



Application of Model Driven Framework For Knowledge Management

* ¹Ruchi Dave, ²Manuj Darbari

* ¹Gyan Vihar School of Engineering & Technology, Gyan Vihar University, Jaipur

²Assistant Professor, Department of Information Technology, BBDNITM, A-649, Indira Nagar, Lucknow.,

ABSTRACT

Enterprise Modeling is defined as the art of externalizing enterprise knowledge, which adds value to the business or needs to be shared. This kind of modeling has been used successfully since its apparition in the 80's in many domains and with different purposes, among them the re-engineering of business processes or the implementation of computer systems. Its constant evolution has given as a result a context in which there are numerous languages, methodologies and tools for Enterprise Modelling available and useful for their purpose, even for modeling virtual enterprises.

KEY WORDS: Enterprise Modeling, Enterprise Modeling Languages, Small and Medium Virtual Enterprises (SMEs)

I. INTRODUCTION AND OBJECTIVE

Enterprise Modelling is defined as the art of externalising enterprise knowledge, which adds value to the business or needs to be shared. This kind of modelling has been used successfully since its apparition in the 80's in many domains and with different purposes, among them the re-engineering of business processes or the implementation of computer systems. Its constant evolution has given as a result a context in which there are numerous languages, methodologies and tools for Enterprise Modelling available and useful for their purpose, even for modelling virtual enterprises.

These languages and methodologies allow model the most of the enterprise dimensions (process, product, organisation, decision, etc.), and they cover different development phases (initialisation and definition of objectives, definition of requirements, design, etc.). Besides, they provide models that can be integrated, obtaining different views of enterprises from several points of view and strategic levels. Therefore, it can be stated that nowadays Enterprise Modelling allows enterprises to obtain a complete vision of its business with different purposes.

However, there exist still some problems without solution in the context of Enterprise Modelling. The great quantity of existing Enterprise Modelling Languages and Tools causes lack of interoperability among them, therefore it is difficult to exchange enterprise models carried out with different languages or tools. Moreover, the problem to obtain enterprise applications from these models, as well as the management of them, it makes difficult the use of enterprise models as an useful tool in knowledge management and continuous improvement of enterprises. Some international initiatives try to solve the problem of interoperability at horizontal level, such as UEML, INTEROP or ATHENA, defining formats that allow the exchange of enterprise models carried out with different languages or tools. On the other hand, in the context of MDE (Model Driven Engineering), approaches such as the MDA (Model Driven Architecture) defined by the OMG

try to define a suitable framework for generating software from enterprise models. However, the key question is how Enterprise Modelling can become the really force for managing enterprise knowledge. To achieve this objective, Enterprise Modelling should cover enterprise knowledge as a dimension in itself, and also making possible that the other modelled enterprise dimensions can provide the required knowledge that enterprises need in each moment. Thus, Enterprise Knowledge Modelling should become in an efficient way to represent knowledge that the enterprises have with the objective to process and use it there and when it was needed.

II. Dissertation Category: Software Engineering and Management.

III. Tools/ Hardware & Software: Rational Suite 11 V

IV. Problem Definition

Enterprise Modelling Languages provide constructs to describe and model the people roles, operational processes and functional contents, as well as support information and production and management technologies. There exists great quantity of Enterprise Modelling Languages and they are overlapped. But the integration of the models generated with these languages is complicated, since tools do not exist to integrate models generated with different languages. In this sense, the objective is to achieve a common format, as UEML or POP*, which are valid initiatives in order to enable exchange between different models and the establishment of an environment for reusing existing models.

This kind of languages are defined in proprietary formats and they are only implemented by proprietary and expensive tools. Therefore, interoperability problem is intensified in Small and Medium Enterprises (SME), who have limited resources to adapt successfully innovative technologies existing in the market. On the other hand, SMEs set up Virtual Enterprises in order to establish flexible collaborations with other partners and to take

advantage of new market opportunities. Virtual Enterprise [3] can be define as a temporary network of independent companies, often former competitors, who come together quickly to exploit fast-changing opportunities. The business partners are integrated using information and communication technology. So, interoperability problem at different levels, including enterprise modelling level, can become decisive aspects to reach business success.

Therefore, the main problem at enterprise modelling level for Small and Medium Virtual Enterprises (SMEs) is focused on the lack of interoperability of existing Enterprise Modelling Languages, and also on the few quantity of enterprise models generated in this kind of enterprises. However, such enterprises use UML to model and generate software artifacts. The idea of this proposal is to provide a methodological approach that can help SMVEs to use successfully UML, not only to generate software models, but also to produce enterprise models that enable them to have a holistic enterprise view and better interoperate with other partners.

V. Scope of the Solution:

The specific objectives of the research work are the following:

- To perform the state of the art in UML and UML Profiles focused on Enterprise Modelling, and in Virtual Enterprises especially in SME; taking into account the MDA framework defined by OMG and European Projects related to interoperability.
- To obtain a set of requirements for modelling whole enterprise dimensions of SMEs, in order to define a framework for describing problematic situation.
- To define a methodological approach for enterprise modelling of SMEs based on UML, which should include the UML Profiles defined in order to extend UML for enterprise modelling, and the guidelines to use this profiles in order to generate interoperable enterprise models.

VI. Analysis

The research aims to improve the interoperability of SMEs that promote Virtual Enterprises towards enterprise knowledge modelling. The results obtained will allow enterprise knowledge to be modelled in this kind of enterprises. According

to enterprise knowledge can be seen as information made actionable in a way that adds value to the enterprise. Taking into account this definition, enterprise knowledge is defined in this work as the network of connections among data and information that enables people involved in the enterprise to act and to make decisions that add value to the enterprise. Moreover, the meta-model obtained will be integrated into the Reference Architecture ARDIN for the integration of Virtual Enterprises defined by the IRIS Group, with the goal of extending its second dimension to enterprise knowledge modelling.

Therefore, the main research goal is to provide mechanisms that can be used to reduce the interoperability problems related to Enterprise Modelling in a model-driven approach and focused on enterprise knowledge, in the context of Virtual Enterprises. In this regard, the objective is to investigate the possibilities of using UML for Enterprise Modelling in order to solve this kind of

interoperability problems. Furthermore, the mechanism provided by UML Profiles, redefined in UML 2, will be analysed in order to extend and adapt UML for the specific domain of enterprise knowledge modelling. The specific objectives of the research work are the following:

- To examine the state of the art in Enterprise Modelling focused on knowledge modelling and UML and UML Profiles focused on Enterprise Modelling, taking into account the MDA framework defined by OMG and European Projects related to interoperability.
- To obtain a set of requirements for modelling the dimensions (process, product, organisation, etc.) of the whole Virtual Enterprise, especially enterprise knowledge, in order to define a framework for describing the problematic situation.
- To define a meta-model based on UML and its extension mechanism, UML Profiles, that allows the knowledge map of a Virtual Enterprise to be represented.
- To define a methodology for enterprise knowledge modelling including the UML Profiles defined, and set out a series of the guidelines of using these profiles in order to generate interoperable enterprise models.
- To validate the methodological approach and UML extension defined in a real case study, by applying the methodology to a Textile Virtual Enterprise.

VII. Complete Structure:

Enterprise models are normally composed of submodels such as organizational models, process models, information models, and so forth. These models must cover at least the following requirements, which are also compliant with the framework:

- Enable three fundamental kinds of flows inside and among enterprises: material, information and decision or control.
- Enable four modelling views: functional, informational, resources and organisational.
- Enable three levels of modelling: definition of requirements, specification of design and implementation description.

On the one hand, these requirements have been established and accomplished by models developed with traditional Enterprise Modelling Languages. On the other hand, CIM models must describe the domain and requirements of the system in a model that is independent of computation representations and is expressed in the vocabulary of the domain practitioner.

Nevertheless, CIM characterisation is an ongoing work that is not yet formally defined or supported by OMG standards and tools. Using a CIM, an enterprise can capture, manage, and make better use some of its most valuable assets: knowledge of its resources, policies, rules, terminology and processes. Moreover, enterprises can specify, in an Enterprise Modelling Language, the requirements of their systems and check that the system design satisfies these requirements. CIM is made up two main subdivisions :

- Business Model: a view of the enterprise and its environment that focuses on the scope and goals of the business, and the terminology, resources, facts, roles, policies, rules, processes, organisations, locations and events of concern to the business.
 - Business Requirements for Systems: a view of the system and its environment that focuses on the purpose, scope, and policies for the system.
- Business Requirements can be divided into Functional Requirements, Interaction Requirements and Environment Contract.

VIII Overall Network Architecture:

The models and UML 2 diagrams proposed for Enterprise Modelling at the CIM level are the following:

- Global model: used to give a general view on the other models performed. Diagrams proposed: Use-Case Diagram, and Package Diagram.
- Organisational model: this must represent both the static structure of enterprise and the dynamic structure at strategic and tactic level. The static structure should depict

the departments and organisation established by enterprise. The dynamic structure should show the target model that the enterprise has (vision, mission, and so on), and the decisional structure and business rules existing within the context of the enterprise. Diagrams proposed:

Use-Case Diagram, Class Diagram, Activity Diagram, Package Diagram, and the use of OCL will also be needed to describe restrictions.

- Static model: used to describe the informational view of the enterprise. Information about products or services provided by enterprise should therefore be represented. Furthermore, this must show the activities carried out in the enterprise to transform inputs into outputs, as well as the resources and restrictions related to these activities. Diagrams proposed: Use-Case Diagram, Class Diagram, and Package Diagram.

- Dynamic model: it should depict business, support and decisional processes from dynamic point of view taking into account events and logical operators at high level. Diagrams proposed: Use-Case Diagram, Activity Diagram, and Package Diagram.

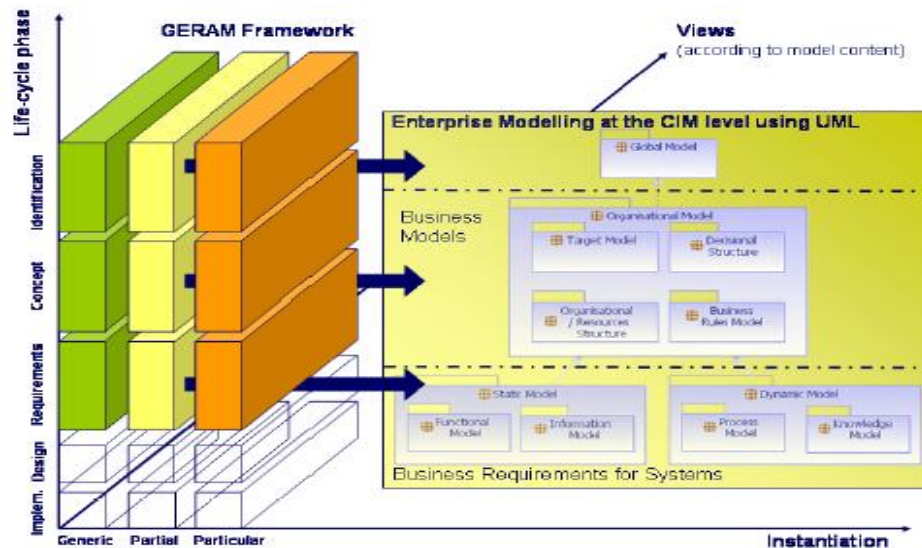


Figure : Network Architecture.

IX. Future Scope

In this paper we have analysed the previous works carried out within the context of Enterprise Modelling with UML. The benefits of model-driven approaches and the new specification of UML 2 provided by the OMG suggest the need to provide more practical examples for Enterprise Modelling with UML based on these recent works. A proposal for Enterprise Modelling at the CIM level using UML 2, based on previously described works and on traditional Enterprise Modelling Languages, will be supported by a Case Study.

We will also show how the interest of defining a UML Profile 2.0 for Enterprise Modelling is achieved by organisational structure point of view, which allows us to describe the 'Organisational Breakdown Structure' of an enterprise, has been presented. This profile is going to be improved by including other concepts which are essential for a complete enterprise model, such as business rules, business process, and so forth.

X. Bibliography:

Vernadat, F.B.: Enterprise Modeling and Integration: Principles and Applications. Chapman and Hall (1996).

Doumeings, G., Chen, D.: Interoperability development for enterprise applications and software. In Cunningham, P., Cunningham, M., Fatelnig, P., eds.: Building the Knowledge Economy: Issues, Applications, Case Studies. eBusiness, IOS Press Amsterdam (2003).

UEML: Unified Enterprise Modelling Language Project (IST-2001-34229). <http://www.ueml.org> (2004) Deliverable 1.1.

EXTERNAL: Extended Enterprise Methodology, Final version 1-12-D-2002-01-0 (IST-1999-10091). <http://research.dnv.com/external/default.htm> (2002).

IFIP-IFAC: Generalised Enterprise Reference Architecture and Methodology (GERAM). Technical Report Version 1.6.3(1999)<http://www.cit.gu.edu.au/bernus/taskforce/geram/versions>.

Chen, D., Doumeingts, G.: European initiatives to develop interoperability of enterprise applications—basic concepts, framework and roadmap. *Annual Reviews in Control* 27 (2003) 153–162

Grangel, R., Chalmeta, R., Campos, C., Coltell, O.: Enterprise Modelling, an overview focused on software generation. In Panetto, H., ed.: *Interoperability of Enterprise Software and Applications Workshops of the INTEROP-ESA International Conference EI2N, WSI, ISIDI and IEHENA 2005*, Hermes Science Publishing (2005)

Fox, M.S., Gruninger, M.: *Enterprise Modelling*. *AI Magazine* 19 (1998) 109–121

MODELWARE: Modeling solution for software systems Project (IST-2004-511731). <http://www.modelware-ist.org/> (2006)

INTEROP: Interoperability Research for Networked Enterprises Applications and Software NoE (IST-2003-508011). <http://www.interop-noe.org> (2006)

OMG: MDA Guide Version 1.0.1. Object Management Group. Document number: omg/2003-06-01 edn. (2003)

Doumeingts, G., Vallespir, B., Zanittin, M., Chen, D.: GIM-GRAI IntegratedMethodology, a Methodology for Designing CIM Systems, Version 1.0. LAP/GRAI, University Bordeaux 1, Bordeaux, France (1992)

Spur, G., Mertins, K., Jochem, R.: *Integrated Enterprise Modelling*. Beuth Verlag GmbH (1996)

IDEF: Integrated DEFINition Methods. <http://www.idef.com/> (2006)

OMG: OMG Unified Modeling Language Specification, version 1.5. Object Management Group. formal/03-03-01 edn. (2003)

Marshall, C.: *Enterprise Modeling with UML. Designing Successful Software Through Business Analysis*. Addison Wesley (2000)

Eriksson, H., Penker, M.: *Business Modeling with UML: Business Patterns at Work*. J. Wiley (2000)

Panetto, H.: UML Semantics Representation of Enterprise Modelling Constructs. In: ICEIMT. (2002) 381–387