

Enterprise Modeling and its Applications in Company Management Systems

Ladislav Madarász¹, Maroš Timko², Michal Raček³

¹ Department of Cybernetics and Artificial Intelligence, FEI TU Košice, Letná 9/B, email:ladislav.madarasz@tuke.sk

² Siemens PSE, s.r.o., Bratislava, Lomená 1, Košice, email:timko@pobox.sk

³ Department of Cybernetics and Artificial Intelligence, FEI TU Košice, Letná 9/B, email:michal.racek@tuke.sk

Abstract: From the experience of last years it seems that enterprise modeling is a necessary step to perform successful changes of the enterprise business operations from a functional to a process-oriented approach. The recency and accuracy of the model is essential in the meaning of usability of the enterprise model. A term “living” or “dynamic” enterprise model was introduced in recent time to address these requirements of the model.

Keywords: enterprise engineering, enterprise modeling, reference architecture, modeling concepts ARIS and CIMOSA)

1 Introduction

Modern modeling technologies are able to utilize enterprise models in more general ways than to use them as descriptive models only. Such a models can form very important part in the process of definition and controlling of the enterprise processes.

Enterprise models can be utilized in a lot of manners but at least they serves as a common repository of enterprise knowledge, which is semantically organized internally. This knowledge can then be used to reach the certain goal with the help of suitable tools. Models describe processes and their interactions within the organization as well as the interactions with information system and are able to provide qualitative and quantitative results of the overall lifecycle process.

Meanwhile, the models were mainly used in their descriptive form only. As long as the important decisions were made and the models helped to reach a defined goal, most of the models were archived and only a few of them were revised again. The reason does not seem to be the uselessness of the model. On the other

hand new models are created because the old ones are not maintained on sufficient level of quality.

The one could expect efficiency of maintaining of the existing model instead of creating the new model from the scratch all around again. Probably there exist some constraints, which then results in complexity of maintainability of the model in contrast to create the new one. Or situations resulting in creating of enterprise models are strictly coupled to the ad-hoc solutions so there is no real intention to maintain the actual enterprise model.

2 Reference architectures

In the process of enterprise modeling and enterprise integration as well as in whatever development process it is meaningful to consider, that a lot of reengineering projects are similar and common to every kind of business. Thus elementary parts of the models and techniques for certain kind of business should be gathered, standardized and reused instead of to be developed from scratch all over again. This is the purpose of reference architectures.

Among standardized, generally accepted concepts supported by resulting models, methodologies and by compatible products belong **CIMOSA** (Open System Architecture for Computer Integrated Manufacturing – abbreviation from the opposite order of the words), **ARIS** (Architecture for integrated Information Systems), **GRAI** (Grophes á Résultats et Activites Interrelies), **GIM** (GRAI Integrated Methodology), **PERA** (Pardue Reference Architecture), **GERAM** (Generalized Enterprise Reference Architecture and Methodology) and some others [6,7].

2.1 CIMOSA modeling framework and its relevancy to the system lifecycle

The CIMOSA modeling framework is usually depicted as a cube (Figure 2.) [6,7].

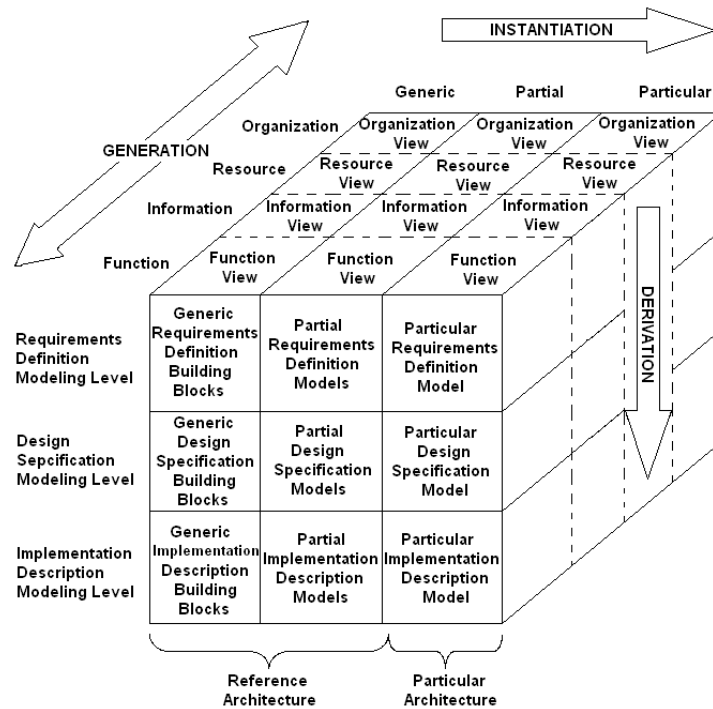


Figure 1: CIMOSA – modeling framework

It consists of CIMOSA **reference** and a **particular architecture**. Particular architecture is a set of models representing the enterprise environment. Reference architecture supports process of creation of the particular architecture. It is decomposed into two parts: **generic** (generic building blocks) and a **partial** (library of re-usable partial models for some type of industry). Each level defines four different **views** (**function**, **information**, **resource** and **organization**) on particular enterprise model.

Reference architecture supports three modeling levels of the complete life cycle of enterprise operations (**requirements definition**, **design specification** and **implementation description**). Relationships between system lifecycle of the enterprise controlling process and the modeling process are depicted on Figure 2.

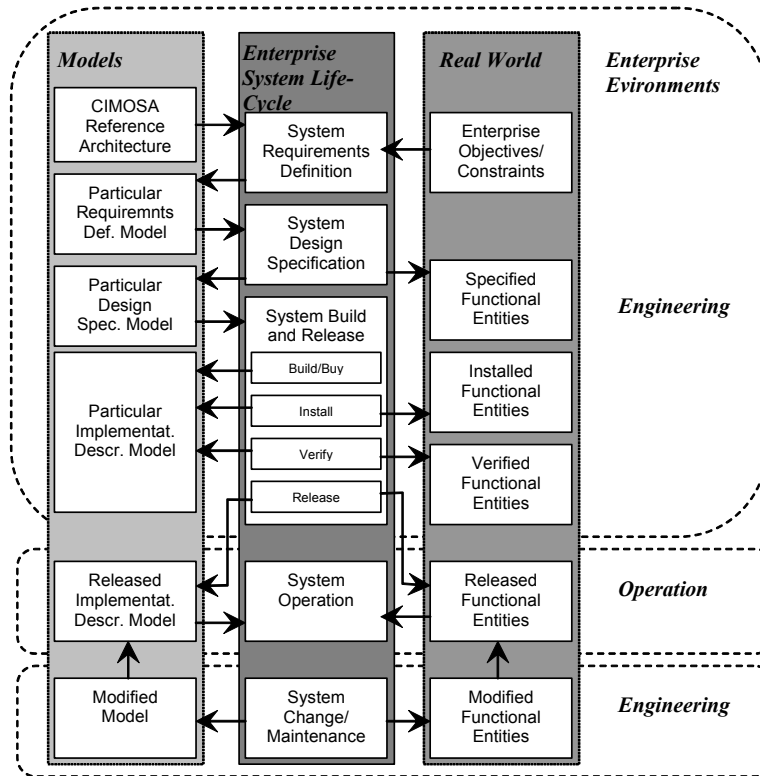


Figure 2: CIMOSA – modeling and system lifecycle

2.2 ARIS reference architecture

Aris means Architecture for integrated information systems. Its overall structure is very similar to CIMOSA but instead of concerning into integrated informational production system it mainly deal with more traditional business oriented tasks of production systems (like ordering process, planning and engineering of production, resource management, quality assurance, ...). Main concern is devoted to the software engineering and organizational aspects of the enterprise integrated system design.

It is structured into four **views** and three **modeling levels**. The modeling levels are the same as of CIMOSA, the four views are (Figure 3):

- The **function view**, which is used to define the function model as a hierarchy of functions.
- The **data view** is used to define semantic data models (in terms of entity-relationship diagrams).

- The **organization view**, which is used to define the enterprise structure summarized by an organization chart, the network topology and the physical network implementation.
- The **services/products view**, which includes all material and nonmaterial input and output services including cash flow.
- The **process/control view**, which federates the architecture and is related to the four other views.

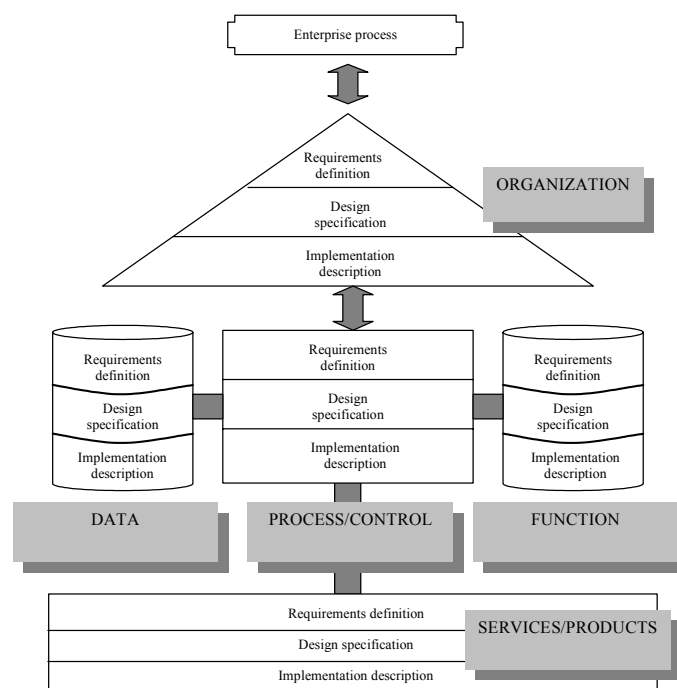


Figure 3.: ARIS reference architecture

3 Current approaches in enterprise modeling

Models must formulate answers to questions relevant to various enterprise operations. Such results are then incorporated (feed backed) into the enterprise as well as into the models itself to be used in next iteration. Models must be accurate enough to be used in this manner. They must be able to qualify overall enterprise state and they must have a deduction ability (therefore simulation) to formulate following business decisions. Thus if enterprise models are aimed to fulfill these goals, following aspects needs to be satisfied:

- Enterprise models must be executable or simply convertible into execution form, thus must be more than just static documents. In other words they must be able to execute simulations of management scenarios and be able to react on enterprise changes.
- They must be able to present information from the optimal perspective of view for decision-making process, which is strictly relevant to the actual context that is treated by enterprise models.

Enterprise models can be presented in many formats. Usually there are prepared high-level and large-scale diagrams and charts for the management. Details of the model are incorporated in binder documents used for referential use. When automated support tools are used, such a tools internally maintain the details of the model and reports can be generated on demand.

Generally, semantic description characterizing functionality of the enterprise cannot be considered as an enterprise model. On the other hand such a description can be used as a basis to create actual enterprise model – for example a model where structural language and structural diagrams distinguish and visualize the particular elements and components of the model.

Following list shortly summarizes the purposes, which lead to create an enterprise model [5]:

- Business process reengineering in the meaning of efficiency.
- Changes of organizational structure to better suit to relevant business activities.
- Design or redesign of enterprise information applications.
- Help to management to gain complete view of the business organization.

In most of the cases enterprise models belong into the modeling category known as descriptive models. Enterprise models are usually intended to explain to the user the enterprise operations. This should incorporate general, high level view of an enterprise as well as the details for specific areas.

Within the category of descriptive models, an important subcategory is prescriptive models. These do not describe the actual state of the area but they try to present the wished state. After completing an analysis of a descriptive model, it is good practice to construct a prescriptive model to illustrate desired changes in the enterprise. This model can be very helpful tool for identification of the changes needed to be applied in enterprise and to design results of these changes.

In connection with the above it is meaningful the use of methods, elements and techniques of artificial intelligence. As there exist two models describing the enterprise – current and future – it is advisable to use such elements to search for

optimal interventions to reach the specified goal in accordance to best criteria values (such a cost, time, ...).

4 New trends in enterprise integration

In the paper [4] there are presented main reasons that lead to a state that enterprise models were not maintained in actual (living) state. The matter of fact that in the process of changes planning with the help of enterprise models the recency of the model is essential question, it force us to investigate our research into the task of the actualization automation of the enterprise model. With the help of actualization of the model we would like the enterprise model to be living, dynamic as opposite to the static model.

Alike important question for the enterprise functionality seems to have prepared recovery plan when disaster damage strikes. Currently when almost all of the enterprise operations are controlled by automated systems (which itself can be controlled by enterprise model) only a short outage of the important controlling part can cause considerable financial loss. If the enterprise would maintain actual model, which incorporates description of all the important components and their relationships it could be very helpful for the recovery process of the production.

When disaster strikes or if there is a need to plan certain changes, the living model will be able to identify all business processes supported by damaged or hit part. Such a model immediately classifies business process and finds relations between business process and the enterprise part.

Based on practical experiences from other application areas it can be assumed that in the process of setting the enterprise under control when some atypical situation occurs (disaster damage or other unexpected incidental situations) in the phase of preparation of strategic decisions, the methodic of situation classification, modeling and control can be used.

In next elegant and strong possibilities of the recovery process could be provided by application of elements, methods and techniques of artificial intelligence (neural networks, fuzzy-neural networks, genetic algorithms, evolutionary methods, etc.) in the actualization process of enterprise model.

Consideration to use living enterprise model must be taken into account as early as the enterprise reference architecture is being designed. As living enterprise model must have an access to deployed applications and their configurations, it must be able to gain information of actual network topology and hardware configurations. Every application and every server should implement defined interface, which provides the needed information and publishes changes.

To meet the goal it appears very useful to apply service-oriented architecture with using of messaging-oriented middleware, which incorporates deployed agents retrieving the needed data and providing them into the upper (controlling) layer [4].

Conclusions

Enterprise environment is so complex, disparate and detailed that enterprise models are needed to successfully prevent financial loss. Modeling of enterprise architectures comes to be an actual trend.

Living (dynamic) model is a model, which automatically identifies and sustains structure of enterprise information technologies environment, involved components, applications, business processes supported by the environment and – probably most important feature – relations between these elements. With using of living enterprise model the responsible can find immediate answers to important questions, generate reports and documents based on actual information, which can then be used to make important enterprise decisions to meet the business goals.

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