An Evaluation Framework for Inter-organizational Business Process Modeling Techniques

Chen Ying  
Department of Information Management and Information Systems, School of Management, Fudan University, Shanghai, P. R. China  
flyflyinwind@hotmail.com

Lin Hong  
Department of Information Management and Information Systems, School of Management, Fudan University, Shanghai, P. R. China  
hling@fudan.edu.cn

Xu Zhengchuan  
Department of Information Management and Information Systems, School of Management, Fudan University, Shanghai, P. R. China  
zcx@fudan.edu.cn

Abstract

Today, the development of information technology has led business process reengineering (BPR) into an age of inter-organizational BPR: rethinking and redesigning business processes at both the enterprise and supply chain level. Meanwhile, growth in BPR results in the popularity of business modeling techniques. The rapidly growing number of techniques induces the complexity in the selection of a suitable modeling technique for a certain BPR project. In this paper, we proposed a framework for understanding and evaluating modeling techniques in order to facilitate the process of selecting a technique suitable for inter-organizational BPR. This framework reflects different perspectives of the process representation and embodies the features of inter-organizational BPR. Furthermore, this paper defines the elements consisting the framework and explains the usage of them.

Keywords: business process reengineering, inter-organizational process, process modeling, process modeling technique, technique evaluation

1. Introduction

Business Process Re-engineering (BPR) is proposed by Hammer and Chaper as an innovated idea in the 1990s (Hammer et al. 1993). Since 1995, the newly introduced information technology, for example Internet, have radically influenced enterprises, stimulating the birth and development of e-business. Business enters into an age of cooperative commerce. Under such business pattern, the scope of a certain organization becomes vague and varies continuously. As a result, business scope is de-emphasized and inter-organizational processes become the basis for organizations to survive and develop. Therefore, people began to pay more and more attention to the reengineering of
inter-organizational process, which is called by Omar and Sawy as the second wave of BPR (Omar et al. 2001).

With the increasing interests in the BPR arena, there has been booming with business process modeling techniques. This rapid increase in process modeling techniques exposes people to an onerous task of selecting, assembling and assessing these techniques. The lack of an effective mechanism of understanding and evaluating these techniques results in false decision on technique selection, which will probably lead to the failure of BPR. Some researches have offered the framework for evaluating modeling techniques, but most of them are targeted at software engineering field rather than at business field and there is no evaluation framework tailored for inter-organizational BPR.

In this paper, in order to facilitate the understanding of process modeling techniques and assist BPR participants with the modeling technique selection, we suggest the importance of modeling techniques in section 2 and propose an evaluation framework in section 3 as well as explain the evaluation factors in section 4. The paper closes with a conclusion of the research.

2. Business process modeling
In order to reengineer present business processes, processes should be represented in some forms for the sake of analyzing and reconstructing. We named this representation as business process modeling. A business process model is a representation that tries to capture the business processes which are essential in understanding the function and performance of an organization in reality.

Modeling business processes has been the subject of numerous methods and techniques in the BPR researching field (Mentzas 1999). According to the research of Hommes, there are about more than 350 business process-modeling techniques and tools (Hommes 2001). Modeling techniques range from traditional data modeling techniques (e.g., DFD, SADT, Entity-Relationship Diagrams, IDEF-0, etc.) to behavior modeling techniques (e.g., State Transition Diagrams, Petri nets, Role Interaction Nets, etc.).

Although there have been lots of business process modeling methodologies, techniques and tools, not all of them can be applied to BPR project indiscriminately. The methods and techniques we need in BPR should have the ability of diagnosing problem, discovering chances, solving problem, improving processes and establishing a new model. Since we have been confronted with the second wave of BPR, we focus on the reengineering targeted at inter-organizational processes in this paper.

3. Evaluation framework for the process modeling techniques
Existing frameworks for evaluating model’s quality mostly focus on the quality of software and information system modeling techniques, rather than on business process modeling techniques (Hommes et al. 2000). The lack of appropriate means to evaluate the quality of business modeling techniques and the dominate roles of the techniques originally used in the field of software engineering all impose a complicated, but urgent, task on the researchers who want to instruct the business process reengineering project. In this paper, we bring out a framework for evaluating the quality of process modeling techniques under BPR enviornment.
3.1 Four perspectives of process modeling
The fact that business processes can be targeted on different application areas suggests that business processes may be studied and analyzed from different viewpoints. (Giaglis et al. 1999). In 1994, Curtis summarized the process modeling objectives and goals (Curtis et al. 1994):
- Facilitate human understanding and communication;
- Support process improvement;
- Support process management;
- Automated guidance in performing process;
- Automated execution support;
However, the term of process modeling in this paper is not refered to all the process modeling in information science field, but specifically to the business process modeling in BPR. Because of that, we cannot take the goals and objectives offered by Curtis for granted, unless we can integrate the characteristics of business process, and the objectives of BPR into them. To be able to accommodate the aforementioned goals and objectives, a model must be capable of delivering complete and correct information elements to its users. To provide these information, cutis suggested, a modeling technique should be capable of representing one or more of the following modeling perspectives (Cutis et al. 1994):
- Functional perspective: represents what process elements (activity) are being performed;
- Behavioral perspective: represents when activities are performed, as well as aspects of how they are performed through feedback loops, iteration, decision-making conditions, entry and exit criteria, and so on.
- Organizational perspective: represents where and by whom activities are performed, the physical communication mechanisms used for transfer of entities, and the physical media and locations used for storing entities.
- Informational perspective: represents the informational entities produced or manipulated by a process and their relationships.
These perspectives present different views of people who observe the business process. Since different people will be involved in the process of process modeling, it is important to catch different modeling perspectives in order to support communication, strengthen understanding and coordinate co-work.

3.2 Evaluation framework
As a matter of fact, it is very difficult to find a model that can fit all these perspectives. Although it is significant to integrate all these perspectives in one model, to this day, none of the extant modeling techniques possesses enough functions to accommodate the need for such integrated design. Frankly speaking, not all business process models should involve all these perspectives. It is not recommended to make great efforts to seek a modeling method or technique that can represent these perspectives at the cost of a large amount of capital, resource and time. People should select suitable modeling methods and techniques according to their own objectives of the process modeling.
In order to help people improve their understanding of modeling methods and techniques and assist them with the selection of modeling techniques, we propose a framework that allows the evaluation of business process modeling techniques. Figure 1 illustrates this evaluation.
framework. In this framework, we identify four perspectives as the main body of the evaluation. Each technique’s quality should be assessed from one or more of these perspectives. As we mentioned before, a good modeling technique depends on its ability of meeting the modeling object. Therefore, the objectives and goals of both modeling and a certain BPR project should be considered in this framework. This framework’s foundation is constructed by evaluation factors, which make up of the evaluating standard for modeling techniques’ quality. These factors will be discussed later.

![Diagram of Evaluation Factors](image)

**Figure 1: Framework for evaluation business process**

4. Evaluation factors
A common way to understand the quality of something is to subdivide quality in a number of quality properties that each addresses a particular aspect of quality (Hommes et al. 2000). Then, our task here is to find those quality factors that provide a good basis for the evaluation of modeling techniques.

Eriksson pointed out that a good model of business process has the following characteristics (Eriksson et al. 2000): 1. Capture the real business as truthfully and correctly as possible; 2. Focuses on the key processes and structures of the business at an appropriate level of abstraction; 3. Represents a consensus view among the people operating in the business. Adapts easily to change and extensions; 4. Is easy to understand and fosters communication among the different stakeholders of the business. According to these characteristics, we summarize the basic factors for evaluating a modeling technique as follows:

**Validity:** the degree to which a given modeling technique is capable of representing the business process as truthfully and correctly as possible.

**Comprehensibility:** the ease with which the way of working and modeling are understood by the participants

**Flexibility:** the capability of a given modeling techniques to deal with the change or unexpected situation.

**Multiple –perspectives:** the capability of a given modeling that can represent different views of people operating in the business.
Due to the fact that the factors proposed above is derived from the characteristics of a model, not from those of a technique, we should advance other factors that can reflect the characteristics of a modeling technique. Thus, we detect other factors that are proposed in literature (Curtis et al. 1994, Hommes et al. 2000).

**Suitability:** the degree to which a given modeling techniques is specifically tailored for a specific kind of application field.

**Expressiveness:** the degree to which a given modeling technique is capable of denoting the models of any number and kinds of application fields.

**Coherence:** the degree to which the individual sub model of a way of modeling constitutes a whole.

**Completeness:** the degree to which all-necessary concept of the application field is represented in the way of modeling.

**Efficiency:** the degree to which the modeling process utilizes resources such as time and people.

**Effectiveness:** the degree to which the modeling process achieves its goal.

**Formality:** the level of mathematical formality needed in process modeling.

**Arbitrariness:** the degree of freedom that a given modeling techniques can offer when modeling a particular field.

A good modeling technique should have the capability to reveal the features of process. Since we focus on the inter-organizational process in this paper, the characteristics of it need to be figured out. We find out that inter-organizational processes are dynamic, open, flexible, integrated, and multiple dimensional. Therefore, some other factors should be included.

**Ability to be dynamic:** the ability of a given modeling technique to represent the dynamic activities and interactions in processes.

**Ability to be open:** the ability of a given modeling technique to construct an open business model, which has less participating obstacles when new organizations enter the inter-organizational processes to establish cooperative relationship.

**Ability to be integrated:** the ability of a given modeling technique to construct the model that has the capability of being integrated with other models.

**Reusability:** the degree that a model could be reused in other application field.

Now, we have considered the characteristics of model, technique, and process. But these factors are only referred to the work of conceptual modeling independently without being considered under a certain BPR project. Since process modeling is one part of the whole BPR project, we should also include the factors that influence a certain BPR project into consideration. For this reason, we proposed three questions, which should be answered in the process of evaluation.

- **Which stage is the technique applied to?** As Kettinger proposed, there are six stages in BPR: envision, initiate, diagnose, redesign, reconstruct and evaluate (Kettinger et al. 1997). In one BPR project, we can use different modeling techniques in different stages.

- **How many modeling tools available to support this technique?** Numerous tools have been invented to support modeling in order to simplify this strenuous work. Therefore, if a modeling technique has more tools to support it, then it can be more applicable and feasible.

- **Does this technique support the simulation later?** Modeling simulation is a technology
that can analyze and evaluate the process model. Thus a good modeling techniques should provide the support for simulation.

![Evaluation Factors Diagram](image_url)

**Figure 2: Evaluation factors**

These factors are represented in figure 2. On one hand, these factors are categorized into three groups, which respectively reflect model and technique, inter-organizational process, and BPR project. On the other hand, these factors are integrated into the complete evaluation framework we proposed in section 3.2.

5. Conclusion:
At present, it is required to apply BPR to inter-organizational processes. Though the increasing popularity of business process modeling results in a rapid growing number of modeling techniques, a framework for evaluating business process modeling techniques are still lacked. In this paper, we introduce a framework for the evaluation of modeling technique
under the situation of inter-organizational BPR. Future research will be aimed at the improvement of this framework. And we will also try to apply this framework into practice, and by application, this framework will be validated further.

Reference: