

SPECIFICATION OF E-COMMERCE SYSTEMS USING THE UMM MODELLING METHODOLOGY

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Abstract: UN/CEFACT (United Nations / Centre for Trade Facilitation and Electronic Business) Modelling Methodology – in short UMM – has been developed by the TMWG (Technical Modelling Working Group) within UN/CEFACT, in order to support the development of e-business applications in a technology-neutral, implementation-independent manner. The purpose of this paper is to provide the results from an EU co-funded project, entitled “LAURA”, where UMM was used for the analysis and design of the e-commerce system to be developed. In particular, an analysis of the strengths and weaknesses of UMM will be carried out, as those were evidenced from a practical perspective in the “LAURA” project.

1 INTRODUCTION

One methodology for the specification of e-commerce systems that has appeared during the last couple of years is UN/CEFACT’s Modelling Methodology (UMM). The purpose of this paper is to examine the UMM methodology, and point out its strengths and weaknesses. The framework used for this analysis is the IST project “LAURA”, where the UMM methodology was used.

In the sections that follow, section 2 presents a high-level description of the UMM methodology. Section 3 presents a description of the LAURA project. Section 4 presents the strengths and weaknesses of the UMM methodology, and section 5 concludes with suggestions for further research.

2 DESCRIPTION OF UMM

According to the UMM specification (UN/CEFACT, 2001), the UMM business process and information modelling technique is based on the Unified Modelling Language (UML) from the Open Management Group. The UMM methodology is based on configuring the Unified Process methodology developed by the Rational Corporation to meet UN/CEFACT needs for modelling business processes in addition to objects. This requires extensions of the UML metamodel through business

domain specific stereotyping to support a complete business process and information definition, resulting objects and interface-specific object behaviour descriptions.

A set of specifications for e-commerce systems that utilise the UMM methodology is ebXML (Electronic Business XML). According to ebXML’s Technical Architecture Specification document (ebXML & OASIS, 2001), the UMM Meta Model is a mechanism that allows Trading Partners to capture the details for a specific business scenario using a consistent Modelling methodology.

The UMM methodology uses a series of worksheets to capture the details of the modelling effort. There are various levels of abstraction in each step of the modelling effort, and each step carries its own set of worksheets. In addition, each worksheet may include one or more Unified Modelling Language (UML) diagrams, to make clearer the purpose and scope of the relevant worksheet.

According to ebXML’s “Business Process Analysis Worksheets and Guidelines” document (ebXML & OASIS, 2001), the worksheets used in UMM are as follows:

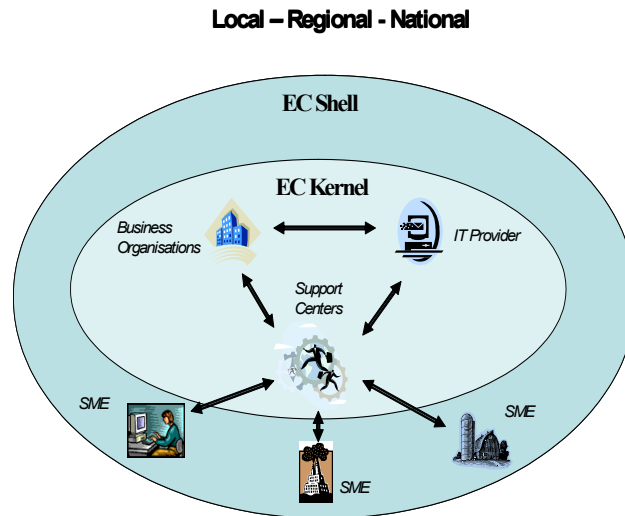


Figure 1: Regional entities in an e-commerce kernel and e-commerce shell

- Business Reference Model.
- Business Process Identification and Discovery
- Business Process Elaboration.
- Business Collaboration Definition.
- Business Transaction Definition.
- Business Information Definition.

As UMM's technical specification (UN/CEFACT, 2001) mentions, many projects have contributed to the specification of the UMM:

- Open-edi reference model (ISO/IEC 14662 1997).
- Unified Modelling Language (OMG, 2003).
- Unified Process (Rational Corporation 1998, Ward & Kroll 1999, West 2002).
- Business collaboration framework (UN/CEFACT, 2003).

3 DESCRIPTION OF LAURA PROJECT

The authors of this paper were engaged in a project co-funded by the European Commission, entitled "LAURA – Adaptive Zones for Interregional Electronic Commerce based on the concepts of Request-Based Virtual Organizations and sector-specific Service Level Agreements" (LAURA Project, 2003). This project belongs to the Information Society Technologies (IST) programme that is part of the Fifth Framework Programme for Research, Technological Development and Demonstration Activities.

The e-commerce system resulting from the LAURA project is initially employed in four Less

Favoured Regions of Europe: Messinia and Epirus (Greece), Saxony-Anhalt (Germany) and South-Central region (Bulgaria).

At the regional level the e-commerce zones include various types of actors that are classified upon the notion of State-of-the-Art "Electronic Commerce (EC) Kernels" and "Electronic Commerce (EC) Shells" (see figure above). Actors may be persons or organizational units from the private or public sector.

The EC Shells include the broad population of small and medium enterprises (SMEs) existing in the geographical area (rural or urban) of each participating region. E-Commerce Kernels have a rather supportive role aiming at facilitating the SME actors to conduct e-business successfully. E-commerce Kernels typically include Business Organizations, Support Centres set up in each region, and associated IT providers for the provision of the hardware and software infrastructure necessary to run the LAURA system.

A more complete description of the LAURA project can be found in its official website, www.lauraproject.net.

4 UMM STRENGTHS AND WEAKNESSES

4.1 UMM Strengths

One major strength of UMM is the fact that it allows for the bottom-up or top-down analysis and design of the e-commerce system to be developed, or indeed a combination of both approaches. As an

example, a person who is trying to model a system that is based on existing document standards (e.g. EDIFACT), might want to start at the lower levels and work his or her way up. On the other hand, a person trying to model an entire industry segment would start at the highest level and work his or her way downwards.

Another major strength of UMM is the definition of business documents to be used and exchanged between trading partners. This allows to use existing standards (for example UN/EDIFACT, xCBL, UBL, RosettaNet, OBI, ANSI X12 850, etc). This use of standards promotes standardisation in the e-commerce arena, but at the same time UMM allows for the adaptability of these standards to the particular e-commerce application being modelled.

Another advantage of using UMM is the ability to choose the level of the modelling details according to the audience and use intended. For an overview of the system to be built it suffices to show the first couple of levels of the modelling effort, for example the Business Reference Model, Business Areas and Process Areas. For a more refined view of the system the use case views and collaboration patterns may be shown. If the modelling effort is targeted to the developers of the system, the lower levels of the UMM have to be shown, for example the definition of the transactions in the system, as well as the definition of the business documents to be used by the trading partners.

UMM is also fully compliant with the ebXML specifications, and its constructs (UMM worksheets) can be stored in an ebXML-compliant registry. The output from the UMM analysis can therefore be a direct input to the specification of an ebXML Business Process Specification Schema (BPSS), that includes the transactions carried out between trading partners, and the choreography (sequence of steps and order) necessary in order to carry out those transactions. UMM is in fact the chosen modelling methodology by the ebXML team.

In addition, as UMM is fully compliant with the ebXML specifications, this means that the modelling of certain business processes can be reused. This adds to the ease of use of UMM, as well as to the standardisation efforts with respect to the e-commerce community.

Finally, as the table below shows, UMM can be considered as a subset of the Rational Unified Process (RUP). This means that UMM is compatible with the RUP, which is a proven methodology for the whole software life-cycle. UMM however, can be more compact than RUP, which allows for the ease of its use.

Table 1: Phases and Workflows used in UMM (Source: UMM Specification)

Workflows	Rational Unified Process Phases			
	Inception	Elaboration	Construction	Transition
Business Modelling				
Requirements				
Analysis				
Design				
Implementation				
Test				
Deployment				

4.2 UMM Weaknesses

Having described the major strengths of UMM, as those were evidenced in the LAURA project, we will now describe what we consider to be some of the weaknesses of this modelling methodology.

As it was mentioned, UMM fits very well with the ebXML technical specifications. As ebXML's Technical Architecture document (ebXML & OASIS, 2001) mentions, Business Process and Information Modelling is not mandatory. However, if implementers and users select to model Business Processes and Information, then they must use the UN/CEFACT Modelling Methodology (UMM) that utilizes UML.

Although UMM fits very well within the ebXML technical specifications, there is no evidence to suggest that it does so within other, non-ebXML environments. As UMM contains a mixture of analysis and design considerations, various levels of abstraction can be used to describe the e-commerce platform to be built. At the higher levels of modelling, the analysis part contains such components as the business and process levels of the system, as well as the individual processes to be carried out. On the other hand, as one gets closer to the lower levels of the UMM methodology (collaboration / transaction patterns, business document structures), which are more design-related, the independence from the underlying technology starts to fade out. As an example, the UMM methodology defines transactions according to pre-specified transaction patterns, for example Query / Response, Notification, Request / Confirm, etc. Each of those patterns has a set of semantic values associated with it, for example if the transaction is legally binding, if authorization for carrying out the transaction is required, if non-repudiation of receipt of messages is compulsory, the time allowed to perform the transaction, etc. There are defaults for each of the semantic values of the transaction patterns, which can be overwritten by the designer of the system. However, the logic of

using these semantic values is not built in many systems other than ebXML, and considerable work may be needed to make the system conform to this logic.

Another drawback of the UMM methodology is that it doesn't encourage definition of transactions with the system, but only those between two trading partners. The worksheet templates used by UMM specify the partner types and authorized roles of the trading partners carrying out the transaction, and the documents that they exchange between them as part of the transaction. However, there is no mention about transactions carried out between a trading partner (a human) and the e-commerce system (a machine). For a complete definition of the system those types of transactions also need to be defined.

As another consideration, the compactness of UMM means that although it is relatively easy to define e-commerce projects in this methodology, crucial information may be lost during the analysis and design stage. As an example, UMM does not allow for the definition of the user interface that the user is exposed to. In this case the designer of the system must resort to other methodologies, e.g. the Rational Unified Process to fill in the missing parts.

Another drawback of the UMM methodology is that at the time of writing of this paper, and to the writers' best knowledge, there is no design tool to ease the task of using the UMM methodology. There is some work by the TMWG group responsible for UMM regarding this matter, in particular a proof-of-concept analysis that certified the need for such a tool. However, up to this point there does not exist a tool that can be useful in the designer's hands when designing an e-commerce system using UMM.

5 CONCLUSIONS AND FUTURE RESEARCH

UMM was found to be a compact and quite robust methodology when specifying e-commerce systems to be developed. There were also several drawbacks which were described, and suggestions for improvement of this methodology were mentioned.

As a suggestion for further research, one needs to examine what changes are required to UMM to include modelling of non-human transactions, i.e. interactions with the system. This may include extensions of the number of transaction patterns currently defined by UMM, as well as inclusion of additional fields in the relevant UMM worksheets to reflect interaction with the system.

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