

A Document Centric Approach for User Requirements in BIVEE*

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Abstract. The BIVEE project addresses the challenge of innovation management in Virtual Enterprise Environments. BIVEE aims to formalize the processes and models for improvement and innovation management in virtual enterprises by developing a conceptual framework and corresponding ICT platform. In this paper, we present a document centric approach towards the identification and formalization of the documents exchanged between the main actors during the innovation processes in virtual enterprises. The results will be leading to the user requirements (esp. data requirements) such that BIVEE platform will provide the necessary software tools for the semantic management of the innovation/improvement documents.

Keywords: BIVEE, User Requirements, Document Centric Approach, Virtual Enterprise

1 Introduction

Business Innovation is an important and a key issue for today's enterprises. Apart from the innovation activities within a single enterprise, it is more important to deal with the Business Innovation in Virtual Enterprise Environments in which several different enterprises (mostly SMEs) are collaborating to respond new business oppor-

* The research leading to these results has received funding from European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no ICT-285746, BIVEE (Business Innovation and Virtual Enterprise Environment) Project.

tunities. The degree of importance has been declared by European Commission through Europe 2020 strategy¹ and the Innovation Union².

Business Innovation and Virtual Enterprise Environment - BIVEE³ is an R&D project co-financed by European Commission FP7 program. “BIVEE aims at building a distributed, collaborative, knowledge-intensive framework, where innovative business models, novel management methods, and emerging ICT solutions will be integrated to the benefit of interoperable virtual enterprises.”³ The goal is to improve the competitiveness of European enterprises (SMEs in particular) by increasing their innovation capabilities in the virtual enterprise environments.

Innovation is a complex issue and BIVEE intends to divide this complexity by addressing two different, but highly interconnected parts. The BIVEE project names these parts as “spaces” and discusses “Improvement” and “Business Innovation” activities separately in these spaces. An improvement can be defined as a small set of activities which can directly be applied to the production processes. Improvement activities are modeled within the Value Production Space (VPS) which can be perceived as a digital virtual realization aimed at modeling and representing a complex, distributed reality of a virtual enterprise, with its operations, in a way that is easy and intuitive to be presented to and managed by a large variety of stakeholders, and in particular business people. For VPS, BIVEE intends to explore and propose innovative management methods, new business models and practices for the “improvement” concept. On the other hand, innovation processes are inherently different than the production related processes and BIVEE tries to model and formalize the business innovation processes within the Business Innovation Space (BIS). Instead of processing raw materials into products or elementary services into complex services, the BIS targets to create new processes and alliances based on the previous experiences. Detailed information can be found in [4].

In this work, we present our document centric approach and intermediate results for the requirements analysis of the BIVEE project. We start with the descriptions and AS-IS structures of the two end-user enterprises in the BIVEE project. We analyze their innovation/improvement activities, identify the key actors and steps, formalize each step and extract “documents”. Having analyzed the AS-IS status, we continue with the identification of the internal processes which can be mapped to VPS and BIS separately. Afterwards, with the document centric approach, we try to identify the key documents exchanged between the actors of virtual enterprises during their improvement and innovation processes. Indeed, this is the data requirements for the BIVEE platform. We start with the data and then elicit the functional, interface and non-functional requirements accordingly. We analyze the structure and content of the identified documents and try to formalize them to come up with a unified/standardized approach in Business Innovation activities. This work is currently

¹ European Commission – Europe 2020,
http://ec.europa.eu/europe2020/index_en.htm

² European Commission – Innovation Union,
http://ec.europa.eu/research/innovation-union/index_en.cfm

³ Business Innovation and Virtual Enterprise Environment (BIVEE),
<http://www.bivee.eu>

ongoing, and in this paper we present our intermediate results. BIVEE will provide a set of software tools in-line with our methodology for the semantic management of the documents exchanged within the VPS and BIS.

This paper continues with the related work regarding our document centric approach for business innovation in virtual enterprise environments. Afterwards, we give details about our approach and list the key documents we have identified for the Business Innovation Space and Value Production Space of the virtual enterprises. Lastly, we conclude the paper and present the plans for the future to improve the results, hence the BIVEE project.

2 Related Work

A Virtual Enterprise can be defined as the alliance, collaboration between different enterprises. A lot of research has been performed on the management of these alliances through ICT. There are several standards (e.g. OASIS UBL⁴) and mature software tools [5] in terms of supply chain management which can be perceived as a document management reality for virtual enterprises. On the other hand, innovation management within the enterprises is a relatively new concept and there are few widely accepted models, approaches and tools for this purpose [4].

The ECOLEAD⁵ project produced valuable results for the collaborative networks of enterprises, called Virtual Organisations. It mostly focuses on the reference models for collaborative networks rather than the innovation management within these networks [1] [2] [3]. Furthermore, it does not address any document centric activities regarding the innovation and improvement processes within the virtual organizations.

A book written by Paul Trott [8] mostly discusses the models for innovation management within a single enterprise. A virtual enterprise exposes way different characteristics for the innovation management than the internals of a single enterprise. Christoph Riedl [6] addresses the importance of Open Innovation and mainly focuses on the semantic management of the ideas. In this paper, we address several different processes within the VPS and BIS. Idea management can be seen as a small part within VPS.

Recently arising research activities address the models and methods for the management of innovation processes in virtual enterprises (enterprise alliances) [4]. However, this new coming research line has little outputs up to now. Furthermore, considering the formalization of the methods and models, there is no concrete definitions for the exchanged documents during the innovation activities within virtual enterprises. For this purpose, the BIVEE project works for the creation of the best models and methods, and our work exposes the novelty in this respect. And, in this paper, we present a document centric approach which we believe succeeded for supply chain

⁴ OASIS Universal Business Language – UBL,
http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl

⁵ European Collaborative Networked Organisations Leadership Initiative - ECOLEAD,
<http://ecolead.vtt.fi/>

management in virtual enterprises (UBL is a CCTS implementation). We briefly describe the CCTS⁶ methodology in the upcoming chapter.

3 Document Centric Approach to User Requirements

Innovation should be a continuous activity which runs in parallel with existing core business activities of an enterprise. While some enterprises have independent R&D departments, most of the SMEs adopt ad-hoc methods for improvement and innovation purposes. Considering the fuzzy “Innovation” term, the BIVEE project makes a distinction between an “improvement” and “innovation” by dividing the innovation activities into Value Production and Business Innovation spaces within the virtual enterprises. Therefore, in this paper, we follow this convention with the core focus in Business Innovation Space.

We adopt the Core Components Technical Specification (CCTS)⁶ methodology which is produced by UN/CEFACT. The objective of CCTS approach is to identify, capture and maximize the re-use of business information to support and enhance information interoperability. The foundational concept of CCTS is the core component (as its name implies). Core components are semantic building blocks, those can be used to build document models (hence documents) through aggregations and associations. CCTS approach says that core components act as conceptual models that are used to define Business Information Entities (BIEs) through the application of context and qualification. Our document centric approach addresses the information entities (the building blocks) and tries to find the common parts of the identified documents by analyzing the structure and content. This means, each document will be constructed by aggregation and association of small information entities (“Business Information Entity” in CCTS terminology).

Our document centric approach starts with the formalization of the improvement and innovation related processes and tries to identify the important documents which are exchanged between the employees of different enterprises regarding the virtual enterprise environment. These are not restricted to the cross-enterprise processes or documents going from one enterprise to another. Inside the same enterprise, the information may follow an important path which should also be formalized in terms of innovation management. This can also be derived from the fact that different departments of the same enterprise can be in an independent role in a virtual enterprise. **Fig. 1** presents a schematic representation of our starting point for the document centric approach. We try to intercept the information flow between the important actors of the improvement and innovation related processes.

⁶ UN/CEFACT Core Components Technical Specification (CCTS)
<http://www.unece.org/cefact/codesfortrade/CCTS/CCTS-Version3.pdf>

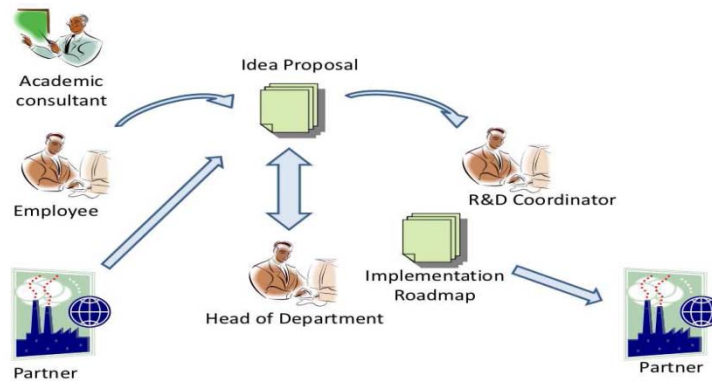


Fig. 1. Document Centric Approach

Exchange of the documents can be through e-mails, hardcopy reports, phone calls or the enterprise may be using a document portal or a content management system for these kinds of documents. Our analysis covers all possible communication lines and identifies the exchanged information by employing Dublin Core Metadata Element Set⁷ which is a vocabulary of fifteen properties for use in resource description. These DC metadata elements (actually a subset of the fifteen elements) and our extensions (applying the BIVEE context) have led to our schema for the metadata definition of the documents. Details of the schema can be found in [7].

The BIVEE project introduces the “waves” concept for the Business Innovation Space. According to this formalization, the BIS activities of a virtual enterprise are divided into four waves, namely Creativity, Feasibility, Prototyping and Engineering. **Fig. 2** presents this waves approach, applied to innovation activities of the Research for Innovation department of Loccioni group. In this paper, after analyzing the processes of the enterprises, identification of the key documents proceed with a classification according to these four waves.

3.1 Methodology

The BIVEE project has two end-user organizations, namely Aidima⁸ and Loccioni⁹. Understanding the current business activities and current application landscape of the end-users is the first step to identify the needs of the systems. To start with this first step, we have prepared a questionnaire for the end-user enterprises. 29 hierarchically designed questions have mostly requested information about the innovation activities. We come up with a detailed analysis of these two enterprises. The main objective is to understand the current business domain, business models, production activities, and the way the end-users look to innovation and innovation activities.

⁷ <http://dublincore.org/documents/dces/>

⁸ Aidima - Instituto Tecnológico del Mueble, Madera, Embalaje y Afines, <http://www.aidima.es/>

⁹ Loccioni Group <http://www.loccioni.com/>

Like most of the European enterprises, Aidima and Loccioni have their own processes for innovation management. Different kinds of information are transferred among different kinds of actors inside the enterprises. Formalizing the structure and content of the information exchanged among the actors is an important issue regarding the BIVEE objectives.

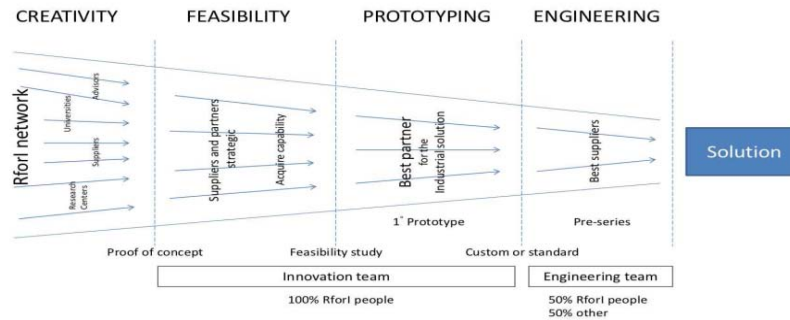


Fig. 2. Innovation Line inside Loccioni

Having detailed descriptions about the end-user organizations, we extract the AS-IS status of them in a formalized and document centric way. AS-IS status of the end-user enterprises is analyzed through two main topics:

1. *Information Flow Analysis* intends to give detailed information about the improvement and innovation related processes of the enterprise. In this part, process flowcharts and their descriptions are analyzed in a conceptual level.
2. *User Specification* provides information about the main actors of the activities, their responsibilities and roles within the processes. Conceptual users and their associated roles are analyzed inside a User Specification Table.

End-user organizations of the BIVEE project work in different domains, and “innovation” is addressed in different levels in each enterprise. Aidima seeks more for Value Production Space and Loccioni seeks more for Business Innovation Space.

As mentioned above, considering “business innovation” as a whole, BIVEE addresses two different, but tightly interconnected spaces: Value Production Space and Business Innovation Space. In this paper, we try to identify the key documents for each space separately.

3.2 Value Production Space Documents

In this space, an enterprise is expected to visualize and follow the production related activities within the virtual enterprise. This corresponds to exchange of information or goods among different enterprises or departments of the enterprises. According to our document centric approach, the goal is to formally identify each document transfer within a virtual enterprise considering the Value Production Space. Before going into the structural details and content of the documents, we analyze the

document whether it is related with an “improvement” activity or not based on the definition in [4]. **Table 1** lists all identified documents. The descriptions of the documents can be found online¹⁰.

| Planning | Sourcing | Building | Delivery |
|-----------------------|-------------------------|-------------------------|----------------------|
| Strategy Report | List of Production | Protocols | Packing Instructions |
| Production Batch | Acquired Material | Non-conformities Report | Delivery Order |
| Estimated Cost & Time | Supplier Budget & Claim | Manufacturing Order | Invoice |
| Go/NoGo Decision | Packing Slip | Work Order | |
| Order | Invoice | Outsourcing Order | |
| Product Data Sheet | | Quality Control Specs | |
| Cost Breakdown | | | |

Table 1. Identified documents for VPS

3.3 Business Innovation Space Documents

While in the value production space we typically transform raw material into finished products (or elementary services into complex services), here we take existing production processes and organizations and we aim at producing new processes and organizations.

But new business models and practices have a risk of becoming obsolete rapidly, therefore it is necessary to enter in the innovation space where it is necessary to put in place the strategies, methodologies, practices, supported by ICT tools which can promote and foster continuous open enterprise innovation.

Table 2 lists all identified documents. The descriptions of the documents can be found online¹¹.

4 Conclusion & Future Work

In this paper, we introduce our document centric approach for the user requirements of the BIVEE project. We start with the identification of the improvement and innovation related processes of end-user enterprises. Then we try to identify the key documents and classify according to the “waves” approach in BIS. We share our intermediate results; identified documents for VPS and BIS. We continue with the detailed analysis of each document. Selected documents will be decomposed and common parts of the documents will be identified. Formal semantic structure for the selected document will be implemented through ontological annotations and our approach will follow a bottom-up approach: tiny information units will come together to

¹⁰ Value Production Space Documents <https://docs.google.com/spreadsheets/ccc?key=0AnUxMImt-28UdEJid0xaV0hhbjZ3UTZ4Nwt3eHpXeGc#gid=0>

¹¹ Business Innovation Space Documents <https://docs.google.com/spreadsheets/ccc?key=0AnUxMImt-28UdEdhSC05eU1iQlZZWk9pTjdDNU1RNxc>

form the improvement and innovation documents. Future work might include a standardization proposal of these documents as BIVEE approaches to a level of maturity.

| Creativity | Feasibility | Prototyping | Engineering |
|--------------------|--------------------|------------------------|--|
| Business Ecosystem | Market Analysis | Prototype Requirements | Budget |
| Partner Profile | Gantt Chart | Implementation Roadmap | Bill of Materials |
| Research Line | Solution | Monitoring Sheet | Cost Report |
| Proposed Idea | Project Validation | Gantt Diagram | Resources |
| Validated Idea | Feasibility Study | Final Technical Report | Protocols |
| Customer Issue | Go/No Go | Results Report | Commercial Components Requirements (CCR) |
| Technical Solution | Project Proposal | | Prototype Modification |
| RforI Report | Candidacy Report | | Product Data Sheet |
| Marketing Report | SWOT Analysis | | New Product Acceptance |
| Innovation Report | | | Working Report |
| Estimated Budget | | | |
| Internal Order | | | |
| Resources | | | |

Table 2. Identified Documents for BIS

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