models for economic objects is convenient. Economic objects in turn work in the computer environment. Business processes are intellectual processes substantially. The use of principles of the artificial intellect, natural human language for the decision of economic tasks is pertinent.

For people the basic channel of receipt of an information is the visual channel, so it is completely fair to use first of all this channel for creation of business models which are determined in business terms and represent graphic structures with weak connections.

Development of computer local and global network architecture in itself became a technological basis of transition in management from automation of separate business processes in separate division to integration of many diverse processes at the level of companies.

This is a list of the basic problems which should be taken into account during economic objects modelling.

The use of programme methods of imitating modelling solves the majority of these problems. Contrary to traditional mathematical methods, which are widely used for modelling business processes, imitating methods are based on network opportunities of computer systems and graphic representation of business problems.

The high-grade working virtual model of business processes with control by natural language commands is created. It has ample modelling opportunities of work of system in a mode of real time, with graphic display of a significant amount of economic indicators and the automatic control of all important parameters.

3. Example of the business script

For modelling the regional medium-sized company which is engaged in sales of the equipment, completing and materials has been chosen. The company specializes in small wholesale sales. It has certain internal problems with efficiency of its own business processes which have not been updated for some years. External pressure, on the other hand, amplifies on the part of competitors who use new business technologies.

According to company clients' opinions the brief list of the basic problems has been prepared: the operating time for orders processing centre is inconvenient, reception of orders by phone is slow, results of orders check process are delays in delivery, regular clients are not satisfied with long term of decision-making for the credit and so on. As the result the company loses clients and profit.

The business purpose of the company is increase of incomes and reduction of expenses. Particularly: it must provide reception of orders 24 hours per day and 7 days in a week, average rate of orders processing should be reduced to 2 working days, it should provide regular clients crediting from 75 up to 80% of orders, to optimize resources, to reduce the number of the personnel and change their business roles, to offer full change of business technologies for sales process.

4. Criteria of efficiency

The estimation of efficiency of business processes is made according to the following criteria:

t – time of execution of an order, days ($0.5 \leq t \leq 2$),

p – probabilities of a choice of intermediate and target results (are set in the table of probabilities),

k – factors of a choice of decisions variants,

n – quantity of the given credits, % ($75 \leq k \leq 80$),

v – cost of process.

For monitoring the specialized business the following metrics are used: a stop watch of the order execution time, the indicator of the new order, the indicator of sending of the order to the client, the counter of orders, the counter of sent orders, the indicator of a reuse of the new order, the indicator of a reuse of shipment of the order to the new client, and the aggregated metrics: total of the orders, total of the sent orders.

5. Model of orders processing

Exact representation of business processes can be made under requirement of creation of adequate models and research of their behaviour in various conditions.

The model of orders processing will structurally consist of four modules which simulate realization of managerial process by the company on the basis of virtual computer information system.

The first module realizes functions of work of applications. It will consist of: the client interface for search of the goods, the client interface for formation of orders, the manager interface for the coordination of orders, the interface of a configuration of orders, indicators of efficiency.

The second module is support of business functions' realizations. It is possible to relate the following services to them: identification of users, complete sets of orders, coordination of orders, safety, business monitoring, management for accounts, complete of orders, clients support.

For support of work of other modules it is necessary to realize some intermediate functions which are structurally united in the separate module. The module contains: the rules processor, the register of services, the directory of services, the service of business processes, the service of used functions, the service of processes monitoring, the service of messages exchange, the service to access to data, the service of tasks, which are carried out by persons, the service of web functions.

The imitating model is constructed on principles of information system in which the information is kept in a database. For a data storage of model the system functions modules are used. There are located: the database about users, the catalogue of goods, database of accounts, database of orders, database of coordination rules.

The decision of a task begins with inspection of existing business processes and their documenting. Further the scheme of sales from reception of the order to sending the goods or refusal in delivery will be made. Business objects (inquiries, orders, information about the clients, the goods and documents about the goods) and their attributes (the status of the order, a credit rating) are defined. Resources with the schedule of their use are planned. There are mechanisms, fuel, transport, account materials. Day and evening shifts, weekends, holidays are taken into account in the schedule features of work. Roles will be distributed. They are managers, senders of cargoes, systems of catalogues, systems of orders processing, support systems for clients.

The prepared information is the starting point for creation of imitating model with the toolkit Business Modeler [*IBM WebSphere...* 2008].

For the start of modelling process it is necessary to determine resources of the company and probabilities of decision-making. There are corporate strategy, the processes scheme, necessary human resources, the tables of cost, the table of duration, the table of availability of the personnel, probability for tables of a choice, probability for tables of target results to determine operating modes (profiles) and attributes for modelling. These data will be entered in corresponding fields of forms of models. After filling forms the process of measurement will start. It allows to create working virtual model and to analyze results of modelling in an interactive mode.

For the script of an example the basic indicator are orders. For example, the company receives 34 orders per one hour. Then for 8 hours the quantity of markers for modelling will make the working day 272. The maximal duration of an estimation of efficiency is one year or 365 days. Frequency of measurement of results is one minute. Inquiries are casual and correspond to the normal distribution.

For the analysis of the results four groups of indicators are used: duration of processes (functions Dynamic Analysis), variants of results of processes, variants of use of resources, costs of processes. The analysis of processes determines necessary modelling duration for calculation of an authentic estimation of efficiency.

6. Results

The received results (see Figure 1) allow to find “bottlenecks” in resources and to replace them with the best choice.

The analysis of results of variants gives the detailed information on throughput for each problem. Average throughputs in some variants are inadmissibly small. The basic expenses of time cause processes to fill numbers and essential data for the client. To increase it is necessary to redistribute resources or to create new model of process with new resources.

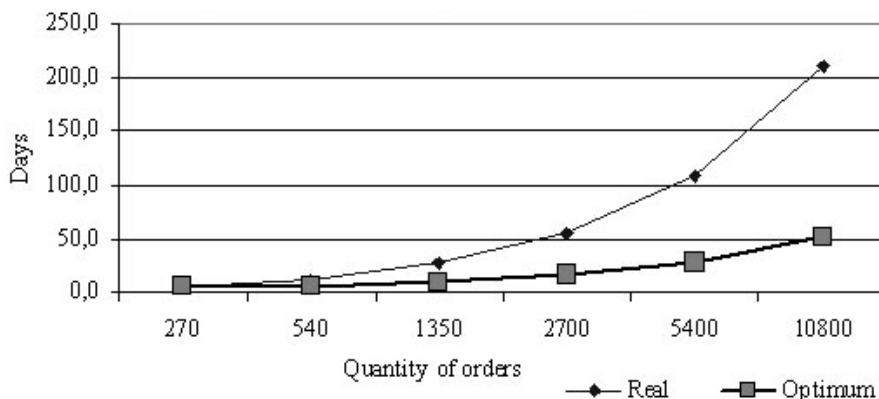


Figure 1. Average duration of orders processing

Source: author's estimates.

The diagram of resources shows an exponential growth of expenses of time for service of the client. This time is the “bottleneck” of process. Possible decisions will be made by transfer of the process “Reception of the order” from the manager to the client, which itself will make the order through a web service of the company.

Modelling enables to execute cost and other kinds of the analysis to investigate expenses, planned schedules, resources, technological procedures and other factors which influence efficiency of concrete process and, if necessary, to improve it.

Changes of business technologies have been executed according to the results of the example modelling. In the process “Reception of orders” employees are

replaced with web service which creates the information on the client and on the goods. Orders are accepted 24 hours for 7 days per week. The client will independently fill in his web form and send the order himself.

The order is checked automatically by the processor on conformity to business rules. The thresholds of the sums of the orders for regular clients, which demand the coordination of the manager, were raised. Other orders are checked automatically.

The suggested changes are realized in change of model. For it new cost and efficiency are determined.

7. Conclusions

Small and medium-sized companies, as a rule, have the insignificant capital at the initial stage and have no opportunity to employ highly skilled economists and analysts. So for small and medium-sized companies, quick decisions modelling is very important. Models allow management, with support of financial and administrative planning, to form reports, carry out their consolidation, supervise and analyze key parameters of efficiency.

The use of software for imitating business processes creates new opportunities of increase in efficiency and competitiveness. Thus high qualifications of the personnel are not required because modelling is realized on the basis of personal computers already existing in the company with statement of tasks in a natural language in terms of business, instead of in terms of programming.

Literature

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