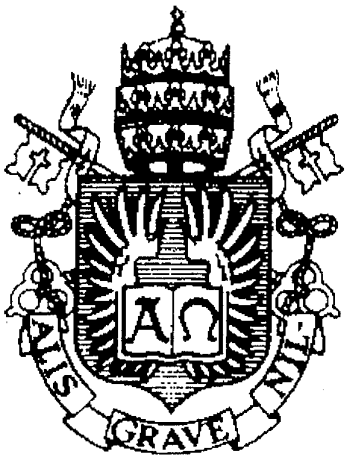

PUC

ISSN 0103-9741

Monografias em Ciência da Computação
n° 38/95

Reusing Business Process Information

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PUC RIO - DEPARTAMENTO DE INFORMÁTICA ISSN 0103-9741

Monografias em Ciência da Computação, Nº 38/95
Editor: Carlos J. P. Lucena December, 1995

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* This work has been sponsored by the Ministério de Ciência e Tecnologia da Presidência da República Federativa do Brasil.

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September 1995

Abstract

The business reengineering movement brought to light the importance of enterprise modeling. Models of the structure and the processes of an enterprise is now a fundamental requirement for managing the information technology of large organizations. Many languages have been proposed for enterprise modeling, but most of them are based on the entites and concepts akin to computer science and not to the enterprise. Our article describes a business process based conceptual model and a schema for reusing business processes information to derive information systems applications.

1 Introduction

It is a shared believe in the field of software reuse that domain knowledge is a key issue for a productive reuse process. As a consequence several researchers have been devoting attention to the problem of domain analyis. Different proposals [19] have been apperaring in the literature and Arango [2] provides a good analysis of several of those. The key aspects of any domain analysis method or strategy is how the generalization process is performed, how it is modeled and made available for further use.

The very fine point of domain analysis is the possibility of reuse at a high level of abstraction, that is the domain. Once a domain is well defined and engineered it would be available to be reused, in different application environments for that domain. That is, if we have performed a domain analyis for accounting, the result could be reused for any organization which deals with accounting. In the Draco paradigm [20] [12] for instance, having an accounting domain language would allow different organizations to write different accounting systems according different requirements.

In this article we will focus on an orthogonal proposal to domain oriented reuse. We will look at the reusability of organizational information in the same organziation. Our proposal

takes advantage of a trend in the business arena. that is the move towards lean and more flexible organizations. In order to change the organization. usually by a reengineering process. it is necessary to have a reasonable model of its behaviour. The consequence of that is the move towards enterprise modeling [17] [10] [21]. The basis for our proposal is a conceptual model based on the total quality management (TQM) principles [14] [9]. This conceptual model is an underlining representation for business process which describe the organization.

Once an organization uses the conceptual model to register its processes, the reuse opportunity is created. That is, if the organization has modeled and kept the process information in a computer accessible form, we may access it to gather important information about the organization. As such, when developing or maintaining an application we use the business process information to help the gathering of requirements. In order to make possible the storage and retrival of business process information we have built a hypertext based infrastructure. On top of the hypertext we also built an assistant to help the software engineer find requirements information in the repository.

A detailed presentation of our strategy is given at Section 2. We will present the conceptual model and its foundations on Section 3. Section 4 will deal with the hypertext model. Section 5 will describe the reuse assistant. We conclude with a descprition of validation efforts and future work.

2 Proposed Strategy

Our strategy is oriented towards organization based information systems, or work known today as IT (Information Technology). A pre-condition for our strategy is that the organization is perfoming a TQM based business process reengineering (BPR) or already have done it. Our basic proposal is exactly the reuse of business process information. Given, that we are reusing information in the process of requirements definition. This vision of reusing information outside the specific software scope was first pointed out by Freeman, who calls this type of reuse an *environmental level reuse* [6].

Figuer 1 gives an idea of the application of our strategy. Once the business process information is already available in a data base, new applications or changes to existing applications are requested by the organization. This fact generates the need for the software engineers (or systems analysts) to understand what is requested in order to elaborate a requirements document. The data base is thus an important source of information to the software professional in order to understand what is needed.

In order to make it possible the scenario shown in Figure 1, we have proposed the strategy shown in Figure 2. The pre-condition for that strategy is that the organization has or is implementing the TQM principles. So, the strategy departs from a business model, transforms it into an hypertext and then uses an assistant to provide a structured access to the hypertext in order to instantiate a requirements engineering conceptual model. Since one organization will have several different applications, our strategy makes it possible a reuse process based on high level organization information.

The first step in the strategy is the construction of the business model. The business model should represent the organizational context from the point of view of the business processes. Business engineers are the one responsible for this step. Is their responsability to collect data

Figure 1: Requirements Elicitation Based on Business Process Information

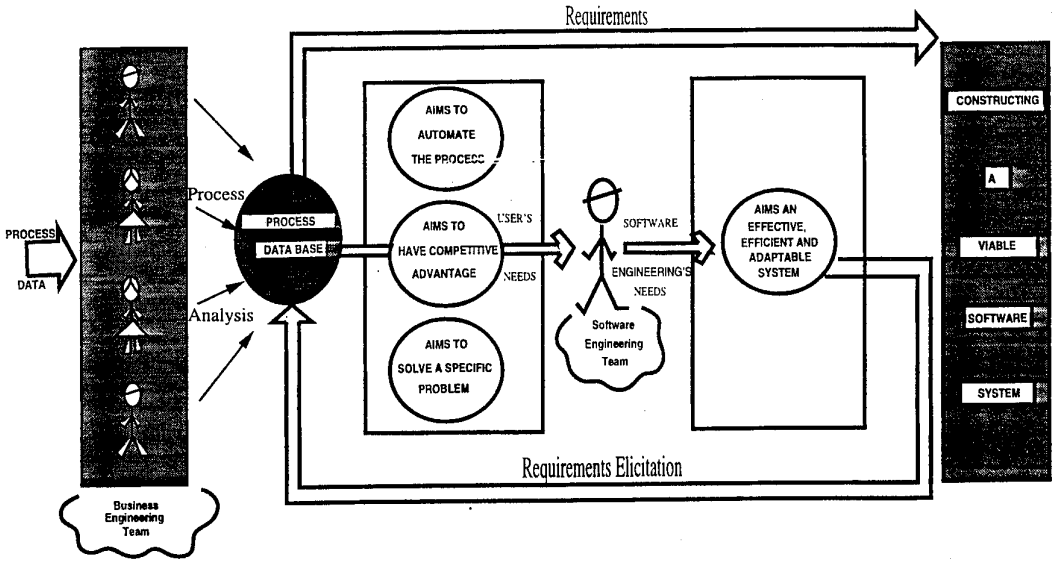
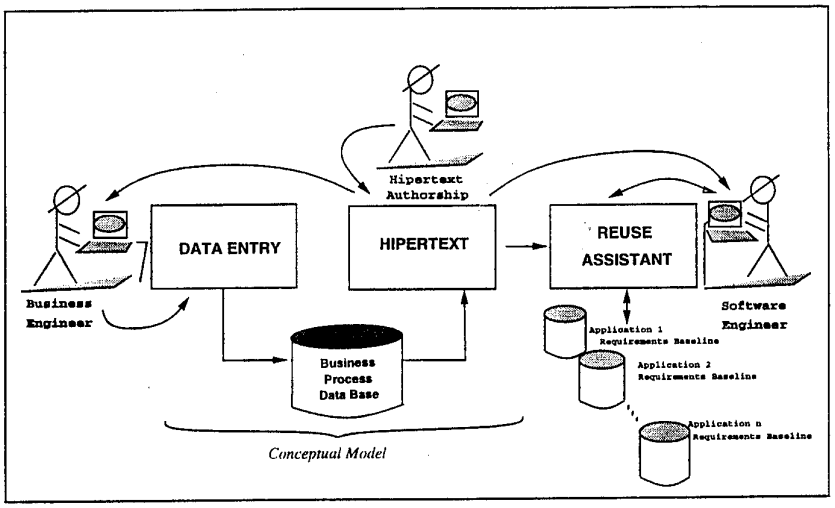


Figure 2: The Proposed Strategy



and stablish the relationships between the data. This collection must result in a data base. In order to build the business model the business engineer has some techniques from the business and the quality areas. This work generates documents that usually are in plain text. In order to help the business engineer in building a model, we have proposed and validated a conceptual model to represent this kind of information. It is proper to say that if the organzation had built the business model without following our conceptual model, the model could be instantiated by transcription of the information found in the textual description.

The second step takes care of the transformation of the conceptual model into an hypertext. This transformation is performed manually and has as its target an HDM (Hypermedia Design Model) [7] model. The HDM model containning the BPR information is then implemented as an hypertext.

The third step is the use of an assistant to help the software engineer to navigate the hypertext. Although browsing the hypertext is already a good source of information, we devised an assistant to improve the performace of the software engineer given that we already have a requirements model. The requirements model we use is the client oriented requirements baseline defined in Leite [13]. This baseline is a structure which incorporates sentences about the desired system. These sentences are written in natural language following defined patterns.

The clients oriented baseline is built upon previous work [3], [16], [11] [15]. Carvalho [3] claims that identifying the clients' actions is the best anchor for guaranteeing the effectiveness of an information system. Clients' actions are the day to day activities which can be expressed by an infinitive verb. Carvalho's idea is very similar to the Jackson's actions [11]. McMenamim and Palmer [16] made a strong argument of the effectiveness of an outside-in strategy as compared to a top-down one when trying to identify true requirements. The backbone of this strategy are the external events. External events are organized as lists [15] and should model the set of all the needs which constitute the origins of the problem to be solved by the system and also map all the perceived interactions between the system and the Universe of Discourse. Figure 3 gives the basic conceptual model behind the requirements baseline.

3 The Business Process Conceptual Model

Figure 4 shows the process view in contrast with the functional view. Usually systems development is very much biased on the functional view, or the hierarchical view of a given sector of the organization. Viewing organizations as a collection of business processes, which are cross functional, gives the opportunity to software engineers to have a broader understanding of the application being considered. Requirements elicitation based on business processes have the advantage that instead of paying attention to specific stakeholders, of a given functional area, it needs to take in consideration different stakeholders of several functional areas.

In order to model business processes, we invented a conceptual model to cast the information associated with a process description. This conceptual model was based on the total quality principles [18], [9], [8], [4], [1] and on the experiences of some brazilian companies which were implementing total quality programs. We have used both the literature and interviews with executives from companies to design the proposed conceptual model.

Figure 5 gives a partial view of the conceptual model with the itens of process information and their relationships. The elipses are the main entities of the Universe of Discourse which

Figure 3: Requirements Baseline Conceptual Model

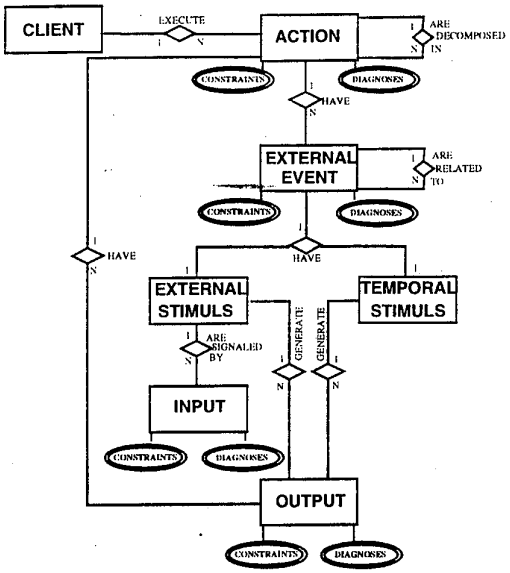
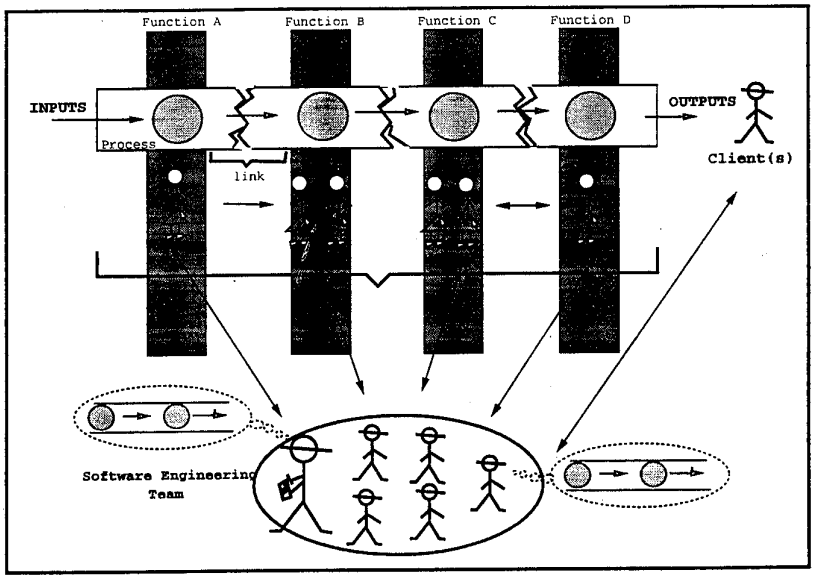


Figure 4: Functional View versus Process View



needed to be known. The rectangles are the information. Links between elipses show relationships, for instance processes do have inputs (see Fig. 5 left side). From each elipse there are possible questions that the business engineer may ask in the task of knowing the subject of the elipse. If the rectangles[1] are accessed, they provide the answer to the question. The links to which there is not an associated question correspond to simple questions of the type: What is..? Who is ...? Bidirectional links indicates that questions can be done departing of both ends of the relationship.

4 The HDM Model

In order to organize the business process information in a hypertext format we used the Hypermedia Design Model[7]. Figure 6 shows the HDM model for the conceptual model presented before. Each elipse represents the entities, the circles represent the **webs** (the n-ary relationships) and the arrows represent the binary relationships. Bi-directional arrows shows that information can be obtained from either entity. The descriptions in *italic* over the entity indicates perspectives, that is how the information will be vizualized. The names over the arrows name the relationships.

5 The Reuse Assistant

As we can see from Figure 2 the reuse assitant helps the software engineer to find information in the business process hypertext. This task is guided by the requirements baseline representation showed in Figure 3. The assistant points to probable places where the software engineer will find information itens as described in the requirements baseline representation. The heuristics contained in the assistant were derived from the study of business process used to validate the conceptual model. So to each item of the requirements baseline the heuristics suggests possible navigation buttons on the business processes hypertext.

Figure 7 is a window of the Toolbook[2] prototype we have built to implement the heuristics. Although the description is in Portugues, the important aspect to show is that at the left window we have a place to fill in the requirements model and at the right window we have the probable buttons where this information could be found in the business process hypertext. Each main entity of the requirements model (see Figure 3) do have an associated window with the probable buttons.

There is one button in Figure 7, *Acrescentar Consultas*, at the right window, that is a very simple learning capability added to the prototype. Using this button the software engineer may add new heuristics to the existing ones. This facility is expected to be used as software engineers get themselves acquainted with the business process base.

Although the heuristics we are using are very simple, they do help to speed up the search in the business process hypertext. We have to stress that different software engineers from different applications projects may use the assistant in trying to find information in order to define the requirements of the given application. It is also a fact that software engineers

[1]For the sake of simplicity, Figure 5 does not show all the rectangles associated with the elipses/questions.

[2]Toolbook, an hypermedia autorship software, is a trademark of the Asymetricx corporation

Figure 5: Partial View of the Conceptual Model

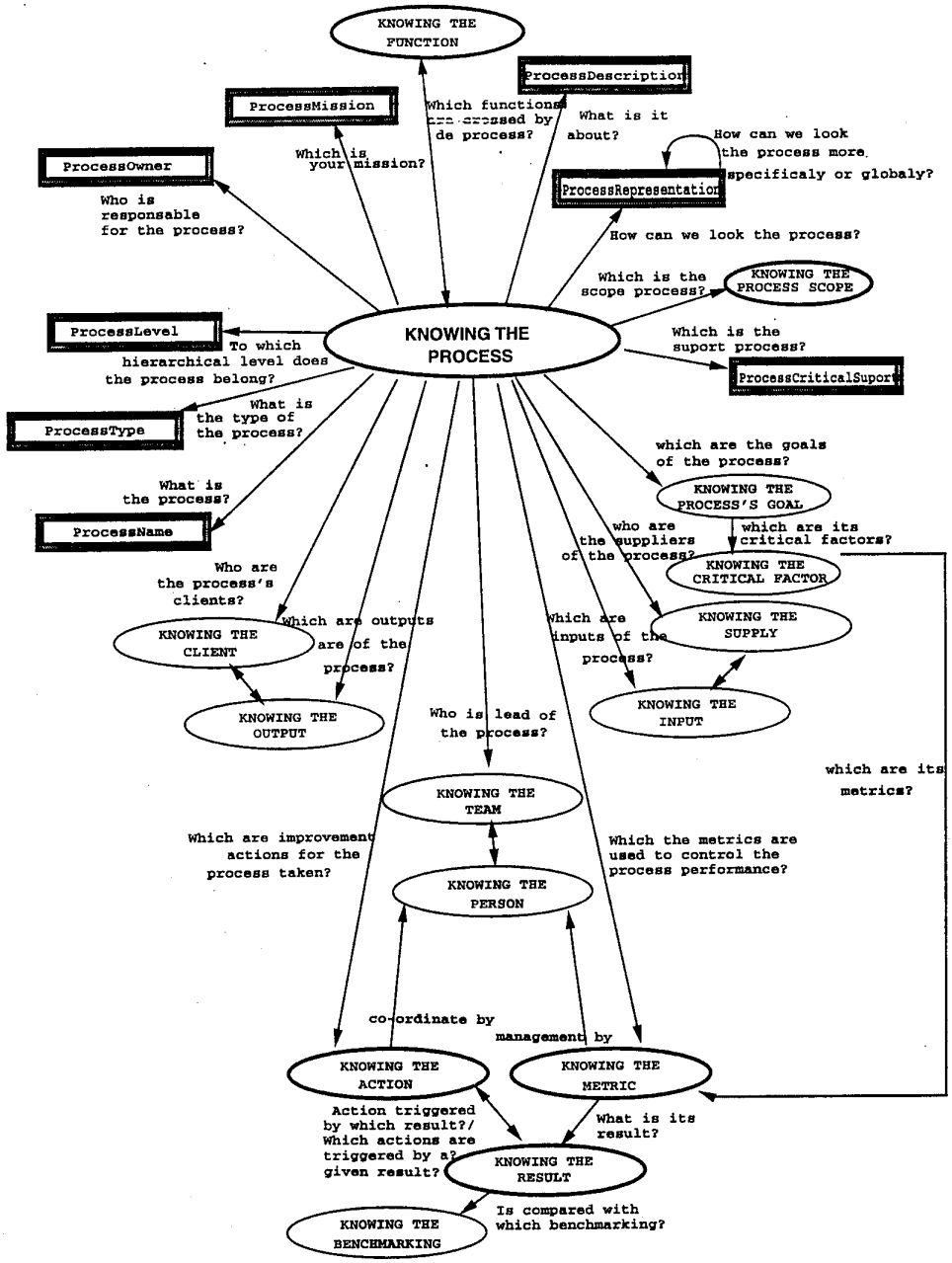


Figure 6: The HDM Model

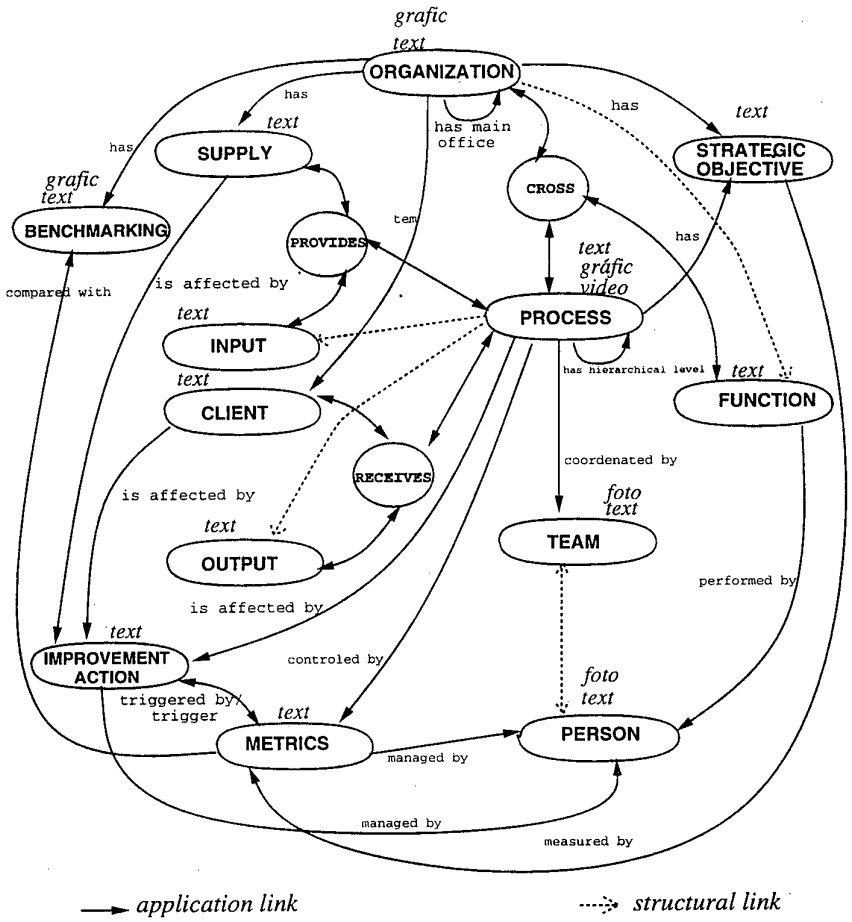
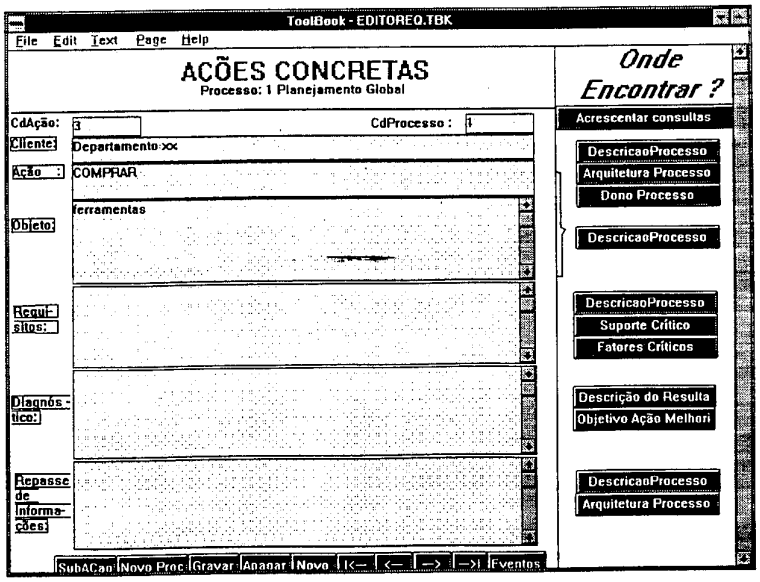


Figure 7: An Example of the Prototype



making modifications on existing applications will both use the requierements baseline and the assistant in order to better define the changes. It is also important to stress that as the requirements baseline should be maintained this is also true about the business model. Failure to mantain the information on the business processes will jeopardize our proposed strategy as well as hurt the total quality principles to which the organization should comply.

6 Conclusion

We have shown a strategy to reuse environmental level information. This strategy uses the opportunity created by the BPR and TQM movements that are pushing corporations to create and maintain business processes information. We have proposed and validated a representation to cast the business process information. We also produced a hypermedia version of this representation using the HDM meta language. On top of the hypermedia structure we have built an assistant that helps software engineers in defining requirements based on the client oriented requirements baseline. The assistant was implemented as a prototype and a case study was performed.

Fiorini [5] conducted a case study in the educational department of a very large organization in order to validate the conceptual model. The model was built upon the textual description of the educational business processes of this large company and validated by visual inspection. The validation was based on interviews with a manager in the educational department. The data collected from this case study was used to produce the HDM that lead to the implementation of the hypertext. Using the hypertext and the requirements baseline, Fiorini [5] conducted a case study in the educational department of a very large organizat

We order to validate the whole strategy is an expensive and time consuming exercise. Besides that it is fundamental that industrial partners be involved. One of the difficulties we had in conducting the validation of the business model is that most of the corporations

contacted withheld their business process information since it was considered business secret. We have to stress that although not making their data available most of the companies were willing to be have their personnel to be interviewed during the construction of the conceptual model. Our future work is going in two directions, the first one is integrating the hypermedia navigation system with the autometed support for the client oriented requirements baseline[13] and the second is the search for a industrial partner to continue the evaluation of our proposal.

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