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Information System Development With the Enhancement of Case Tools Functionality

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Abstract: This paper presents how funcionality of certain CASE tools can be extended in order to facilitate requirements engineering. It describes the technique for information flows analysis, which can be used in conceptual modelling and further development of the system.

Keywords: Requirements engineering, information flows analysis, conceptual modelling, CASE tools.

1 Introduction

REQUIREMENTS engineering presents the first process during the development of the information system (IS). The result of this process is a conceptual model of the information system on which further system development depends. A conceptual model of informative system is created based on the acquired knowledge and requirements from the applied fields. Their development is not an easy task a unique and clearly defined method does not exist. Basically, conceptual modeling is a great step away from the informal toward a formal field specification. Because of the communicational gap between the user and the designer, this process demands a lot of knowledge, effort and experience. Researchers have developed numerous techniques for requirements engineering [1–4]. None of them are ideal, of course, which limits the application of these technologies.

Numerous methods and powerful CASE tools (for instance, Oracle Designer, Rational Rose, MagicDraw, etc.) already exist so that they can aid the designer in the development of an information system. However, commercially available

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methods and CASE tools do not lead designers through the process of requirements gathering the instructions and advice for modeling are very general.

The first thing which the designer needs, before he starts with requirements engineering is to choose the best method, techniques and tools appropriate for a certain case. That is not an easy task. Further development of the existing models, techniques and tools can reduce the problem of choice.

2 Case Tools Functionality Analysis

Most of CASE tools implement one of the methodologies for system development. Different methodologies use different techniques. For the explanation of our ideas which concern the extension of CASE tools functionality, we have chosen the Oracle Designer CASE tool which can be used for conceptual modeling, system design and implementation. It implements techniques for modeling business processes, business functions, modeling the relationships between the entity and modeling the data flows. The simplified storage model in the Oracle Designer is shown in figures 1 and 2. Figure 1 shows the storage part which is used for conceptual modeling. The development of the conceptual model of the information system starts with the identification of business functions and entities. Later, the attributes of the entities, the connection among entities, data flows, data flows structure and the attribute usage can be determined. The specification of the conceptual model is finished by drawing the well-known types of diagrams, such as: hierarchical functions, relations between the entities and data flows.

Base on the conceptual model, system design is also possible. Figure 2 illustrates a part of the storage model which is used in system design. The basic concept which is used in an information system are tables, columns, foreign key and module: tables implement entities, table columns attributes, foreign keys roles (or connection points), modules functions. Oracle Designer automatically creates the first version of the system design which can be further developed. The diagram for data bases model and the diagram for the software module model serves this purpose as an interface. Automatic generating of a logical data bases scheme and module models are of great help when designing a system. However, from the designers point of view, such functionality of CASE tools should be extended.

The class of entity or object and function or use case is a primary concept in conceptual modeling. But the user usually does not express his needs and requirements in conceptual modeling he does not know this specific terminology. The user usually expresses his requirements in natural language. Therefore, the system designer must do a great work of analyzing user requirements and translating into a formal specification manually.

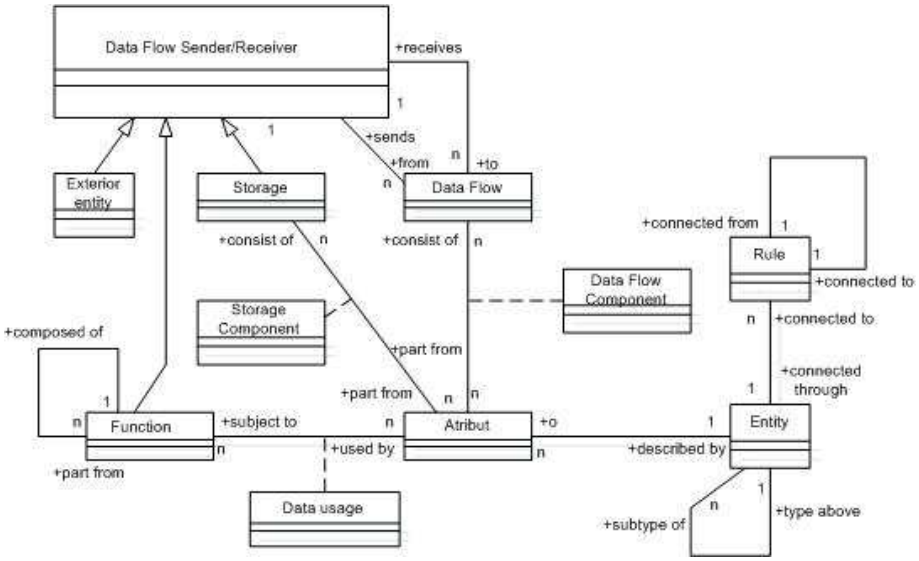

Fig. 1. Storage model for conceptual modeling.

Another way of communicating between the user and the designer is through the training of the user for conceptual modeling. Furthermore, if the user knows the languages which are used in specification of the conceptual model, he will then check the accuracy of that model. And if he does not refuse the training, his acquired knowledge is usually not sufficient for executing quality checks. The system prototype can be used for the resolution of this problem. Development of the system prototype can require a lot of resources, especially if CASE tools are not being used. But most of CASE tools enable the creation of a prototype only when the phases of modeling and designing are finished. From the designers point of view, the creation of the system prototype from an incomplete specification of a conceptual model can be the needed quality of CASE tools.

3 Improving Analysis of Information Flows

Data flows diagrams are the basic techniques used in the structural analysis approaches. In the approach related to the information system development presented in this paper, data flows diagrams are not used for analyzing the users requirements, but analysis of some data flows have the main role in this approach. Information system can be defined as a system which collects, processes, storages, analyzes and spreads information for ceratin purposes. Just like any other system, IS processes inputs (data, instructions) and produces results (reports, calculations) which are

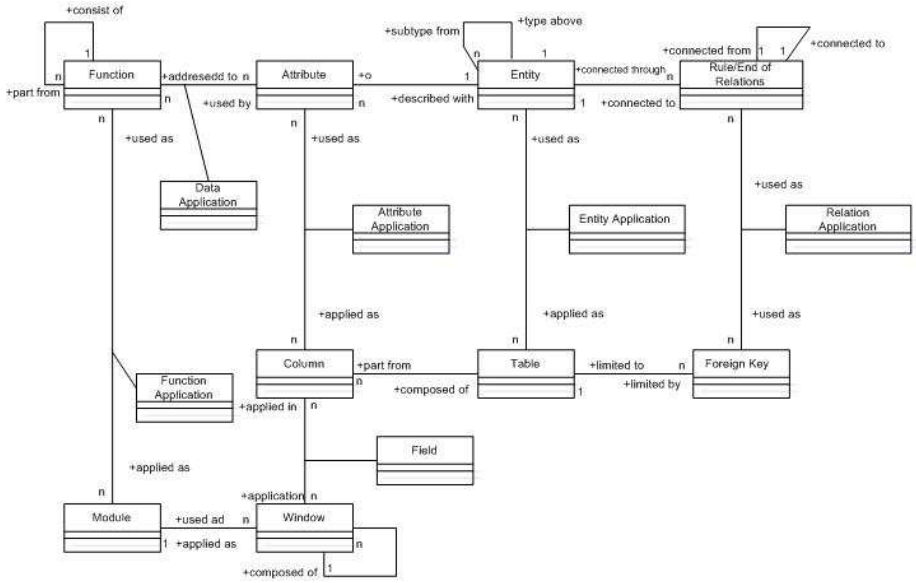

Fig. 2. Storage model for system design.

sent to the user or to other systems (figure 3). The resulting information flow is an information which is the most interesting to users. The need for more efficient reception of such information is one of the reasons for the creation of a computerized information system.

A natural and logical way to initiate the specification of requirements with analysis of the information flows results (for example, sales reports). The user usually knows which type of information he needs in order to efficiently do business. The result of information flow defines the type of information which has to be entered, so the next step is determining the requirements, the structure and classification of input information flows.

The specification which is created during the information flow analysis is used for the creation of a conceptual model for the current information system. Based on this model, a conceptual model of a new information system is created. The specification of the output information flow has an important role it is used for the control of completeness and minimal size of the model.

The specification of information flow has an important role not only during conceptual modeling but also during the logical model development. It is used for designing a computer-user interface.

It is well known that document forms are one of the information sources which are used in the creation of a model such as object class or entity connection. Docu-

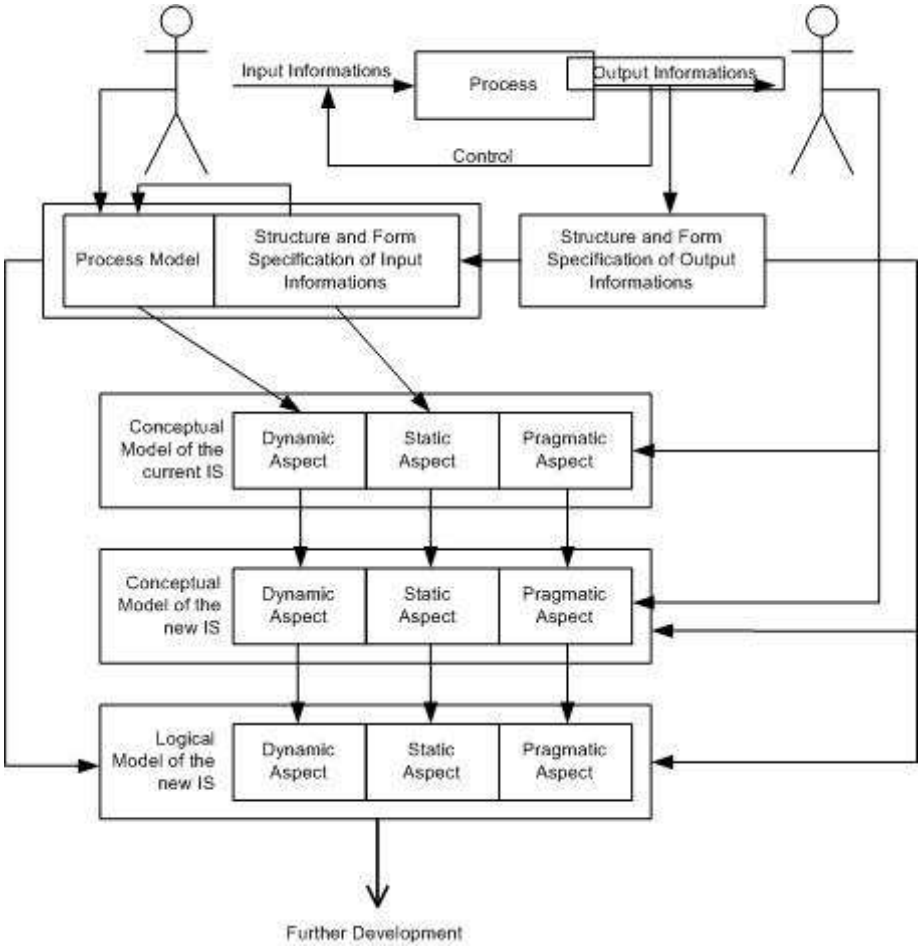

Fig. 3. Partial view at the development process of IS.

ment forms usually have a predefined structure. The transformation of an informal but structured information into a formal meaning conceptual diagram models is an easier task for analysts than the transformation of the natural language. Numerous researches have suggested several solutions on how analysis forms can be mechanized. However, practical use of systems of this type is limited because it needs a lot of time, consuming input examples form instance in order to receive such characteristics such as data types, size, cardinality, etc., different form types. This still does not guarantee completeness and validity of the resulting conceptual scheme. An experienced analyst can receive such information much faster and better.

The specification of information flow is described in three layers. The first layer

presents the users view. The flow is informally determined here. In this case, it is the copy of a form for ordering.

The second layer presents the analysts view. The first version of the specification in this layer is received by including concepts from the layer of the users view. It can be done automatically. Later, the analyst determines these concepts as entities, entity attributes, the limitation of the attribute values, adds statistical dependency.

The third layer presents the system designer. In this layer, business entities are presented in a typical form as rectangles with a list of attributes inside the rectangle. The specification in the third layer is a simple transformation of the specification which is presented in the second layer.

The second layer is the agent. Its purpose is to help the user and the designer to understand each other better. The user can see how the analyst interprets concepts which are presented in the first layer and learn something about conceptual modeling. The analyst receives useful information about the domain much easier because the user uses well-known examples of document forms or screen views for explanation.

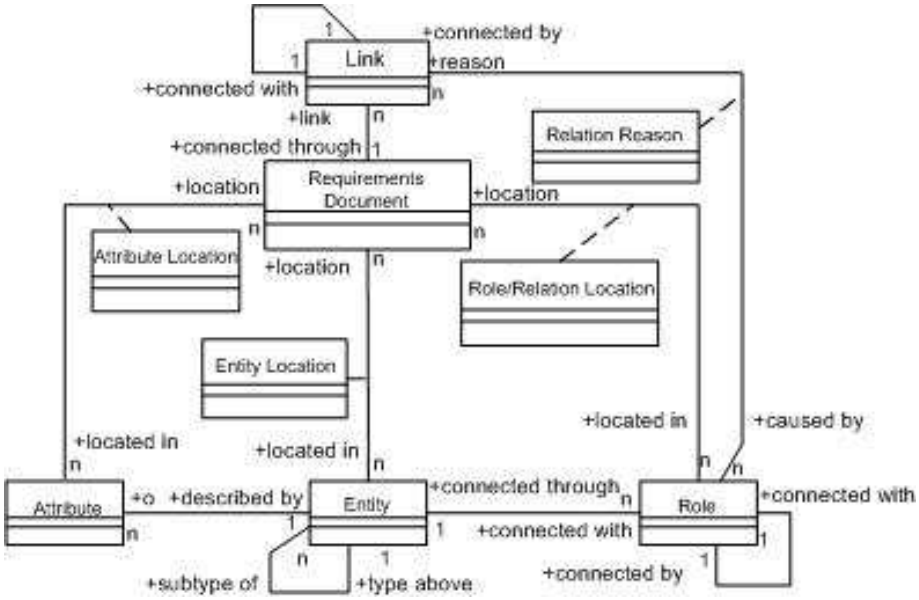

Fig. 4. Extended model of storage for conceptual modeling.

By the implementation of CASE tools, the first version of specification of the second layer is automatically created, the specification of the second layer is automatically transformed into the specification of the third layer, all specifications

are kept in the storage, the completeness and the minimal size is checked. Figure 4 presents a fragment of the conceptual model of storage implemented in this tool.

4 Conclusion

Information flows can be used not only for modeling the static aspects of the system, but also for deriving information concerning the dynamic aspects of the system. By asking the user how a certain information flow is created, the analyst can receive information about the processes which must be computerized. The process model is determined for every information flow. Transitions of the object state and the dependency of the communication flow are used for process modeling. All these specifications are later used for modeling the dynamic aspects of the whole system.

When the information flow structure is determined, as well as the processes, there is a possibility of creating an automatic computerized prototype of information system, which is then presented to the user for evaluation.

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