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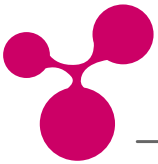

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B.4 Adapting Enterprise Architectures for Health-Care Networks – Field Report of an Implementation

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1 Introduction

In near all business areas enterprises face the globalization and the opening of new markets. To master that situation large and complex networks of autonomous units emerge in Europe. This applies also to the health sector. In 2008 several large health care networks have been started in Germany. The health care networks are initiated to face the demographical changes and aim the development and improvement of innovative care concepts.

Health care networks need a clear operational structure and a transparent design to manage the constant evolution of the network organization. Enterprise Architectures (EA) established as holistic approaches to manage various views, i. e. structural and behavioral, onto an enterprise in an integrated way. The modeled domain typically goes beyond pure technical aspects and involves the whole enterprise. In the special case of a networked organization, a management system e. g. to ensure a constant process quality over a large number of participating institutions. Furthermore the network management system makes the structures transparent and it allows the management of the inter-organizational relations.

Usually the management of the different parts of the network is a highly manual task and causes extensive effort. An increased efficiency could be achieved if the necessary tasks are solved completely model based. Then algorithms, based on a set of rules, perform model operations. Thus, the required time and effort for solving the overall task is reduced.

In this paper, we adapt enterprise architectures to introduce an approach of a model-based management system. Therefore, we explain the fundamentals of enterprise architecture, information models and network organizations. Based on our experiences in the healthcare networks *Carus Cosillium Sachsen* (CCS) we introduce our approach and describe how a first implementation was realized (section 3). The paper ends with conclusions and suggestions for further research.

The authors used the research concept of action research [1]. A problem is solved by a group consisting of partners both from the scientific community and domain experts. Several iterations of analysis, action and evaluation are traversed.

2 Background

2.1 Domain: Health Care Network

In the literature exist different understandings of the network concept. In our research, we refer to the sociological and organizational aspect of the network concept. SAILER defines the term as pattern of social relations over a set of persons, positions, groups, or organizations [2]. Some authors understand the network organization as a specific type of cooperation beside a lot of other cooperation forms [3] [4]. Other authors use this term synonymously for cooperations just like strategic alliances [5]. A third paradigm defines inter-organizational network as a generic term for a set of inter-organizational relations. Basically, these paradigms have the same characteristics: The network consists of different usually autonomous organizational units, which are tied by relations [6].

Organizations are differed in a structural part and a process part. ALYSTYNE creates in combination with the goals and characteristics of networks the following definition: "Network organizations combine elements of structure, process, and purpose. Structurally, a network organization combines co specialized, positive intangible, assets under shared control. Cospecialisation is important for increasing organizational returns" [7]. The complementarity of the network members in the specific process instance is important for maximizing network outcome. But within the group of network members the partner need not to be complementary. They just follow the collective goal and hope to improve or keep their market power. Wetzel describe this like that: The network has a pool of possible activities that can be linked to a cooperation, to gain a network outcome. Networks are the potential interacting contacts and useable resources [8]. Thus, networks are characterized by the potential for cooperation, not by a single instance of cooperation.

Health networks are "networks with a limited selection of providers and coordinated services to better control expenditures, service quality and the rights and obligations of health professionals and patients" [9]. They are a kind of an inter-organizational network. The network members are the nodes of the network. They agree according to certain principles applicable regulations interact. The potential relations of the network members are the edges. The incentives to participate in the network form the "glue" of the network.

To support the modeling process with different, individual methods, meta-CASE tools have been widely established. Those tools enable the user to define and modify methods that will be used within the modeling project. Afterwards, the methods can be used for modeling instantly [10] or for creating new modeling tools based on the defined method [11].

2.2 Enterprise Architecture

An „Enterprise architecture (EA) is about understanding all of the different elements that go to make up the enterprise and how those elements interrelate “elements enclose all aspects of enterprises. Examples of elements are strategies, goals, information objects etc. EA focus on a holistic view on the whole organization [12]. They include the automated and not automated parts of the information system [13] and serve for an integrated, enterprise wide management [14]. EA management aims to enhance the complex relations and elements of the EA in a way that the strategic and technical requirements of the enterprise are fulfilled. Models are the most common form to describe organizational elements and their relationships. The models within the EA form an interrelated business model.

The management of EA focuses on the successful implementation of the enterprises objectives. The supporting information systems are called EA management systems [15]. To support the development and the management of the elements of enterprises, enterprise architecture frameworks are developed. EA frameworks are guidance for architects to assists the development of organization-specific EA.

They describe principle dimension of enterprises on an abstraction level [16]. There are a number of architectures and architectural frameworks today. The most common frameworks are the Zachmann framework and its extensions, the TOGAF, GERAM, TEAF, ArchiMate, FEAF [12], [17].

Recent surveys provide evidence of the acceptance of EA and the growing importance over the last year. They are used in different ways, such as for business – IT alignment, for managing business change, for transformation of the road map, and for infrastructure projects etc [12].

Dresden Enterprise Architecture Framework (DAF). The DAF (Fig. 1) was created with the aim to restructure the existing (architectural-) models to make them consistent and integrated for the purpose of reuse in a central repository. It is designed as an order system for managing enterprise elements. The DAF was created with the goals to:

1. Ensure the completeness, consistency and comparability of the models,
2. Simplify the search of existing model and their parts,
3. Support a transparent communication about elements of the enterprise.

The DAF was built on the evaluation of different architecture frameworks like the Zachmann Framework, TOGAF, ArchiMate [16]. It consolidates and extends the view information system design of ArchiMate and the views of the enterprise of the Zachmann Framework [18], [19].

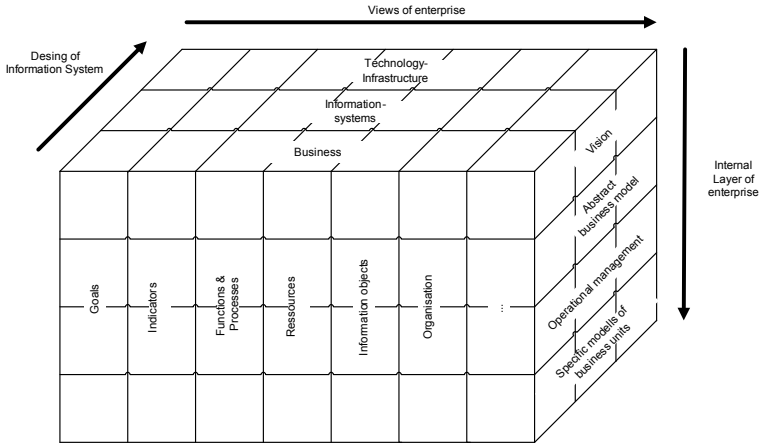

Fig. 1: Dresdner Architecture Framework

The internal view of the enterprise was introduced as the third dimension in the framework (Fig. 1). The DAF does not define a specific modeling languages or techniques of model usage. The layers are not required to compel. They can be expanded or modified in accordance with the requirement and the project-specific.

3 Implementation of the CCS Management System

3.1 Projectbackground of Carus Consilium Saxony

We implement the model based EA management system prototypically for the CCS. The CCS is a health care network in Germany. It was founded with the aim to establish a model region for innovative care and management concepts. Especially for the rest of Germany this region can be a reference to master upcoming challenges in health care sector.

The main challenges are to assure the care in the region facing the demographical changes and limit finances for care. The philosophy of the network is to include all existing groups, networks and physicians in the region, who wants to be member. Thus, we have a very heterogeneous network. There are 34 hospitals, 25 medical practices and more than 400 participating partners.

The network of CCS is organized in three layers as shown in Fig. 2. The first layer is the network layer including competence centers for information and communication (ICC), for evaluation and for education. On the next layer the medical cores such as corona disease, diabetes, oncology and dement are collected. Under this layer the specific network-function and activities are grouped.

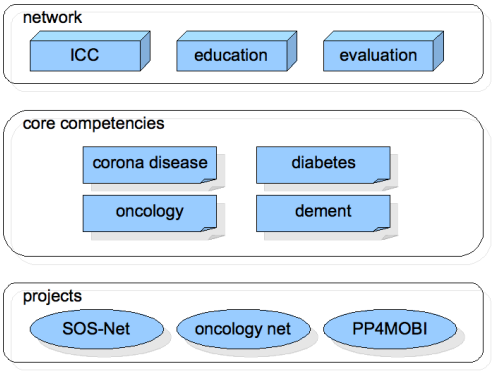

Fig. 2: CCS network layers

3.2 Prototypical Implementation

According to the requirements, we implemented a prototypical management system for the health care network CCS. We use the meta-CASE tool cubetto® toolset for implementation [11]. Based on a meta-modeling language E3, it is possible to develop specific methods in the toolset (Fig. 3). Meta-Models created in E3 can be transformed to a specific modeling language. The syntax of E3 is similar to the class diagram of UML and can be interpreted by the toolset [10].

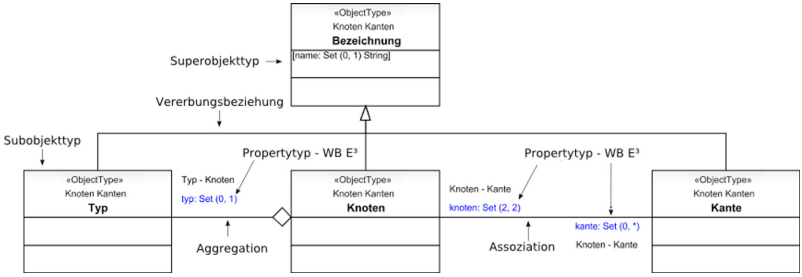

Fig. 3: E3 meta-language

So we are completely independent to specific modeling languages and aspects. Rather, it is possible to develop method according to the requirements. Also the used modeling language can be selected on the basis of the requirements. Once the toolset and the E3 have described, we will now introduce method, which we have created according to the DAF. To make an adequate selection of the modeling language,

were initially identified the key-user-groups and formed a work group. This consists of members of management, quality management, methods specialists, project management and individual project managers. The goal of this group was to develop a comprehensive prototype that can be constantly improved due to the generic meta-model. We combine several modeling techniques in the prototypical EA management system and integrate them.

For the modeling of goals and their relationship, we have implemented the Balanced Scorecard and target maps [20]. With indicators, the objectives are operationalized. For description of indicators, we use indicators maps. The indicators can still be assigned to the target. So, the goals and indicators are integrated. To describe processes we implement process maps. Process can also be modeled from the external point of view as well as the internal point of view. Process are linked to the other layers of the DAF in the external view. With process turtle it is possible to describe used resources, responsibilities, input, and output as well as linked goals. For the process detail we implement the flowchart, because of its high acceptance in our work group. Additionally, we implement a milestone-based project plan to describe network project. For organizational view we use the organization diagram [21]. The resource layer is implemented in an application map. The document model is used to structure documents with a special focus on their relation to each other. Needed documents are stored separately in the file system and are linked by the information object.

Fig. 4 depicts an example for navigation in EA management system. The complete system based on the DAF. The entry is a diagram of the framework (upper left hand). In this example, we take the structural organization as entry and open the organization chart. By clicking an organizational element and choosing process view, we get the process map of this unit. There, we choose the internal view of the process and get the flowchart. Due to the complete integration of all models, there is no unique way of navigation. Principle, you can switch to every representation, which have an integrated part to another model. For example, it is possible to start with resources and navigate to the processes where the resource is required.

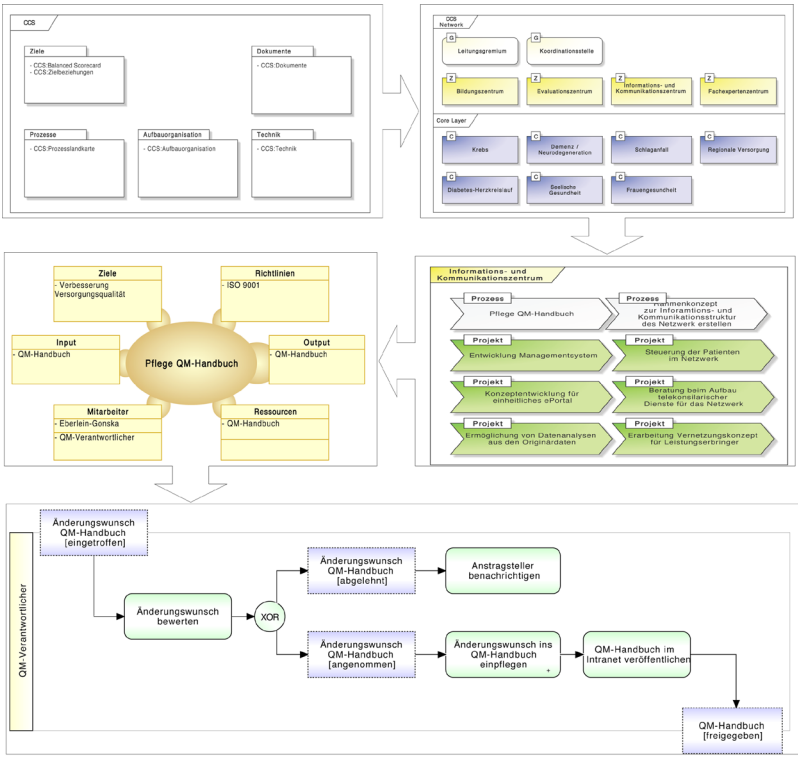

Fig. 4: Navigation in the Management System

4 Conclusion and Future Research

With the prototypical implementation of the presented approach of this paper, a system using information models for storing and distributing EA management data has been implemented. Together with the version management of the meta-CASE tool cubetto® toolset and its ability to share the models and integrate date from other systems, we were able to realize a model based management in the CCS regarding the specific problems of inter-organizational networks. With the proof of concept within the CCS, we showed to achieve the requirements for an EA management system. Additionally, we worked requirements for an EA management system for network organization out. In doing so, we showed solutions for the requirements. The paper shows also how a meta-case tool can be used to design a flexible and customizable EA management system. Main contributions of the research are:

Con. 1: Model-based approach improve acceptance of EA management system.
Con. 2: Model-based EA management system improves transparency of network interrelation.
Con. 3: Meta case tools provide a good foundation for developing an EA management system.

The models, however, can be used not only for EA management but also for other uses cases like web-service development or controlling other software like identity management systems [22]. Our future work will focus the further development of the modeling language used within the approach. As different use cases may need different information, there is need to adopt the modeling language permanently. To avoid quality problems due to uncontrolled modifications of the modeling language, a change process has to be installed. Thus, we need to integrate our approach into other management methods.

Secondly future work relies on a comprehensive evaluation of the prototype in a case study conducted at the university clinic of the University of Technology in Dresden. Getting the decentralize parts of the clinic involved the acceptance of the method will become apparent.

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