

Use and extension of ebXML business profiles for Textile/Clothing firms

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Abstract. Managing business workflow can benefit from the adoption of new solutions proposed by different initiatives of ICT. MODA-ML project defined an interoperability framework, based on ebXML standard, to enhance collaboration and interaction inside the Textile/Clothing supply chain. In this paper we briefly give an overview of the architecture of MODA-ML and we present our approach to generate automatically BPSS documents to provide a common formal description of the business process supported. Because of the requirements of the T/C sector, we have also studied some improvements to obtain more flexibility in defining partner profiles with CPP documents.

1 Introduction

Electronic business surely represents the new development perspective for the world-wide trade. Together with the idea of the ebusiness, and the exigency to exchange business messages between trading partners, the concept of business-to-business (B2B) integration arouse. B2B integration is becoming necessary to allow partners to communicate and exchange business documents, as catalogues, purchase orders, reports and invoices, overcoming architectural, applicative, and semantic differences, according to the business processes implemented by each enterprise.

Business relationships can be very heterogeneous, and consequently there are various ways to integrate enterprises with each other. Moreover nowadays not only large enterprises, but also the small- and medium- enterprises are moving towards ebusiness: more than two-thirds of SME use the Internet as a business tool [7]. One of the business areas which is actively facing the interoperability problem is that related with the supply chain management.

In general two distinct supply chains that look alike do not exist: depending on the enterprise, the same concept of a supply chain can be very different; in some cases what is called supply chain is not a really supply chain at all. In [4] 16 types of supply chain are listed, each of them characterised mainly for the intended output companies are seeking to obtain.

SCM solutions concern not only new technologies to manage the processes, but also the designing of new processes well-suited for the new kind of market that is now

arising [2]; in this article is highlighted as many companies, despite the high cost of SCM products they bought, they can't use them successfully because of two main problems: the understanding how their existing supply chain processes work really and the conflicts between different silos in the same enterprise. These problems require developing a real SCM process to cut across the divisional boundaries and in which to use the new technology. The central point is to understand the change management issue that will need to be addressed. In the new era of the Web and considering the new communication means, many companies must consider to deconstruct their conventional supply chains and to build an interactive ebusiness network to gain flexibility [14].

Surely e-business has conditioned supply chain management: [10] focuses on the role of e-business in supply chain integration. Improving interoperability can lead to a more successful management of the supply chain: [1] lists seven principles that would drive the efforts improving SCM. These principles aim to enhance revenue, cost control, asset utilisation and customer satisfaction exploiting ICT to obtain more flexibility and to balance customers' demands with the company's needs for a growth.

But what can we expect from a solution and architecture for supply chain management and integration? Which are the goals of a truly integrated supply chain? In some cases it is not clear which are the advantages in implementing and using software for SCM. At the beginning the companies viewed SCM software as part of their business architecture that would bring to "cost saving" advantages. Actually proper platform for SCM can not only streamline production processes, but also create value for the enterprises. [9] discusses the meaning of "value" of supply chain software: this paper highlights that software creates value when it brings to ROI (Return Of Investment), and examines how application can create value for supply chain. ROI occurs when the investment returns exceed the cost of the capital, but the value of supply chain software could vary depending on the perspective. [11] asserts that an integrated supply chain does more than reduce cost, but also creates value for the enterprises, the partners and the shareholders. In [15] the real leverage of a lean supply chain is in creating capacity of growth. This paper argues that the companies must realise that instead of expense reduction or profit enhancement, the main benefits of architectures and software for SCM consist in a new capacity to match with customer demands.

The content of this paper is based on the experience of development of a sectoral framework for the Textile Clothing sector, MODA-ML (Middleware tools and Documents to enhance the Textile/Clothing supply chain through XML) [5], and its first steps in analysing and formalize the business processes in the T/C supply chain.

2 The workflow management scenario

Each activity within an enterprise, whether it is a production or management one, is inserted in an enterprise business process that in general involves different actors and sectors of the same enterprise or requires the co-operation among different company. A business process can then be defined as a collection of activities (performed by human personnel or by automatic mechanisms like software systems)

to achieve a particular business object. Some examples can be the hiring of new employees or the definition of a purchase order. These business processes must be represented in some manner. A workflow, or workflow process, is a formal executable description of a business process.

Workflow management is done using Workflow Management System (WfMS): a WfMS is a framework and a set of tools to facilitate the definition and the maintenance of the integration logic and to control how to dispatch information among (human) participants of an administrative process. It also defines the business logic necessary to integrate heterogeneous and distributed systems. WfMS presents many advantages (but obviously they depend on the specific framework used), but suffers of drawbacks like expensive software licenses and complex installation and operation (they are not a plug a play applications). These drawbacks derive from the fact that a WfMS implements a complete middleware platform: this results in WfMS turned out to be heavyweight platform, difficult to manage and maintain.

The strength of WfMS consists in the ability to make integration logic explicit and, in some cases, to hide the complexity of this integration logic behind a visual language and sophisticated development interfaces. WfMS becomes thus a framework for business integration. On the other hand WfMS has proved to be most useful with repetitive well-defined processes, which are in many cases already managed using traditional and well-tested middleware.

During the last 10 years many initiatives have faced the management workflow problem. The Workflow Management Coalition (WfMC), founded in August 1993, is an international non-profit organisation composed of over 285 members and embraces software vendors, research groups, university, and customers. WfMC devotes to the research and development on workflow area, and its main aim is to define and to spread standards for interoperability and connectivity between workflow software. The basic result consists in the definition of the Workflow Reference Model [8], a description of a workflow system architecture that attempts to construct an abstract view of the core characteristics of business processes, separated from the technologies.

BPMI is another initiative that promotes and develops the use of Business Process Management. It aims, like WfMC, to establish standards for process design, development, management, maintenance. BPMI initiative stems from a non-profit corporation within the state of California. Its main results (that are completely free to implement or extend) are represented by the release of three specifications: BPML (Business Process Modeling Language), that is a meta-language for the modelling of business processes, BPMN (Business Process Modeling Notation), that defines a graphical language to express business processes and BPQL (Business Process Query Language) that provides a standard interface to manage and monitor the instances of executing business processes.

WfMC and BPMI are only two of the major protagonists in the scenario of the Enterprise Modelling, that is in truth composed of many other languages and frameworks.

In order to contribute (partially) to solve the problem of multiple enterprise modeling languages, the European Commission funded the Semantic Network Project called UEML (Unified Enterprises Modelling Language) [16]. The main object of UEML is to provide industry with a unified and expandable modelling language,

which should serve as an interlingua between EM tools and applications. The project is setting up a UEML working group, which activities plan the following steps: creating a European consensus on a common modelling language, building a UEML demonstrator to promote the initiative and implementing the complete UEML.

There are several commercial products available for those enterprises that aim to manage their business processes using a WfMS. Among them are WebSphere MQ Workflow, from IBM, BEA Weblogic Integration and Microsoft Biztalk Orchestration. We will talk about ebXML approach to model workflows in section 4.

Besides WfMS, a new approach is now being diffused in the ICT research field: Web services represent a future perspective for the development of interoperability web-based solutions that can leverage on new emerging technologies. The main aim of Web Services is to provide the enterprises with a standardised way and a framework to define application-to-application services available via Web. XML represents the basis to construct and define the syntax and meaning of messages to exchange.

Nevertheless the real challenges that Web Services framework are facing, is to provide a way not only to advertise a single web service allowing its usage for a specific task, but to provide a way to compose and connect different services together, providing more and more powerful and flexible services [13].

Web service composition can be divided in two main folders: orchestration and choreography. There are a number of initiatives to provide XML-based languages for Web Service orchestration and choreography:

- WSCI (Web Service Choreography Interface) is a choreography language that is been introduced in 2002 by Intalio, SAP, and SUN. WSCI proposes a way to extend a WSDL interface definition for Web services collaborations.
- BPEL4WS (supported by Microsoft, IBM, BEA and other vendors) is originated from the convergence of two-workflow languages: WSFL and XLANG. Its specification have been released in May 2003: it aims to describe how to coordinate Web services within a process flow.

Considering Web services as a framework to define, advertise and connect business processes, making them accessible within the same enterprise or across different ones, and the new efforts to develop service composition languages, it becomes necessary to focus the relationship between Web services and business process management [12].

3 MODA-ML, a framework to integrate business processes in the Textile/Clothing sector

The MODA-ML project (Middleware tOols and Documents to enhAnce the Textile/Clothing supply chain through xML) was born to build an architecture to provide an interoperability framework among the enterprises in the Textile/Clothing sector and aims at contributing to establish an European standard for the sector. This project collected various research organisations (ENEA, Politecnico di Milano, Domina, Gruppo SOI, Institut Francais Textil Habillement - IFTH) together with a representative set of leading Italian Textile/Clothing manufacturers. It has been supported by the Fifth Framework programme of the European Commission within

the IST (Information Society Technology) initiative (more information can be found in <http://www.moda-ml.org>) and took part in the cluster of project about Agents and Middleware Technologies (EUTIST-AMI) (IST-2000-28221). The project has adopted the guidelines published by the ebXML initiative: ebXML (Electronic Business using XML) is a set of specifications from UN/CEFACT and OASIS that defines a collaboration framework over the Internet to enhance interoperability between enterprises. The main aim of ebXML is to support two different aspects of the interoperability processes:

- The semantic definition of the documents: ebXML proposes a set of “core components” used to define the semantic value of a document. Differently from the traditional EDI approach, ebXML emphasises the importance of these components on the entire document structure, and this aspect gives ebXML more flexibility with respect to EDI.
- Several technical specifications on the communication protocols: MODA-ML follows completely ebXML transport specifications.

The basic structure of the architecture is a vocabulary of well defined terms. These terms represent the basic business components and are defined as XML elements. Some components of these documents are specialized for particular needs, but many components are shared by all the documents: each component of the dictionary represents in fact a well-defined concept that can be specified in the messages. This organization of the dictionary makes it possible to perform the necessary distinction between the syntactical model, the semantic model and the transport model of the messages being exchanged. Public business document types can then be built starting from this set of business elements and upon them in a modular manner, defining rules and constraints to express the interrelations existing among the concepts they represent. Also the structure of these document templates is contained in the vocabulary.

The effective implementation of the vocabulary is done using a database application that provides a sophisticated description of the defined basic components. This database collects any information on the semantic blocks needed to build the document types. Such information include the name of the XML elements, their description and the associated properties such as data format, length, range of permitted values and so on. The vocabulary further specifies a root element for each document type and all the relations existing among the elements such as sequence, cardinality and so on. A simple application will then re-create the complete set of rules (an XML Schema) for each document type by starting from the root element and following the defined relations.

MODA-ML also provides a set of XSLT style sheets to create HTML pages off the XML instances so that the document content can be visualised in a readable manner even if using a simple Web browser. The Vocabulary represents the core of the management of every aspect related to the MODA-ML document types, schemas and instances. We call this approach the XML document factory (fig 1).

Together with the vocabulary, the framework provides the necessary tools to exchange MODA-ML documents. These tools are collectively called the message switching system.

The message switching system implements a transport protocol based on ebXML messaging service specifications; since the Textile/Clothing sector is composed of

various kinds of enterprises, each characterised by a different level of technological sophistication in its information systems, it becomes fundamental to create simple software modules that can be made publicly available, providing an easy and low-cost integration with complex legacy information systems within skilled companies.

The main component of the MODA-ML message switching system is the Message Service Handler (MSH), that acts as an email client, sending and receiving MODA-ML documents as attachments to email messages: it takes care to validate MODA-ML documents and it uses SMTP as its transport protocol.

In order to enhance the functionalities of the MSH, we have considered:

- Security aspects for authentication and non-repudiation of MODA-ML messages.
- Integration of user guides and XML schemas as automatically generated products of the MODA-ML vocabulary.

MODA-ML staff and the pilot users can automatically generate the XML schema and the user guide on every message, even in course of definition; generating XML schemas or user guides produces documents that can be immediately downloaded. A generic user seeking information about the message usage can only download all the developed versions of the schemas and the users guides. These operations are all ASP applications executable from the web.

4 Partner collaboration profiles within the MODA-ML framework

Besides the semantic definition of the documents and the transport specification, ebXML defines a standard mechanism to describe business processes. In this way ebXML aims to increase the interoperability among the enterprises easing the spreading and the interchange of the different business processes. This mechanism is the Business Process Specification Schema (BPSS)[3] that, by formally defining the business processes, integrates the modelling of the e-business processes together with the software components meant to implement them. This specification is used as an input for the definition of the company profiles and the successive collaboration agreement between commercial partners in an ebXML scenario (respectively Collaboration Protocol Profile, CPP, and Collaboration Protocol Agreement, CPA).

Inside the MODA-ML initiative we have faced the definition and management of inter-enterprise collaborations. The proposed framework defines both business messages and the way to exchange them, but aims to provide also a mechanism to improve the workflow management, the integration and the interoperability among different partner of the Textile/Clothing supply chain, and the agreement about interaction mechanism. In order to achieve this aim, it is necessary a standard formal definition to describe business processes. This definition can ease inter-enterprises collaboration and commercial transactions, overall spreading information about business processes.

MODA-ML business processes are specified using BPSS documents. Every BPSS is generated directly from the MODA-ML dictionary. Using a web interface and an HTML form it is possible to select a process and build, from the implicit definition contained in the vocabulary, the corresponding BPSS.

During the development of the tool to create BPSS document we have found two different DTD to validate our BPSS: one found on www.ebxml.org, and the second on www.oasis-open.org. Also the examples we have found on the web sites to understand the correct use of the BPSS were not coherent: these examples propose different ways to structure the XML elements and adopt differently a XML schema or a DTD to validate the BPSS. Finally we decided to adopt the DTD for the version 1.01 of BPSS provided by the official web site of ebXML.

MODA-ML process definition is not completely compliant with ebXML specification: MODA-ML processes are composed of one or more activities each of which can consist in the exchange of one or more MODA-ML messages. Differently from ebXML, MODA-ML messages exchange is not collect into a “request-response” atomic activity to better represents really implementations.

ebXML uses the BPSS as the starting point to generate a CPP document. As defined in [6] a CPP (Collaboration Protocol Profile) “defines the capabilities of a *Party* to engage in electronic *Business* with other *Parties*. These capabilities include both technology capabilities, such as supported communication and messaging protocols, and *Business* capabilities in terms of what *Business Collaborations* it supports”. A CPP document describes an enterprise and the role it can carry out inside a business process, but does not allow to define more specifically the information that can be managed by the enterprise itself. The ebXML definition of CPP results to be not flexible enough to tackle the requirements of the T/C supply chain.

Together with the generation of BPSS documents, the MODA-ML project takes care to produce CPP documents to describe the collaboration profile of the MODA-ML users. MODA-ML refers to 2.0 version of the CCP, available on the official site of ebXML (www.ebxml.org).

On the other hand MODA-ML approach to define enterprise profile aims to be more flexible than ebXML one. As we have highlighted in section three, the Textile/Clothing sector is composed of a large set of very different and heterogeneous companies that establish very dynamic collaborations with their sectoral partners. These collaborations can change depending on the final product that has to be realised. Moreover the enterprises in general are not well disposed towards sudden and drastic changes of their “well-proved” management systems. They surely prefer a gradual approach in adopting new mechanisms to manage business processes, to exchange documents and contact their partners. It is not feasible to impose completely new transport mechanism or to propose absolutely unusual and unfamiliar documents.

These practical issues conditioned the way to compose CPP documents: in defining their profile, MODA-ML users require:

1. To choose a specific sub set of documents to manage for a particular business process. The real scenario of the T/C supply chain is composed of a large variety of partners that want to interact according to MODA-ML process, but can implement only a sub set of the exchange activity inside the process. In general, there are many enterprises that, depending on their internal organisation, do not know how to manage a certain kind of information, and how to insert the related electronic business documents inside their internal workflow.
2. To specify which part of the business document they can manage. MODA-ML messages contain different kinds of information. Depending on the enterprise, this information can result as absolutely indispensable, optional or instead not

required. MODA-ML document schemas provide a flexible structure of business documents to reflect enterprise requirements, providing a mechanism to produce business messages customized for each situation.

In order to provide a mechanism to solve the first issue, we have considered three possible approach: modify the CPP DTD for an enhanced version of CPP documents, use of the “SimplePart” element to specify the message type to be sent for a particular activity as a “completely arbitrary type”, or use the “CanSend”, and “CanReceive” elements to specify the transport method to deliver business documents. Finally we have chosen to use the CanSend and CanReceive elements to point out different way from MSH to exchange MODA-ML messages. In this way a partner of the supply chain, that does not want to use the MODA-ML framework (i.e. MSH) to exchange a particular business message, can point out, using these two elements, an alternative mechanism to deliver the message (i.e. phone or fax or whatever). Using ebXML terminology, in our CPP a MODA-ML user can specify inside a Binary Collaboration the supported sub set of Binary Transaction Activity, avoiding the constrain to manage the whole Binary Collaboration (that represents the business process) defined.

To solve the second issue, we decided to modify the DTD of the CPP introducing a new element to allow the users to specify how she/he considers determined parts of the message. In this way a MODA-ML user editing its own CPP can define which information she/he judges to be binding, optional or rejected inside the business message that have to be exchanged. This information will become fundamental for a successive definition of the Collaboration Protocol Agreement (CPA) document: the table 1 can be used as a reference to match those message parts that are customisable to define a final message.

Table 1. Possible matches between different requirements on same part of the message

Definition of user 1	Definition of user 2	Final definition
Binding	Binding	Binding
Binding	Optional	Binding
Binding	Rejected	<i>To contract</i>
Optional	Optional	Binding/Rejected
Optional	Rejected	Rejected
Rejected	Rejected	Rejected

Following the guidelines of the project, that developed all of its services like web applications, the tool to generate the BPSS has been implemented as a set of VBScript dynamic web pages. Once that every element concerning the new business processes and the relative business documents has been specified and its description has been included in the vocabulary, it is possible to automatically generate the related BPSS starting from such description. Using an appropriate web interface the MODA-ML staff can select a particular process and then, by a simple click, generate the XML files. The BPSS documents are then stored in a directory publicly available via web for MODA-ML partners (Fig. 1).

The two main aims of this tool are:

- to have a standard-formal definition of the processes supported by the MODA-ML framework.

- to maintain the vocabulary as the only central component of the framework to update during its growth.

Besides the BPSS generator tool, we have implemented an on line editor for CPP documents. In fact, starting from the BPSS it will be possible for each actor to edit his own Collaboration Protocol Profile (CPP), that will be used as reference for the role of the actor in the relevant process. The possibility for every enterprise to tailor the message set defined in the BPSS and to customize interaction parameters on its own capabilities is related with the basic requirement of the MODA-ML project that aims to face the heterogeneity of the Textile/Clothing sector.

From the user's point of view, BPSS and CPP implementation can enhance the understanding of the services provided by each enterprises, and the analysis of possible interaction mechanisms.

Naturally the work in implementing BPSS and CPP documents targets to a future definition of CPA documents. As explained in ebXML specification, CPA documents represents the agreement achieved by two different partners in the supply chain to do electronic business. This agreement stem out from the possible matching between the enterprise profiles expressed in CPP. The future step will be the analysis of (semi-automatic) tools to build CPA documents.

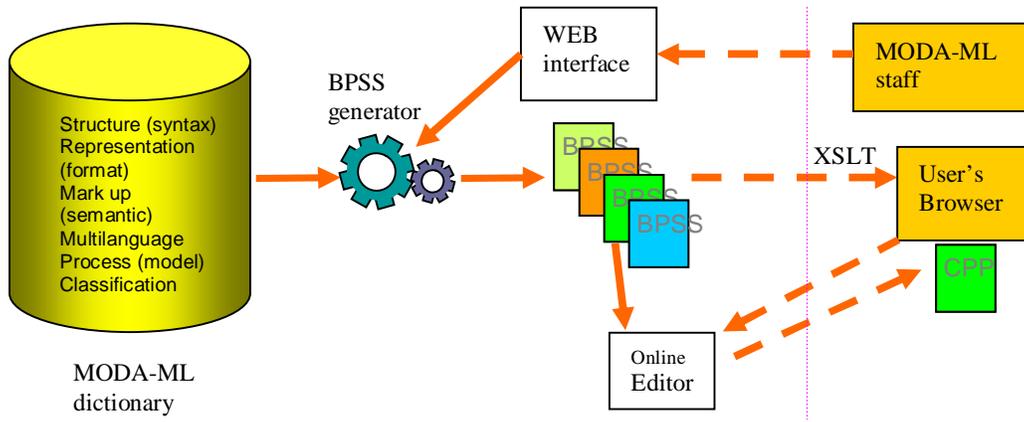


Figure 1. MODA-ML architecture for BPSS and CPP management

5 Results of the MODA-ML project

The MODA-ML project involved some industrial pilot users (five leading firms), that experienced the result of the project. In the first phase the pilot users began to check the documents' capabilities to fit their information flows that were already managed via phone or fax. Then they began to insert the MODA-ML documents in their real workflow with customers and suppliers

The introduction of MODA-ML suggested evolutions of the internal information systems and new services to be offered to the customers. Moreover the adoption of

the (pure) data exchange framework has resulted very inexpensive (in terms of both licence and human resources) for the industry.

The project has demonstrated a good capacity to attract new potential users: 3 consortia (110 firms) in the industrial textile districts of Biella and Prato and also four technology providers are going to MODA-ML. Nevertheless, we still haven't got a critical mass for a fast spreading of the MODA-ML results. Presently they support further developments to extend the supply chain coverage and to improve the usability and flexibility of the framework.

But the most important result obtained by the MODA-ML is that its results have been absorbed in the final document of the CEN/ISSS TEXSPIN Workshop. Promoted by Euratex (European association of national industry trading association of the T/C) and supported by CEN/ISSS (*European Committee for Normalisation/Information Society Standardisation System*) TEXSPIN aimed "to provide a framework for the (B2B) integration of the European Textile/Clothing/Distribution chain". This initiative ended in July 2003, and the final CWA was published in autumn 2003.

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