Business Process Modelling Using Activity Table Technique

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Abstract. *This paper discusses a new perspective on business process modelling with an aim to create a successful and competitive enterprise. To achieve this goal, we use a technique called activity table, which is presented in a new and unique way. Business process modelling is carried out in two steps. The first step develops the activity table and the second step creates the property table. A model of business process should reflect its reality by capturing all necessary information on process behaviour. The business process "Surgery" is used as an example to show the implementation of the methodology.*

Keywords: Business process modelling, Activity table technique, TAD methodology

1   Introduction

In recent years thorough understanding of business processes became a very important way of ensuring changes in an organization's structure and functioning to create a better, more competitive and successful enterprise.

The purpose of this work is to present the use of activity table technique. This technique is used in a framework of an object oriented methodology called TAD (Tabular Application Development) to model business processes, which is invaluable in developing an efficient information system of the organization discussed.

In Section 2, we discuss in detail business process modelling. The problem of performing Surgery is also presented to illustrate the use of the technique. In Section 3, some useful remarks and conclusions are introduced.

2   Business process modelling

A business process is defined as a structured, measured set of activities designed to produce a specified output for a particular customer or market

[2]. Hence, a process converts the inputs by summing their value through various activities into the outputs. However, [1] stressed that a business process is related to the enterprise, as it defines the way in which the goals of the enterprise are achieved.

Most of problems faced by enterprises concern internal business procedures that are neither well defined nor particularly efficient [3], [4], [5]. The business process modelling system is a computer-based, potential solution to these problems. It is a system for managing a series of tasks (actions) defined for one or more procedures [6].

Business process modelling generates a model to describe a certain business process in an enterprise using different diagrammatic and tabular modelling techniques. A model is a representation of a business process, which reflects its reality by capturing all the necessary information on process behaviour. The modelled process is then analyzed and improved instead of the real business process.

To carry out business process modelling, we have to organize interviews with the employees of departments concerned. The aim of these interviews is to define in detail the work processes

of the business process discussed by identifying their activities.

Work processes are the sets of procedures or activities, tasks, and steps where the real work of the organization is accomplished to produce the economic output that generates the profitable return on the capital employed [7].

TAD methodology performs business process modelling by developing two tables called the activity table and the property table. Therefore, business process modelling consists of two steps, in the first step the activity table is developed and in the second step we create the property table.

Activity Table

An effective way to carry out business process modelling is achieved by developing the activity table. An activity table could be developed to represent one or more business processes depending on the complexity of the processes we intend to model.

TAD methodology uses the term "entity" to define a user, group of users, or other system of importance in the enterprise's functioning. An entity is either part of the system or is not inside the system. Therefore, an entity may be internal or external. An internal entity takes part in the system's operation such as an employer. An external entity has one or more interactions with the system such as a customer, supplier or other system. Thus, an entity may send an input into the system, participate in performing an activity in the system, or receive output from the system.

The activity table is organized as follows: the first column represents business process(es) and the second column shows work processes of the business process(es) discussed. If the work processes include procedures, then these procedures are presented in the third column and the activities performed in the framework of the procedures are written in the fourth column, otherwise the activities of the listed work processes are shown in the rows of the third column. The entities are introduced in the remaining columns of the table grouped by the departments to which they belong. First we define the internal entities and then continue with the external ones. Such organization of the activity table enables us to create a clear and visible picture of every business process, its work processes, and the procedures and activities of the work processes.

To make the activity table reflect the real world, we link the activities horizontally and vertically. The purpose of making horizontal and vertical connections is to define their similarity to the real world in which they occur.

Horizontal linkage means that each activity must be connected with those entities in the columns which are involved in it. Usually, each activity is connected with two entities; these are the source and target entities. The source entity starts the activity. The target entity receives the activity's input, if the activity is started by an external entity, or the activity's output if the activity is started by an internal entity.

An activity may be related to only one entity. This occurs when an entity performs an activity and the same entity uses the output of this performance. On the other hand, an activity could be connected with more than two entities. This is possible when more entities receive the activity's output. It is also possible that different alternative entities perform the same activity at different times.

Any activity in the activity table is always performed by an internal entity, such an entity is called a resource of the activity.

Vertical linkage is used to define the order in which the activities are performed. Each activity is connected with one or more predecessor activities, except the first one, and also is linked to one or more successor activities, except the last activity.

To carry out horizontal and vertical linkages, symbols are used such as: $\square, \diamond, \rightarrow$ and $\blacksquare$.

Symbol $\square$ in square(i,j) means that entity(j) is a resource of activity(i), where j ranges from 1 to the number of internal entities. For example, symbol $\square$ in square(1,1) means that entity(1) is a resource of activity(1), see Table 1.

Symbol $\diamond$ in square(i,j) means that activity(i) is a decision activity. Such an activity starts different alternative paths and is succeeded by different alternative successor activities. For example, Symbol $\diamond$ in square(7,2) means that activity(7) is a decision activity followed by activity(8) and activity(9) as alternative successor activities, see Table 1.

Symbol $\rightarrow$ is used to connect the activity horizontally and vertically. An arrow drawn from square(i,j) to square(i,k) shows the horizontal linkage of activity(i), which flows from its source entity(j) to its target entity(k). For example, an arrow from square(2,1) to square(2,2) means that entity(2) receives the output of activity(2).

An arrow drawn from square(i,j) to squre(k,j) indicates that activity(i) is linked vertically to its

successor activity(k). For example, an arrow from square(2,2) to square(3,2) means that activity(2) is linked to its successor activity(3).

Symbols □ in squares (i,j) and (i,k) mean that activity(i) could be performed by entity(j) or entity(k) as alternative resources.

Symbol ■ in square(i,j) means that activity(i) is an end activity of a certain path in the process discussed. For example, symbol ■ in square(8,2) means that activity(8) is the end activity of the path activity(1) - activity(8).

Surgery: The business process "Surgery" was modeled, corresponding to the first step of the second phase of TAD methodology, by developing Table 1, which represents the activity table.

Table 1 contains 4 work processes. In the framework of these work processes 36 activities are performed. Ten internal entities are involved in performing the listed activities. The last entity "Patient" is an external entity. Due to length limitations, a reduced activity table is shown with twenty-six activities.

Property Table

As we develop the activity table we simultaneously develop another table, the property table, which is very important in describing activities in detail. So, for each activity inserted in the activity table, we open a new row in the property table, which shows detailed information about this activity.

The property table is organized as follows: the activities are represented in the rows of the table and the characteristics of the activities are defined in the columns. Activity characteristics are description, resource, time, rule, input/output, and cost.

Description: this is used to write a short description of the activity defined in the current row of the table.

Resource: this is used to determine the entity, which performs of the activity defined in the current row of the table.

Time: this is used to denote that the activity discussed needs a determined time to be accomplished. Time may become a very useful parameter should we wish to use it to improve business processes.

Rule: this is used to define when performance of the activity requires that one or more rules must be fulfilled. Rule is a precise statement that defines a constraint, which must be satisfied in order for a certain activity to be executed. Input/Output: this is used to indicate which inputs or outputs are connected with the activity described.

Cost: this is the sum of the costs of the resources needed to accomplish an activity. This parameter is used to calculate the cost of work and business processes and therefore is important in improving business processes.

Developing the activity and property tables is an iterative process. Some of the interviews have to be repeated to arrive at a precise understanding of the user's work. If anything is misunderstood, then we have to organize new interviews with the responsible users until everything is clear.

Surgery: Because of length limitations, only six activities defined in the activity table are described in detail in the property table, Table 2. The values shown in the column Time in Table 2 are approximate values obtained from the medical staff. Unfortunately, we could not get any information concerning the costs of the listed activities from the management of the hospital.

3   Conclusion

The aim of this paper was to represent a technique, which is capable of overcoming difficult and complex problems which accompany business process modelling.

The problem of business process modelling is well-solved by developing the activity table that represents the as-is model by using symbols to illustrate the flow of the process. Using horizontal and vertical linkages enable us to develop a model which is a true reflection of reality. Furthermore, the main problem of business process modelling is the visibility of the model obtained and the follow-up of its activities, particularly when the model of the process contains hundreds of activities.

The use of activity technique contributes a great deal in solving the problem of process visibility and follow-up of its activities.   This is achieved by creating and analyzing the complete activity table, on the one hand, and analyzing each work process separately, on the other.

Table 1. Activity table

Business Process	Work Process	Department	Reception Office		Clinic			Lab	X-Ray	Anaesthesia	Surgery Block		
		Entity / Activity	1. Nurse	2. Doctor	3. Nurse-In	4. Nurse-Cl	5. Surgeon	6. Technician	7. Doctor	8. Doctor	9. Anaesthetist	10. Surgeon	11. Patient
Registration	Registration	1. Register patient	☐										
		2. Forward patient	☐										
		3. Examine patient		☐									
		4. Send blood	☐										
		5. Test blood						☐					
		6. Forward blood findings	☐										
		7. Decide type of treatment	YES ◇ NO										
		8. Issue a release report		■									
		9. Order hospitalization		☐									
Surgery	Hospitalization	10. Accept hospitalization order	☐										
		11. Prepare examination order				☐							
		12. Make x-ray examination							☐				
		13. Create anaesthetic report								☐			
		14. Forward medical findings				☐							
		15. Analyze findings					☐						
		16. Decide on surgery					◇ YES NO						
		17. Explain surgery					☐						
		18. Schedule surgery					☐						
		19. Get information for anaesthesia									☐		
		20. Sign documents				☐							
		21. Wait for surgery				☐							
	Carrying out Surgery	22. Prepare patient				☐							
		23. Carry out anaesthesia									☐		
		24. Carry out surgery										☐	
		25. Wake up patient									☐		
		26. Post-surgery recovery									■		

Table 2. Property table

Characteristic / Activity	Description	Resource	Time	Rule	Input/ Output	Cost
1.Register patient	Nurse in Reception Office accepts patient's medical card, Doctor's order, registers her/him	Nurse	10 min	Check medical card validity	Doctor's order, Medical card	
2. Forward patient	Forward the patient and patient's documents to the doctor	Nurse	5 min		Medical card	
3. Examine patient	Doctor in Reception Office examines the Patient	Doctor	10-20 min	Check patient medical record	Medical record	
4. Send blood	Nurse in Reception Office takes patient's blood sample and send it to Laboratory	Nurse	10 min	Indicate needed blood examination order	Blood examination order	
5. Test blood	Technician in Laboratory tests blood example and sends results back to reception office	Technician	30 min	Check blood examination order	Blood exam. order, Blood findings	
6. Forward blood findings	Nurse in Reception Office prints patient's blood findings and gives it to Doctor	Nurse	5 min		Blood findings	

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