AN EFFECTIVE PROCESS MODELLING TECHNIQUE

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Abstract: This paper discusses the problem of process modelling and aims to introduce a simple technique called the activity table to find a better solution for the problem mentioned. The activity table is a technique used in the field of process modelling and improvement. Business process modelling is done by identifying the business processes and is continued by defining work processes and activities of each chosen business process. This technique is independent on the analyst ans his/her experience. It requires that each identified must be connected to its resource and its successor activity and in this manner contribute a great deal in developing a process model, which represents a true reflection to actual business process. The problem of conducting a surgery is used as an example to test the technique.

1 INTRODUCTION

Business process modelling is a complex and difficult problem. A process model, which represents a true reflection of the business process discussed, is essential for carrying out business process improvement and information system development successfully.

There are many methods and techniques which cover the field of business process modelling. We are looking for a technique, which is independent from the analyst and his/her experience.

The aim of this work is to represent a new modelling technique called activity table to develop a process model which truly represents the original business process.

In Section 2, the problem of business process modelling is discussed, different techniques and approaches which deal with this field are mentioned, and the studies of a number of researchers are addressed.

In Section 3, activity table technique is introduced. The activity table enable us to model a process by linking its activities to their resources (performers), which contribute a great deal in identifying them as they occur in the reality and defining their sequence order.

In Section 4, property table is presented, which enables us to describe the activities in detail.

The last section contains some useful remarks and conclusions. The process is used to illustrate the implementation of the technique.

2 BUSINESS PROCESS MODELLING

The recent literature offers various definitions of and the extent of a process or process modelling. Throughout the last decades, the fields of business process modelling and consequently business process renovation have been gaining recognition and acceptance. The reasons for such evolution are found in the literature, academic publications and research studies that deal with the theme, as well as in the increasing involvement of consultancy and software development companies. A comparative study that closely examined 25 methodologies, 72 techniques and 102 tools was conducted (Kettinger et al., 1997).

Business processes come within our scope in that they potentially add value to the organisation and as such are attracting attention (examples given in Martinez et al. (2001); Aguilar-Saven (2001); Chan (2002); Hammer (1990); Hammer and Champy (1993); Davenport and Short (1990) and so forth). Consequently, business process modelling is on the increase as only a thorough comprehension of the business processes within the organisations can lead to effective, efficient and value-adding systems. It is the business processes that are the key element when integrating an enterprise (Aguilar-Saven and Olhager, 2002). Furthermore, conceptual modelling of business processes is deployed on a large scale to facilitate the development of software that supports

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the business processes, and to permit the analysis and re-engineering or improvement of them (Aguilar-Saven, 2003).

To elaborate on definition of a process referred to above, the following one is added. A process is defined as structured, measured sets of activities designed to produce a specified output for a particular customer or market (Davenport, 1993). Hence, a process converts inputs by summing their value through various activities into outputs. A business process is a collection of activities that takes one or more kinds of input and creates an output that is of a value to the customer (Hammer, 1990). However, other stressed that a business process is related to the enterprise, as it defines the way in which the goals of the enterprise are achieved (Aguilar-Saven, 2003).

The input and output, and the entry and exit points determine the process boundaries within which the relationship between the process and its environment is created through the inputs and outputs. Besides the inputs and outputs, the process architecture also includes four other main features: the flow units, the network of activities and buffers, the resources, and the information structure (Anapindi et al., 1999). The flow units are the temporary entities that flow through diverse activities in order to exit as a completed output. A process is described as a network of activities and buffers through which the flow units have to pass in order to be transformed from inputs to outputs (Laguna and Marklund, 2005).

There are many reasons that the field of business process modelling is still evolving (Armistead and Rowland (1996); Ackerman et al. (1999)):

- Business processes enable a whole and dynamic overview of an organisation, which is in contrast to the broken down and static view of business-functional organisational structure. To acquire such an overview, groups of dependent activities are identified, which overlap the borders of traditional functional organisation, evolve through time and consequently add value to consumers. This is opposition to the traditional approach, where hierarchical and functional departments are responsible for the execution of a number of small tasks that may cause delays and interruptions of process completion (Armistead and Rowland, 1996).
- By observing the working of organisation's operations through its business processes, the organisation acquires a better ability to concentrate on its customers. Such an approach enables organisations to discover the true demands and desires of the consumers rather than spending time dealing with internal matters such as organisational structure or business rules (Ackerman et al., 1999). Also, the approach points out the needs for flexible and responsive mechanisms to efficiently meet the requirements of ever-changing consumers needs.

As stated earlier, successful business process modelling depends on the appropriate selection of available modelling methods, techniques or process flow analyses. There are many techniques or analyses used in this field, such as general process charts, process activity charts, flowcharts, dataflow diagrams, quality function deployment, the integrated definition of function modelling, coloured Petri-nets, object-oriented methods, seven management and planning tools and so forth.

In this paper, we introduced a simple technique, which enables the analyst to produce a process model that represents the reality of the business process discussed.

3 ACTIVITY TABLE

Business process modelling is a complex and difficult task. Many times the process model developed depends on the analyst and his/her experience. For this reason, we are looking for a technique, which could produce a process model that represents a true reflection of reality of the actual business process and is independent on the analyst his/her experience.

The activity table is a unique technique for process modelling and improvement. This is achieved by identifying business processes of the organisation and is continued by defining their work processes and activities. To do that, we have to conduct interviews with the management at different levels. The purpose of these interviews is to identify the organization's business processes, the work processes related to each business process, and the activities related to every work process identified.

The activity table uses the term "entity" to define a user, group of users or other system of importance in the organization's functioning. An entity is any source of information that is part of the system or is connected with the system by some interaction. Therefore, an entity may be internal or external. An internal entity is inside the system and takes part in the system's operation. An external entity is not part of the system, but it has one or more interactions with the system (Damij, 2000).

A work process is the lowest-level group activity within the organisation (Watson, 1994). A work process is a collection of activities followed in a

determined order in carrying out distinguishable work to produce a certain output.

The activity table is organised as follows: the first column represents business process, the second column shows work processes, the activities are listed in the rows of the third column, and the entities are introduced in the remaining columns of the table grouped by the departments to which they belong. Such organisation of the activity table enables us to create a clear and visible picture of every business process and its work processes, and also of each work process and its activities (see Figure 1).

Each activity occupies one row of the table. A non-empty square(i,j) links the activity defined in row i with its source, this is an entity defined in column j. Developing the activity table is a result of interviews organised with the internal entities defined in the columns of the table. In the rows of the activity table we first register each activity identified during an interview and then link this activity with the entities in the columns, which cooperate in carrying it out. To make the activity table represent the real world, we link the activities horizontally and vertically. The purpose of defining 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. To indicate this, symbols □, ◊, → and ← are used. Symbol □ or ◊ in square(i,j) indicate that entity(j) is a resource of activity(i), where j ranges from 1 to the number of internal entities and i ranges from 1 to the number of activities. An arrow drawn from square(i,j) to square(i,k) indicates an input enters activity(i) from another activity performed by entity(j), where i ranges from 1 to the number of activities, j and k rang from 1 to the number of entities, and $j \neq k$.

Vertical linkage is used to define the order in which the activities are performed. Vertical linkage is used only in connection with the internal entities. This is achieved by using arrows ↑ or ↓ to connect the activities.

An arrow ↑ or ↓ from square(i,j) to square(m,j) means that activity(i) is a predecessor to activity(m). Two activities, which are not indicated in the same column, may be connected by horizontal and vertical arrows. For example, to connect square(i,j) to square(i,k), we use two arrows. A horiyontal arrow to connect square(i,j) to square(i,k) and then a vertical arrow ↓ to continue from square(i,k) to square(m,k). This means that activity(i)is a predecessor to activity(m), which is performed by entity(k). Of course, these two horizontal and vertical arrows can be replaced by a diagonal arrow from square(i,j) to square(m,k).

The main difference between the introduced technique and others is that this technique requires linking each activity defined in the rows of the activity table with its resource (an internal entity) defined in the columns.

Linking the activities with their resources in a visual manner cooperates a great deal in identifying the activities and tracing their order, which leads to discover the process as it occurs in the reality and enables us to develop a model that is a true reflection of the original process.

Surgery: The management of a clinic wished to improve this process by making it more efficient and less time consuming.

The process Surgery leads the patient, who needs to have surgery, through a number of activities in different departments of the hospital such as Reception Office, Clinic, Laboratory, X-Ray, Anesthesia and Surgery Block.

The process “Surgery” was modelled using the activity table technique, see Figure 1. This shows that process Surgery consists of 4 work process, which contain 36 activities.

4 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.

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

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

Time. This column 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.

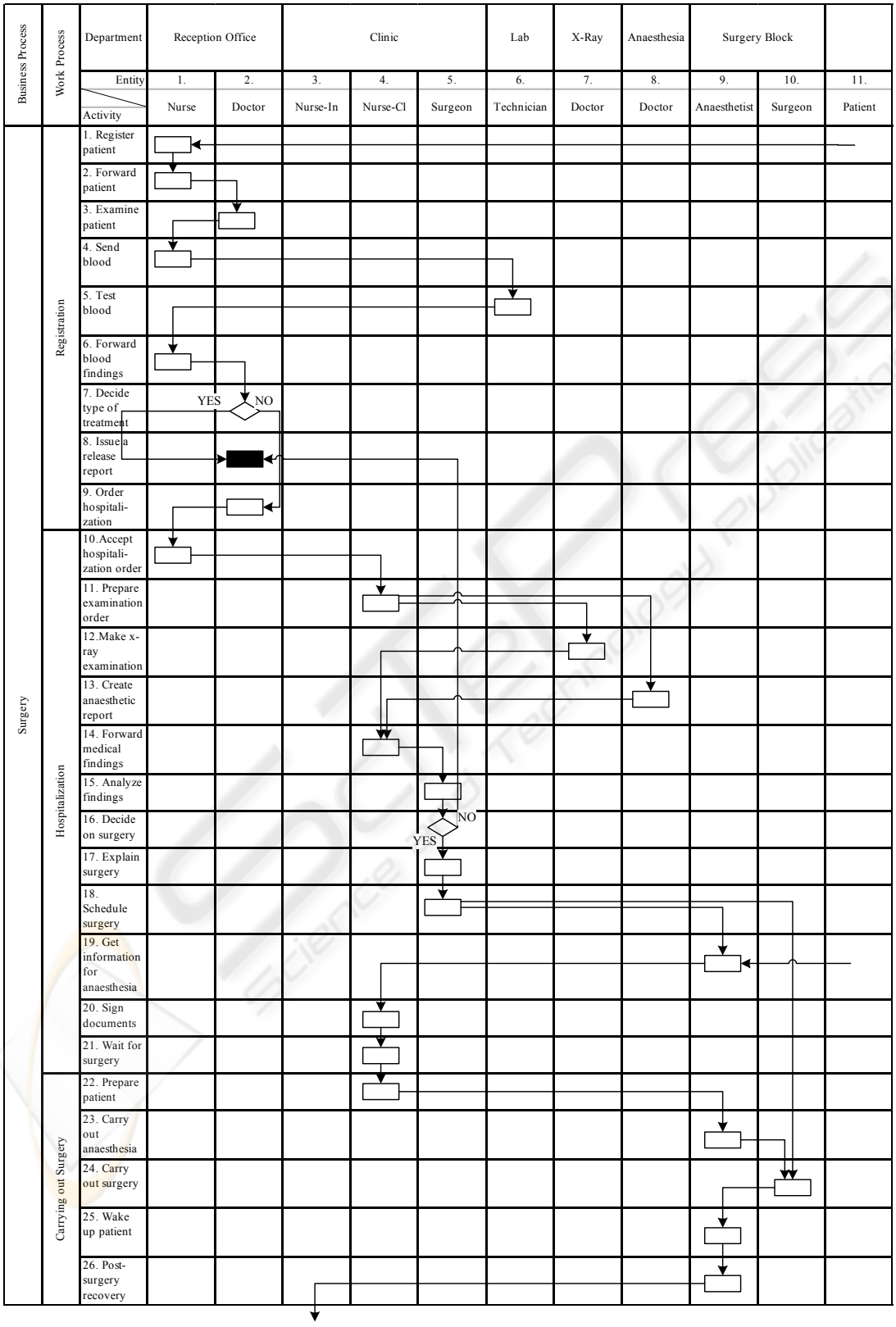

Figure 1: Activity table of process Surgery.

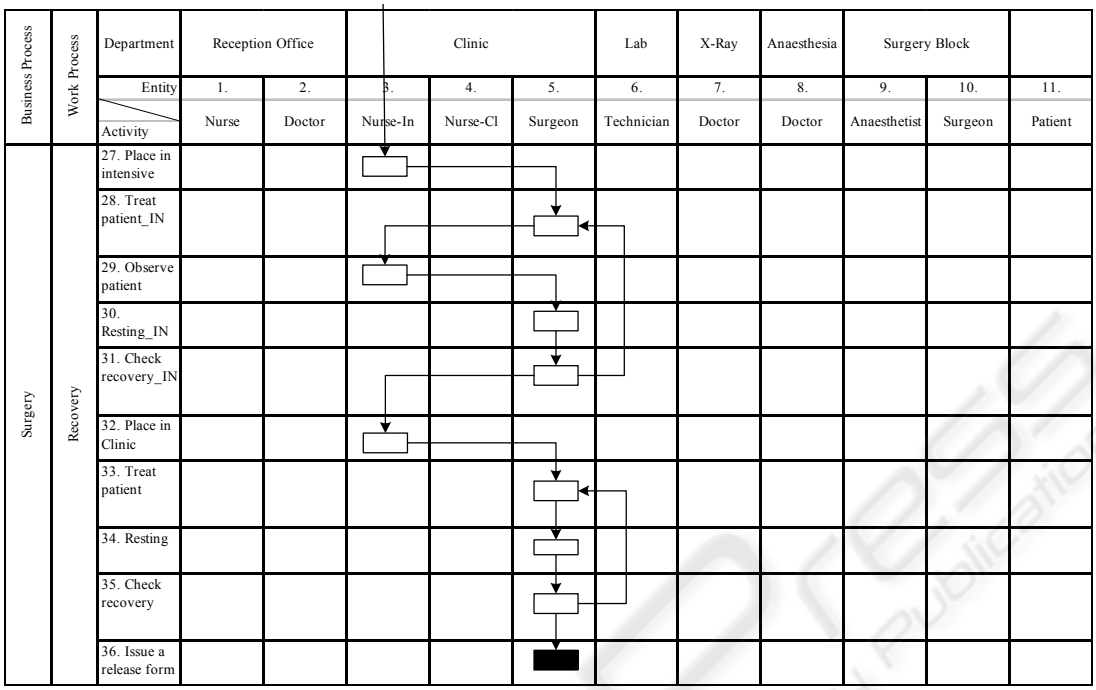

Figure 1: Activity table of process Surgery (cont.).

Table 1: Property table of process Surgery.

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 examina-tion 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	
7. Decide type of treatment	Doctor in Reception Office decides for a conservative treatment or for surgery after analyzing blood findings	Doctor	10 min	Check blood findings	Medical record, Blood findings	
8. Issue a release Report	Doctor in Reception Office issues a release report and prescribes needed medications	Doctor	20-40 min	Prescribe medications	Medical report	
9. Order hospitalization	Doctor in Reception Office asks Nurse to prepare hospitalization order	Doctor	30 min		Hospitalization order	
10. Accept hospitalization Order	Nurse in Clinic accepts hospitalization order from Nurse in Reception office to hospitalize the patient	Nurse	30-60 min	Check hospit. orders & register the patient	Hospitalization order	

Rule. This column 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 column is used to indicate which inputs or outputs are connected with the activity described.

Cost. This column 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 space limitations, only ten activities defined in the activity table are described in detail in the property table, Table 1. The values shown in the column Time in Table 1 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.

5 CONCLUSIONS

The aim of this paper was to introduce a technique, which enables the analyst to overcome problems of business process modelling.

Business process modelling is solved successfully by developing the activity table technique, which requires that each activity, identified in the framework of the process, has to be linked with its resource and its successor activity. This is achieved by using horizontal and vertical linkages. Connecting the activities to their performers (resources) represents a new dimension in process modelling, which contribute a great deal in leading the modeller to identify the activities as the occur in the real world and to develop a process model that represents a true reflection of reality of the business process discussed.

Such a model enables us to continue with business process improvement, which is carried on by analyzing the activity table. This table could be divided the table into clear, manageable, and easy to understand subtables. Analysing is essential in discovering improvements, removing obstacles, shortening time, reducing cost, and solving other problems of the business process discussed.

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