MAPPING TECHNICAL PROCESSES INTO STANDARD SOFTWARE FOR BUSINESS SUPPORT

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ABSTRACT:
Integrated software systems have been implemented in the last years to support business activities in companies including enterprise resource planning. These systems are characterised by the possibility to be customised with respect to the specific processes which already take place in companies. The use of these systems is not restricted to a specific industrial sector. It is of common use to support business activities of construction companies by these systems.

Construction companies are characterised by extensive and complex processes which take place in technical divisions. These technical processes are executed for specific projects. To support the technical processes by an information system, two major problems have to be solved. The first problem is concerned with the interaction of the processes which take place in the projects and the processes which are independent of project work. The second problem is concerned with the interaction of the technical processes and processes for the business activity. Existing software systems support project work. Therefore, these systems have to be expanded with respect to the technical processes.

The paper presents a concept to expand existing software systems in such a way that technical processes are supported as a part of the project work in the context of a company. The technical processes are specified on the base of the set theory. The processes which are supported by the existing system are specified in the same manner. Both specifications are unified. On the basis of the unification, the interaction of the different processes is illustrated. In addition the specifications are used for the implementation. The specifications of information are used to generate a schema for a database and to expand the existing schema. The specifications of the tasks are used to identify algorithms which have to be implemented.

Results are presented. Technical processes are shown which are executed as a part of facility management. The interaction between these technical processes and existing processes is illustrated. On the basis of the existing system Navision Financials, the support of technical processes is shown.

KEYWORDS: Product and Process Modelling, Integrated Environments, Facility Management

1. INTRODUCTION

In general, a major problem in companies of the building industries is the fact that the financial effects of technical activities are known much to late. The consequence is that controlling algorithms can not be executed timely. An efficient controlling can hardly be executed.

One reason is based on the situation that technical staff is not familiar with the requirements of the merchants. In general, technical staff does not know the kind of information which is necessary for the execution of controlling algorithms. Information systems do not support both, technical and economical tasks. The interaction between these different tasks is not supported.

This paper is focused on a concept to expand existing software systems for business support in such a way that technical tasks are supported, too. This way is chosen because software systems for business support already satisfy the requirement that project work is supported as a part of the tasks within a company. This is a fundamental requirement of the building industries where most of the work has to be performed in the projects.

2. STANDARD SOFTWARE FOR BUSINESS SUPPORT

Today it is of common use to support business activities with the help of standard software in the building industries. Solutions are implemented which are focused on the specific requirements of the different industrial sectors. These solutions can be customized to the specific requirements of the companies.

In general, standard software for business support consists of several modules. These modules support different tasks. Examples are modules for financial management, human resource management, sales and distribution, project work or material management. A fundamental module is the module to support the accountancy. Specific legal requirements have to be satisfied by this module. In general, the systems satisfy these legal requirements.

For this purpose, two fundamental data structures have been developed in the commercial information technology, the voucher and the account. The voucher is used to document each business activity. The account is used to determine the amounts of money including their changes for each class of business activity.

Therefore, the fundamentals of standard software for business support is not based on a large number of data types. Different business activities are documented and stored in the same data structure. These data are evaluated after the specification using a lot of different criteria. This functioning differs from the functioning technical staff is familiar with. In technical software systems, a lot of data types are introduced to classify the objects.

In general, standard software for business support is used in multi-user modes. The users are instructed to execute different tasks. For the coordination of the execution of these tasks, information about the sequence of the tasks is necessary. It has to be known when which task is executed by which person. These sequences are described in process models as described below.

Process models are used do describe the actual sequence of tasks in companies. They are also used to simulate and optimize these sequences. The software has to support these sequences so that data are available at the time they are used in the specific level of detail which is necessary for the execution of the actual task.

3. PROCESS MODELING

The mathematical background of process models is the graph theory, a part of the set theory. A process model is a graph which consists of two sets and two relations. The intersection of both, the sets and the relations is empty. One set describes events, the other set describes tasks. The relation between the events and the tasks describes the tasks which are initiated by the associated events. The relation between the tasks and the events describes the events which are initiated by the associated tasks.

Figure 1 shows an example of a process model. The graphical symbols are described by [Scheer 98]. The events are denoted by hexagons. Tasks are denoted by rectangles with rounded edges. The elements of the relations are visualized as arrows. The models shows two tasks, the auto discovery and the personal discovery of an interruption message. Both tasks can be initiated by the event "Interruption has occurred". They end with events to initiate the processes of forwarding the message.

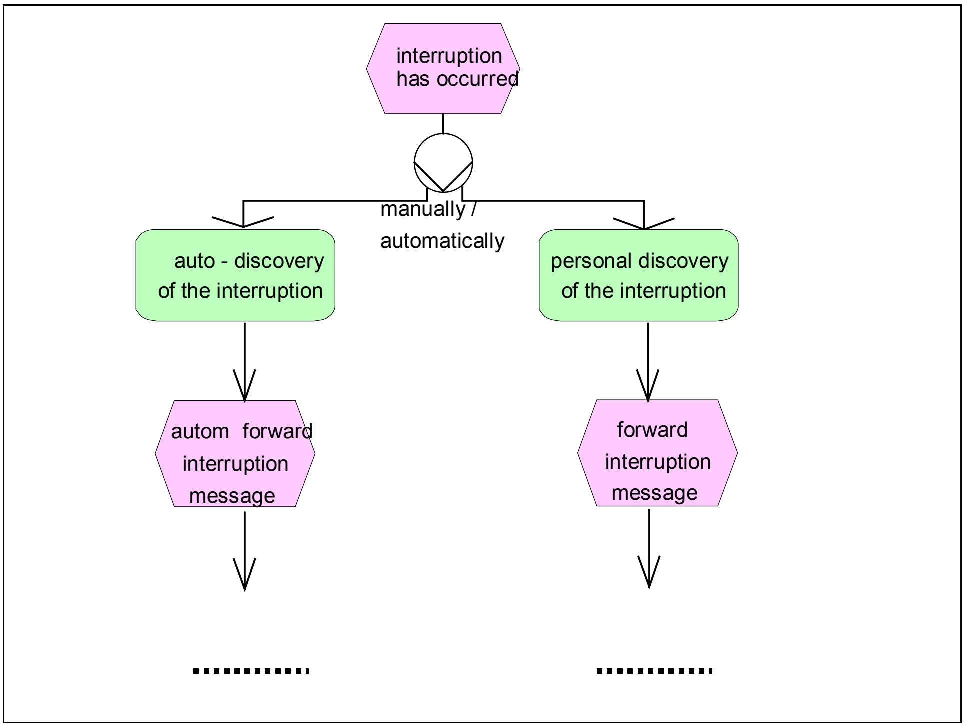

Figure 1: Example of a process model

The graph theory supports the specification of subsets in the graph. The application of this subsets enables the specification of a process model on different levels detail. Figure 2 shows the principle way of specifying models with different levels of detail.

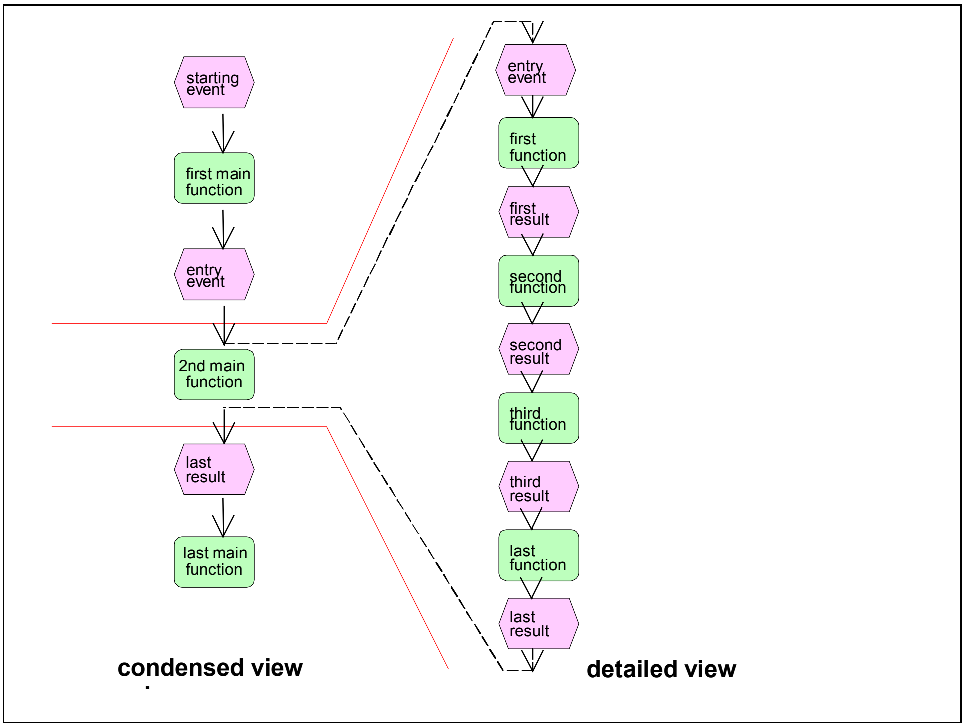

Figure 2: Process models with different levels of detail

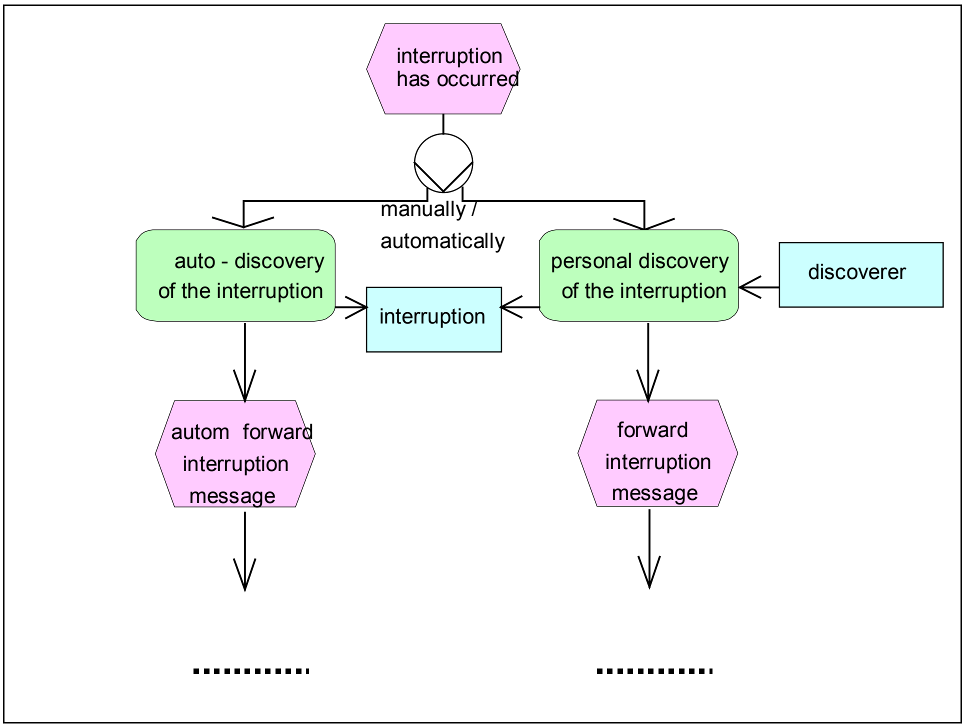

Figure 3: Expanded process model

The process models can be expanded in such a way that the information and the relation between tasks and information is added into the graph. This extension allows the specification of the information which are necessary for the execution of each task. Figure 3 shows an example of such an expanded process model. The types of information are denoted by rectangles. Four relations are introduced between the tasks and the types of information. One relation describes whether an information of this type is specified during the execution of the tasks. A second relation describes whether an information is read, a third relation describes the change and the fourth relation the deletion. In figure 3 two of the relations are visualized. The arrow from a type of information to a tasks visualizes the relation “read”, the arrow from a task to a type of information visualizes the relation “specify”.

On the base of these process models, the plausibility can be checked. It can be evaluated whether information are used for the execution of a tasks (read, change or delete) without tasks occur which are used to specify information. These checks can not guarantee a process model which works well in reality. However, mistakes can be avoided.

The process model can be expanded in such a way that process simulations can be executed. For this purpose, additional information like the duration of the tasks and the occurrence of events have to be specified. On the base of this additional information, e.g. the duration of a sequence of tasks can be determined.

Software tools are available which support the specification of process models, e.g. the ARIS toolset [ARIS 98]. In economics, the use of these tools is state of the art. Reference models are available to visualize the processes which are supported by software system. For instance, such a reference model exists for ‘Navision Financials’ [i-process 98] and for ‘Intershop enfinity’ [INTERSHOP 00]. Both models are modeled using the ARIS toolset.

4. TECHNICAL PROCESSES

In technical disciplines, process models are not widely used. However, the principal method can also be used for the description of technical tasks. Figure 4 shows a part of tasks which are usually executed as a consequence of an interruption or an error in the technical equipment of a building.

The task “reception of the interruption message” can be executed by a call-center. This task consists of the acceptance of the error or interruption message and can be done for several buildings of different contract partners. After the reception, the message has to be forwarded to persons with technical knowledge.

The task “classify the interruption message” can only be executed by persons who have technical knowledge about the building and the built-in installations. This knowledge is necessary to decide for instance whether further information or a visit of the location are necessary. The message has to be interpreted. The interruption or error has to be classified. It has to be decided whether help is immediately required or not.

Further tasks are necessary to solve the problem which has occurred.

A basic requirement is the fact that each message has to be documented. In addition, all steps which follow after the reception of the message have to be documented, too. Therefore, figure 4 shows the data which have to be specified or read for the purpose of documentation.

The whole process is modelled as an Event-driven Process Chain (EPC) with the ARIS toolset [ARIS 98]. The ARIS toolset is chosen because a reference model [i-process 98] is availabe which shows the tasks and their sequences which are supported by ‘Navision Financials’, a standard software for business support [Navision 97].

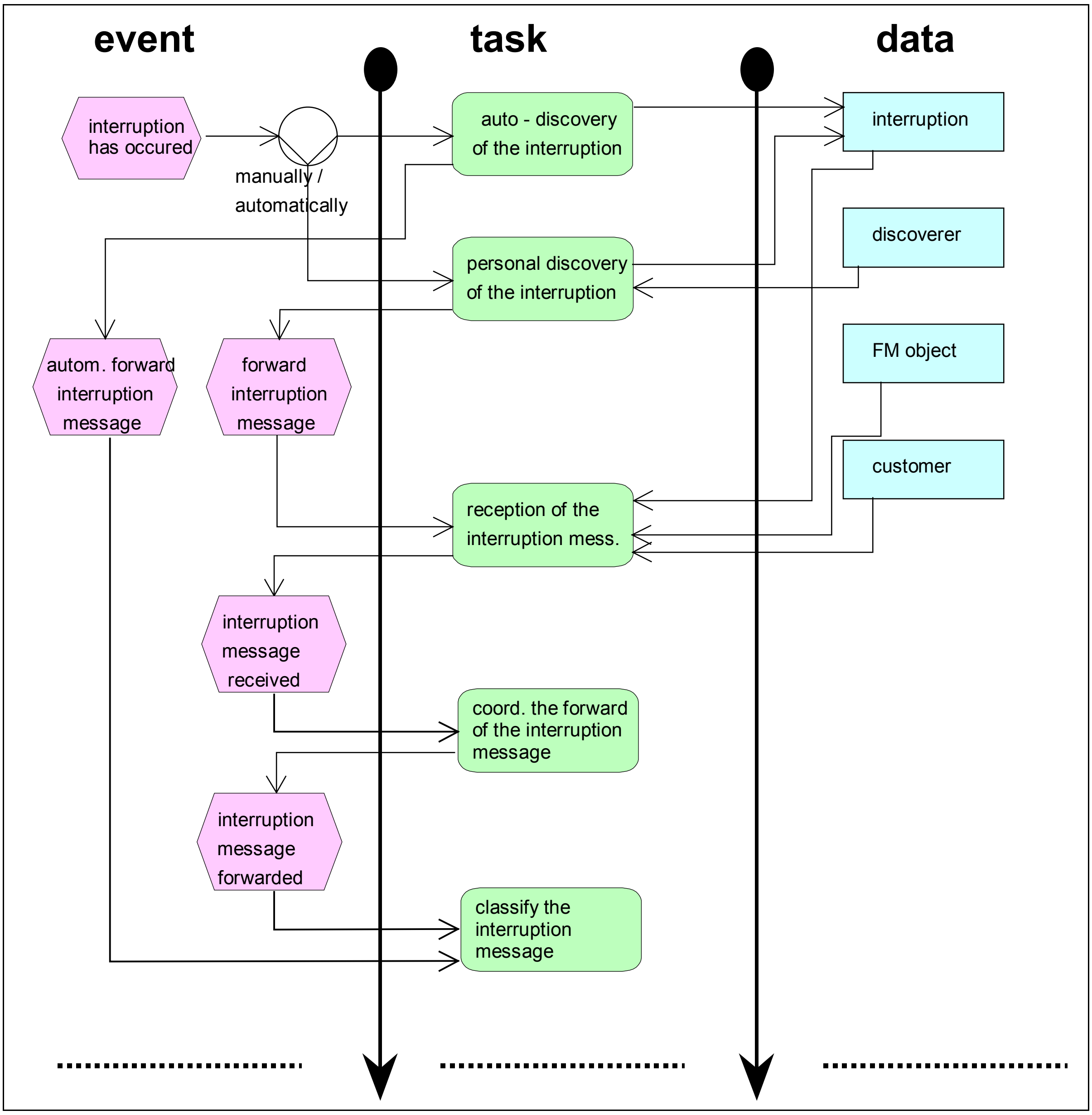

Figure 4: Modelling tasks to manage facilities

5. MAPPING PROCESS

The goal of the mapping process is the creation of an integrated model of an add-on component and an existing model. The add-on component is the service department. The existing model is the reference model of 'Navision Financials'.

After the creation of the model of the service department the following main objectives were deployed:

- Identification of corresponding objects in both models (Navision Financials & the service department)
- check of the possible exchange of objects from the add-on model with the existing Navision model (elimination of entities or attributes with double occurrence)

- integrating the additional more technical oriented business logic from the service department into the standard software
- automatic generation of a complete business logic scheme which includes the add-on "*service department*"

To follow these main objectives the model of the service department was analysed and all attributes and also the objects in which they occurred were identified. With this list there was a basis available to look inside of the Navision Financials reference model. This leads to a second list of corresponding objects and attributes which has similar information stored in it. After identifying and sorting of all these objects, common functions have to be found to integrate the technical processes into the business oriented standard system.

It was discovered that the project handling in the 'Navision Financials' has much in common with the service department, and thus the derivation of an additional "project handling" was begun in parallel to the current project handling of the standard software.

Figure 5 shows a survey about the tasks and their connection to achieve an integrated process model. Figure 6 shows attributes which are used to support both, the service department and the business processes which are already supported by the standard system for business support.

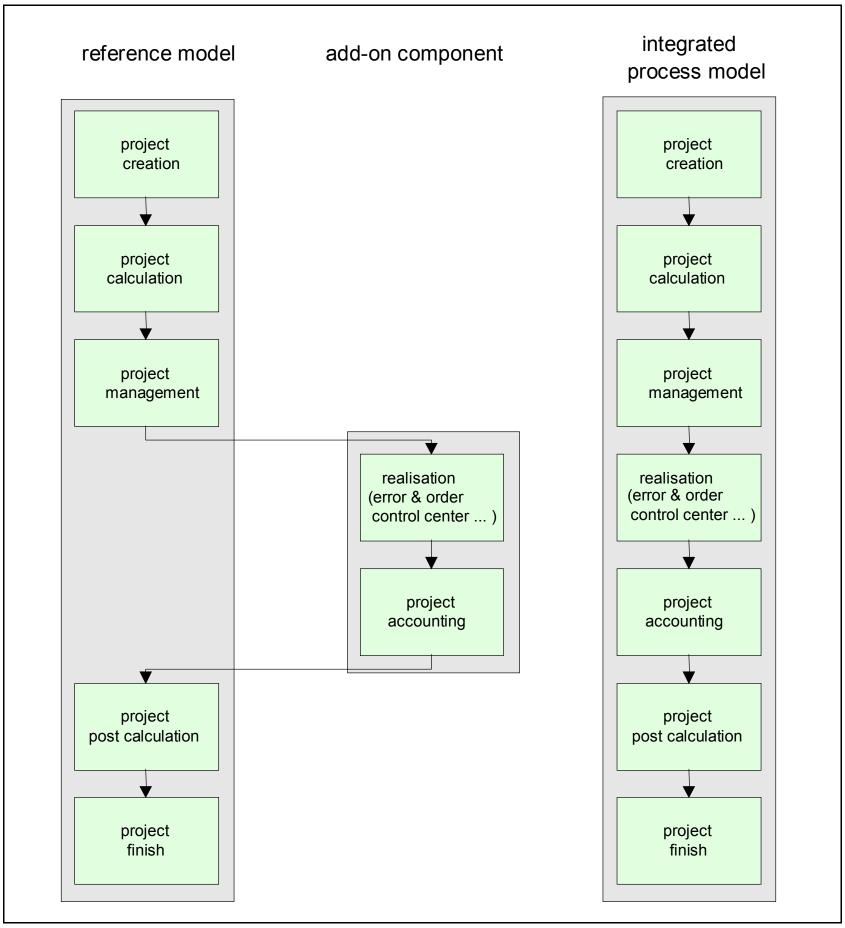

Figure 5: Steps to integrate process models

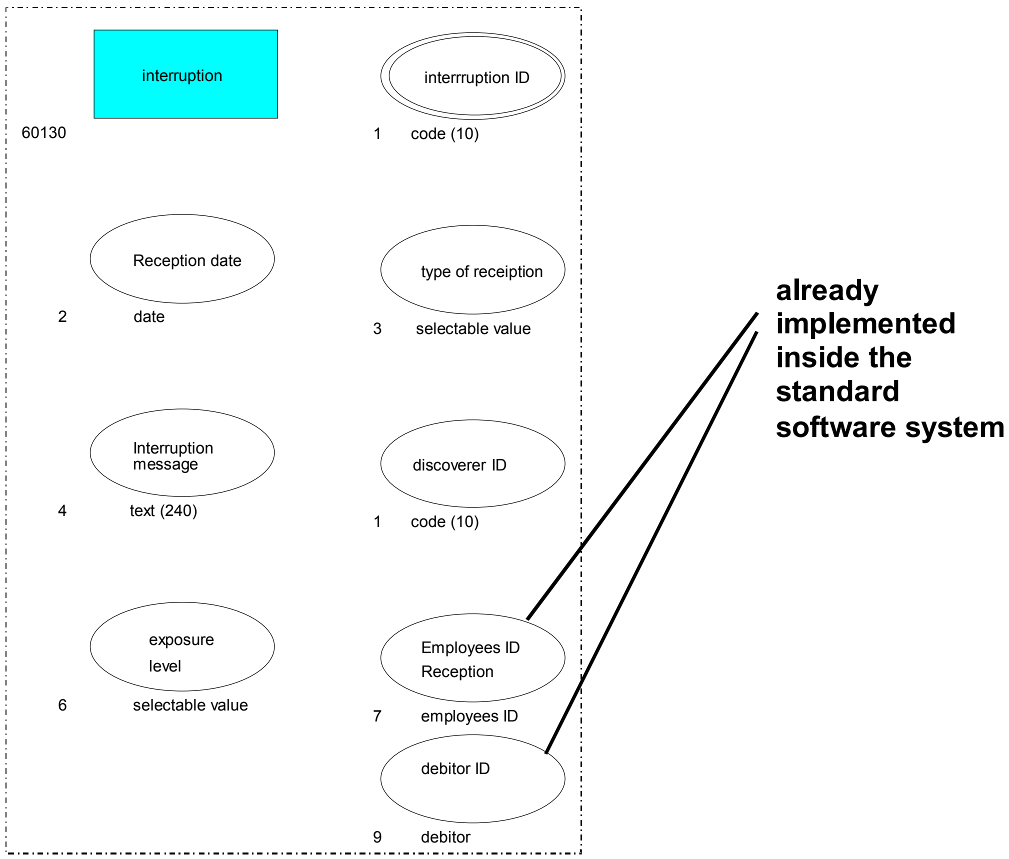

Figure 6: Identification of attributes to integrate data

6. IMPLEMENTATION

The data types which are part of the process model are used to expand the existing data base of the standard software. The existing reference model of the standard software describes the complete database schema to support the economical tasks. The data type which support the service department are now used to expand the existing database schema.

Navision Financials makes use of a relational database. New tables are created. Figure 7 shows a data type description in the process model and the corresponding table definition in the data base. Masks are implemented to specify the data. Reports are implemented to evaluate existing data in these tables. The implementation makes use of C/AL, the programming language which is a part of the 'Navision Financials' system. After these steps, the functionality to support the service department exists independently of the existing functionality.

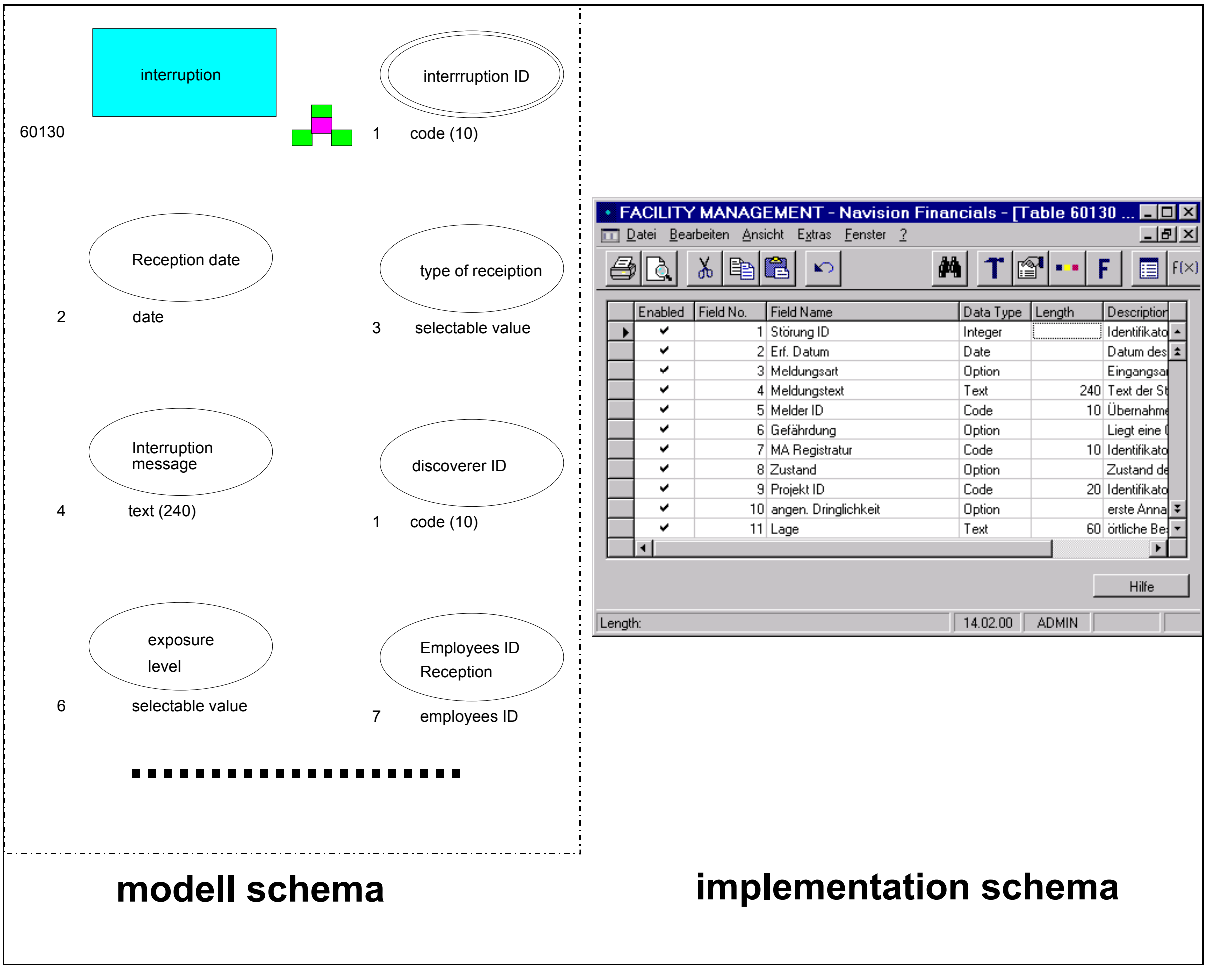

Figure 7: Data type description and table definition

The next step is the interconnection of both, the functionality to support the service department and the existing functionality. For this purpose, C/AL is used. Menu entries are added. Sub-forms are created. Items are made public to the event driven engine of the Navision Financials system. These items are used as identifiers for events. If these events occur the associated functions, menus, forms, sub-forms or reports are executed. The functionality for both, the service department and the business support are integrated into a unique user interface. A part of this user surface is shown in figure 8.

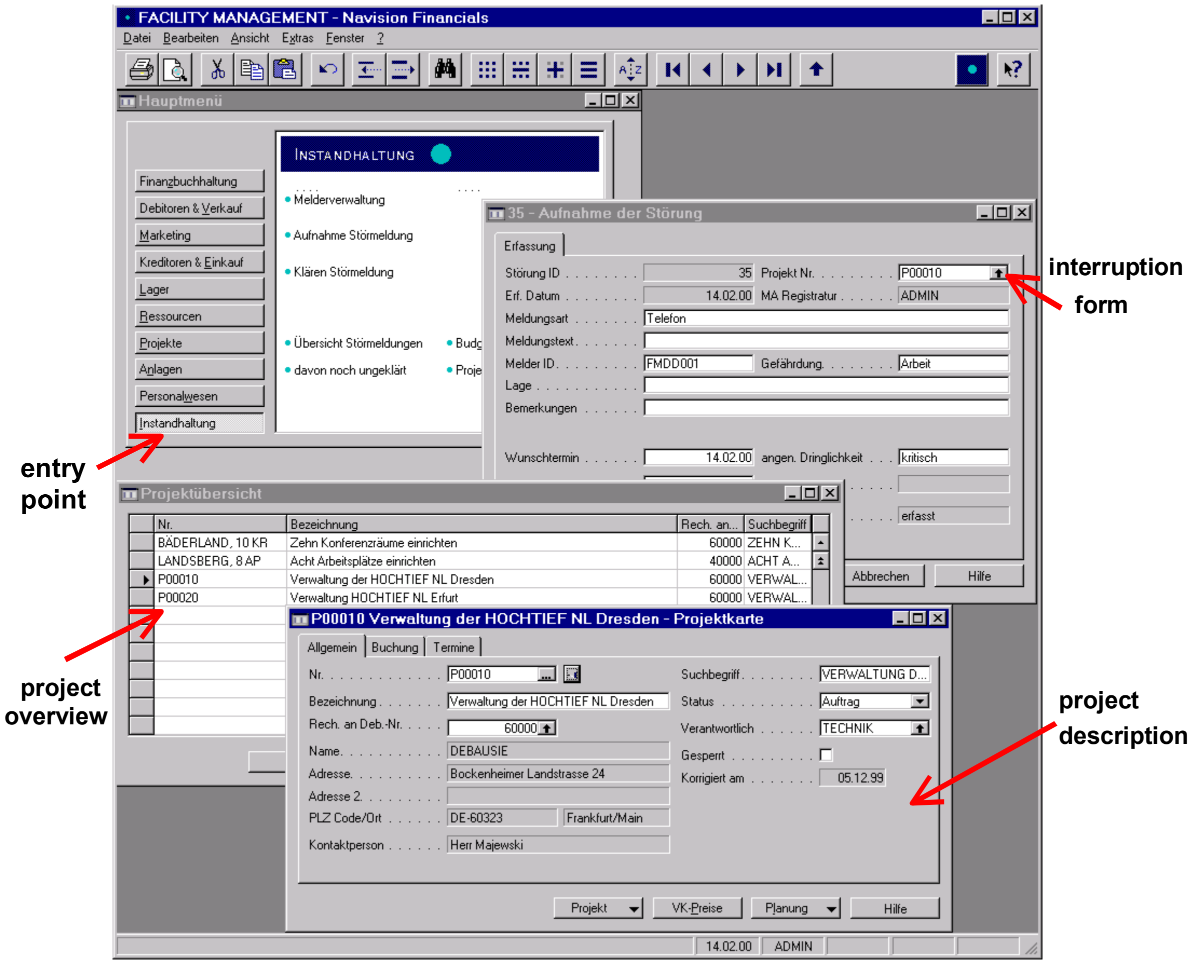

Figure 8: Part of the user Surface

The last step is the transfer of the rights of access. This information is derived from the process model. It can be transferred from the process model to the database.

7. CONCLUSIONS

The approach presented in this paper is a step towards an investigation how technical and economical tasks can be supported by an integrated system. The approach is influenced by concepts which have been developed in commercial information technology.

Based on existing process models for the economical tasks of a companies, technical tasks are modeled in the same manner. Both models are merged. This is done by mapping the technical tasks as an add-on component into the existing model.

The result is used to expand an existing information system so that technical tasks are supported, too. The benefit is that the interaction between technical and economical tasks is supported. Technical and economical tasks can be executed in an integrated way.

As an example, technical tasks are chosen from the field of facility management. A standard software for business support is expanded with regard to the support of these tasks.

The pilot implementation shows that the principal ideas yield to an integrated system where the boundaries between technical and economical software are overcome. Further investigations have to show the benefit in the field of technical tasks as part of the classical field of engineering work.

REFERENCES

IDS Prof. Scheer GmbH — ARIS Produkte, Version 4, *1998*

INTERSHOP — www.intershop.de, news, *2000*

i-process consulting GmbH — Navision Financials Referenzmodell V 2.0, *1998*

Kluge, M. — Abbildung technischer Abläufe in betriebswirtschaftliche Standardsoftware, *Diplomarbeit*, *Weimar, 1999*

Navision Software — Navision Financials, Handbücher, *1997*

Scheer, A.-W. — ARIS – House of Business Engineering – Business Practice and approaches in the R&D stage, *Proceedings of the European Conference on Integration in Manufacturing, Dresden, 1997*