CBR-BPR: A CASE-BASED REASONING TOOL FOR BUISNESS PROCESS REDESIGN

Farhi Marir and Selma Limam Mansar
Department of Computing, London Metropolitan University, Holloway Road,London N7 8DB, UK.

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Abstract: This paper presents a new approach for business processes redesign (BPR). The approach uses case-based reasoning techniques to model past business redesign into a case or stories based on a developed BPR framework and best practices rules. The resulting case base of past failing or successful experiences will be used to support business process designer and practitioner in redesigning or improving existing business processes. This work came to address the limitation of most methodologies developed to support the application of BPR principles in providing clear guidance on deriving a process design threatening the success of BPR.

1 INTRODUCTION

Business Process Redesign (BPR) addresses the reengineering of one specific process within the firm. It distinguishes itself from Business Process Reengineering where the focus is rather on developing a "business architecture", which later requires in depth re-thinking and re-assessment of the firm's mission and of the processes required in order to fulfil it, (Edward et al., 1994). So BPR helps rethinking a process in order to enhance its performance. Academics and business practitioners have been developing methodologies to support the application of BPR principles (for an overview: see Kettinger et al. 1997). However, most methodologies generally lack actual guidance on deriving a process design threatening the success of BPR. Indeed a survey has proved that 85% of projects fail or experience problems (Crowe et al., 2002).

The work presented in this paper aims to overcome this problem through the use of case-based reasoning technology enhanced with a framework for BPR implementation which allows the recognition of important topics and their relationships and also the best practices which defines rules to be applied to redesign a process for each topic of this framework developed in (Limam et al., 2002).

There are many arguments supporting using CBR against other knowledge-based methodologies (Luger 2002). However our main interest in CBR relies in that it allows a system to avoid past failures and exploit past successes. CBR can provide a model of learning that is both theoretically interesting and practical enough to apply to complex problems. This is a key issue in business process redesign where practice has proved that successes are few and failures quite common (Crowe et al. 2002). Being able to learn form past experiences could then be of great added value for whoever is involved in the redesign of a similar process with similar goals and targets. Another argument in favour of using CBR for BPR implementation is that, traditionally, redesign has been the area of consultants and "experts" in the field. Thus, redesign is often the result of the application of so-called "best practices" rather than on the use of analytical methods (theoretical models and heuristics) to derive improved or redesigned processes (Reijers et al. 2003). Some authors are working on the development of such analytical tools. However none of them is currently capable of dealing with every particular aspect of a redesigned business processes. In fact much of the redesign still rely on past experiences and on the application of the aforementioned best practices. In this context, CBR can be viewed as a good compromise between a completely empirical study and redesign of business processes and a pure analytical method. CBR can support the redesign process by finding similar cases: experts or consultants can then compare and learn which best practices to apply and also, hopefully avoid past mistakes.

The purpose of this research is to develop a tool that would allow practitioners to access previous

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redesign projects and, possibly, reapply some of the best findings. Although CBR is useful for the reuse, it has not been applied for business process redesign. However, CBR has been employed successfully for other similar activities such as workflow design (using a clean-sheet approach) (Kim et al. 2002), concurrent product development (Haque et al. 2000) and business automation (Cheung et al. 2003).

The paper is divided into three main sections. Section one is devoted to the representation of the business process case, which is developed using ReMind Version 1.1 (a CBR tool produced by Cognitive Systems Inc.) (Watson, 1997). This section describes how the business framework and best practice rules are modelled into a case. The second section is devoted to the description of the indices taken from the framework and the best practice rules for the CBR-BPR case, and the third section is devoted to the BPR-CBR case retrieval. However, the last two sections are devoted to the conclusion and references respectively.

2 REPRESENTATION OF A BUSINESS PROCESS CASE

A case is a contextualised piece of knowledge representing an experience. It contains the past lesson that is the content of the case and the context in which the lesson can be used (Marir et al., 1994). Typically a business process case comprises four components as shown in Figure 1 (See Limam et al., 2003 for more details) :

- The features that define the context of the business processes e.g. business area, business sub area, and the business process itself,
- The business best practice rules applied on the components that compose the proposed business process framework,
- The business process solution which states the solution to previous experiences and
- The goals and targets that characterise the improvement brought by previous BPR solutions e.g. reducing time and cost, etc…

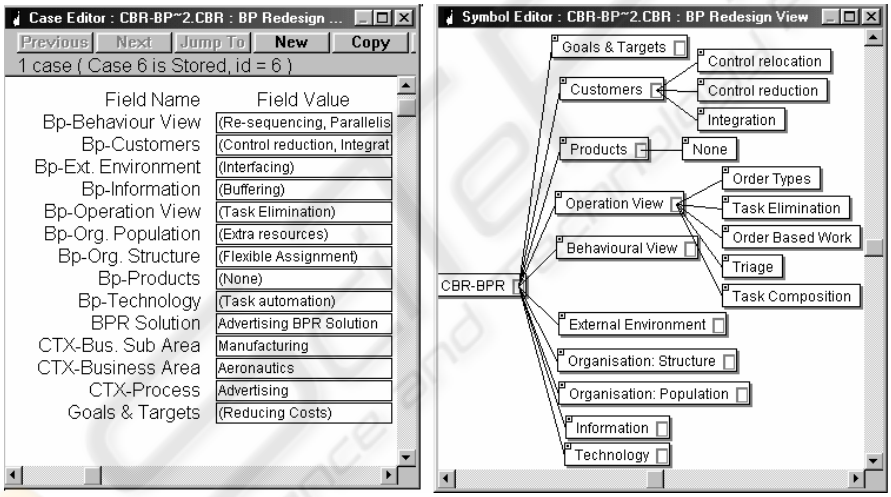

Figure 1: Framework business process case and its business process best practice rules

2.1 The Context of the BPR Case

This part of the case describes the context of the business process by specifying the business area such as manufacturing, banking finance, and mining oil, the business sub area such as cars, aeronautics, and textile and most importantly the business process itself e.g. invoicing, advertising, and inventory management.

2.2 BPR Framework

The idea behind a framework is to help practitioners by identifying the topics that should be considered and how these topics are related (Alter 1999). In this perspective, the framework should identify clearly all views one should consider whenever applying a BPR implementation project. The framework is derived as a synthesis of the Work-Centered-Analysis framework (Alter 1999), the MOBILE workflow model (Jablonski et al. 1996), the CIMOSA enterprise modelling views (Beriot et. al. 2001) and the process description classes of (Seidmann et al. 1997). The proposed framework

contains six linked elements are linked: the *customers* of the business process, the p*roducts* (or services) generated by the business process, the *business process* with two views, the operation view: how is a business process implemented? (Number of tasks in a job, relative size of tasks, nature of tasks, degree of customisation), the behaviour view: when is a business process executed? (Sequencing of tasks, task consolidation, scheduling of jobs, etc.), the *participants* in the business process considering the organisation structure (elements: roles, users, groups, departments, etc.) and the organisation population (individuals: agents which can have tasks assigned for execution and relationships between them), the *information* the business process uses or creates, the *technology* the business process uses and finally, the *external environment* other than the customers.

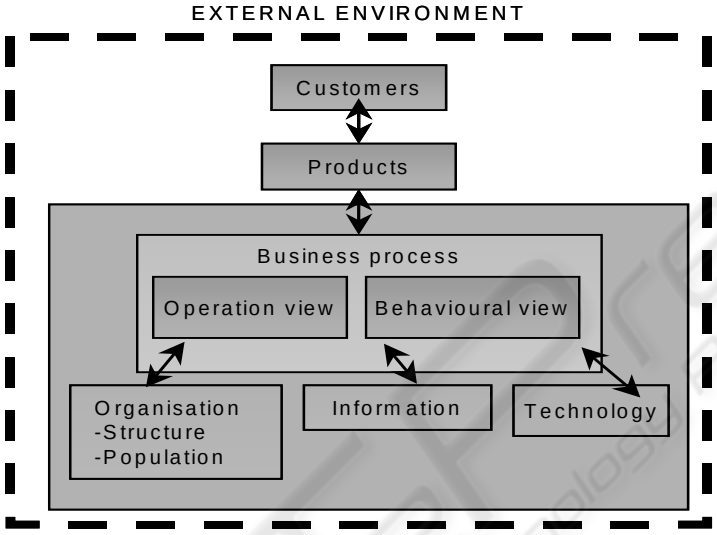

Figure 2: Framework for BPR implementation

2.3 Best Practice Rules

As mentioned above, our BPR implementation approach is based on a framework and on a set of BPR best practices. Over the last twenty years, best practices have been collected and applied in various areas, such as business planning, healthcare, manufacturing, and the software development process (e.g. Martin 1978, Butler 1996, Golovin 1997). In Table 1, we present the surveyed best practices rules, which can actually support the re-designer of a business process tackling the technical BPR challenge of implementing an improved process design. These best practice rules are classified to evolve around the component of the adopted BPR framework because improving the redesign of a process is a matter of improving any of these components.

Table 1: BPR best practices classified according to our BPR implementation framework

Framework elements	**Best practice name**
Customers	Control relocation, Contact reduction and Integration
Products	NONE.
Operation view	Order types, Task elimination, Order-based work, Triage and Task composition
Behavioural view	Re-sequencing, Parallelism, Knock-out, and Exception
External environment	Trusted party, Outsourcing and Interfacing
Organisation: structure	Order assignment, Flexible assignment, Centralisation, Split, responsibilities, Customer teams, Numerical involvement and Case manager
Organisation: Population	Extra resources, Specialist-generalist, Empower and Control addition
Information	Buffering
Technology	Task automation, Integral Business Process and Technology

2.4 Goals and Targets

Different goals might lead to completely different redesign options. (Brand and Van der Kolk 1995) demonstrate this issue using their "devil's quadrangle". The authors distinguish four main dimensions in the effects of redesign measures: time, cost, quality, and flexibility. Ideally, a redesign of a business process decreases the time required to handle an order, it decreases the required cost of executing the business process, it improves the quality of the service delivered, and it improves the ability of the business process to react to variation. The attractive property of their model is that, in general, improving upon one dimension may have a weakening effect on another. In order to reflect this difficult reconciliation between the targets and goals of the BPR implementation, it is important to include it as part of a case's characteristics. Figure 3 below shows some of the targets and goals classification adapted from (Guimaraes and Bond 1996).

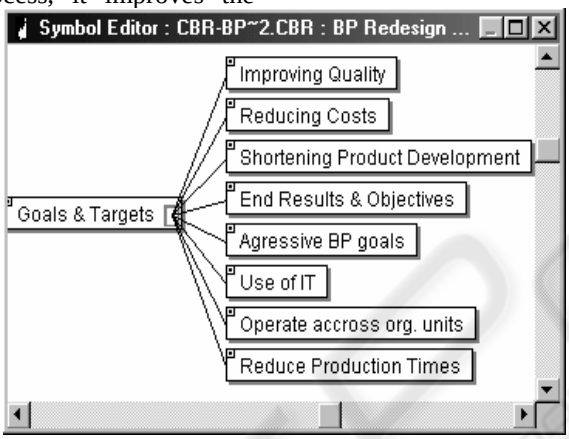

Figure 3: Goals and targets for BPR implementation (adapted from Guimaraes and Bond 1996)

3 BPR CASE INDEXING

Case indexing involves assigning indices to cases to facilitate their retrieval. Since there are two different ways of retrieving cases, the case indexing of CBR-BPR system is designed using two different schemes (Figure 4) to cope with both views:

- If a practitioner wishes to apply a given set rule and would like to retrieve cases where similar rules were applied. In this case the business process context (business area, business sub area and business process) and the rules are used as indices for the BPR case.
- If a practitioner doesn't know which rule to apply and would like to retrieve cases where similar business processes have been redesigned. In this case the business process context and the goals and targets are used as indices for the BPR case.

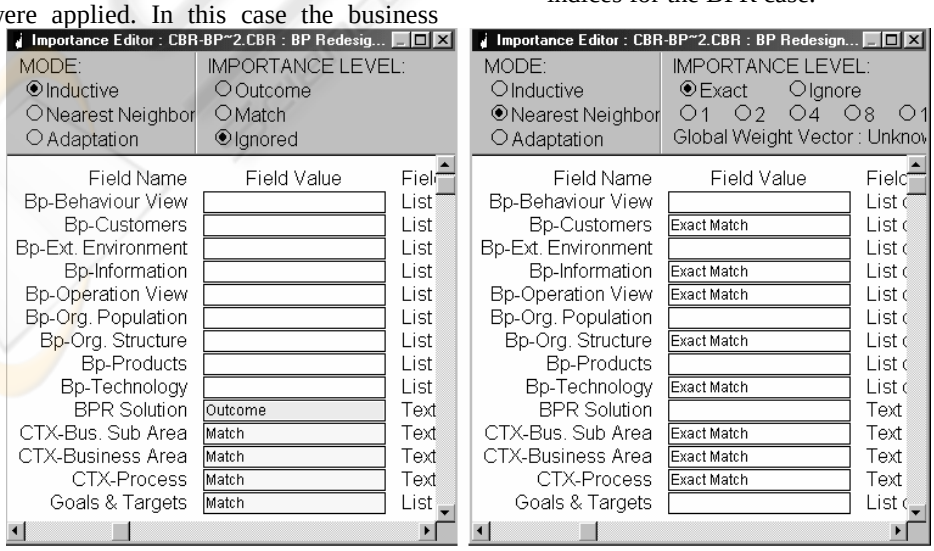

Figure 4: Inductive and nearest neighbour indexing techniques

4 BPR CASE RETRIEVAL

The retrieval algorithm relies on the indices set in the previous section to direct the search to potentially useful cases. As shown in the case indexing, the current process and the problems those need to be addressed (reducing costs, improving the quality, etc.) are known, a consultant might whish to know whether similar processes with similar problems have been already redesigned. He might wish to find out which best practices rules have been applied to solve that problem and the technical and organisational solutions adopted in that previous case. In this instance, the inductive algorithm with BPR solution as its and business context (business, are, business sub area) and goals and targets indices are used to retrieve the rules as shown in Figure 5 below. However, in the situation where the consultant has already an idea about some rules he wished to apply but he is not sure about the impact of applying them, or he wants ideas about possible adopted solutions. The nearest neighbour algorithm uses the best practice rules and the context of the business process as indexes to retrieve business process solution applied in similar business processes, with a similar problem and similar rules applied.

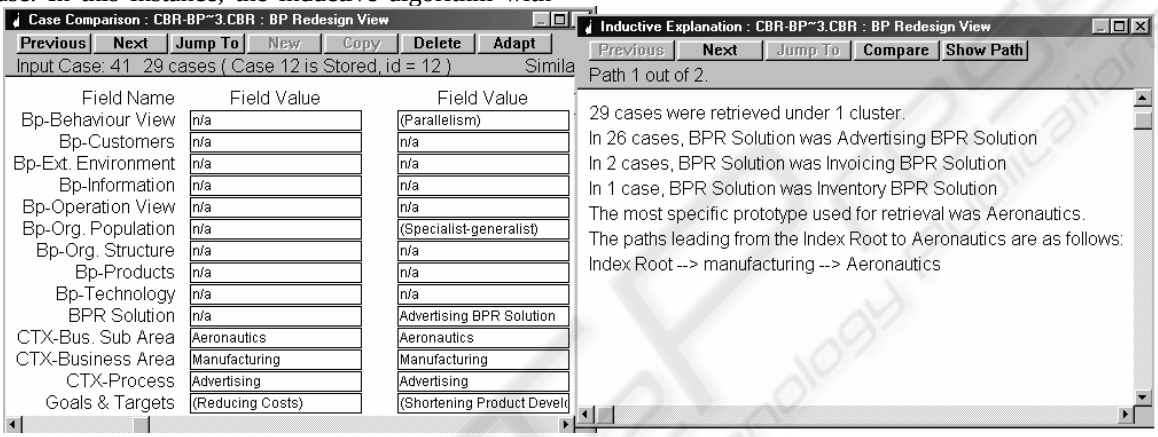

Figure 5: Retrieval process and the explanation path

5 CONCLUSION

In this paper we have presented the use of case-based reasoning for the reuse of previous business process redesign to design or improve an existing business process (sharing and adapting previous practices). This includes collecting the knowledge and storing it into the case base and making it available do that knowledge about BPR is shared, adapted and applied to new situations. This is a novel approach to BPR and has not been explored before. We have demonstrated through case representation, case indexing and retrieval that applying CBR is possible for BPR implementation and would benefit business process re-designers.

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