EXTENDED INFORMATION MODEL (EIM)

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Abstract: The Extended Information Model (EIM), presented in this paper is intended for data modelling in development of the Enterprise Architecture. It is the base of data, applications and infrastructure architectures. In EIM the process oriented data model PER is used as a main building element. The PER model appears as a development of principles of semantic data modelling of E/R model of Chen and ET/P model of Codd. The proposed model uses the main principles of SID model, further developed up to using typical data structures in creating aggregated business entities and their integration with respective business processes.

Key words: Information Modelling, Data model, SID model, PER model

РАЗШИРЕН ИНФОРМАЦИОНЕН МОДЕЛ

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Резюме: В доклада е представена гледната точка на авторите за информационното моделиране, компонентите от които се състои и структурата на която се базира. Обсъжда се разширен информационен модел, базиран на модел за структуриране на данни ПЕР и модел за моделиране на данните на телекомуникационна кампания СИД. Дискутира се въпросът за използване на типови градивни блокове при моделиране на данни.

Ключови думи: information modeling, data model. SID model, PER model

Доклада е публикуван в :

INTRODUCTION

Information modeling is a major part of data modeling[4] and provide formalized representation of the object (entities) and concepts, their properties, relationships, as well as operations that can performed upon them [6,8].
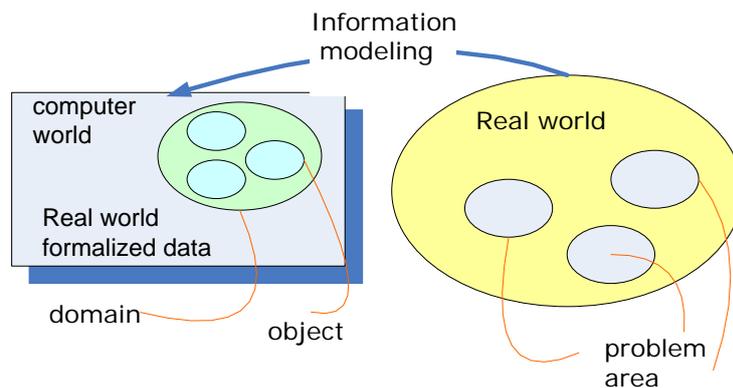

Figure 1. Information modeling

Its main task is transferring the thing from the real world into the computer world, i.e. developing of the formal description of a problem area, independent from specific software realization of the model [15].

As a rule, the subject of the information modeling is a domain that can be fully described with limited set of entities, properties, relationships and operations [11].

The purpose of this paper is to presents the structure and the components of information modeling.

The conclusions and proposed construction are based on two models: PER model and SID model.

PER model [13] – a tool for systematization and modeling of the real world data, as the objects are arranged in hierarchical structure according to specific rules.

SID [12] – Shared information model for representation of the data, generated from the business processes in the telecom operators.

CIM – Common Information model – define the approach for describing and using data, generated by the business processes of the telecom operator.

The model describes and classifies all concepts (entities) relevant to the telecom operator's activities. A Common Information Model is created on the base of CID model that considerably simplifies the management of the enterprise knowledge and improves the interactions between their subdivisions in the framework of implementation of the business processes. The process and architectural approaches were used.

MAJOR CONCEPTS OF INFORMATION MODELING

The main task of information modeling is the development of formalized description of a particular problem area (usually concerning one enterprise), independently from the characteristics of realization and software used.
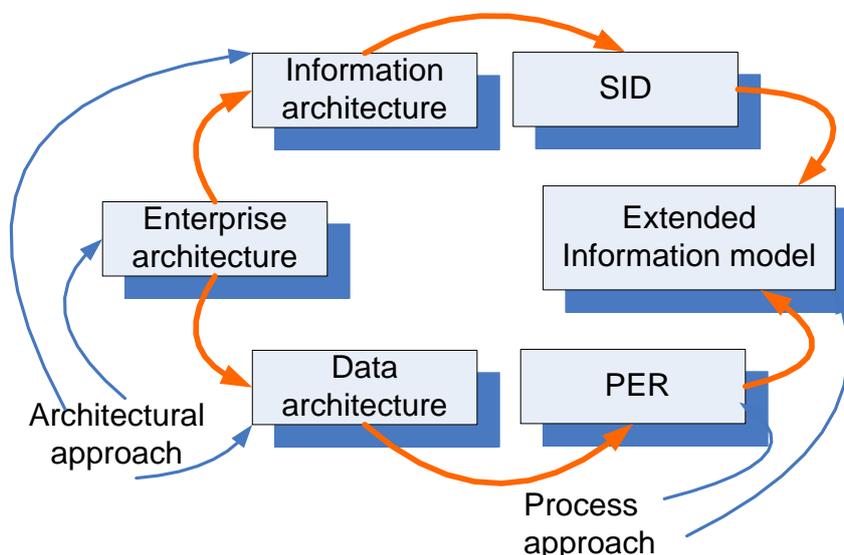
Figure 2. Major concepts of information modeling.

Architectural approach [14] – the idea of close interaction between business and information technologies become a base of the architectural

approach in which these two concepts are viewed as a whole – the enterprise architecture. On the basis of synchronizing the business and information technologies stands the data architecture, which on its part is based on data information models.

Information architecture [9] – process of organizing and representing of valuable information for users in intuitive understandable form, using appropriate tolls for cataloging and navigation.

Data architecture [7,9] – consists of models, policies, rules and standards that regulate which data could be collected how it should be saved, arranged, integrated and used in information systems in the organizations. Process approach [2] – all activities in the organization are a chain of interconnected business processes – from marketing and planning to the sales and services. It is natural to try to find a relation between connected processes and data provided in developing information systems.

Information model – affect processes of originating, transmitting, transforming and using information in different systems.

Instance – presentation of a real object with certain set of properties, essential for deciding a given information problem.

Object (called brick) – a number of instances with the same properties and obeyed the same rules. All objects must unique name and should be identified by key.

Subject of the information modeling – domain that can be fully described by certain set of entities, properties, relationship and operations.

CLASSIFICATION OF THE OBJECTS – BRIEF DESCRIPTION OF THE PER MODEL

A large part of objects used in information modeling could be assigned to the following categories.

Table 1

Symbol	Meaning	Description
AO	Associative object	Logical connection between two or more objects. Used in relations of type "many to many". Presented by expression – sale of products, students exam, borrowing of a book etc.
PO	Process object	Include data of the process, subject to modeling. Presented by a verb – sell, buy, order.
BO	Basic object	Include basic data of the objects that take part in the process – direct or indirect. Presented by a noon – clients, products, books, authors.
SO	Subordinate object	Include detailed data for the basic object. Presented by the name of the basic object and explanatory suffix – clientFD, clientCOM, clientID.
OL	Object fixed list	Include relatively unchangeable data for an attribute of the basic object. Presented by a noon – city, profession, education, department.
⬭	Attribute	Property of the object of the real world.

		Every attribute has a value that identify a particular object – number, name, price,date.
⟶•	1:N	Type relationships between objects.
⎯⎯	1: 1	

This example shows how the classified objects could be used in description of particular problem domain "University" (figure 3).
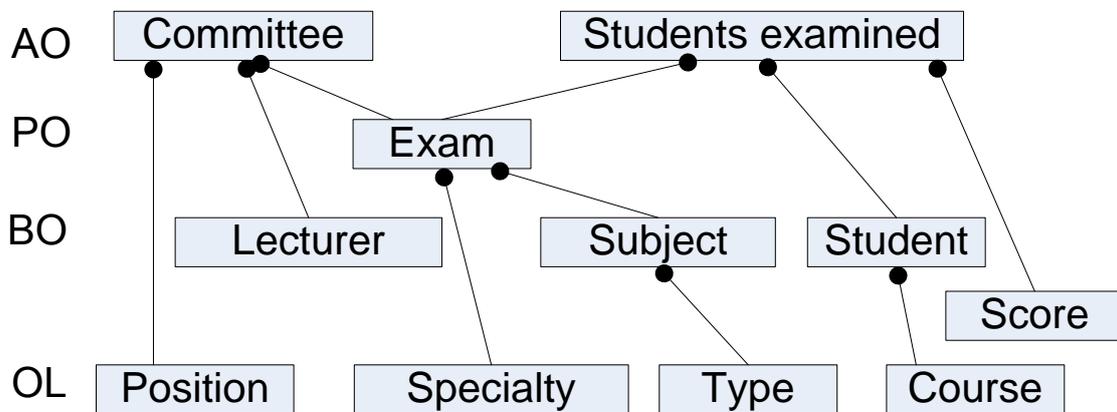

Figure 3. Domain "University"

COMMON INFORMATION MODEL

An independent from practical realization model that serves for presenting important for the business concepts and entities, their properties and relationships [15]. The information model enables describing interactions and giving a visual presentation of the entities and relationships between them. Advantages of using Common information model:

- Create unified format for collecting and exchanging the data both in an organization and between different organizations.
- Simplify integration of the different modules of the management system of the organizations.

- Create a possibility for unified data base for all business processes.
- Realization of transparent and reliable device for management.
- Diminishing of expenses for managing many dispersed and poorly - integrated information systems.
- Creasing the rate of usage of the IT infrastructure.
- Optimizing the many factors about operational and strategic activities of the organization (for example promotion of the new product).

An example of Shared Information Model– SID. The SID is a part of the NGOSS [3,10] project, realized in TMF. The SID model is part of the knowledge base NGOSS and consists of definition and description of the elements and data structures used in business processes of the telecommunication companies. On the base of SID, a unified information model is built, that considerable simplify the management of the enterprise knowledge and improves interactions between divisions.

EXTENDED INFORMATION MODEL

The Extended Information Model (EIM) appears as a development of the SID model toward using it in other fields except for telecommunications, by adding some building elements that make it more usable (See figure 4).
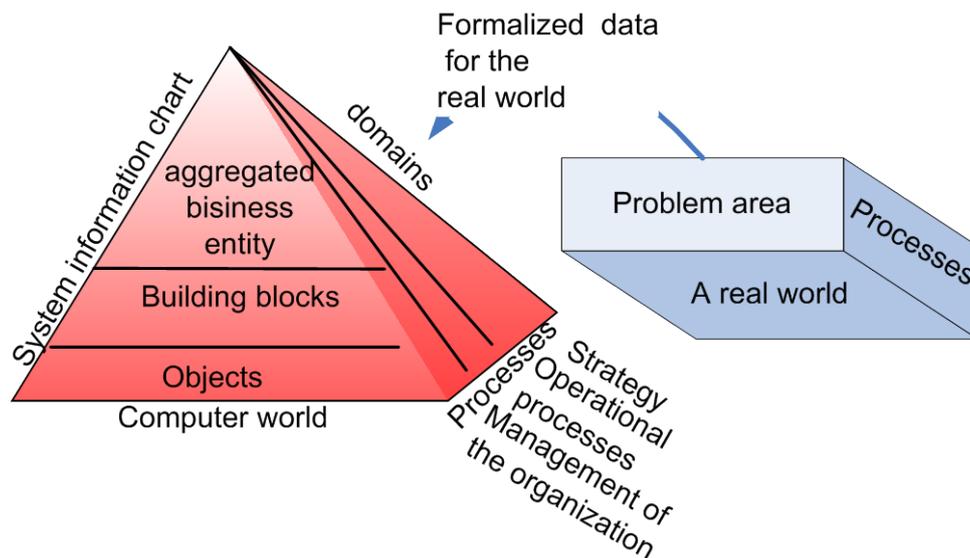
Figure 4. Extended Information Model.

Domains - for every organization there are three typical directions in activities, which are described with corresponding business processes.

Strategy - includes all spectrum of problems related to strategy of the organization, the development of infrastructure and management of the life cycle of the products (services).

Operations - they are the most important processes in organizations on which depends delivery of products and services.

The Enterprise Management - embraces general problems about human resource management, finance and assets, knowledge management etc.

These three directions are the main domains that should be modelled with development of applications and information infrastructure of the organization. They are well developed in NGOSS concept [2, 13, 15] of TMF [5], especially in the process model eTOM.

In the levels 1, 2 and 3 of the eTOM model, detailed description of the above domains are made, down to sub processes (for example Diagnostic of the problems or Control of the indexes of effectiveness of the recourses).

In case of need for further details, decomposition should continue in accordance with company characteristics. In development of Extended

Information Model (EIM) model it is appropriate the three TMF domains to be used as follows:

- Strategy and infrastructure – partially.
- Operational processes – a separate application.
- Management of the organization – in full.

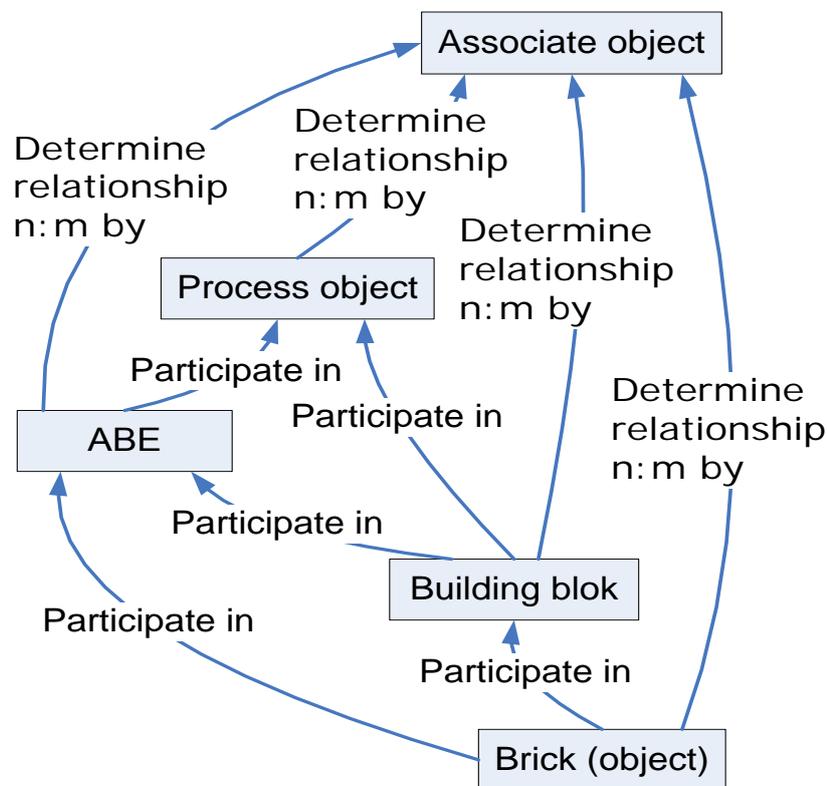*System Information Chart*. It is used for data structuring in the EIM model, shown in figure 5.

Figure 5. Data structuring in the EIM model

Process object. Principles of relationships between business processes and ABE:

- If it is possible, every ABE is linked with one of the processes at level 2 of eTOM. Such process is referred to as initial.
- The initial process can create, update or remove ABE. Example: Student's exam.

- The processes that only used ABE, but aren't basic are referred to as secondary. Example: Valuation of utilization of resources.

Aggregated bisiness entity abe. Closely connected objects put together in one group. The group consists of objects that participate in respective process. For example of "ABE- domain University " figure 6.
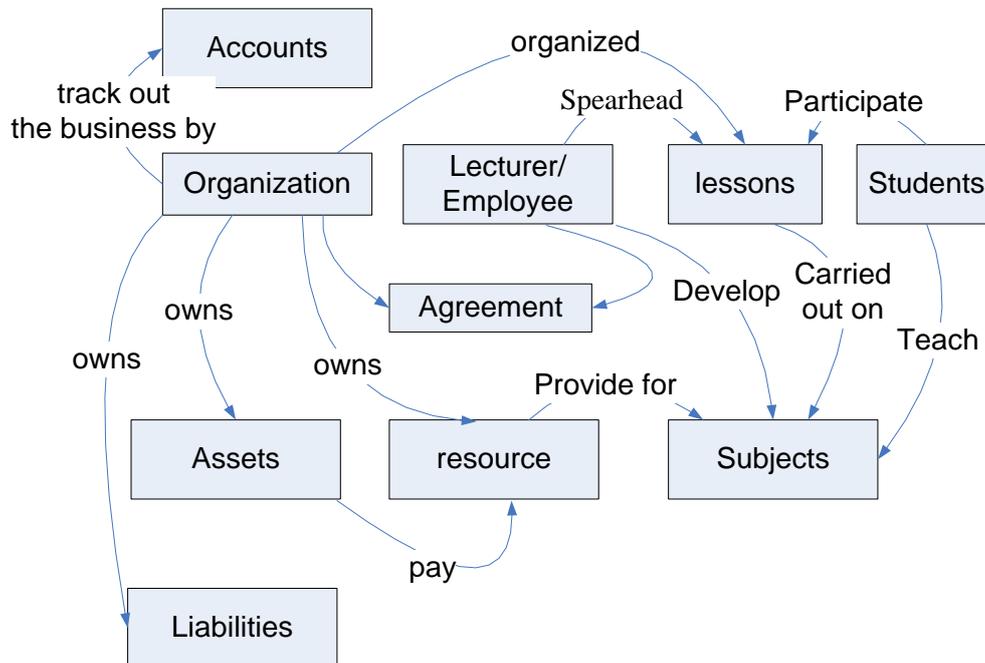

Figure 6. ABE - Domain University.

It is recommended the following building blocks to be included in ABE :
- Basic object.
- Strategy and planning.
- Specification of the basic object.
- Communication with the basic object.
- Configuration describing the inner structure of the basic object.
- Indexes for effectiveness of the basic object.
- Tools for testing of the basic object.
- Possible problems.
- A space of time for use.

Examples of usage of the objects above.

Category ABE	Lecturer	Student	Subject
Entity	Lecturer	Student	Subject
Strategy and plan	Tasks and criteria		Tasks and criteria
Status	Scientific degree	Educational,family etc.	Exam
Communication	Communication with the lecturer	Communication with the student	Communication with other subjects
Configuration	Personal data	Personal data	Data for the subject
Indicators for effectiveness	Indicators for effectiveness	Indicators for effectiveness	Indicators for effectiveness
Tools for testing	Attestation	Exams	Discussion
Problems	Lecturer's problems	Student's problems	Subject's problems
History/Biography	Lecturer's biography	Student's biography	History of the subject

An Example of PER model of ABE "Student" is given on figure 7.
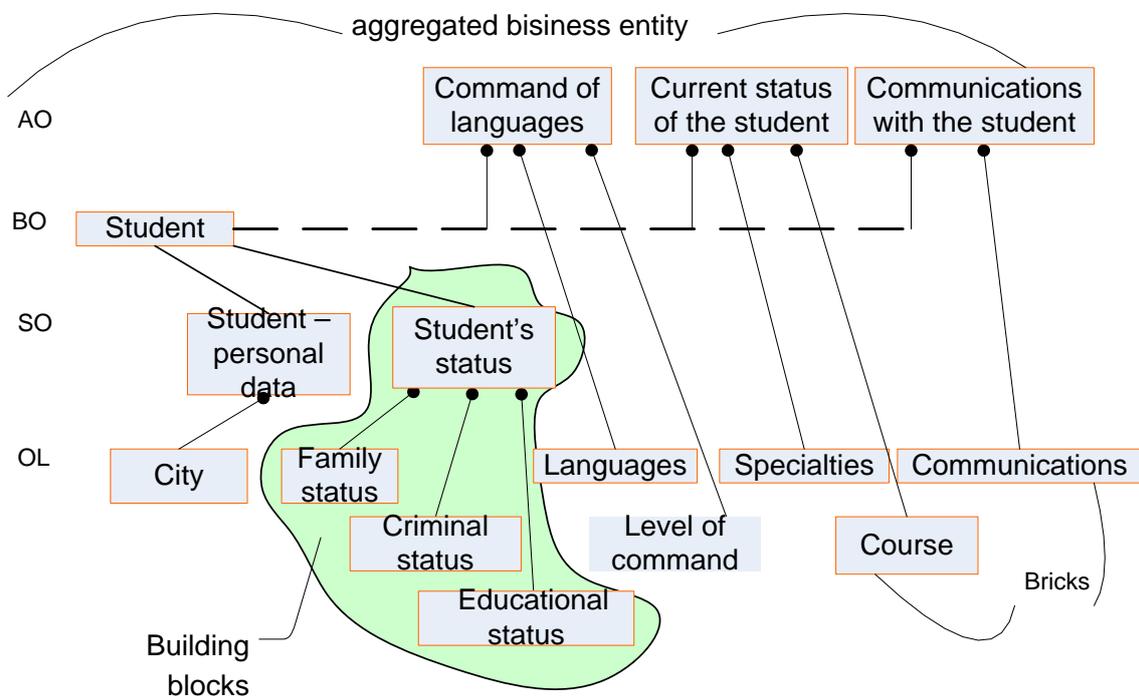

Figure 7. ABE "Student".

BUILDING BLOCKS. Bricks - they described particular architectural solutions that are typical and could be used repeatedly in different

applications. They represent functionally isolated object or group of objects that realized a particular function in respective domain.

- Description of the building block.

- Accomplish textual description of the entity.

- Enumerate the ABE, in which the building block participates.

- Enumerate the entities that participate in the building block.

- Describe rules of use and development.

Example is shown in the next table 2.

table 2

Name	Communication with the person
Description	Detailed description of building block.
ABE	Student, Lecturer, Employee.
related entities	Person, Communication, Communication with the person.
Rules	

Entities/Objects/Bricks. Instances with the same properties and submitted to the same rules. Every object in the information model must have unique ID and name.

Entities. Description of attributes of the entity (Product specification) is a table that include:

- Description of the attribute.

- Type of data.

- Allowed values.

- Indication required/optional.

- Specifics of use and notes .

CONCLUSION

The EIM, presented in this paper is intended for data modelling in development of the Enterprise Architecture. It stays on the base of data architecture, applications architecture and architecture of the infrastructure.

In EIM the process oriented data model PER is used as a main building element. The PER model appears as a development of principles of semantic data modelling of E/R model of Chen and ET/P model of Codd. The proposed model uses the main principles of SID model, further developed up to using typical data structures in creating aggregated business entities and their integration with respective business processes.

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