

IMPLEMENTATION OF COLLABORATION MODEL WITHIN SME'S

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World globalization affects customers and push toward rapid products replacement. Companies compete to get their product on the market first. Continual reduction of product life cycle and product development time results in perpetual change of processes. This puts on engineering activities (design, production, logistics, etc.) enormous pressure to be performed with higher quality and in shorter time. Within this paper is presented the work on research project "Research and Implementation of the Virtual Enterprise Model - RIVEM" which deals with co-operation among SME's. Its aim is to implement collaboration tools within companies to be able perform electronically activities connected with product development and production to cooperate with other participating partners. Inside this research project cooperate geographically distributed manufacturing companies. Although the own paradigm of Virtual Enterprise is exploited on sufficient level, the technical and technological solutions which allows companies to work in qualitative new environment, only start to be implemented in the SME's. Groundwork of this project is focused on homogenous and holistic solution for operation the virtual enterprise.

1. INTRODUCTION

Nowadays the environment where companies compete is under significant change. Setting processes within small and medium enterprises (SME's) to sustain competitiveness is being crucial for facing new challenges. Companies have to deal with more exacting requirements within more complex projects. It is difficult to handle the cooperation and coordination among geographically distributed partners, and what is more this becomes order of the day.

Continual time reduction of product life cycle and product development results in perpetual change of processes. This puts on engineering activities (design, planning, production, logistics, etc.) enormous pressure that have to be performed with higher quality and in shorter time. These increasing pressures are driving organizations to work in ways that overlap the traditional approach.

2. VIRTUAL ENTERPRISES

2.1 Concepts of Virtual Enterprise

The virtual enterprise can be understood as an organization structure unit, a strategy of the company to handle constant scenario or a way to manage processes in single company or among all cooperating companies.

A large number of research publications focus on the benefits brought by virtual enterprises (VE)/ virtual organizations (VO). The idea of highly dynamic organizations forms according to the needs and opportunities of the market, as well as remaining operational as long as these opportunities persist (Camarinha-Matos, L. M., Afsarmanesh, H., 2003).

Enterprise interconnection allows companies to share resources. Cooperation of companies enables to accomplish more complex projects.

Contributing entities are added to the network when they can add value and are disengaged as their competencies as long as they are no longer required. This poses a specific set of requirements on the capabilities and resources of organizations that take part or want to take part in a virtual organization (Saabeel, W. et al., 2002).

The main contributions of the VE paradigm:

- Growing complexity of projects
- Shortening of product life cycle
- Increasing the productivity
- Flexibility and agility
- Cost reduction
- Sharing resources (knowledge, information ...)

The concept of VE is supported by the newest Information and Communication Technology (ICT) and enables enterprise to cope with processes exacting cooperation and engineering issues.

2.2 Collaboration in Virtual Enterprise

It is usual that between development centers and production facilities are quite big distances. The development of complex product brings together large number different mutually independent companies Figure 1. This creation of efficient cooperation entities leads to intricate organizational unit.

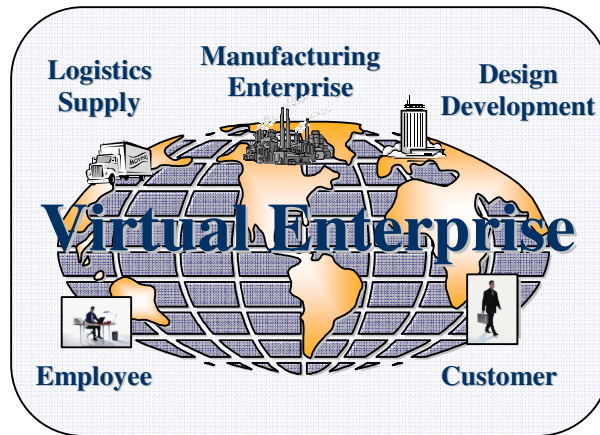


Figure 1 - Virtual Enterprise – cooperating enterprises

Research publications concerning the VE collaboration address the general processes that have to be done (set up and break up). The area of implementation research of specific process operation to the VE environment is rare. However, this appears as the limiting factor in real enterprise operation as well.

The implementation and configuration of a supporting ICT infrastructure requires considerable engineering effort. This is still an obstacle to dynamic VE's (Hannus, M. et al, 2004).

During the product design and its production it is necessary to handle large number of processes. To deal with this, it is necessary to bring the final solution, which consists of combination of many independent support tools. Therefore, the interconnections are inevitable among supporting systems. This leads to continual work process with respect to design, development, testing and production.

From this viewpoint can be differentiated support tools for engineering activities as followed:

- CAx systems (CAD, CAM, CAQ, CAE, ...)
- PLx systems (PDM, ERP, CRM, SCM, ...)

The next category could comprise of collaboration tools. But in this could arise a polemic if this should be not included in the PLx systems category. The set of collaboration tools:

- Communication systems (MSN Messenger, Sametime, NetMeeting, Skype, ICQ, ...)
- CAD viewers (DWG Viewer, Autodesk DWF Viewer, SolidWorks 2005 Viewer, VoloView Express, WHIP, PS-Exchange, Bentley View, DWF Composer, eDrawings)
- Design Collaboration Modules (ProE –PTC, Catia V5 - Dessault Systems) with communication backbone (Groove, Netmeeting)
- Project management tools (MainsGate, Flypaper Enterprise Collaboration Platform, TeamSpace, eRoom Collaboration, Groove Workspace, PH Projekt, TUTOS, TeamCrossing, IBM LOTUS Team Workspace, IBM Lotus Quickplace, eProject, ePeople)

3 PRODUCTION ENVIRONMENT IN SME'S

Impact of the virtual enterprise paradigm, its relatively open and easily reconfigurable structure, affects the way of work. In general, companies focus on their core competencies and the missing elements are outsourced. The companies define the specifications and submit them to potential suppliers. In this point appears that the key factor for SME's is the ability to prepare detailed project proposals in a very short time. This becomes a barrier in context of project proposal complexity. Handling of this important issue and to place the order, relies on the processes within the company.

During the preparation period, from the order acceptance to the final proposal presentation, is maintained the majority of groundwork procedures needed for the real production process. But in fact the manufacturing company haven't had signed the contract and the whole proposal was made without any assurance that the order will be approved by customer Figure 2.

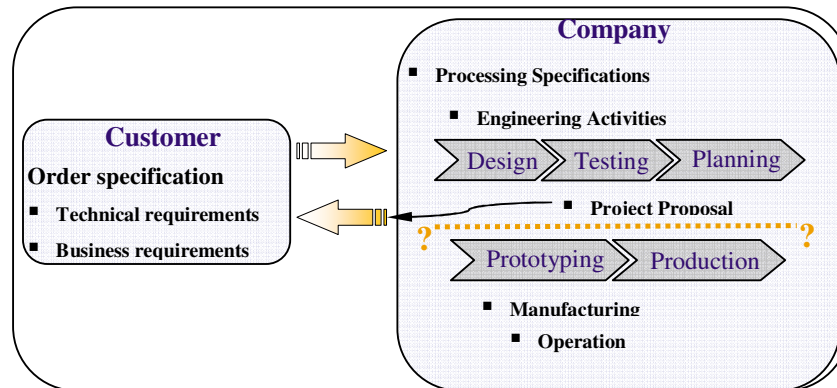


Figure 2 - Procedure of project proposal and ongoing production

From the company point of view appear two approaches for the collaboration. Firstly, collaboration process is between the customer and company. Secondly, the next collaboration process could be focused on collaboration among teams within the single company. In fact it is going here about almost the same processes; if it is not taken on account the different software equipment in companies.

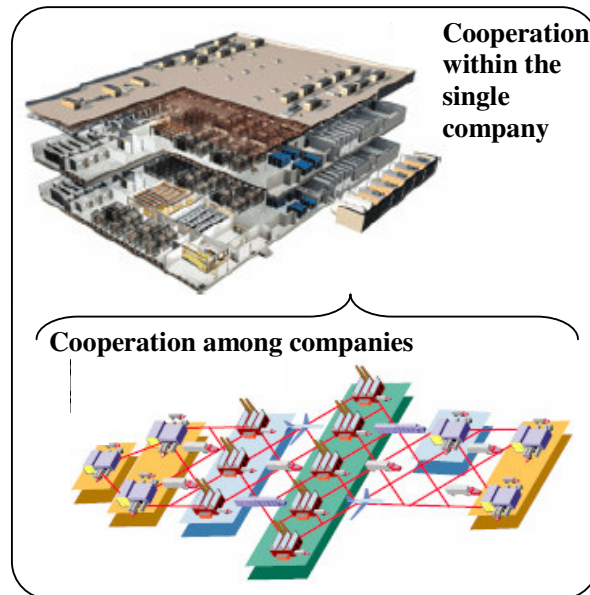


Figure 3 - Cooperation in a single and among manufacturing companies

Processes provided within single company, have to be operated also in terms of enterprise collaboration.

The development and operations of Extended Manufacturing Enterprises often suffer from insufficient co-operation within the manufacturing company (Higgins, P. et al, 2005). This pushes companies to standardize their processes, which are already partly enforced by big companies during the supplier selection.

In the past, the implementation of team collaboration tools was mainly oriented to designing teams. This implementation leaked also to the manufacturing area, where the designed part comes to real environment. Assembly, its process stability as the final points verified the whole design. An the need of modification have to be operated with assistance of process engineers.

It is the reason why engineers call for efficient collaboration tools not only in product development but also in production areas. For them, it is essential to work together and to bring the concept to real a product (Šišlák, J. and Valčuha, Š., 2005).

Within a complex project as a car surely is, may appear problems during the assembly of series prototype with component supply of different suppliers. Here the problem emerges because of different design versions. At the end during the assembly of series prototype are different versions of components assembled. Therefore, next very necessary requirement is to implement project collaboration tools. It should be considered the collaboration at lowest levels of company structure as well.

4 RESEARCH FOCUS

The research project “Research and Implementation of the Virtual Enterprise Model - RIVEM” deals with co-operation among SME’s. Its aim is to implement collaboration tools within companies to be able perform electronically activities connected with product development and production to cooperate with other participating partners.

Inside this research project cooperate geographically distributed manufacturing companies. Although the own paradigm of Virtual Enterprise is exploited on sufficient level, the technical and technological solutions which allows companies to work in qualitative new environment, only start to be implemented in the SME’s.

Groundwork of this project is focused on homogenous and holistic solution for operation the virtual enterprise.

Within this project was created preliminary model of Information system and model of project collaboration.

5 COLLABORATION MODEL

The very first step of implementation process of the collaboration model was the intimate analyze of conditions in manufacturing companies. Introduction of VE paradigm for companies brought overview which resulted to specification the expectation of companies. As well were analyzed tools to integrate the virtual and physical work of companies. From this analyze was concluded the cooperation structure Figure 4. The role of central coordinator is playing Dept. of Manufacturing Systems.

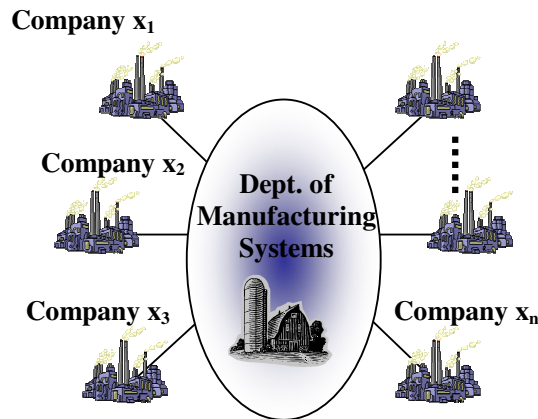


Figure 4 - Structure of cooperation model

During the collaboration with Slovak companies was examined that the internal collaboration activities within the company have big gaps. Therefore, the research project is firstly focused on the internal processes which results can be exploited also in the outward processes.

The collaboration model of the project considers data sharing and processing with respect to the exploitation of manufacturing potential (human resources, machines, tools, fixtures...). It takes on account as well tools that involve support for communication and online product consultations in native design environment.

The preliminary model consists of tools focused on collaboration support:

- Communication system - MSN Messenger
- CAD viewer - eDrawings
- Design Collaboration Module of Catia V5 with communication backbone Netmeeting
- Project management tool (not specified yet)

This model is a starting point for future enlargement. In present time is the work orientated toward the information system and project collaboration.

6 DISCUSSION

Recent way of cooperation puts high demands on social factor in system. This includes communication, coordination, sharing information and applications among geographically distributed partners. Technical requirements which arise together with collaboration strategy of VE consist especially in new processes operation.

There is however the need for a more holistic understanding of the area, namely in terms of the emerging collaborative teams, and the optimization of the support infrastructure and tools. It is also important to reach harmonization of models and approaches in order to achieve inter-operability.

During online product consultations engineers call for support that involves effective communication. The video conferences together with prepared presentations do not offer possibility to discuss effectively detailed technical issues (design modifications and associated simulations...) (Somora, et al., 2005). From this point of view prepared presentations create boundaries due to of ad hoc solutions.

These increasing pressures are driving engineers to work in ways that challenge traditional information and collaboration systems.

7 CONCLUSION

Even though the systems for VE support are partly implemented in companies their mutual cooperation is lacking. Therefore, it is the need for an integrated approach leading to truly joint of work of different areas.

It is important to mention also the legal and trust issues which appear as a hold back factor. These issues arise together with setting up the partner cooperation.

8 ACKNOWLEDGMENTS

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