SIMULATION MODELING OF PROCESSES USING NUTSHELL APPROACH

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This paper describes simulation modeling using the example of an already existing process at the Faculty of Mechanical Engineering in Skopje. The paper is based on the use of a so-called Nutshell approach that allows defining the already existing processes, their visual presentation (graphs, diagrams) and creation of scenarios for improvement of the processes. The modeleing is made on the basis of the implemented changes in the processes using the Nutshell approach as a technique for detecting process characteristics for how it was (as-is), how it is going to be (to-be) as well as to define the actors in the process. As a very simple but not often used graphic presentation of the processes in this paper it is used the Swimlane diagram.

The data presented in this paper are taken from various materials from the Faculty of Mechanical Engineering, as well as the consultations made with persons involved in the process of application forming.

Key words: simulation modeling ; process**;** Nutshell approach; Swimlane diagram; changes

1. INTRODUCTION

A major problem confronting business today is how to increase productivity, provide higher levels of service and responsiveness, and at the same time reduce costs. Since the begining of the 1990s, companies have added time to market, response time, and customer service to a list of competitive "must have's" that already included quailty, innovation, functionality and cost.

Companies are increasingly coming to realize that traditional organizational structures, customer service philosophies, and business methods are no longer competitive in today's global market. They are also coming to realize that the old cost-cutting methods of slashing through departments and functions and reducing head count do not make them more competitive either.

No metter if the organization is public or private what is needed is an organization that is

customer-focused and market-driven in its external relations and process-focused and team-oriented in its internal operations. Only such an organization can look at the way work is performed across functions and seek to make those cross-functional operations more logical, effective, and efficient. Such an effort is at the heart of the Business Process Reengineering.

As the name for itself describes, Business Process Reengineering, is based on mapping, analysisng and changing of the processes within an organization. The processes approach is very important during the institutional transformation. This article has a purpose to show a simulation of modeling of an already existing process using the most common Nutshell approach. Consultants, professors and people that works with this matter knows the benefits of the use of the Nutshell approach but also many people rearly know that the whole concept of identification of one process untill its use-case scenarious is called an Nutshell which means "working in a shell". The identification of the process is the first phase from the so-called Nutshell approach for workflow modeling. This approach is organized into four phases: 1) Framing the process; 2) Understanding the current (as-is) process; 3) Design the new (to-be) process; and 4) Developing use case scenarios.[7] In this article we describe three of the four phases. The last phase is not describe because our tendency is to show and map the old process and the new implemented process at the Faculty of Mechanical Engineering in Skopje.

For this purpose we use graphical presentations in form of diagrams not so frequently used but very efficient called Swimlane diagrams (other names: Process map, Process responsibility diagram, Responsibility process matrix and so on). The Nutshell approach is a process for process improvement in which various modeling techniques and frameworks are involved. The process workflow modeling is the central technique for the process [5]. This approach is useful not only for the transformation process but as a tool for the reviewing already made transformation as well.

It is an approach that offers continuous follow up of the processes.

2. IDENTIFICATION OF THE IMPROVEMENT PROCESS (FRAMING THE PROCESS)

The president of the Texas Instruments had this message on his desk: *If you do not change the processes you cannot expect changes into results*. [4] People that work on the quality management are familiar with the importance of the processes reviews even when a change has been made. No matter of the quality philosophy (TQM – Total Quality Management, Kaizen's, Crosby's or Juran's) the key issue for the quality is the process management. It is very important to mention that processes are different from functions. In one company/institution functions are given by default by the job but the process is the "invisible" part of the collaboration between functions or just as a part of one function. With a simple definition, a process is a particular course of action intended to achieve a result (procedure);[5] a series of actions or operations conducting to an end [6]; or: a process is a way for enterprise to organize work and resources (people, equipment, information and so forth) to accomplish its aims [7]. According to these definitions it might be easy to figure out which activities are part of the process. The employees are usually those who identify processes, which is the case with the student's application at the Faculty of Mechanical Engineering in Skopje. This student's application process has three basic phases:

1. Fulfillment of an application form by the student (recommended from the Ministry of Education and Science);
2. Receiving the forms by the student service at the Faculty;
3. Issuing permission by the student service, which allows the student to the following year (except for the first year application).

Fig. 1. Basic relation between the enablers of the application process

With this basic approach we are able to see two enablers (actors) - the student and the student service (Fig.1). What we are not able to see is the interrelations that define the real structure of the process. This is how the real process goes. The vice Dean for Education proposes conditions for assigning new study year (except 1st year of study). Proposed conditions are approved by the Educational and Scientific Council at the Faculty. When conditions are approved they are published at the information panel at the Faculty, at the web page and at the student service. The basic requirements for student application process are: number of passed exams during the previous year that, completition of the application forms, payments for student funds and participations, confirmation form the library and the time period for application. When the student has collected all signatures from his teachers for the attended classes from the previous ye ar and grades for the passed exams, he has to pay all expenses for the Faculty in the bank (student funds and participations). Also he has to buy application forms and statistic forms that are issued by the Ministry of Education and Science. Next, the student completed the forms and goes to the student service desk (which works from 12 till 14 o'clock every day) during the application period with the student identification card (ID in further text) to apply for the approval to continue next year. The approval can be given for a day or a week. The process is mostly confusing for the students. The process continues within the student service. The student service currently has three employees. Their job is to open a register/file for every student (in directory book and in the computer data base). When the student passes an exam he brings a grade form to his teacher. The teacher signs the form grade year and brings to the student service. The student service collects grade form s and adds every single grade in the database and puts the grade forms into the student's file. When a student gives his application for the new study year (in September) the student service checks whether the student has fulfilled all conditions for assignment of a new study year. If it is all right the service brings the student's ID back to the student with a stamp for permission, if some problem exist the Vice-Dean for Education is informed about it or the student has to pay to repeat the previous year again (Fig.2).

The employees at the Faculty have recognized the problems that occurred during the application process and have decided to make changes in the part that can be changed by the Faculty and that is in the student service part.
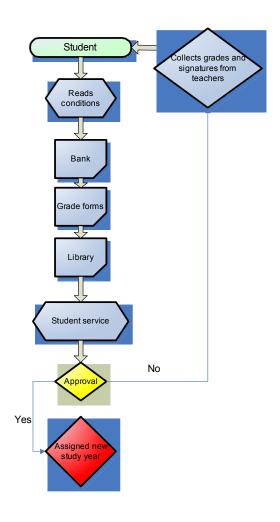

Fig. 2. Student's application process

In this way are able to finish the first step of the Nutshell approach – framing the process. We can name the process as an application process, we can identify the event that triggers the process; we can see the result achieved by the process, identify the stakeholders and the results they expect, actors, mechanisms that support the process (systems, forms, equipment), process time and frequency. When the process is framed and the main questions are answered, the second step is to understand the current (as-is) process.

2.1. The as-is process and the problems

If we want to model the process effectively to be visible from outside it is not enough just to explain that process in words. It is important that visual aid is added. This is a basic part of the second phase of the Nutshell approach for understanding the as-is process shown visually by diagrams or drawings. At the Figure 2 we can see a very simple workflow diagram. We are all used to draw diagrams and tables to simplify our conclusions or main points. In this modeling we use the so-called Swimlane diagram that show what is done, by whom, and in what sequence. Some authors describe the three Rs: roles, rules and routes [8]. Just as a fact it is useful to mention that every year (every September) there are approximately 300 students per year applying for new study year. For three years (except the students that applies for the 1st year) there are 900 students applicants. Every student should get a signature or a grade from approximately at least 5 (five) te achers, which is $900 \times 3 \times 5 = 112500$ signatures and grades.

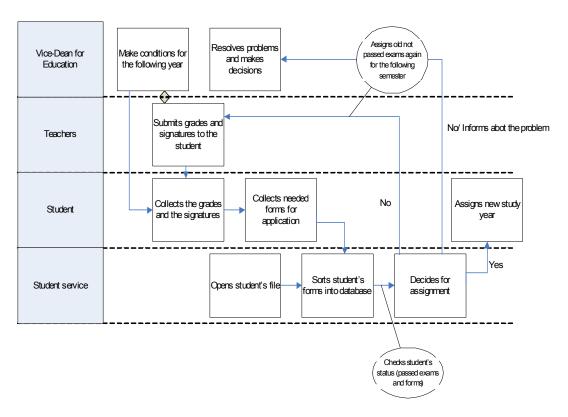Figure 3 shows the model of the student's application process using the Swimlane diagram.

Fig. 3. Swimlane diagram of the student's application process – old process

We can see the roles or the actors that perform the process: the Vice-Dean for Education, Teachers, Students and the Student service. We can also see their responsibilities and the routes or the workflows and decisions that connect the tasks together and therefore define the path that an individual work item will take through the process. The Faculty has noticed the following problems of the old application process. The process is too long; the student needs days, sometimes weeks to collect all signatures and grades from his teachers; the student has to spend time for paying all expenses in the bank because there is no such at the Faculty building; he has to fill a lot of application forms given by the Ministry of Education and Science; he needs to go to the student service desk at specific time period; teachers sometimes lose the grade forms

so the student service does not have information if the student really passed an exam. If everything is all right the student service n eeds few days to give back the student ID to the student.

2.2. The to-be process planning

Some of the problems the Faculty could not resolve without permission from the University management. This includes the time spent for different payments for the studies as well as for the grade forms for each exam. This regulation is for all Universities in the Republic of Macedonia given from the Ministry of Education and Science in collaboration with the Ministry of Finance and there is no way to avoid it. For this reason the Faculty decided to find a solution only for the administrative part of the process where the Faculty has an influence. The changes are made on the part of registering the students in the database also in the student service for checking student's status. Now the student can check his status on his own using the database. A team has been formed and consists of: Vice-Dean for education as leader of the team, IT professionals from the Computer Center, IT external consultants who helped the database to be developed and the student service administr ation that helped focusing on the problems that could occur during the application database development. The team decides that the most effective solution (in this pilot solution project) would be a development of online application form. The application form can be filled only with IT Center's approval and the student will have a permission to fill it only in the Computer Center at the Faculty. IT experts and consultants created a new IT package using several databases consist of the following inputs:

1   The student's condition (student's grades, passed exams in the previous year/semester);
2   Study program fulfillment;
3   Active subjects.

This application became active in September 2007 when students during the 15 day period, organized by their mentors were able to fill their application form in the Computer Center at the Faculty. The Figure 4 shows the to-be Swimlane diagram of the process that has been designed.
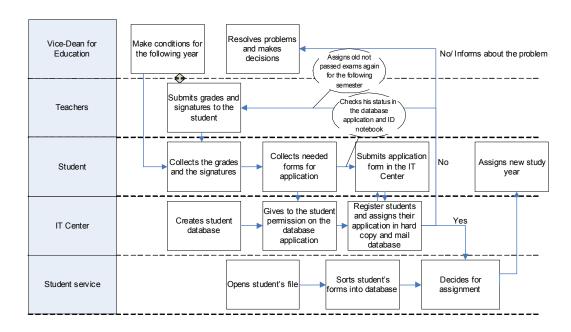

Fig. 4. Swimlane diagram of the student's application process – new process

2.3. Realization of the process

With the new database application form a new process has been made. In this process students to go to the Computer Center bringing with them the ID notebook and grade forms for each exam in the following year. In the Computer Center they receive help for submitting the application by the IT expert. Using their own account (username and password) the students could see their status, how many exams are registered by the student service, which subjects they are allowed to attend and professor's names. With this they are able to check their status on their own and to see if any mistakes are made by the professors or the student service (for example, lost grade forms). When the student has checked all exams and everything is all right he submits the form to an e-mail data base and receives a hard copy and e-mail confirmation for his application. When the student finishes the application at the Computer Center he goes to the student service with all documents (application li sts from the Ministry and statistics, the list from the obtained application, confirmation list from the bank for his expenses and ID) to receive stamp for permission to attend the next study year or the next year on condition that he finishes all exams during that year. As we can see from the Swimlane diagram (Fig. 4) with this reconstruction of one process a new enabler is added – the IT Center.

3. RESULTS

As it was mentioned before, the purpose of the restructuring process is to make changes of an already existing process that would bring effectiveness and efficiency in the work. Some of the obstacles are bypassed with small changes in the application process but yet the total application process remains inflexible for the students. Now the student service has more secure information and reduced work with the students but another entity plus is involved in the new process (Fig. 4). On the other hand the Vice-Dean for education has relevant data for all problems as well as for all statistic data (During the application process the Vice-Dean received information that only 10% from approximately 900 students from the three years were having problems). The student can also see if there is

any problem. Teachers could also have up-to-date information about the interest for their classes. The student procedure now has a plus level and plus work. With this application pilot process th e work of the staff is reduced which is very positive and the students can act very fast if there is any problem.

4. CONCLUSION

With the implementation of the Bologna process Faculties in the Republic of Macedonia have faced a lot of problems. The real challenge for them is how to make real improvements.

The main mistake that companies and institutions make during a process reconstruction is not defining processes [7]. The real issue is to recognize where and what has gone wrong and set it right. Well-reviewed process means a process that is supported by modeling and metrics. This research article is not about finding any mistakes or recommendations, even though they would be very useful for those who are concerned, but to show possible ways for further improvements based on Nutshell approach and Swimlane diagram. The workflow modeling is relatively new approach in the Business Process Reengineering (BPR) even though consultants used various simulation diagrams of the workflow to describe visually processes, but more for manufacturing equipment.

5. REFERENCES

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