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Enterprise Architecture Management-based Framework for Integration of SME into a Collaborative Network

Igor Polyantchikov[1], Anoop Bangalore Srinivasa[2], Guruprakash Veerana Naikod[2], Tarvi Tara [1], Taivo Kangilaski [1], Eduard Shevtshenko [1]

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Abstract. In current research it is suggested to use the Enterprise Architecture (EA) management approach, which enables to decrease the duration and to improve the efficiency of IS integration process. Developed framework for business process implementation is adapted to the requirements of the Virtual Collaborative Network of Enterprises. The key business processes should be described internally based on common standard for all collaborative partners and it is suggested to use the ISO 9000 Quality Management standard as a base. This process is followed by analysis of inter-organizational business processes and possible process modeling solutions are also outlined in the paper. The implementation and management of collaborative business processes decrease the risks for the new potential customers and partners on the way to successful collaboration. After the collaborative business process is described it is possible to proceed with the implementation of collaborative IS.

Keywords: ARIS, ISO 9001, Business Process Modeling

1 Introduction

Under the new business conditions and increased market competitiveness, the companies often need to integrate their business processes with other company's business processes. It is considered as a Virtual Enterprise or a temporary coalition of enterprises that co-operate to fulfill common goals. Such cooperation can be successfully supported by data received directly from Information Systems (IS) of partner enterprises, but the implementation of such systems as Enterprise Resource Planning (ERP) is time and resources consuming process. There is the need to start the implementation in the cost efficient way, due to the reason that usually small companies do not need the full functionality of ERP from the beginning.

In current research it is suggested to use the Enterprise Architecture (EA) management approach, which enables to decrease the duration and to improve the efficiency of ERP system implementation process. It is suggested that key business processes should be described internally based on common standard. The implementation and integration of enterprise IS with the collaborative partners should

be started from the integration of business processes. The implementation and management of collaborative processes will decrease the risks for the new potential customers and partners on the way to successful cooperation.

2 Background

In global market the standalone companies are not able to stay competitive and provide the full spectrum of products and services to satisfy today's customer requirements. To face those challenges organizations should be flexible, adaptable, and prepared for the collaboration. It could be achieved through integration of Business Processes (BP) followed by efficient implementation of ERP systems and integration into the Collaborative Network It is suggested to use ISO standards and EA management for the better integration of collaborative partners. The collaborative networks enable partners to concentrate on core professional skills and capabilities [1].

2.1 ISO Standards

ISO 9000 is a family of standards developed to provide framework for implementation of an effective and operative quality management system in organizations. The most recent ISO 9001: 2008 standard QMS clearly emphasizes on the process approach for realizing the quality within the organization. The advantage of process based approach is that, it helps organizations to identify the necessary process required to achieve the product or services [2]. Also, the interaction of these processes within the organization can be visualized and the expected outcome of the process can be measured against the real outcome of the process. Organizations within the collaboration network are required to have ISO 9001:2008 QMS for understanding each other's major process. However, some of the major limitations of ISO 9001: 2008 QMS are, it is time consuming process for implementation and certification, difficulties in interpreting and adapting standard [3].

2.2 ERP Systems

Over the past decade, several vendors have successfully offered configurable off-the-shelf software that functions as a tool for building enterprise IS-s, known as ERP system [4]. ERP systems do central work of running, tracking and reporting on business data processing. Even when data is efficiently captured and stored in ERP systems, it may remain relatively useless for reporting and decision making purposes. [5]. The ERP systems are mainly focused on transactions and insufficient for VE requirements. Despite of ERP systems popularity, the failure rate of the ERP implementation still remains high [6]. The majority of the ERP implementations made in SME's fail to deliver the expected results [7]. In PRODNET project it was proposed to use internal module and cooperation layer in order to achieve the software interoperability [8]. Moreover the important critical failure factors are poor

top management support, ERP software misfit, poor knowledge transfer, poor IT infrastructure and unclear conception for the use of ERP system from the users' perspective [9]. Finally, it can be seen that the major problems which occur in the ERP projects is due to not considering the non-technical aspects like people [10].

2.3 Collaborative Networks and Virtual Enterprises.

Collaboration starts with a shared objective. In a collaborative process, participants need to assume certain roles and responsibilities; they share information, take sequence of actions to accomplish the same goal [11]. (Highly) customized According to Stephan Alter, setting-up a collaborative network requires integration of partners on five subsequent levels, see Fig 1. [12].

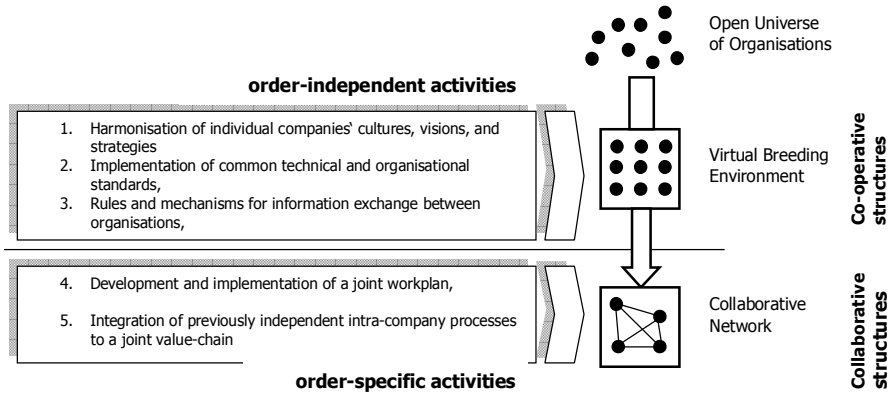

Fig. 1. Five steps in implementing collaborative networks [12]

2.4 Enterprise Architecture Management

In today's business environment organizations move towards business process oriented architectures like defined with the three-tier architecture of business process excellence [13].

When a business Process is executed by a VE parts of the decomposition of this Business Process (BP) are assigned to different enterprises, becoming a distributed business process (DBP). Several languages and formalisms have been used for BP modeling. Examples are IDEF3, MANIFOLD, UML, PIF and workflow definition languages [14]. In production area problems can appear in any of the basic elements. [15]. Still, there is a lack of adequate concepts and tools for ensuring effectiveness of integrating potential partners in collaborative networks. To improve the manufacturing activities (quality, cost, time) is necessary to find the sources of enterprise problems.

3 Framework for Collaborative Business Process Implementation

3.1 Importance of ISO Implementation for Virtual Enterprise and CN

In case of the collaborative networks faith and integrity between partners has overcome the need of quality standards. However, organizations that are collaborative network partners, have obligation to measure or control the quality of the other organization's processes [16]. ISO 9001 QMS will provide the environment for a network partners who tries to integrate their core competences of their processes for a specific period of time in order to fulfill the customer's requirements in the best possible way. Also, by combining the core competences of all the organizational members in the collaborative network, a value chain can be created where customer requirements will act as a link between core competences of each of the organizational member in the CN.

3.2 Framework for Inter-organizational Business Processes

Developed framework for business process integration is adapted to the requirements of Virtual Collaborative Network of Enterprises. It is suggested to start from the analysis of inter-organizational business processes, prior to implementation of IS and possible process modeling solution is outlined in the current paper, see Fig. 2.

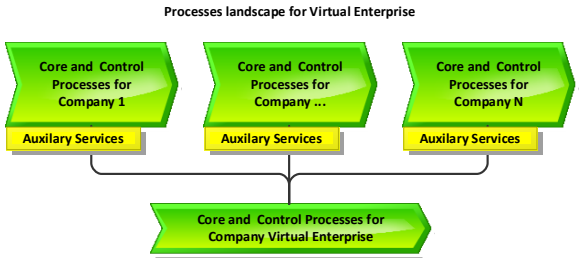

Fig. 2. Framework for the business processes integration within Virtual Enterprise

The prerequisite is that both the customer and vendor enterprise processes are described accordingly to the ISO 9001 recommendations, because it will guarantee the discipline, control of repeatability, traceability and conforms to the product quality. We suggest using the Event-Driven Process Chain (EPC) methodology for description of business processes and ARIS Express 2.3 software for this purpose. The partners in the CN share their core processes and selected supporting processes.

When the processes of partner enterprises are described, the structure of collaborative business process will be described in the same way. The following steps are to be performed prior to the successful implementation of collaboration, see Fig 3.

1. The business processes of the customer enterprise are described as the sequence of events and activities based on ISO 9001 standard.

2. The business processes of the vendor enterprise are described based on the same standard as in the customer enterprise.
3. The audit of vendor enterprise business processes is performed by customer followed by recommendations of what should be improved before the cooperation.
4. The collaborative business process is described. During this process the inputs and outputs of collaborative process are clarified, which is used as input for the integration of enterprises.
5. The plan for the collaboration establishment is developed. During this step the list of activities to be performed prior to establishment of the cooperation is created.
6. The required changes are implemented in the IS of customer and vendor enterprise.

Fig. 3. Six steps of successful implementation of collaboration.

3.3 Framework for the Forming of Virtual Enterprise

Virtual Enterprise (VE) is usually formed based on existing requirements. In current paper we developed different topologies of VE see Fig.4. In First Use Case the VE is formed between the Customers and Collaborative Network which include Manuf.1 and 2 partners; In second Use Case the VE is formed between the Manufactures and Collaborative network which include Customer 1 and 2; In third Use Case the VE is formed between the Customers 1 and 2, Manuf. 2 and CN which include Manuf.1.

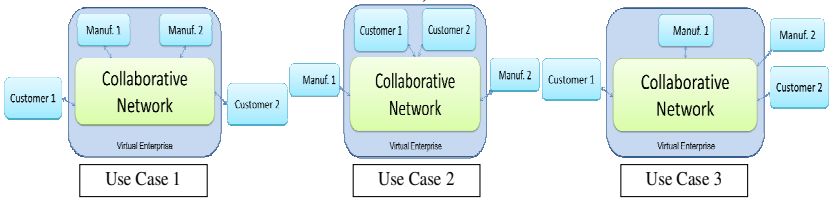

Fig. 4. Virtual Enterprise forming Use Cases

3.4 Data Exchange

After the data required for the collaboration is known it is analyzed from which informational sources it could be received. One way to exchange data is import-export through Microsoft Excel or point to point integration see Fig 5.

Next option is CN solution when both customers and manufacturers have their own ERP systems. In order to exchange and transform the data the mapping of data within existing functionality of ERP system is done. Usually no changes are required from the customer side in this case. Most of the today's ERP can share data through Web Services. With proper authentication and authorization, external systems like Collaborative Network, can read and write data on pages and call code units as XML

Web services. If the ERP system is not implemented the analysis will heal to agree on priorities of modules implementation. Last option is to use the Web module to provide the EPR system service for the CN participant enterprise [17].

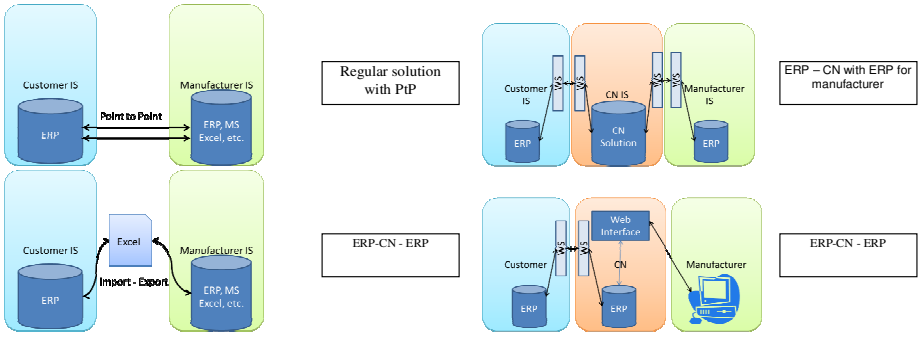

Fig. 5. Integration of Customer and Vendor business

4 Case Study APL Production-Densel Baltic OÜ

In current case study we consider how EA management based framework can be used for the integration of business processes of collaborative partners, see Fig 6.

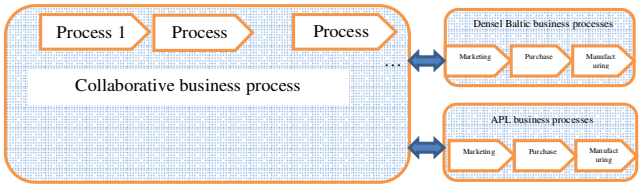

Fig. 6. Integration of Customer and Vendor business processes

In order to prepare for collaborative solution implementation the Marketing, Purchase and Manufacturing business processes of Densel Baltic and APL are described in ARIS express based on ISO 9001 standard. The major activities of marketing process are discussion and order confirmation. The confirmation of order in marketing process is recorded in the web of collaborative network. The next process 'purchasing' is initiated; the main activities of this process are placing purchase order and receiving it in to the warehouse. The quality of the goods received in this process is ensured by the collaborative partner. This is seen as advantage of collaborative network, where it is easier to find the trusted partner.

Finally, the manufacturing process is initiated by the last activity of purchase when it is updated in the web of collaborative network. Main activities of this process includes, getting drawings from web of CN, planning the production and execution. The execution process is updated on the web of CN. Hence, it is easier for the customer to check the status of the order.

The next step on the way to collaboration is to design the future CN system. In designed CN web environment we are going to use the basic ERP functionality for small manufacturers that enables the integration of several web based applications for production management.

In current case study it is considered that the customer APL has a signed agreement with manufacturer Densel Baltic, which includes the fixed price list. Before the order is placed the customer has the possibility to check the availability of resources directly from collaborative network, see Fig 7. Collaborative network will discover if manufacturing resources are available directly from the production planning system of Densel Baltic. When customer receives this information he will place the order, which is forwarded to Manufacturer. Here we have also additional possibility for the credit check. If the answer is positive the order is forwarded directly to production planning operation, if not the corresponding answer will be received by customer.

Current solution will enhance the collaborative work and it will be also possible easily to add more customers and manufactures in future.

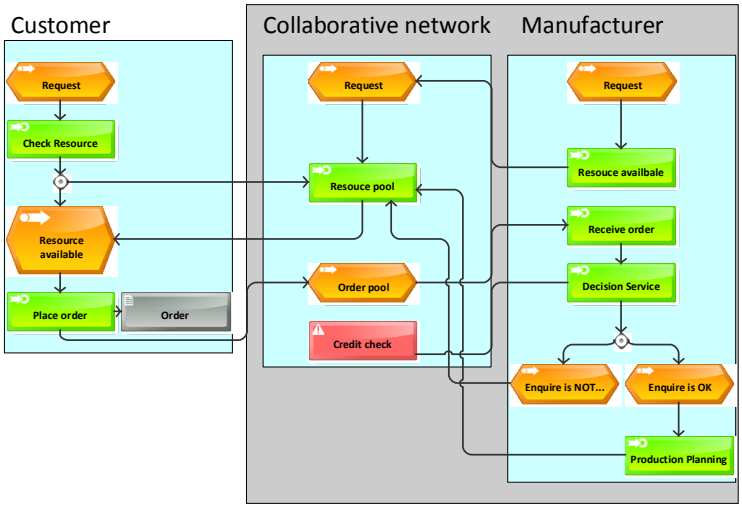

Fig. 7. The integration of collaborative network business processes with manufacturer and customer.

5 Conclusion

Developed framework for business process implementation is adapted to the requirements of Virtual Collaborative Network of Enterprises. It is suggested to start from the analysis of inter-organizational business processes, prior to implementation of IS which is followed by collaborative business process development. Consensus within the project team has to be established while deciding what should and should not be included in process documentation. Finally, project team has to be realistic in deciding resource implication and training activities for staff.

After the collaborative business process is described the framework suggests using the existing legacy software for communication. The data exchange can be done from Web Server of main enterprise or the Web Server of subcontractor can be used instead. This research paper is intended for use by partner enterprises that are looking forward to enhancement of collaborative business processes.

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