WORKSHOP

Success Factors for Virtual and Intercultural Project Work

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Abstract

Current trends like the increasing globalisation, the need for shorter product development times or the growing number of product variants lead more and more to new and more flexible forms of engineering collaboration in automotive, engineering and similar industrial sectors. The emerging forms of collaboration are characterized by an increasing cooperation across organisational, company and cultural borders as well as by an increasing level of virtuality and distribution (-> Cross Enterprise Engineering). This kind of "new" collaborative project work requires different thinking and new approaches – not only from technical but also from an organisational and human centred perspective.

After a definition and classification of what is meant with cross-border and virtual project work (e.g. "Cross Enterprise Engineering") and short introduction presentations to highlight current research projects especially in the organizational (e.g. collaborative project management, trust-based intercultural collaboration and a work-psychological framework for analysis of collaborative processes) as well as in the human resource area (e.g. competencies for project leaders of cross enterprise projects) the authors would like to discuss the different approaches and would like to develop a road map for future research activities together with the audience. The workshop addresses itself to all people that are involved or interested in virtual or distributed project work – scientists and practitioner.

Keywords

Cross Enterprise Engineering, Cross Border Collaboration, intercultural cooperation, virtual teamwork, human factors, competencies, trust, collaborative project management

1 Introduction and state of the art regarding cross-border collaboration in engineering

Current trends like the increasing globalisation, the need for shorter product development times or the growing number of product variants and growing cost pressure lead more and more to new and more flexible forms of engineering collaboration e.g. across organisational borders, more and more distributed, parallel and international, e.g. in form of supplier cooperations or OEM – supplier cooperations.

In the automotive industry as well as in connected areas like machine-building or electronic systems engineering new product development increasingly takes place in cross-border collaborations. Phenomena such as "strategic alliances" – the collaborative development of a hybrid car between General Motors, DaimlerChrysler AG and BMW AG is one impressive example in this context – "joint ventures", "supplier networks" or "offshoring" activities characterize ongoing tendencies. In the scientific literature case studies and empirical analysis show, that these new forms of cross-border collaborations contain specific challenges. In this context an European Manufacturing Survey (Dachs et. al., 2006) showed that "varying from country to country, every second to sixth offshoring company is countered by a backsourcing company" (Dachs et.al., 2006, p. 14). Evidently, development projects currently face a higher complexity based on at least the following factors (see Kealey et al. 2005)

- Cross-company integration: increasingly, in new product development partners outside the original equipment manufacturer (OEM) are integrated. In this context two different forms of partner integration exist: The

integration of Suppliers into the development process of one OEM and the collaboration between competitors in cross-company alliances.

- Cross-cultural and cross-functional collaboration: Increasingly, development projects have to integrate partners with different cultural as well as different professional background. Not only do the national cultures differ, new development projects often have to deal with different organizational cultures. Therefore the project management has to cope with different types of cultural differences.
- Effects of distance: Increasingly new development projects are organized via "virtual" or "global" teams. Difficulties of communication between personnel working in the field and headquarters manager are often reported (e.g. Kealey et. al, 2005).

Especially for the engineering area this kind of new cooperation can also be referred to as "Cross Enterprise Engineering" (Champy 2002) which can be defined as the totality of all engineering activities along the complete product lifecycle across organisational and companies frontiers. It needs to be strongly supported by fitting organisational structures and information technology.

In this approach collaboration takes place more and more virtually or distributed (-> Virtual Collaboration). Employees are based at different locations within one company or across different companies – often embedded in a global project structure. Communication (which includes all aspects of communication: verbal communication and technical communication) between employees can be splitted into at least three different levels:

– cross location: employees at different locations communicate with each other
– cross domain: employees of different disciplines (e.g. mechanics, electronics, software, pneumatic) communicate with each other
– cross process: employees of different process phases communicate with each other (-> design for X) (Eigner, Schleidt 2006).

Unfortunately, the available statistics on the actual success and failure rates of international projects are not very clear or consistent. In a recent literature review Kealey et. al. refer to data due to International Joint Ventures captured in the 1980s and 1990s. Failure rates were put at 50% and higher (Kealey et. al., 2005, p. 292). The authors conclude that the available statistics on the success rates of international projects "do testify to their greater difficulty".

This international review is valid as well for the situation in the German automotive industry. Wagner (2004) in behalf of the German association of Project Management (GPM) conducted a study "Cross Company Collaboration Management (C3PM). Major German OEMs and their suppliers were involved in the study based on qualitative interviews with project managers and project workers. The study identified current challenges regarding the collaboration between OEMs and Suppliers. One major deficit turned out to be the "cultural environment for cross-border projects" as well as the "competencies and skills" of workers and managers in cross-enterprise projects. Disillusioning are especially the lack of trust between the Producer and their suppliers due to the asynchrony in the power relation of the partners. Lacking skills to establish communication networks as well as to implement reciprocal mutual understanding turned out to be major challenges on the side of the personal competencies.

In summary, the current situation can be characterized by two divergent arguments: On the one hand cross-border collaboration such as cross enterprise engineering and international project work is of increasing importance not only for the automotive industry and on the other hand experiences show dramatic challenges due to individual competencies as well as due to organizational processes. Reciprocally the identified challenges provide fields for action. For instance, the C3PM study came out with four major recommendations (Wagner 2004):

- Stronger consideration of social competencies (e.g. communication, openness, mutual understanding, social cohesiveness)
- Enable more opportunities to establish and nurture informal communication and cooperation networks (e.g. increase trust by informal meetings)
- Provide platform for common understanding by "common experiencing" (e.g. collaborative project management with a focus to partnership)

On a more abstract level room for improvement can be classified in the following 3 dimensions or levels (see Kealey et al., 2005, p. 308):

- At the individual/interpersonal level (e.g. cross-cultural skills and knowledge, specialized management and interpersonal skills like negotiation and teamwork)
- At the organizational level (clear and shared project goals, collaborative project management between the partners, informal communication networks, framework for cooperation in unexpected and critical situati-

ons or process standards with flexibility due to culture-specific procedures (Steinbrink et. al., 2006))
- At the environmental and technological level (consideration of different environmental conditions due to cultural differences, local networks, community involvement, technical matters like infrastructure for computer supported cooperative work)

In the next sections the first two of these dimensions for improvement will be discussed in more detail. The third dimension refers more to the topic of "virtual and global teams" and is – at this stage of the discussion – of minor interest. For an overview see Saphiro, Furst, Spreitzer & Glinow, 2002.

2 Competency management – an integrated approach for improvement at the individual/interpersonal level

In this section an approach for improvement on the individual/interpersonal level will be described. The concept of competencies is among others a modern and useful way to better understand and influence human behaviour in a working context. A current research project at the Technical University of Kaiserslautern works on an integrated approach regarding Competency Management for people working under the conditions of Cross Enterprise Engineering. The approach bases on the so called person-environment psychology that states the better persons fit to their environment the better they perform (-> Person Environment Congruence). This idea builds the fundament to design measures for both

1. the environment (which will be called the Cross Enterprise Engineering Index)
2. the individual level (which is the mentioned competency model that we will focus on in this article)

and to match the measurement results, analyse correlations and draw conclusions for improvements.

In a recent interview study in the automotive area relevant competencies for people working under Cross Enterprise Engineering conditions were identified.

One of the key competencies which was mostly mentioned is the ability to communicate. The second important competency is professional knowledge. Other competencies mentioned by the interviewees were "to interact with others", decision making and being able to flexible and fast being integrated into a team (which is related to team competency), understanding of different cultures, analytical thinking, objective orientation and project management skills. In addition trust builds the basis for successful distributed cooperation.

The high meaning of communication skills fits very good to the rest of the results: in all interviews quality of communication was a discussion point and identified as source for conflicts, redundancies and misunderstandings. Communication seems to be the foundation of a team and the basis for accomplishing all necessary tasks.

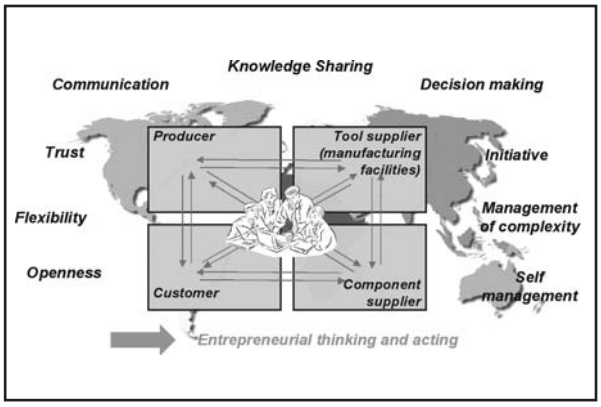

Figure 1: Competencies for Cross Enterprise Engineering (answers to open questions)

Based on a set of competencies which Erpenbeck and Heyse published in 1999 another task of the interviewees was to judge the relevance of different given competencies related to efficient team work in Cross Enterprise Engineering.

The following table shows the different groups of competencies.

Professional competencies:

General know how, professional know how, organisational abilities, economic know how (BWL knowledge), IT know how, marktet Know How, language skills, entrepreneurial thinking and acting

Social competencies:

Team ability, empathy, communication, cooperation, conflict solving, partner centric interaction, consens, understanding others

Methodical competencies:

Analytical thinking, conceptual abilities, structural thinking, to see connections and interpedendencies, holistic thinking, feeling for future trends, creativity and innovation

Personal competencies:

Self development, self reflection, performance, learning, openness, risk taking, capacity, credibility, emotionality, flexibility

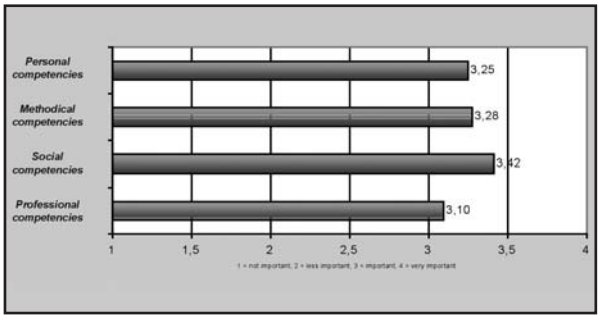

Figure 2: Importance of groups of competencies in Cross Enterprise Engineering

The results of this study will flow into the main study.
Competency models in general can be used for hiring new employees or project members as well as for developing existing employees. They just make sense if they are embedded in the organisations people development plan and if they are aligned with the organisations strategy, goals and structures.
The integrated approach for Competency Management can be shortly described as follows:
After an analysis of requirements for every function within the organisation a set of competencies and behaviour anchors per function should be defined. On the individual level the employee and his manager should identify areas for improvement – based on the specific competency profile for the position. On the interpersonal level competency models can be used as basis for team interventions like team workshops.
To improve competencies the traditional human resource development offeres a wide toolbox, e.g. seminars, web based trainings, coaching or mentoring. There are at least two main success factors to be mentioned:

1. to really understand the development needs of an employee
2. to find the best fitting intervention to help the person to improve

3 Approaches for improvement at the organisational level

In the following sections two concepts to improve the collaboration within intercultural and cross-enterprise development projects will be presented. First of all, a method and toolbox, called "Collaborative Project Management" is described. Afterwards, a framework for the analysis of cooperative processes is provided

4 Collaboration project management (CPM) – a method and toolbox for cross-border collaboration

The CPM method focuses on project management (PM) across companies. The method describes the project management tasks within the product development process (PDP) in the automotive industry that extend across the borders of partner enterprises.
The CPM method is a result of the ProSTEP iViP project group CPM and is specified within a ProSTEP iViP Recommendation (PSI 1) (ProSTEP iViP. 2006).
The recommendation covers the processes, roles, methods, information, language and culture in collaboration projects. It explicitly excludes project management within the enterprises involved. The recommendation is published in two parts. Part 1 contains the reference model and Part 2 contains the data model for exchanging project data. The diagram below illustrates the scope of the recommendation:

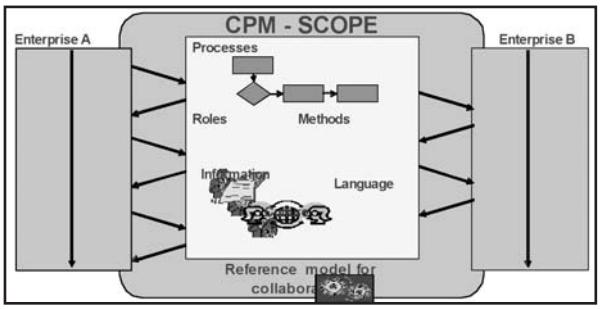

Figure 3: Reference model for CPM

Throughout the value creation chain in the development of automotive products, activities are constantly being undertaken to decrease the development time and increase the quality of the project and the product. Simultaneous engineering and collaboration with partners are the methods of choice to fulfill these requirements. There is still considerable room for improvement within the project management profession, especially with respect to the management of projects across partner enterprises and the harmonization of project culture.
The task of engineers during the product development process is changing from the design of a product and the design of respective production tools to the management of complex implementation strategies. The exchange of product data and project management data is crucial to meet these new challenges. Standards such as ISO 10303 –214 and the PDM schema already exist for ex-

changing product data in the automotive sector. Methods for managing projects have been defined in the companies and have also been broadly standardized at a high level with initiatives such as like PMBoK®, VDA 4.3, DIN 69900 ff, APQP, etc. But no committee or standard has addressed the issue of exchanging project data in the automotive industry until the ProSTEP iViP project group CPM was established. Collaborative Project Management (CPM) is the solution for handling complex development partnerships.

The ProSTEP iViP Recommendation is aimed at business management and people bearing responsibility for project management. People in charge of product management, process management and information technologies are also encouraged to make use of this document. During the initial preparatory phase, the team defined the terms of reference as follows: "Optimization of project management across partner enterprises in the product development process of the automotive industry, focusing on the areas of time, activity and communication management."

The most common standard used for project management in the automotive industry was taken to form the basis for the activities. The PMI Standard, documented in the PMBoK (A guide to project management – Body of Knowledge) and VDA 4 Part 3 (Quality assurance prior to series deployment / Part 3: Project planning) form the basis for this Recommendation. Other standards such as APQP, AIAG (Automotive Project Management Gudie) or DIN 69900 ff were also taken into consideration.

The Recommendation relates to a relationship between two partners. In practice, network structures will be found. However, since project management demands that each interface between different companies must be the subject of an agreement, it is recommended that the current Recommendation is employed at each of these interfaces. The resulting joint procedural model allows the current level of outlay for complex and time-consuming harmonization to be reduced considerably and also permits the effectiveness of the agreements to be significantly improved.

5 Framework for the analysis of collaborative processes

In the following section a conceptual framework for the analysis of collaborative processes from the point of view of work and organizational psychology (see Wehner, Clases & Bachmann, 2000)[1] is presented. In the discussion we will successively introduce concepts that highlight various modes of joint activity and introduce structural differences between cooperation, coordination, and co-construction as three basic modes of joint activity. These different modes of joint activity will then be integrated into our conceptual framework. In the analytical framework the coordinatedness of actors represents a conceptual link between the analysis of cooperation on the action level, and its preconditions and consequences in relation to organizational regulations that structure joint activity.

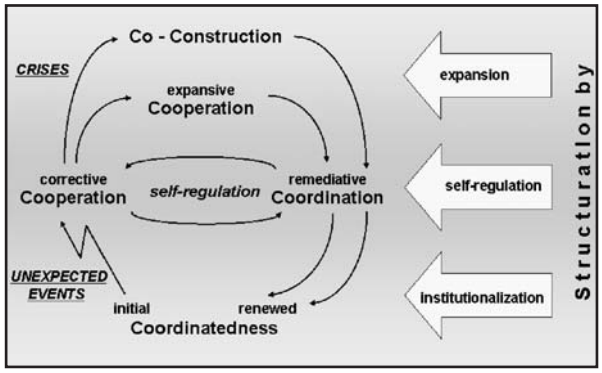

Figure 4: Work psychological framework for the analysis of collaboration

Due to the division of labor, the interrelated differentiation of organizational roles and the high degree of diversification of tasks, inter-organizational relations may be characterized by specific practices of coordinating boundary-crossing activities. This is what we call the (initial) coordinatedness within and between workplaces, departments, and organizations (see figure 4). Our model predicts that - based on the initial coordinatedness of actors - unexpected events launch the interplay of cooperation and coordination at work. These unexpected events result from the fact that the planned division of labor in work and the anticipated patterns of interaction as, e.g., formulated at a managerial level are necessarily vague and underdetermined compared to the concrete work processes. A (necessary) mismatch may be observed in practice between formal demands and practical realization of work tasks. Unexpected events have to be dealt with in various situations: unanticipated decreases in product quality, fluctuations in project team members, etc., reveal the abstractions of formal regulations with respect to unique cases which trigger cooperation. We talk about corrective

[1] The following presentation of the conceptual framework follows in general the ideas formulated in the basic contribution by Wehner, Clases & Bachmann (2000).

cooperation if – in the course of coping with events that deviate from the expected flow of activities – the coordinatedness structuring the joint activity is not questioned. The common object of work – the problem that has to be solved – remains at the focus of attention. Corrective cooperation leads to additional efforts as actors simultaneously strive to maintain the ongoing production process.
Coordination may be characterized by the use of routines and well-known patterns of interaction based on a certain coordinatedness of actors. The benefit of coordination result from its functionality in reducing the complexity of everyday project life and through the fact that the actors are freed from the need to constantly debate and reflect on the basic rules and patterns of joint activity. In the mode of coordination, joint activity is stabilized and guided by implicit mutual understanding which develops in everyday practice over time. In this respect coordination is a mode which provides a relief from the strain to repeatedly negotiate the ways in which common tasks should be performed.
In our conceptual approach we emphasize expansive cooperation as a specific form of joint activity between firms. The main point of expansive cooperation is that the structural aspects of joint activity – i.e. the initial coordinatedness – are explicitly questioned and reflected upon. Expansive cooperation may, for example, become obvious in a search for new partners and for the explicit search for new forms of organizing and structuring joint activities. While the triggering factors for corrective cooperation may be identified in various deviations from the expected developments in practice, we found in our empirical research that stages of expansive cooperation were often motivated by a crisis in joint activity. While the objective of corrective cooperation is primarily the immediate solution of an actual problem, in co-construction an attempt is made to generate organizational solutions that transcend single cases. Co-construction, as a specific form of expansive cooperation, differs in its underlying structure from coordination and cooperation because the focus of attention now lies in the common redefinition of roles, work objectives, and patterns of interaction. Not only may the different points of view on common work objects and tasks be exchanged, but so may the rituals of everyday life, its formal procedures and its often unwritten rules. The objective is to change the patterns of the initial coordinatedness. Stages of co-construction must be explicitly designed and planned. Time and space beyond the constraints of everyday working life are necessary. Relevant actors needed for the development of new ideas must be identified. Co-construction may take place in different forums as, for example, project teams and inter-organizational workshop circles. Forums of co-construction take place apart from everyday practise. Here, perspectives may be exchanged to create a new common understanding of mutual dependencies and to work out possibilities for improvements.
Scenarios worked out in co-construction may point to a future form of coordinatedness. However, they will still have to be remediated to practice. In co-construction new possibilities may only be envisioned. These possibilities must be practically generalized; a process we call remediated coordination. A successful remediation of the possibilities worked out in co-construction would result in a renewed form of coordinatedness of inter-organizational relationships. Co-construction will not always lead to improvements in the organization of joint activity between firms. Conflicts and a lack of trusting relationships – resulting e.g. from the underlying crisis or diverging interest and motivations to participate in the forum – may represent serious barriers. Forums of co-construction are always a field for micro-political activities which reflect power relations in a practical way.
Summing up the considerations put forward, the conceptual framework suggests a broader understanding of cooperation by considering that the structuration of joint activity in inter-organizational relations is realized by processes of

- institutionalization (initial and renewed coordinatedness),
- self-regulation (in corrective cooperation and coordination), and
- expansion (expansive cooperation, co-construction, remediative coordination).

6 Conclusions and workshop organization

In summary, first solution concepts at the individual level as well as at the organizational level are already available or under development. The set of competencies for employees and managers of Cross-Enterprise-Projects is going to be evaluated until the end of 2007 at the Technical University of Kaiserslautern. The method of Collaborative Project Management will be proved by realistic scenarios and demonstrators and the framework for cooperative work is already implemented in several projects. The integration of the collaboration framework is

currently on its way. At this point of conceptual work it is the right time to discuss the different approaches under review with researchers and as well with experts from the business fields. In addition it is time to develop a road map for future research. In this context and with this motivation the authors are looking forward to having interesting discussions at the workshop at the ProSTEP iViP ScienceDays 2007.

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