

Enterprise Interoperability Value Proposition: A Practical Case Analysis

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Abstract

An enterprise's competitiveness today is to a large extent determined by its ability to seamlessly interoperate with others. Observing and analyzing the growing need for collaboration, an international team of academic and industry partners is involved in an EC funded project for the development of an innovative integrated collaborative platform. This paper is focused on the elaboration of the Enterprise Interoperability Value Proposition (EIVP) at the enterprise-community level, considering the practical case of the platform implementation in a Bulgarian manufacturing company. The provided argumentation reveals the great potential of the new collaborative environment to bring EI value especially for SMEs participating in business networks and having intensive relationships with many business partners. The improved communication, coordination, cooperation and collaboration activities and processes between the participants in extended enterprises and cluster communities will strongly contribute to increasing the competitiveness of SMEs in Europe.

Keywords

Enterprise Interoperability, Value Proposition, Extended Enterprise

1 Introduction

Globalisation nowadays is linked to the enterprise challenge of managing changes and innovation in an increasingly competitive world, as noted in the Enterprise Interoperability Research Roadmap [European Commission, 2006]. The Roadmap also observes that this challenge is greater for small and medium-sized enterprises (SMEs), "which do not have the large R&D budgets available to the large corporations and have more limited capability to interoperate with other enterprises (if at all)". An enterprise's competitiveness today is to a large extent determined by its ability to seamlessly interoperate with others. Collaboration, in terms of the increased (by the medium of Internet) opportunities different objects (things, people and firms) to work together, is considered as the new foundation of competitiveness [Tabscott, 2006]. There is a process of transformation of the companies into flatter and more specialized enterprises, that link suppliers and other businesses and form a larger, more open, value-creation entity ("business web") [Tabscott, 2007].

While, globally, virtual collaboration among enterprises is growing, the clear lack of collaborative networks among SMEs in the EC region and Eastern Europe is an issue that comes with the looking for reliable partners and investors. In domains, concerning the manufacturing of assembled products, suppliers and SMEs rely upon a great variety of tools, which are not integrated, difficult to use and often ineffective. High costs are sustained to train employees and acquire tools of different make as required by the Original Equipment Manufacturers (OEM). Besides, some challenges evolving from the OEM and SMEs requirements for team productivity should also be considered. A technology, specifically designed to support product development and manufacturing processes for co-located teams, is needed. Since the enterprise "moves from simple organization to a complex networked organization (an extended enterprise)" some enriched views about it are needed [Nightingale & Rhodes, 2004]. Enterprise Systems

Architecting is considered as a “new strategic approach which takes a systems perspective, viewing the entire enterprise as a holistic system encompassing multiple views such as organization view, process view, knowledge view, and enabling information technology view in an integrated framework”.

Observing and analyzing the growing need for collaboration, a team of academic and industry partners has applied with a proposal for a project titled “Extended Enterprise management in Enlarged Europe” (E4) which has been approved and funded within FP6 of the European Commission . Universities, manufacturers, software developers and consulting companies from Western and Eastern Europe are partnering in the project, gathered by the main objective to develop an innovative integrated collaborative environment, specifically tailored to support the communication and design needs of suppliers, operating in a network which could involve companies from all over Europe.

This paper is focused on the elaboration of the Enterprise Interoperability Value Proposition (EIVP) at the enterprise-community level, considering the practical case of the innovative collaboration platform implementation in a Bulgarian manufacturing company Sparky Eltos. The EIVP Framework [European Commission, 2008], provided by the European Commission, is briefly described in the second paper section. The company’s profile and its most important business challenges are discussed in the third paper section. The main research and development aspects of the collaborative platform development within the European project, and the platform innovative features and functionalities, are presented in the fourth paper section. The advantages for Sparky Eltos when using the new collaborative environment are analysed and figured out in the fifth paper section, based on the different dimensions of the EIVP Framework at the enterprise-community level.

2 The Enterprise Interoperability Value Proposition Framework

According to the EC report on Value Proposition for Enterprise Interoperability [European Commission, 2008], an Enterprise Interoperability Value Proposition (EIVP) in a generic context is “a set of ICT resources, capabilities and competences, bundled into commercial products, services and R&D offerings, which are of value to individuals, private and public stakeholders, and which contribute to social and economic growth”. In order to cover the complexity of the subject area, a multi-level and multi-dimension framework (Figure 1) is developed and presented in the report [European Commission, 2008].

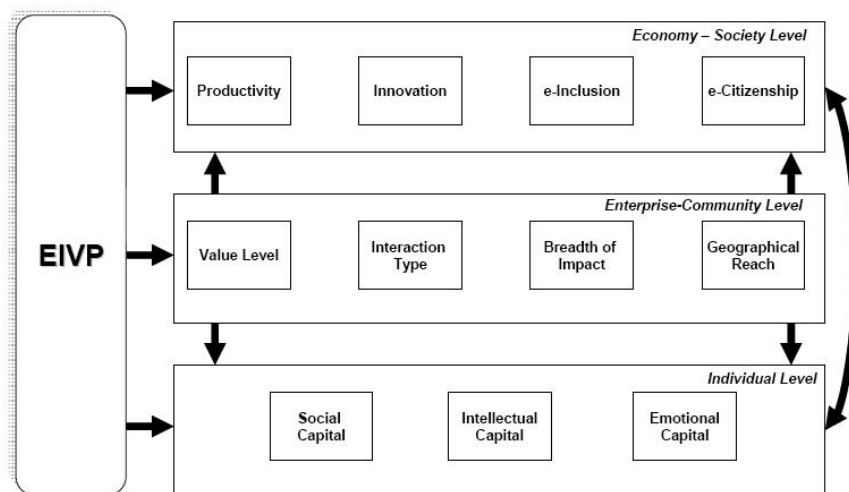


Figure 1: EIVP Framework [European Commission, 2008]

The value proposition of Enterprise Interoperability (EI) is considered at three different levels - Economy-Society, Enterprise-Community and Individual levels. It has the greatest and direct impact on enterprises and communities of enterprises, while at the other two levels it has indirect

and “spill-over” effects. Different dimensions are identified for describing the EI value proposition at each level of the Framework. The dimensions at the Enterprise-Community Level (Figure 2) are: Value Level; Interaction Type; Breadth of Impact; and Geographical Reach.

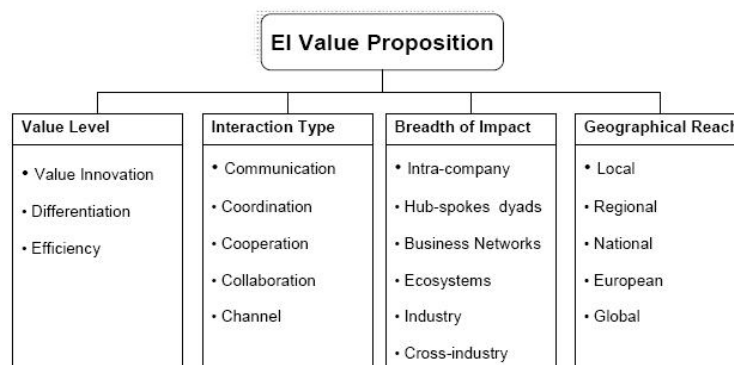


Figure 2: EIVP at the Enterprise-Community Level [European Commission, 2008]

Value Level measures the utility of interoperability for enterprises in their strategic positioning, and consequently, how EI deployment is perceived and valued by consumers, citizens, enterprises and governmental bodies. Interaction Type reveals how the value derived from interoperability may be created and why EI is needed for improving companies’ strategies. The five interoperability interaction types (the 5Cs) [European Commission, 2008] are communication, coordination, cooperation, collaboration and channel. Breadth of Impact describes the scope of interoperability, ranging from an intra-organisation initiative to broader situations that are industry wide or even cross-industry. The Geographical Reach dimension addresses the impact of EI on geographical boundaries.

3 Business Challenges for a Manufacturing Bulgarian Company in the Complex Business Environment

Sparky Eltos is a manufacturing enterprise producing electric tools: a wide range of hand-held power tools (drilling machines, rotary hammers and hammers, angle-grinding machines, circular saws, milling machines, knife saws, eccentric grinding machines), as well as collector motors for alternating current and collectors. Sparky Eltos is a part of the SPARKY Group with a head office situated in Berlin, Germany, and other two offices – in Sofia, Bulgaria, and in Moscow, Russia. Sparky Eltos AD is the design department and manufacturing plant. The company has more than 1350 employees, modern equipment and is implementing a powerful investment plan for the introduction of new hardware and software systems. All activities related to creating new power tools - from the concept and designer’s model to the successful completion of the first production series - are carried out by the own company R&D department experts who use the latest computer technologies. The company’s products are distributed to more than 40 countries all over the world.

Sparky Eltos produces the so called assembled products which mean that a number of suppliers are involved in the collaborative process for the design and manufacturing of each product. Some of the suppliers are Bulgarian SMEs situated all over the country, but there are also German, Austrian, Russian and Chinese companies involved as well. The successful operation and growth of the company depends strongly on the established communication, coordination and collaboration between all stakeholders involved in the business processes. A customized ERP system has been developed in Sparky Eltos for managing primarily the internal business processes. However, some very important relationships with suppliers are still conducted by using traditional means for communication and collaboration, including personal meetings, phone calls, fax and e-mail messages. That turns out to be a critical problem for the enterprise,

especially in recent years when globalization is strongly affecting enterprises worldwide and competition is more and more intensive and severe.

The needs for solving the pressing problems concerning relationships with suppliers are strongly related to the perceived critical business goals faced by Sparky Eltos - reduced Time To Market and Cost, improved Quality and Innovation. Furthermore, they are also consistent with the company critical business initiatives - Real Time Meetings/Online Access, Single Point of Access, Lifecycle Configuration and Version Control, Integrated Development Process with Re-use, Integrated Manufacturing Planning and Manufacturing Resources at the Right Time.

4 Innovative Collaborative Environment Development

The results of extensive research work reveal that in all domains concerned with assembled products, the design is usually carried out by a network of enterprises which take responsibility of subsystems at the higher tier, and of simpler components at the lower tier. SMEs, most often placed at lower tiers, usually perform activities that tend to be short and plagued with frequent design changes originating from the higher levels. When working with different Original Equipment Manufacturers (OEMs), they are often required to use specific tools, leading to higher expenses of suppliers for buying and adopting new software, for training employees, etc.

Based on the research results, a consortium of academic and industry partners from Western and Eastern Europe joined their efforts and initiated the development of a new collaborative environment, intended to be an integrated, user friendly and low cost software solution, supporting the participation of SMEs in collaborative networks with different OEMs and making more effective and efficient the collaboration of OEMs with their suppliers.

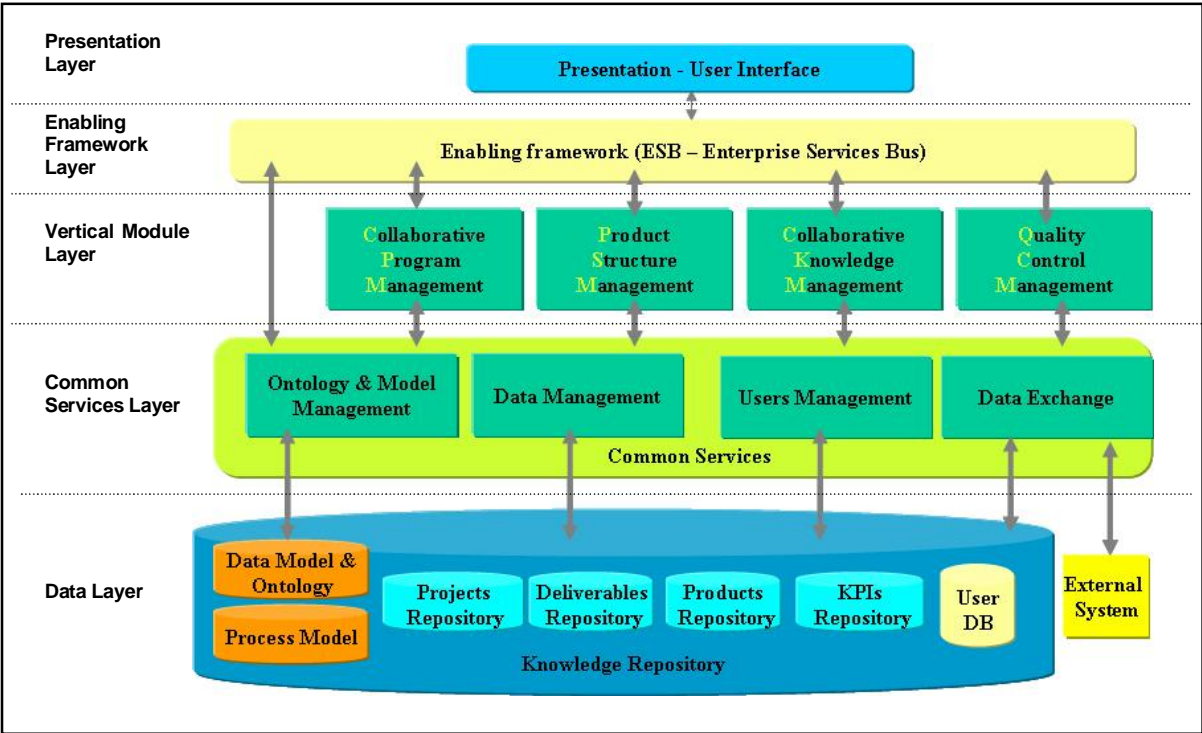


Figure 3: E4 Collaborative Platform Architecture [E4 Consortium, 2005]

When the experts from Sparky Eltos were invited to join the consortium they were ready to accept that challenge, because they realized the available opportunity to solve one of their most pressing problems – the strategic relationships with suppliers. The enterprise is involved in the European project in the role of an end-user who is in an urgent need for an effective, integrated, easy to understand, user friendly and low cost collaborative environment, that could solve the enterprise interoperability problems existing in the complex enterprise network in which the company is operating. The collaborative platform is still under development since the project

will finish at the end of October 2008. However, the testing results of the first platform version are already available and prove the important changes that it introduces in the company.

The logical architecture of the new collaborative environment is presented in Figure 3. It is split into 5 layers – Data layer, Common Services layer, Vertical Modules layer, Process Choreography layer and Presentation layer, which are briefly described below.

The lower layer is the Data layer. Data may reside in the platform itself or be part of External Systems. The Platform can exchange information with External Repositories or Systems through standard formats such as XML. The Knowledge Repository is the whole common repository of the platform; it contains all the information needed by the vertical modules and all the knowledge shared within the virtual organization. This information may come from Projects, Deliverables, Products, Key Performance Indicators (KPIs) and any other source of knowledge such as documents, ideas, emails, media, exchanged by the platform users. The User Database resides here; it contains all the user profiles: enterprise employees, customers, suppliers and administrators of the platform. The Process Model, the Data Model and the Ontology Database contain the description of the adopted value chain reference model.

The Common Services layer is the lower layer of services: the layer of technical fine-grained services. It consists of Ontology and Model Management, Data Management, User Management, Data Exchange and all services that can provide reusable functions.

Above is the Vertical Modules layer where the coarse-grained services reside. The vertical modules are logical clusters of the main functions of the complex product development and manufacturing process from a supplier perspective: Collaborative Program Management (CPM) Module - manages the planning and monitoring of development activities; Product Structure Management (PSM) Module - manages the structure of the product under development and all related information; Collaborative Knowledge Management (CKM) Module - provides knowledge re-use and learning from past experiences; Quality Control Management (QCM) Module - keeps records and provides reports of all planning and execution activities traced by the platform.

The Enabling Framework represents the Enterprise Service Bus and the Process Choreography layer of the collaborative platform, based on Service Oriented Architecture (SOA) principles. This module provides a set of infrastructure capabilities, implemented by middleware technology, that enable the integration and the choreography of services in the SOA.

The top level is the Presentation layer including the User Interface module providing an access point to all platform functionalities.

The five architecture layers are fully integrated ensuring the provision of different functionalities- Project Management, Project Monitoring and Control, Project Traceability and Quality Control, Product Structure Management, Knowledge Management and Connectivity to local OEM systems – combined into just one web-based platform.

The constantly increasing complexity and heterogeneity of contemporary collaborative business networks have led to the urgent needs for common standards and terminologies to support and improve the collaboration between the participating partners. An important innovative feature of the new collaborative environment is related to the use of a value chain reference model, providing a process perspective view on networks and thus improving the collaborative business processes mapping. The software solution is realized by implementing key emerging technologies - service-oriented architecture based on Web services and ontology. The developed common ontology represents in a common and formal way internal knowledge, to add semantics to Web services and to enable data exchange with local or Original Equipment Manufacturer (OEM) systems and retrieval of previous knowledge.

Sparky Eltos has participated in the development of the new collaborative environment since the very beginning, initially by formulating user requirements for the platform design, and later by providing valuable feedback resulting from functionality analysis and software testing. The

company experts readily agreed on the new software solution to be realized as a service-oriented architecture based on Web services, because that made it adaptive, facilitated easier reflection of business changes and increasing modularity, re-use and interoperability. The available platform functionalities, extensively discussed and analyzed in workshops and focus groups, are considered useful and relevant to the company's business needs for increasing the effectiveness and efficiency of Sparky Eltos relationships with the SMEs participating in their manufacturing networks. The improved collaboration with suppliers is seen as one of the critical success factors for achieving the company's business goals. The importance of the new collaborative environment implementation in Sparky Eltos and its relevance for increasing the sustainability and competitiveness of the enterprise are considered in more details in the next paper section.

5 Analysis of the Enterprise Interoperability Value Proposition at the Enterprise-Community Level

The four dimensions of the EIVP Framework at the Enterprise-Community Level, as presented in Figure 2 above, are considered in this paper section as leading aspects for analyzing the advantages and shortfalls of the newly developed and tested collaborative platform in Sparky Eltos, focusing on the EI value it brings to the company.

The Value Level dimension of the EIVP is first discussed. The new collaborative platform provides opportunities for the creation of the best possible networked enterprise, allowing the user to choose the most suitable suppliers (according to preliminary chosen criteria, i.e. lowest costs, shortest delivery time, sufficient production capacity, etc.) to be included in a manufacturing network, as in Sparky's case. This functionality will certainly contribute to the company's better strategic positioning, as it will provide an access to a great number of enterprises in Europe (that will be available in the Platform database) and will support Sparky Eltos in finding new potential suppliers that could be performing much better than the existing ones (and in close proximity, which will lead to reducing costs and delivery periods). It will also guide the company in the creation process of the best possible network of suppliers for each particular new product.

The product structure management functionalities will contribute to the easier and faster design of new products by allowing the use of previous projects as basis for the development of new products. It will also facilitate the participation of the suppliers in the design process. The error prone activities, such as re-keying Bill of Materials, messaging information, re-entering drawing numbers, descriptions, revisions, component numbers, are also eliminated. The collaborative program management functionalities will give Sparky Eltos the opportunity to better control and manage the collaborative business processes involving all the suppliers participating in the network for the design and manufacturing of assembled products. All these advantages will contribute to the achievement of one of the important targets for Sparky Eltos - reduce time to market for new products. Reduction in time to market provides a potential increase in product revenues for the duration of product lifetime. A further positive effect is that by getting to market quicker an additional advantage is gained of being able to charge a higher initial premium product price. Being able to reduce time to market will also enable Sparky Eltos to react to changing market demands in a shorter and more competitive timeframe, which will become more and more important if the current trend of shortening product life time is to continue.

All these arguments reveal the new collaborative platform EI Value Proposition related to Efficiency and Differentiation. Reduced time to market and reduced management costs will contribute to the improvement of Sparky Eltos competitiveness, giving the company chances to deliver to the market new products with better quality and at lower costs (efficiency), and to target new market segments with premium prices (differentiation).

The knowledge management functionalities of the new collaborative platform support knowledge re-use and learning from past experiences. They contribute to the use of collective

knowledge of people (either at the individual level or at the institutional level) on the decision-making processes and also in the product development. Therefore, Sparky Eltos will also benefit in terms of Value Innovation by introducing radical innovations in the products, services, and business processes of the extended enterprise.

Analysing the Interaction Type dimension of the EIVP, we can conclude that the new collaborative platform will strongly contribute at least to four of the five interaction types. The traditional communication channels used by the suppliers participating in Sparky's manufacturing network, including regular face-to-face meetings, phone calls, fax and e-mail messages, etc., will be replaced by the more sophisticated communication facilities provided by the new collaborative platform. That will lead to reducing the proliferation and confusions by making the required information available on-line. Coordination will also be supported by the above described collaborative program management functionalities. All platform functionalities are intended to improve cooperation and collaboration activities in networked enterprises. It could be concluded that at this stage only the Channel interaction type is not covered by the platform functionalities because the newly developed working environment is focused mainly on the collaboration between the company and its suppliers participating in the manufacturing of assembled products, and it does not support the relationships with customers. However, the intentions of the project partners for the future deployment of the new collaborative platform include also the development of additional functionalities, depending on customers' needs and preferences.

As far as the Breath of Impact dimension is concerned, the new collaborative platform could successfully be used both, for achieving a company's internal information integration (for management of its internal business processes, e.g. the workflows between the enterprise workshops for the manufacturing of specific components – plastic, rubber, aluminum - used in the final products), and for managing the external business processes running between the company and SMEs (suppliers) participating in the extended enterprise. The new working environment could also be successfully used for collaboration between SMEs participating in industrial clusters. That is a very important aspect related to increasing the competitiveness of SMEs especially in Central and Eastern Europe.

As already mentioned before, Sparky Eltos is a company whose head office is in Berlin (Germany), there are two representative offices in Sofia (Bulgaria) and Moscow (Russia), and it is working with a wide network of suppliers situated in Bulgaria and China. Therefore, the global geographical reach of the Enterprise Interoperability solution is of great importance for the successful operation of the company. The E4 platform has initially been planned to support collaboration at European level. However, during the deployment phase, the platform will be widely distributed to be used globally, depending on the needs of its users.

6 Conclusions

Based on the results of a feasibility study and market analysis in Western and Eastern Europe, a new collaborative platform is being developed to support the participation of SMEs in complex business networks. The new working environment integrates different functionalities into just one web-based platform. This is an easy to understand, user friendly and low cost software solution intended to support collaboration activities of SMEs which cannot afford the expensive software solutions available on the market.

The participation of different types of potential users, such as Sparky Eltos, in the process of platform design, development and testing, is of great importance because it brings the customer perspective and contributes to achieving functionalities that are well aligned with end user needs.

The practical case analysis presented in this paper focuses on the Enterprise Interoperability Value Proposition (EIVP) related to the implementation of the newly developed collaborative platform in the Bulgarian manufacturing enterprise Sparky Eltos. The platform functionalities are

analysed by using the EIVP Framework, focusing on the dimensions at the Enterprise-Community Level. The provided argumentation reveals the great potential of the new collaborative environment to bring EI value especially for SMEs participating in business networks and having intensive relationships with many business partners. The improved communication, coordination, cooperation and collaboration activities and processes between the participants in extended enterprises and cluster communities will strongly contribute to increasing the competitiveness of SMEs in Europe. That will also have an impact on the human capital of companies, improving their knowledge, technical competences, relational and behavioral skills, and as a whole on the economy and society.

Future research could be focused on the various impacts that the new collaborative platform implementation brings to potential users of different types – medium-sized enterprises acting sometimes as OEMs and sometimes as suppliers in different manufacturing networks, and smaller enterprises acting mainly as suppliers.

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