

BUSINESS PROCESS MODELLING USING ROLE ACTIVITY DIAGRAMS

Costin BADICA

*Department of Software Engineering
University Of Craiova, Romania
Lapus 5, Craiova, RO-1100
c_badica@hotmail.com*

Amelia BADICA

*Department of Business Information Systems
University Of Craiova, Romania
A.I.Cuza, 13, Craiova, RO-1100
ameliabd@yahoo.com*

Abstract. *This paper presents a case study in modelling the business process through which an academic claims financial support from an academic institution to participate at an international conference. As modelling notation have been used role activity diagrams. A role activity diagram is a high-level visual notation with an object-oriented flavour for modelling the dynamics and role structure of an organisation.*

Key words: *business process, role activity diagram, visual modelling*

1 INTRODUCTION

An increased interest in applying information technology to the problem of representing knowledge about business processes has been manifested during the last decade in both business management and computer science communities. Because organizations are very complex artefacts it has been claimed that carefully developed models are necessary for describing, analysing and/or enacting the underlying business processes ([1]). As a result, many formal notations for modelling business processes have been proposed. They can be broadly classified in high-level, visual notations, with an intuitive meaning, mainly addressed to the business management community and low-level foundational formalisms, with an elaborated formal semantics, mainly addressed to the computer science community ([2]). The second class was mostly inspired by the work done in the formal methods community and the similarities that has been noticed between computational processes and business processes.

Role activity diagrams (RAD hereafter) are a very popular high-level visual language that it is useful for capturing the dynamics and role structure of an organization ([1]). The RAD notation has been adopted in many applications involving business processes and has proved useful for various tasks like modelling ([3], [4]), simulation ([5]) and enactment ([6]).

Recently has been shown that the formal semantics of RAD can be defined using finite state process algebras ([11]).

The paper is structured as follows. Section 2 contains some definitions of key terms encountered in the field of business process management and re-engineering. Section 3 is an introduction to the RAD high-level visual notation for business process modelling. Section 4 contains a description of a case study in using RAD for capturing a business process model. It describes the process by which an academic claims financial support for participation at an international conference to present a paper. Section 5 concludes the paper.

2 BUSINESS PROCESSES: MODELLING AND RE-ENGINEERING

Informally, by a business process (BP hereafter) we mean a process that is carried out in an organization in order to achieve the organization's business objectives. An organization usually runs more than one business process. Some examples of business processes are: handling order for goods, recruiting staff, designing a new product, building a software system according to a specification, installing a new telephone service, a.o. Ould ([1]) identifies three major types of BPs: core processes, support processes and management processes.

There are also a lot of definitions in the literature on the subject of business processes:

i) A BP is a set of partially ordered activities (carried out inside an organization) intended to reach a (business) goal ([3]);

ii) A BP is “a set of related activities that produces a result of value for the customer” and a “specific ordering of work activities across time and place with a beginning and clearly defined inputs and outputs” ([7]);

iii) Ould ([1]) avoids to give a precise definition of what a BP is. Rather, he describes the key features of a thing that he calls a BP: it contains a set of activities done for some reason; the activities are carried out by people and/or machines it is carried out collaboratively by a group; it often crosses functional boundaries; a functional unit is here understood as a part of an organization with specific responsibilities like personnel, manufacturing, marketing, finance, a.o. it is driven by the outside world (reactive in software engineering terms ?); i.e a BP has generic customers or clients

We conclude that a BP is set of logically interrelated activities in an organization carried out by people and/or machine to contribute to the achievement of the business objectives of the organization. So, a BP has: *activities* (also called *tasks*), *participants* and *goals*. The participants are artefacts (products, machines) and/or human beings (customers, workers). We must distinguish between *active participants* that execute activities and *passive participants*, i.e. the ones the process activities are directed to. The active participants are sometimes called *resources* and are organized in *resource pools*.

Business process modelling (BPM hereafter) is the task of producing an abstract description of a business process. The BP can be an existing process running in an organization or a new process existing only in the modeller mind.

Curtis, Kellner and Over ([10]) mention the following purposes of BPM:

- to facilitate human understanding and communication;

- to support process improvement, which is based on a formal or informal assessment of the process model;
- to support process management, i.e the process model can be the basis for planning, monitoring and coordination of the underlying BP;
- to automate process guidance by capturing and reusing the process know-how;
- to automate process execution support, for example with the help of a workflow management system. According to Wieringa ([9]), an workflow management system monitors and controls the tasks to be performed in an organization.

BPMs are expressed using representation formalisms that should be able to capture all the relevant model information and additionally should facilitate the analysis of the process (for example, in a BPR context).

The classical definition of BPR given by Hammer in [8] states that BPR is the radical redesign of business processes, usually enabled by information technology, in order to achieve dramatic improvements in their performance. Some examples of performance indicators of a BP are: cost, quality (of the products and/or services provided), speed, productivity, a.o.

The BP field is of interest for the software engineering community for several reasons. One reason is that the software process can be thought of as a BP with the goal of developing a program according to a set of specifications. Maybe this is why most of the BPM formalisms have their origin in the research on modelling the software process.

3 OVERVIEW OF RAD

RAD is a very popular visual notation specially tailored for business process modelling. It is originating from the work on coordination in programming environments ([12]). The reference textbook that provides an extensive

introduction to the notation and its practical applicability to business process modelling is [1]. RAD was used in various applications reported in the literature ([4], [5], [6]). In what follows we shall briefly introduce the RAD concepts and graphical notation. The RAD notation is summarized in figure 1.

Roles group together activities into units of responsibility, according to the set of responsibilities they are carrying out. A role has one or more execution threads containing sequential activities, activities executed in parallel – *part refinement* and choices – *case refinement*. Roles are like classes in object orientation, i.e. they describe the behaviour of a class of individuals or role instances. A business process can contain one or more active instances of the same role. An *actor* is an agent that acts a role instance. An *agent* can be either a human or machine, single or group, which is capable of carrying out the work specified in the role.

Activities are the basic building blocks of a role. An activity can be carried out in isolation or it may require coordination with activities in other roles. In the last case the activity is called *interaction* and it requires the involvement of all the participating roles when it is carried out.

External events are points at which state changes occurring in the process environment influence on our process.

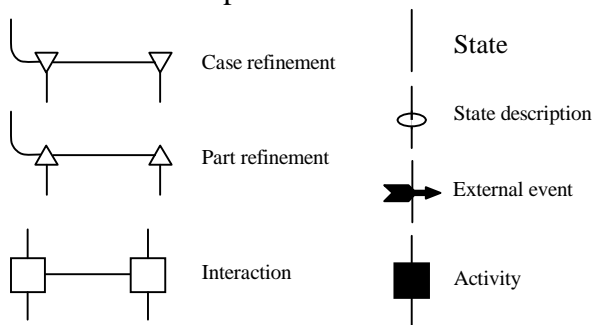


Figure 1. Summary of the RAD notation

Roles have *states* similarly to dynamic systems. Carrying out the activities inside a role can be seen as moving from state to state. States are useful for modelling point wise process goals,

i.e. when a particular state has been reached it means that a certain goal has been fulfilled.

4 A MODELLING CASE STUDY

We have chosen an example process through which an academic claims financial support to participate at an international conference for presenting a paper. Basically, there are two slightly different cases: the support is claimed from the central fund of the academic institution or from a research fund that has been granted to the academic. We have considered here only the first situation.

The first step is the identification of the roles in the model and the interactions between the roles. We have identified the following roles: *Academic*, *Rector*, *Senate Bureau*, *Rector Secretary*, *Faculty Secretary*, *Departmental Secretary*, *International Relations Officer*, *Administrative Manager*, *Currency Officer* and *Cashier*. The *Academic* role interacts directly with the majority of these roles.

The *Academic* hands out an application form to the *Rector* to approve the financial support from the central fund. The *Rector* presents the application form in the *Senate Bureau* of the academic institution who approves or rejects the claim. The result is then returned to the *Academic* via the *Rector Secretary*.

If the application form with the claim has been approved then the *Academic* must meet the *International Relations Officer*. Here the *Academic* will hand out the approved application form together with the conference announcement and a proof that the paper has been accepted. The *International Relations Officer* is responsible for producing a document called *travel order*. Three copies of this document are produced. One is sent to the *Administrative Manager*, the other to the *Faculty Secretary* who will pass it to the *Departmental Secretary*, and the last is hand out to the *Academic*.

The *Administrative Manager* must approve the travel order and sign it by certifying that there are resources in the university financial accounts such that the financial support can be granted to the *Academic*. After approval she will pass the document to the *Currency Officer*.

The *Currency Officer* revises the travel order, calculates the amount granted based on the country where the conference is held and finally instructs the *Cashier* to pay the money to the *Academic*. The *Academic* must meet the *Currency Officer* to be told the amount granted. Then he will go at the *Cashier* to get the cash.

After the return from the conference the *Academic* must meet the *Currency Officer* to check the bills for all the expenses incurred during the travel. If she spent a bit more or a bit less than the amount granted then she will meet the *Cashier* for the final payments.

5 CONCLUSIONS

Role activity diagrams have proven a useful modelling notation for the case study considered in the paper. We intend to use the resulting model to derive some guidelines for improving the business process through which an academic is granted financial support to participate at an international conference.

6 REFERENCES

- [1] Ould, M. *Business Processes: Modelling and Analysis for Reengineering and Improvement*, John Wiley & Sons, 1995
- [2] Badica, C., Badica, A., *Understanding, Modelling and Verification: Emerging Problems In Business Processes*, Annals of the University of Craiova, Electrical Engineering Series, pp.3-10, 2002
- [3] Murdoch, J., McDermid, J.A., *Modelling Engineering Design Processes with Role Activity Diagrams*, Journal of Integrated

Design and Process Science, vol.4, no.2, pp.45-65, 2000

[4] Dawkins, S., *Role Activity Diagrams for Safety Process Definition*, 16th International System Safety Conference, Seattle, WA, System Safety Society, USA, 1998

[5] Martinez-Garcia, J.A., Warboys, B.C., *From RADs to DESs: a Mapping from Process Models to Discrete Event Simulation*, Proceedings of the Software Process Simulation Modeling Workshop, ProSim'98, 1998

[6] Phalp, K., Henderson, P., Abeysinghe, G., Walters, B., *RoleEnact – Role Based Enactable Models of Business Processes*, Information and Software Technology, 40(3), pp.123-133, 1998

[7] Davenport, T.H., *Process Innovation: Reengineering Work Through Information Technology*, Harvard Business School Press, 1993

[8] Hammer, M., Champy, J., *Reengineering The Corporation: A Manifesto For Business Revolution*, Harper Business, 1993

[9] Wieringa, R.J. *Design Methods for Reactive Systems: Yourdon, Statemate and the UML*, Department of Computer Science, University of Twente, 2000

[10] Curtis, B., Kellner, M.I., Over, J. (1992) *Process Modelling*. In: Communications of the ACM 35 (9) 75-90

[11] Badica, C., Badica, A., Litoiu, V., *Role Activity Diagrams As Finite State Processes*, International Symposium on Parallel and Distributed Computing, ISPDC'2003, Ljubljana, Slovenia, 2003

[12] Holt, A.W., Ramsey, H.R., Grimes, J.D., *Coordination System Technology as the Basis for a Programming Environment*, Electrical Communication, 57, 4, pp.307-314, 1983