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SAMBA – Structured Architecture for Medical Business Activities

Maria Areblad, Magnus Fogelberg, Daniel Karlsson, Hans Åhlfeldt

Department of Biomedical Engineering / Medical Informatics, Linköping University, Sweden

Abstract

SAMBA has been a project with the commission to develop a process model describing the workflow of Swedish health care in the care of an individual subject of care. The work has included literature review and a review of process models developed in different counties in Sweden. These models showed differences caused by the fact that they had been created from different perspectives, and it was therefore necessary to find a modelling method that was completely context neutral. The solution was to describe a set of processes, where one process is allowed to handle only one object, a refinement object. The project team created a process model consisting of three parallel processes, a core process, a management process, and a communication process. To regard this kind of work flow as three synchronously running processes is a partially new approach to process modelling. It was used to describe the workflow of health care. This method seems to be applicable in most instances of care and can be used for description of the enterprise on different levels of detail.

1. Introduction

Since many years Swedish health care has tried to analyse the work process of care of an individual patient in order to establish a foundation for the development of IT support in process oriented care. Several different process models have been developed by the autonomic counties and regions.

An example of Swedish health care process models (Figure 1) shows the basic features of health care. It is presented as a flow chart with decision points and forking.

The main steps in the process are:
- receive demand for care
- assess the demand for care by perceiving the condition of the person as it is described in the demand for care and matching the condition against the service repository of the health care provider –
- decide whether or not the demand for care shall be accepted and a health care commitment stated
- assess the need for care and make a care plan with a defined objective
- decide whether or not the demand for care shall be accepted and a health care commitment stated
- assess the need for care and make a care plan with a defined objective
- perform activities
- assess the result in relation to the objective
- consider continued process
- finish the care process

Different models have been developed from different perspectives, which is one reason why they do not look the same. These differences make it difficult to compare the health care business of one county with that of another county.

To make information systems cooperate it is necessary that the meaning of each information element is clear. This calls for a common view on the concepts and a well formed information structure. The architecture of the information components must be based on a profound knowledge of the work processes in health care with definitions of the concepts and their relations. The purpose of the SAMBA model is to create a basis for such information architecture.

Much work has been done over the last decade concerning systems modelling of health care enterprise from different perspectives, e.g. business development and organisational structure [1], Dynamic Essential Modelling of Organizations (DEMO) as method for analysis of interacting processes in health care [2], integrated modelling of the multi-professional health care processes as a precondition for process reengineering and quality measurements [3], and analysis of the mutual influence of organisational structure and ICT-infrastructure on each other by means of DEMO together with the Unified Modeling Language (UML) [4].

In August 2001 a national Swedish project group started a work to present a structured architecture for health care services, their concepts and their organisation in a work process. The group was called SAMBA and presented a preliminary report August 2003. After a national enquiry, the final document was delivered November 2004. The objectives of the work have been

- to develop a general process modelling method
- to use that method to analyse the common work flow in the care of an individual subject of care.
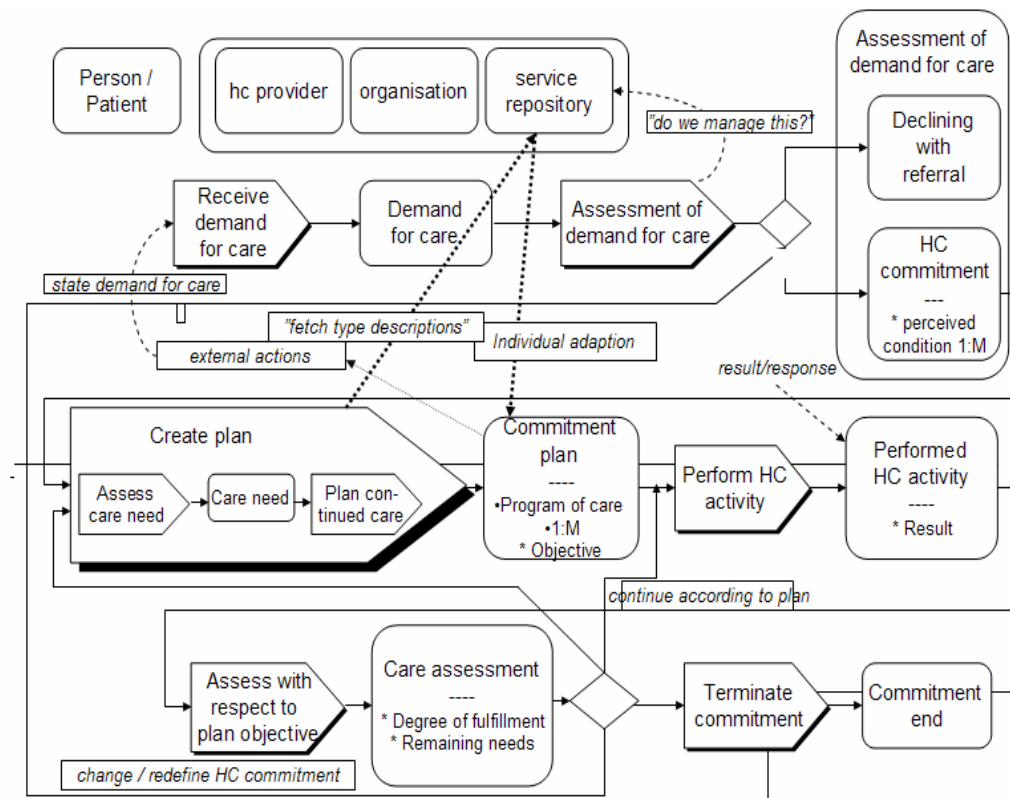

Figure 1 - Sample of Swedish process models

This modelling method is applicable for health care in any country, but the mission has been to deliver a model to be used in Sweden.

2. Methods

The SAMBA work has been carried out by a project team of 15 persons, a project team leader from the Swedish Federation for Medical Informatics and modelling assistance by a consulting agency. The work covered literature review, analysis of former Swedish process models and development of a partially new process modelling technique. Analysing and modelling sessions were arranged on 17 occasions, in total 19 days with the project team and 6 days with a preparatory task force of 6 persons. Approximately 2100 hours were spent

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for the work. Parallel to the process modelling, all concepts encompassed in the process model have been analysed, modelled and defined.

Between the modelling sessions a structured discussion was carried out in an Internet forum developed in Sweden for evaluation and development of terminologies.

The concept system of SAMBA was modelled in the UML. The behavioural diagrams of UML do not sufficiently describe the interaction between activities and objects. Therefore SAMBA chose a process notation evolving from the IDEF0 language [5], from which a partially new method for process modelling was developed as one of the results of this project.

3. Results

Analysis of earlier process models

The earlier process descriptions (as in Figure 1) were found to deal with three different kinds of actions:

1) activities with impact on *either* the health condition of the patient *or* the perception of that health condition by health care professionals

2) decisions and evaluations within the framework of a care mandate (as defined in prEN 13940-1:2004) [6] given to the health care provider managing the type 1 activities

3) information handling which is necessary to make type 2 decisions and to communicate with the surrounding world including other processes and resource management.

The SAMBA process modelling technique

Former workflow models, like the one shown in figure 1, have described changes of several parallel objects influenced by the three kinds of actions described above. This fact has caused different perspectives in modelling to give different images of workflow although it is the same enterprise that has been depicted. SAMBA's process modelling technique has the purpose to clarify the processes by letting each process handle only one *refinement object*, i.e. an object which enters into the process in the beginning (input) and is changed by the activities in the process (refinement) until it leaves the process as a product (output) when the process is finished. The object of the process shall be changed in every process step. It can be a change of the object's characteristics but also a change in the perception by the production business of the object. Every change is called *refinement*, a word which does not necessarily mean *improvement* but at least means *change*.

The development of this process approach has made it possible to achieve one common image of the health care process.

Originating from ISO 9001 [7], which demands a management process to take care of decisions, monitoring and quality check of the actual production process, SAMBA has defined something which was designated *process package*. It contains – compliant with ISO 9001 – a core process, which contains only activities affecting the production object, and a management process. In health care, the core process is called clinical process, and its refinement object is the health condition of the patient. The management process contains decisions as well as basis for decisions, evaluation of the activity results in the core process and planning of the core process activities. The refinement object is the care mandate, which is the framework for all decisions and planning, as it delineates the authorisation of the health care provider to manage the case. It also states the task which is given to the health care provider. It will encompass the actions which comply with the mandate and manages the activities of the core (clinical) process.

Furthermore, SAMBA has defined a communication process running parallel to the other processes. It handles information about the process package and is an interface to other process packages. Its refinement object is an information token with the demand for care as input in health care. This information token is finally transformed into a discharge message, which is the output of the communication process.

The core and management processes do not communicate directly with other process packages. Instead, all communication is carried out by the communication process.

This means, that the three processes forming the process package can be regarded as a three-tiered tube with the core (clinical) process in the middle, covered by the management process, and with the communication process as the outer shell.

In accordance with IDEF0 [5], SAMBA stresses the difference between management objects, which trigger activities or decide when they are to be carried out, and resource objects, which are assets for an activity to be carried out.
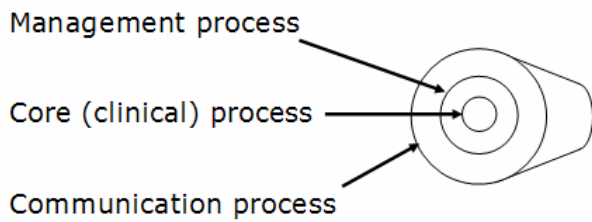
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Figure 2 – Cross section of the three-tiered process package.

The activities in each process consist of several deeds. Even if the refinement object of the process is taken care of by the activity and is delivered in a new shape when the activity is finished, there are deeds of management and communication within the activity besides the actual processing of the refinement object. Each activity can be regarded and modelled as a process package of its own with the three parallel processes, and the deeds of the activity may be regarded as activities in that process package. Therefore the modelling technique is recursive, i.e. every activity can be depicted as a process packages similarly built as the superordinate process package. The overall process package must therefore be described on a specific level of granularity which is decided by the context and purpose of the model. The communication process in each activity can, however, interact directly with the communication process in any process package regardless of the level of granularity.

The process model "care of one individual subject of care"

The three parallel processes are depicted as three parallel boxes where the flow goes horizontally from left to right.
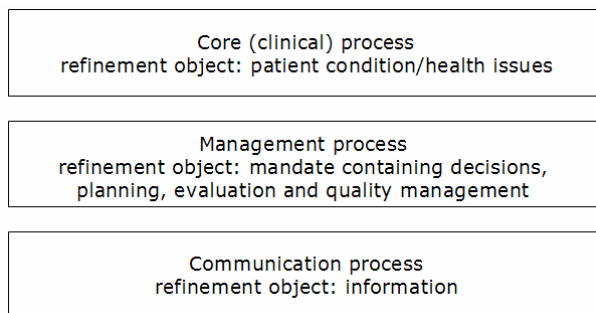

Figure 3 – The process boxes.

In each box the refinement object is changed by the activities, and a thin-lined arrow pointing to the right indicates the flow of the object. The workflow means interaction between the three processes, and a thick arrow shows the actual workflow, where an object resulting from an activity in one process may act as a resource or a trigger in the adjacent process before it is processed by a new activity in its own process.

The SAMBA method used in health care process analysis

In the SAMBA model the processes are described according to the sequential activities influencing the three different refinement objects. Some activities may yield different results depending on the status of the incoming object and the resources used. A brief walk-through of parts of the processes will illustrate this.

The demand for care is received in the communication process (Figure 4). It contains a pending mandate stated by the party issuing the demand for care to the receiving health care provider giving an authority at least to assess the demand for care. This will immediately start the management process.

There is a decision whether or not the demand for care shall be assessed for further action. It might turn out that it is not a demand for care, or the demand is presented where the subject's insurance is not effective, or the subject might have called at the wrong hospital. In that case the demand for care is referred and no clinical process will be launched.

If the decision is to assess the demand for care, its description of the health condition will be perceived by a health care professional from the information provided in the demand for care. The clinical process starts with the health condition as input.

The health issues are clinically assessed from the information about the health condition. They are matched against the service repository of the health care provider. If there are adequate services in the local service repository to handle the patient's problem, a health care commitment is made by the health care provider and establishes the care mandate. This will be the framework for a definition of the health care objective, which in turn is to be achieved by means of a programme of care. Activities in the programme of care will be provided resources and booked.

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The processes continue with the decision to perform a certain investigating activity, refining the mandate by marking one planned activity as decided (Figure 5). This activity is carried out in the clinical process followed by an assessment refining the condition to an assessed condition with increased knowledge about the nature of the health issue. This knowledge makes it possible to redefine the health care objective tied to the mandate, and the redefined objective will be matched against the service repository revising the list of available adequate activities.
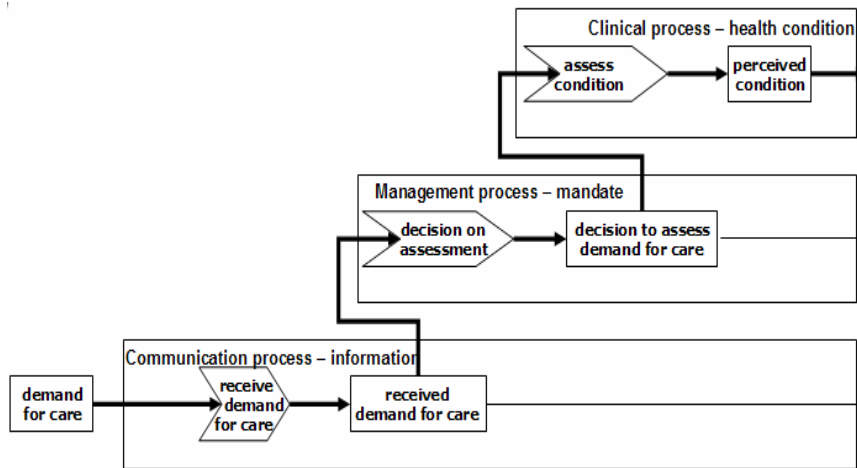

Figure 4 – Beginning of the processes.

Next section of the processes is treatment, where the condition is refined to a treated one. It may be a medical or surgical treatment or a compensating activity, such as delivery of a wheel chair, performing a training program, action by social worker, etc. It may also be a referral to a supporting process.

The result of the activities will be evaluated giving possibility for a quality assessment and once more a redefinition of the health care objective. Now, the health care objective must be tested against the current condition. If the objective is not achieved, the programme of care must be updated, and the processes are repeated with new investigating and treating activities.

If the health care objective turns out to be achieved, there is a possibility to terminate the processes (Figure 6). The clinical process is finished leaving a perceived condition which is the basis for the discharge decision. This decision will carry the description of the final health condition to the communication process, where the discharge message is issued in the form of a discharge letter, lab report, information to the subject of care or any similar final communicated clinical statement.
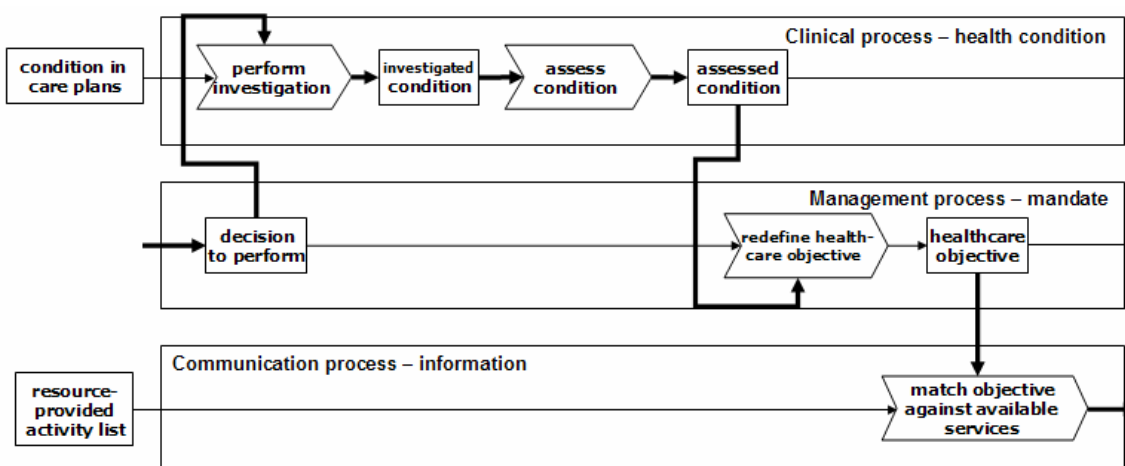
4. Discussion

Figure 5 – Investigating activities and redefinition of healthcare objective.

The modelling technique with three parallel processes described has made it possible to analyse the evolution of each refinement object influenced by the activities in the workflow of health care. If there is no appropriate health care activity in the service repository a referral may be issued to another health care provider for a supportive process or to take over the responsibility for the care process. Any referral to x-ray or lab may be considered such an activity depending on how the enterprise context is defined. A referral to another hospital or from primary care to hospital is a demand for care made by the process owner to another health care provider.

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When that provider has made a health care commitment the health care objective of the referring provider has been achieved and the process may end.
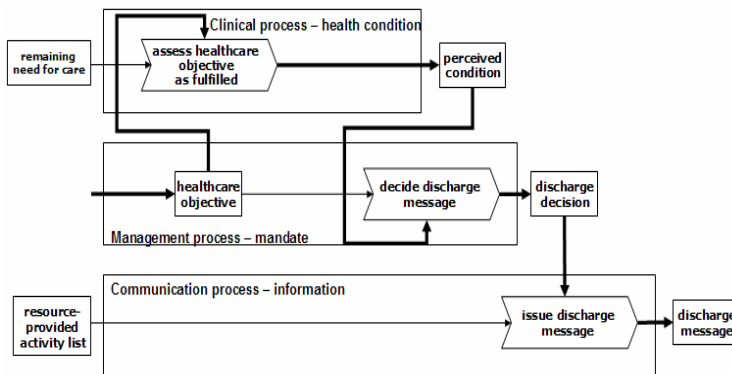
5. Conclusions

Figure 6 – Termination of the processes when the objective has been fulfilled.

Perspective depending incongruence between older Swedish process models has been reason for development of a process modelling technique supporting workflow analysis. This method has given possibility to describe the common main work flow in the care of an individual subject of care. The technique can be used to describe activities within the processes on different levels of detail and can be used as basis for different kinds of work concerning business development as: IT architecture, terminological work, quality development etc. Probably the process modelling technique will prove to be general and possible to use outside health care.

6. Acknowledgments

7. References

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Address for correspondence

Maria Areblad, Vårdprocesscentrum, Landstinget, SE-581 85   LINKÖPING, Sweden, tel +4613221054, fax +4613223043, e-mail: maria.areblad@lio.se