

# **TEAMS OF PRACTICE: INTERDEPENDENT CONDITIONS FOR INTEGRATING GROUPWARE IN COLLABORATIVE PRACTICE WITHIN VIRTUAL TEAMS**

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## **Abstract**

**In this paper we investigate collaboration within global virtual project teams. Our objective is to understand the practice of virtual teams to determine conditions needed in order to integrate groupware in such a context. The research question explored is: What are the conditions for integrating groupware technology in collaborative practice within virtual teams? Investigating this question we first develop a model explaining interdependent conditions for integrating groupware in collaborative practice (InterCon-model). We discuss our model theoretically, focusing on the negotiation of joint enterprise as the intentional practice within what we define as ‘Teams of Practice’. Finally, our model is validated in an analysis of two empirical cases involving the establishment of virtual teams as Teams of Practice in a large global transportation company.**

**Keywords:** virtual teams, distributed teams, groupware, integration, InterCon-model, interdependent conditions, teams of practice, joint enterprise, intentional and actual practice, action research, Lotus Notes

## 1. INTRODUCTION

The importance of organizational implementation, assimilation, or adoption of groupware technology to support collaboration is known and has been investigated through many studies within IS e.g. Orlikowski (1992) and Grudin (1994). Models for understanding the adoption of groupware have been proposed (e.g. Gallivan 2001), and literature studies of basic assumptions behind groupware adoption and use have been examined (e.g. Karsten 1999). Still little research has been done investigating project work conducted by geographically distributed actors (Maznefski and Chudoba 2000), which we in the following refer to as ‘virtual teams’. We define virtual teams as teams depending on mediated communication to perform the project at hand because they rarely meet. Research on organizational implementation of groupware in virtual teams has focused on the understanding of the actual adoption process (e.g. Majchrzak, Rice, Malhotra and King 2000). Yet none of the existing research has investigated the collaboration within the teams prior to the implementation process. In this paper, we investigate the collaboration within virtual project teams prior to an organizational implementation process, with the objective to understand which conditions are needed in order to successfully integrate the use of groupware technology in the collaboration among the team members.

Participants need to be engaged in activities extraneous to the activities that contribute directly to the project goal, this extra work we define as articulation work (Schmidt and Bannon 1992). When geographically distributed actors must engage in highly complex collaboration in order to accomplish the work tasks involved in the project, the motivation for integrating groupware is to reduce complexity of articulation work. We define the criteria for successful integration of groupware technology as a combination of three objectives: Attribution to meet a need (for supporting complex and problematic collaboration), integration of the technology with work practice (involving changes in both technology and work practice), and supporting the articulation work involved in the collaboration.

This paper reports on an action research project conducted in a global transportation company, investigating two virtual teams engaged in process definition and deployment of common processes for doing software development in the organization. The team members were globally distributed throughout many different countries. Both teams had access to a Lotus Notes database to support their collaboration but none was able to integrate Notes in practice. The groupware in question was Lotus Notes which is a very widespread groupware technology used in practice, as discussed by Ginsburg and Duliba (1997). The empirical approach follows the triangle of understanding, support, and improvement as presented by Mathiassen (1998; 2002). The aim of the research was to understand the actual collaborative work practice within the two teams and to use this knowledge to design an in-depth action research project facilitating support for the collaboration with groupware, as well as to facilitate the improvement through intervention with practice. However when we met ‘real-life’ practice, we experienced that certain critical pre-conditions were missing; conditions which needed to be addressed before initiating the organizational implementation of groupware. This is why the research question explored in this paper is: What are the conditions for integrating groupware technology in collaborative practice within virtual teams?

In addressing the research question, we have developed a model that describes four Interdependent Conditions for integrating groupware in collaborative practice within virtual teams (the InterCon-model). The InterCon-model is grounded in theory on Teams (Ferrán-Urdaneta 1999) and on Communities of Practices (Wenger 1998), as well as on the in-depth empirical data from the two virtual teams. The InterCon-model is related to CSCW research on computer support for collaboration (e.g. Schmidt and Bannon, 1992, and Schmidt and Simone 1996) and to IS research on integration (e.g. Majchrzak et al. 2000). The model adds to the

existing research the concept of *Teams of Practice*, as well as the four general and interdependent conditions for integrating groupware in virtual project teams.

The following is divided into four sections. First the research method and the activities conducted during the investigation are presented (2). Then the InterCon-model and the theoretical framework behind the model are developed and presented (3), with emphasis on the concept of Teams of Practice (3.1-3.2). Then there is a presentation of the empirical findings validating the InterCon-model. First, a presentation of the organization (4), followed by an analysis of two virtual teams in (4.1 and 4.2 respectively). Finally the conclusion (5) presents a discussion of the findings related to the research question.

## 2. RESEARCH METHOD

The starting point for this empirically driven study has been seven previously studies in a large distributed financial organization. These studies, comprising a number of case studies of groupware use, proved that using groupware in distributed project settings is significantly more problematic in comparison to other settings, for example teams handling recurrent tasks (Pors and Simonsen, 2003a; 2003b). These studies analysed a range of critical conditions that influence adoption and integration of groupware (Simonsen and Pors, 2003) and they provided us with the initial idea of interdependent conditions related to distributed and collaborative project settings. On this ground we conducted an exploratory study in a global transportation company (GlobalTrans) with a two-fold objective. First we wanted to understand the nature of collaboration in two virtual teams, and secondly we wanted to use this knowledge trying to overcome the difficulties when facilitating the integration process of groupware in the two teams. During the investigation we found that it was impossible to ‘design the integration process’ because critical conditions were missing in one of the teams. The conditions were analyzed in a theoretical perspective (see section 3) and presented to the organization at the end of the study.

Our research approach was a combined action research project (Mathiassen 1998, 2002) and literature study. We wanted to *understand* practice (collaboration within virtual teams) with the aim of *supporting* the practice (by means of groupware) by *intervening* with the practice (facilitating organizational implementation). The intervention however changes during the empirical study from facilitating an actual integration process to presenting issues and conditions important prior to integrating groupware support. The intervention was in form of various reflective conversations with project managers, and oral presentations to the top-management team.

In the empirical study, two teams were investigated: the One-Set-Of-Process-team (Process-team) and the Software-Configuration-Management-team (Configuration-team). The following activities formed the empirical study: one group-interview with the two project managers; two reflective interview with the project managers; participation in two top-manager meetings; two interviews and one group interview with participants from the Process- and the Configuration-team, mapping out the problems experienced with concern to collaboration (Lanzara and Mathiassen, 1985); document analysis of flash reports (a weekly report from each team member describing the work); and analysis of structure and content of the Process-team-Lotus Notes database. Besides these activities one of the authors had an office in GlobalTrans and was invited to observe 13 sessions where internal consultants from Canada reviewed the work processes within the software engineering department placed in Denmark. Being placed inside the organization the author developed a trustworthy relationship with the employees, who also in the process went by the office for different kinds of advises.

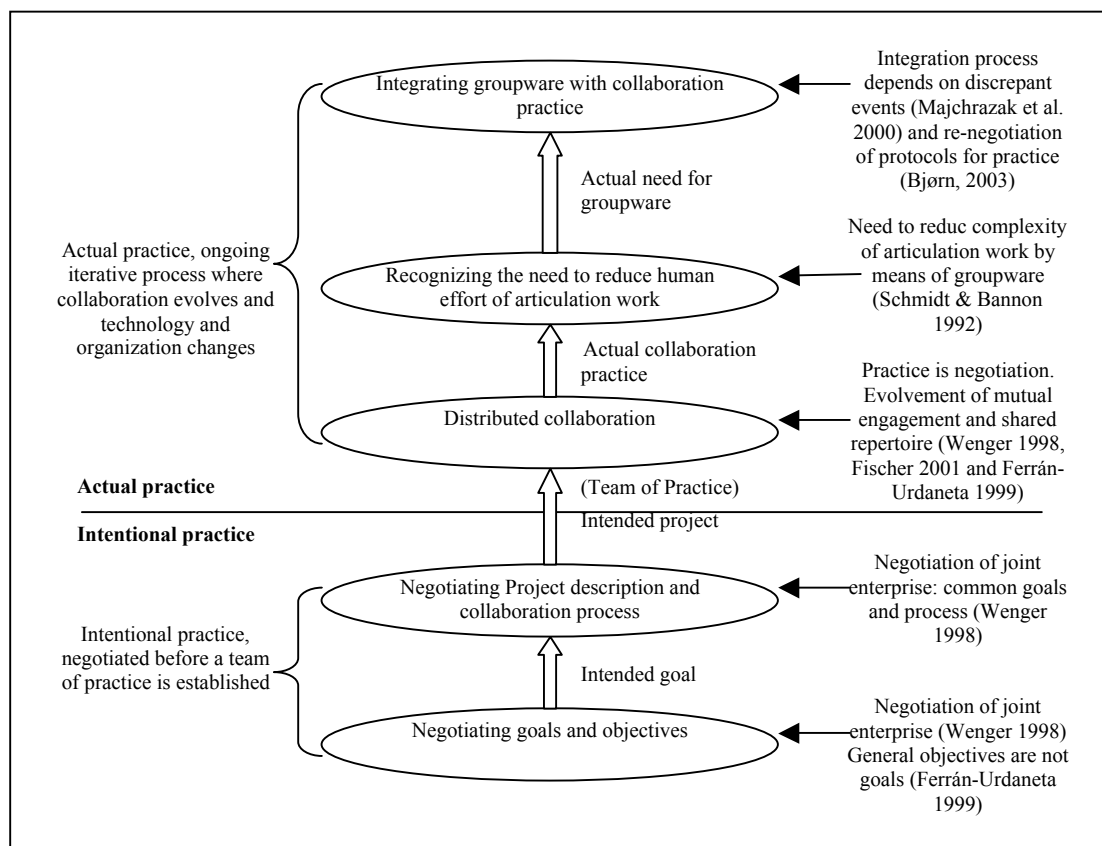
During the investigation results from the study was presented to the project managers for discussion in the reflective interviews and in informal encounters, and in the end of the study an

oral presentation of the findings was presented in a top-management meeting. In this meeting the project managers was present supporting the findings.

### 3. THEORETICAL FRAMEWORK: INTERDEPENDENT CONDITION MODEL AND TEAMS OF PRACTICE

Applying the theoretical framework to practice, we have developed the InterCon-model, integrating the framework of Teams of Practice in the integration process of groupware. The InterCon-model is both founded in empirical data and theoretical knowledge.

The InterCon-model illustrates the overall integration process of groupware technology in collaborative practice within virtual teams. There is an overall distinction in the InterCon-model between *intentional practice* and *actual practice*, where intentional practice describes activities prior to actual practice (left side of fig. 1). This distinction is generally accepted within IS-research. Suchman (1987) uses the concepts of plans and situated actions, where plans are the intended formal description of process and situated actions are the informal actions surrounding real-life collaboration. A similar distinction has also been referred to as the difference between espoused theories and actual practice (Argyris & Schön 1978). In accordance with Suchman (1987), we too investigate collaboration, arguing for the need for ‘plans’ before the ‘situated actions’.



**Fig. 1: Interdependent Conditions model (InterCon-model) for integrating groupware in the collaboration within virtual teams.**

The circles in the InterCon-model indicate the organizational implementation process from the point in time where the team is initially formed until a collaborative practice is established and supported by the use of groupware. If we start with the actual practice part of the model it consist of an ongoing iterative process that analytically can be characterized as 1) distributed collaboration between mutually dependent individuals within the team, 2) the recognition of a need to reduce articulation work and 3) integrating groupware use in the actual collaborative work practice. The *distributed collaboration* consists of activities, tasks and processes all leading to reach the common goal of the project. In the collaborative practice the team develops their collaboration, building up a common ground or shared repertoire to negotiate meaning upon (Wenger, 1998). Because we are focusing on virtual teams, they will have to mediate their distributed collaboration. Typically this is initially done by means of physical meetings, phone calls, and using email. However in their collaborative practice the team can reach a state where they experience the constrains on their collaboration efforts e.g. the recognition of the difficulties in maintaining a shared archive when only supported by email technology. In this situation the team experience a *need to reduce human efforts of articulation work* (Schmidt and Bannon, 1992). The next step is *integrating groupware with collaboration practice*. For the team this includes establishing an overview of the possibilities within collaborative technologies e.g. how to change structures and functionalities in existing available technology or how to apply new technology better suited to support the actual practice and reduce the complexity of articulation work. This could consist of applying a new Lotus Notes database to assist the use of email or it could mean changing the conceptual structures in an all ready existing Lotus Notes database. In both cases it is crucial that the team is able to analyze the collaboration practice experienced, while having knowledge of the possibilities of computer supported collaboration in general to be able to come up with changes to structures in existing technology or suggesting applying new technologies. Knowledge of how to proceed in the process have been examined in a few studies and it has been suggested that the continuously integration process depends on discrepant events (Majchrzak et al. 2000) and the importance of re-negotiating protocols for collaboration (Bjørn, 2003).

The arrows connecting the activities indicate the interdependent conditions needed in order to complete the next process with success. We propose the interdependency by arguing that in order to integrate groupware with collaboration practices in virtual teams, the team members must experience an *actual need* for using groupware, and that the technology potentially can support the *actual collaboration* within the team. Prior to establishing a collaborative practice in the team the *team* must initially be formed in order to accomplish an *intended project*. And an essential requirement needed to define a project is to clarify its purpose and *intended goal*.

Most of the concepts from the theoretical sources that support our model (right side of fig. 1) have been developed to describe co-located collaboration in non-project work. In our study we found that especially the conditions important for project teams (prior to the actual collaboration) lack elaboration. We need a theoretical framework to explain the conditions needed for groupware to support collaboration between mutually dependent individuals in virtual teams, i.e. a framework elaborating the intentional practice in figure 1. We therefore develop and use an analytical framework to investigate the negotiation of the intentional practice in project teams by developing the concept of 'Teams of Practice'.

### **3.1 Teams of Practice**

The concept of 'Teams of Practice' is inspired by the Team definition by Ferrán-Urdaneta (1999) and Communities of Practice by Wenger (1998). The concept Community of Practice presented by Lave and Wenger (1991) has been used in explaining design and software development practice within IS-research (Clases and Whener, 2002; Muller and Carey, 2002), to explain knowledge management within organizations (House et al., 1998; Sandusky, 1997), and to

explain technology acceptance and training (Gallivan, 2000). However there is a difference between the concept as used in prior IS-research and the concept used in this paper. This is why we have developed the concept: Teams of Practice.

Researchers have been investigating how to distinguish between different usages of Community of Practice by proposing different categories connected to the settings under investigation. Wellman (1998) defines eight different types of virtual communities, Vick (1998) proposes four categorizations for teams, and Fischer (2001) proposes the concept of Communities of Interest. Through the development the framework of Teams of Practice, we have combined Ferrán-Urdaneta (1999) and Wenger (1998) in order to understand and describe the conditions found in our empirical data.

Ferrán-Urdaneta (1999) investigates the distinction between teams and communities. He defines teams as: “A small group of perfectly identifiable individuals committed to a common, clear, measurable short-term goal that requires their coordinated and interdependent effort for which they hold themselves mutually accountable and who get together for a finite amount of time”, (ibid p. 29). Using Ferrán-Urdaneta’s definition, we extract the following three concepts for investigating the empirical data: *interdependency*, *synergy*, and *goal*. Ferrán-Urdaneta states that goals have to be clear, measurable, and accomplishable, and that general objectives are not the same as goals. When interdisciplinary team members collaborate they have to supplement each other, when reaching for the team’s goal, and this ability is defined as synergy. Interdependency is a critical factor when defining a team. According to Ferrán-Urdaneta, a team who can accomplish the goal without coordination besides meeting a common deadline is not a team. All members need to be equally responsible for the quality of the outcome and therefore need to be mutually dependent on each other.

Wenger (1998) defines a Community of Practice as having a joint enterprise; having a shared repertoire; and being mutual engaged in each other and the joint enterprise. The joint enterprise comprises the ongoing negotiation of meaning as defined by the participants in the very process of pursuing it. Joint enterprise is then, in accordance with Ferrán-Urdaneta, a goal. The goal is not only intended but becomes an embedded part of practices by creating relationships of mutual accountability among the participants (Wenger 1998, p. 78). Joint enterprise contains both the team’s goal and the team’s negotiated process to reach that goal. Shared repertoire is the resources used by the participants during negotiations. When participants collaborate they share different experiences, tools, documents, language, stories, and genres. The collective of these common ‘objects’ constitute the shared repertoire. Objects, within the shared repertoire, have a meaning in the community. When participants negotiate meaning in practice the objects become reification for practice. The shared repertoire can be understood, as suggested by Fischer (2001), as the shared understanding which needs to be built, bearing in mind that the shared repertoire also includes social issues. Finally the concept of mutual engagement as relationships between participants can be understood as the interdependency and synergy suggested by Ferrán-Urdaneta (1999). It is however important to stress that social issues affect social relations between the participants.

In summary, Teams of Practice are project teams characterized by *having a common practice*, which consists of a joint enterprise (not the same as common objectives), by *developing a shared repertoire*, which consists of reifications, common experiences, and social issues (which must be built up during the process), and by *being mutual engaged* in each other and in the joint enterprise creating interdependency and synergy.

### **3.2 Intended Practice: Negotiating the Joint Enterprise**

Now we can explain why the top three circles alone (in fig. 1) cannot fully capture conditions important for integrating groupware in virtual teams. If we want to support team collaboration

with groupware, we need a project team who will collaborate. The team needs a common understanding of the objective for the project and of how to reach the goal (the process) before collaborating. They need a joint enterprise (two bottom circles in fig. 1).

Successful negotiation of the joint enterprise depends on how well the participants know each other and how they, as individuals, interpret the objective presented by management: it depends on the shared repertoire within the team. Knowing each other from earlier practice, the team members' shared repertoire is a resource in the negotiation process. This might however be a rare case, especially in virtual teams, because they normally are formed to accommodate for different interdisciplinary and experienced differences across country borders. Our empirical data reveals that it is crucial for team members to engage in negotiation activities prior to the actual practice, including developing a common understanding of the joint enterprise, agreeing on the objectives and goals, and most importantly discussing the project-process that is ahead of them. Here it is important to state that discussing the project-process also involves negotiating future protocols for collaboration and use of groupware (Bjørn, 2003). They need a 'plan' before the 'situated actions' can take place.

To answer our research question from a theoretical perspective, we can now state: It is a condition that the virtual teams negotiate the joint enterprise in the integration process of groupware (the two circles in the bottom of fig. 1). Prior to integrating groupware, the team needs to be established as a Team of Practice to be able to engage in the iterative process of integrating organization and technology.

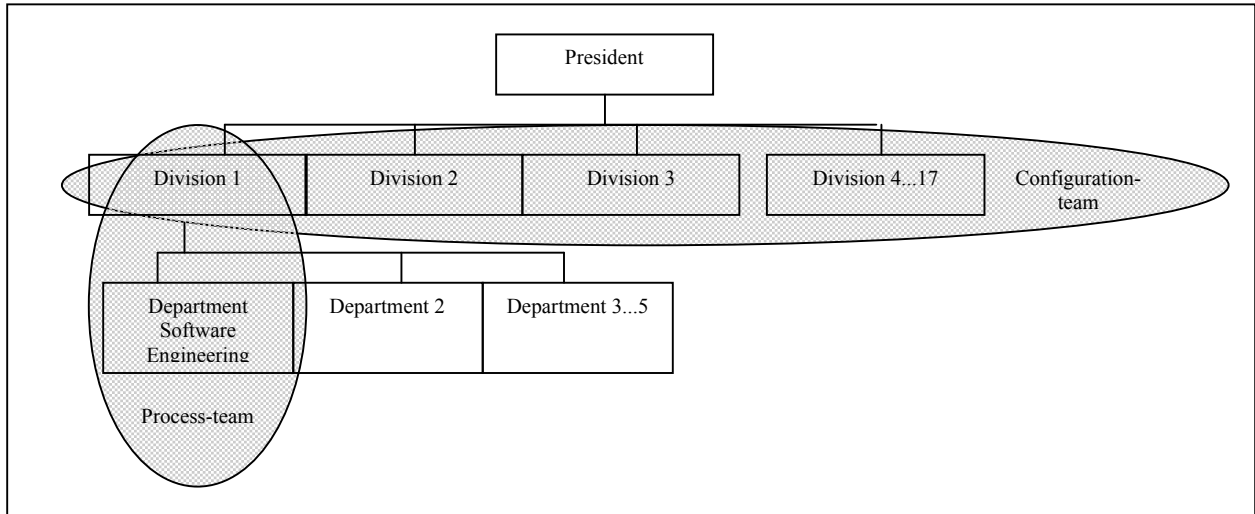
#### **4. EMPIRICAL FINDINGS: VALIDATING THE MODEL**

The study's empirical part was performed in a large Global Transportation Company referred to as GlobalTrans, in the software engineering department. GlobalTrans has several thousands employees. The software engineering department, comprising in total 300 employees, is located on seven sites in five different countries: Denmark, Sweden, Germany, England, and Thailand.

Two virtual teams were formed in the spring of 2002. The Process-team was formed with the objective to define, develop, and deploy 'one set of processes' for doing software development at department-level. The Configuration-team was formed with the objective to define, develop, and pilot a common process for Software Configuration Management on the division level (see fig. 2).

The two teams had the same kind of assignment, but they differed in terms of conditions: Some of the Configuration-team's members knew each other from other settings and they managed to be established as a Team of Practice. In this regard, they ended up in the actual practice part of the InterCon-model (fig. 1). The Process-team lacked conditions for forming a Team of Practice and was never able to step out of the intentional practice part of the InterCon-model. A sub-team was however formed inside the Process-team (Coding-team) and they were established as a Team of Practice and went into actual practice. Many factors influenced the following success for the Configuration-team and Coding-team, and the failure for the Process-team, but with regards to groupware support, one major factor turned out as most important: the negotiation process of joint enterprise. This factor can be explained through the theoretical framework of Teams of Practice as described in section 3.

Both teams had access to Lotus Notes to support their collaboration, but neither of the teams succeeded in integrating the groupware in practice. In this way, both teams had a need for outside facilitation in order to utilize and integrate the technology but on different levels as we will illustrate in this paper. In the following two sections (4.1-4.2), we describe the Process-team case and the Configuration-team case respectively.



**Fig. 2: Configuration-team work on the division level and Process-team work on the department level**

#### 4.1 Process-team in the InterCon-model

The Process-team is a virtual team within GlobalTrans. The team consists of 10 participants located in Germany, Denmark, Thailand, Finland, and on two different sites in Sweden. The team was formed by top-management in the spring of 2002 with the objective to define and deploy 'one set of processes' for software development in the software engineering department.

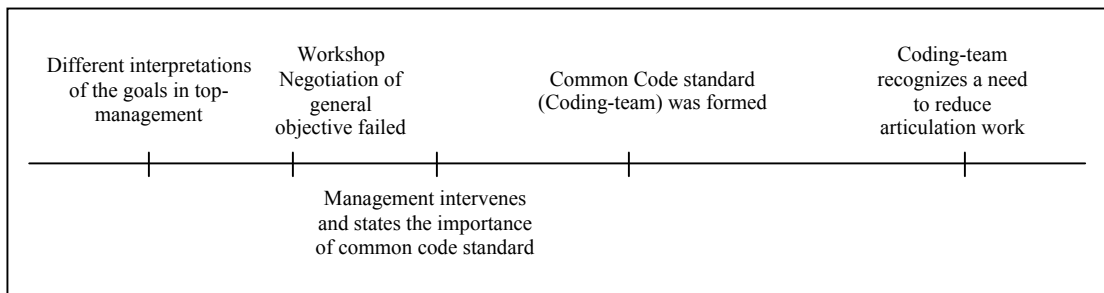
We started investigating the collaboration in the Process-team with the aim of understanding the collaborative practice within the team, but it soon became clear that the participants were not collaborating with each other, even though they had weekly phone-meetings, flash-reports, e-mail correspondence, and access to Lotus Notes. The project manager explained that they had difficulties with communication, and most of his time was spent travelling, trying to get the team to collaborate. He was eager in getting the participants to phone each other to discuss various topics, but none of the members contacted each other.

The team was first formed during a co-located kick-off workshop in the spring. The project manager was aware of the difficulties in technology-mediated communication and therefore rules for communication were explicitly stated here. In the workshop, he presented situations where using e-mail was inappropriate and where phone calls were a better choice. The project manager was also aware of the factor 'out-of-site out-of-mind', which he tried to challenge by using the metaphor: Knights of the round table (Kostner, 1994). None of the initiatives supporting communication worked. When the difficulties concerning communication in the Process-team were discussed in a group-interview with the two project managers of Process-team and Configuration-team, the Configuration-project manager stated: "It seems that you [the Process-project manager] have done all the right things and still you are experiencing problems. Can it work at all?"

Interviewing the team members in the Process-team and comparing utterances to the flash-reports, the documents and the Lotus Notes database, it became clear that the participants did not collaborate. The members did participate in the weekly phone-meetings and they did write the flash-reports, but it was all a kind of one-way communication. There were no discussions during the phone meetings and no one read the flash-reports. Why was this so?

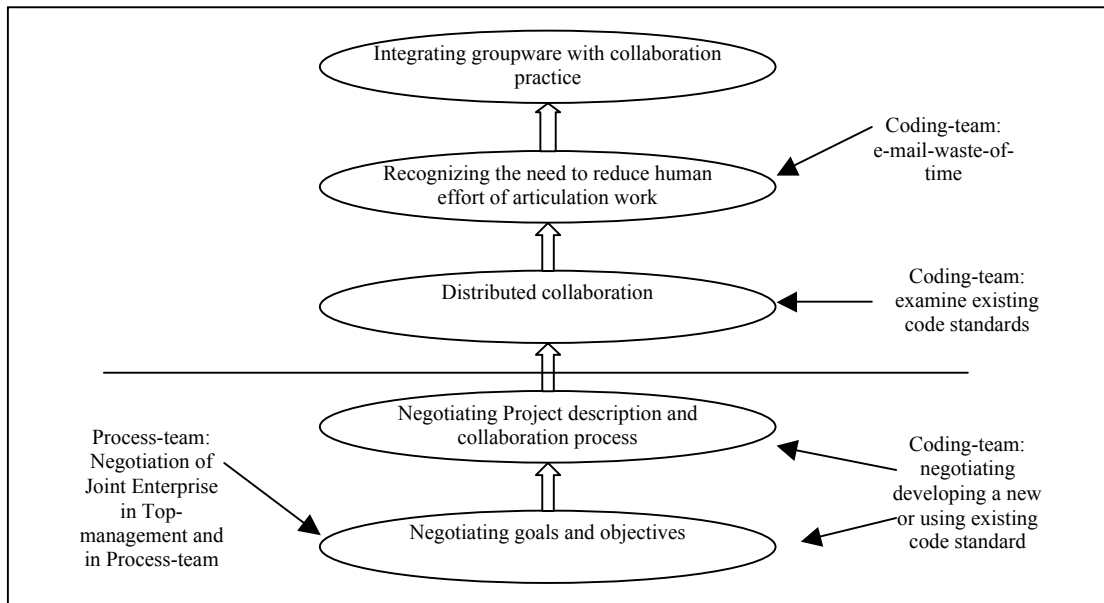
The reason surfaced during a session with a diagnostic mapping of problems (Lanzara and Mathiassen, 1985) with team members. It became obvious that the members did not have a clear

idea of the common goal and objectives of the Process-team. Working in the team, members mostly did what they were used to prior to entering the project e.g. for one member doing his normal job was perceived as contributing to the goal, even though his job was the same as before the project: maintaining a database with no relation to process-definition. It is important to notice that the team members were all experts in software engineering with some kind of interest in processes, but they all had different reasons for joining the team. It was also revealed that different interpretations of the goal existed within the top-management team. This affected the Process-team-members' perspectives and resulted in members working in different directions: doing training in safe software; developing common coding standards; and developing processes for vital software. In the co-located kick-off workshop, the Process-team-members began negotiating the joint enterprise, translating the general objectives into grounded goals (event 2 of fig. 3). The negotiation process failed in spite of the good intentions from the project manager, but why?



**Figure 3: The process of Process-team**

If we were to examine the Process-team in our model (fig. 4), we can explain the situations in terms of Teams of Practice and establishing the situation prior to actual practice.



**Fig. 4: Process-team & Coding-team in InterCon-model**

The issue of the missing common understanding of goals and objectives in the Process-team resulted in the team not going further than the *intended practice*. The team does not have a common understanding of the joint enterprise and neither does the top-management team. The goal and objective 'one set of processes' can be interpreted in many different ways, and the negotiation of which process to 'begin with' has been experienced as extremely difficult. Because

of this, the Process-team is not yet a Team of Practice, but can only be categorized as a group of people. Lack of communication is caused by the missing interdependency. They have nothing to coordinate. The main issue, which should be addressed, is not groupware support, but is establishing the team as a Team of Practice and as thus having a negotiated joint enterprise.

The team members did not know each other before entering the Process-team. This meant that they missed having a shared repertoire as a resource for negotiating. The lack of common understanding, experiences, and reifications influenced the work, which led to confusion about the overall goal and how each individual could contribute to reaching that goal. In co-located teams informal social encounters around the coffee-machine contributes to the development of a shared repertoire (Wenger 1998). In virtual teams, informal social encounters do not exist. Team members have to seek communication explicitly, e.g. by picking up the phone, writing an e-mail, etc. This makes co-located negotiation of the joint enterprise prior to distributed collaboration vital for the team in the process of transforming into a Team of Practice. Finally the team cannot experience interdependency and synergy while disagreeing on the joint enterprise.

Around the time when the negotiation had failed in the co-located workshop management on division-level intervened and stated that especially developing of a common code standard was important for the organization (event 3 in fig. 3). This formed the Process-team in two ways. First they got a concrete target for a sub-project and secondly the utterance from management also prioritized what the team should be focused at. The result was the development of a sub-team within Process-team working with common coding (Coding-team). Emphasizing on the Coding-team, it consisted of three participants: one located in Denmark and two in the same place in Sweden. The objective for the team was to define a common code standard for the software engineering department. The participants still needed to negotiate and develop a common understanding of the goal as well as negotiate the process of collaboration. There was however one major difference in this negotiation process. The team was formed with the objective to 'develop a common coding standard', a much more concrete goal, than the 'one set of processes', which meant that the Coding-team had a better opportunity to negotiate the joint enterprise. Of course there were disagreements during the negotiation process, but the project manager resolved these, and the team accepted his decisions. The team was supposed to develop a common code standard by examine existing standards, choosing one and then applying this to the organization. In this way the project goal and objective was negotiated while the process and plan for reaching the goal was clarified. The Coding-team then had a joint enterprise and was in this way established as a Team of Practice. As they started to collaborate reaching for the goal they also started developing a shared repertoire in terms of analysing different alternative existing standards, and they were mutually engaged in the joint enterprise, though they still had some personal difficulties because of the earlier conflict, which affected the work up until the end.

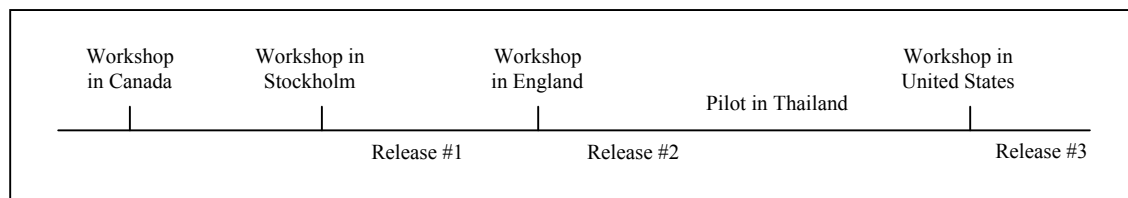
They also recognized a need for supporting articulation work, which was mediated by e-mail. They experienced difficulties in using e-mail for coordination, which surfaced in an example presented by one of the team members labelled 'e-mail-waste-of-time'. The e-mail correspondence issue was: "can we make documents available on the intranet web?" And consisted of no less than 15 responses, starting with the statement: "Can you access this link?" followed by a range of replies, which were misunderstood and followed by a range of technical advice resulting in the statement: "Tough luck. (...) PS: I hate Notes (& Domino)". The Coding-team member presenting the e-mail correspondence stated that they needed 'something' to reduce the difficulties caused by e-mail.

The Coding-team was not able to integrate Lotus Notes in their collaboration, but did recognize the need. In this way, the Coding-team almost reached the top level in the InterCon-model, which means that they were open to start the integrating process of groupware to support their collaboration.

## 4.2 Configuration-team in the InterCon-model

The Configuration-team is a virtual team within GlobalTrans. The team consists of 5 participants located in Canada, the United States, on two different sites in Sweden, while the team manager was located in England. The team was formed on the division-level in the organization in the spring of 2002, with the objective to define and pilot ‘a software configuration management process’ to the whole GlobalTrans, including the software engineering department.

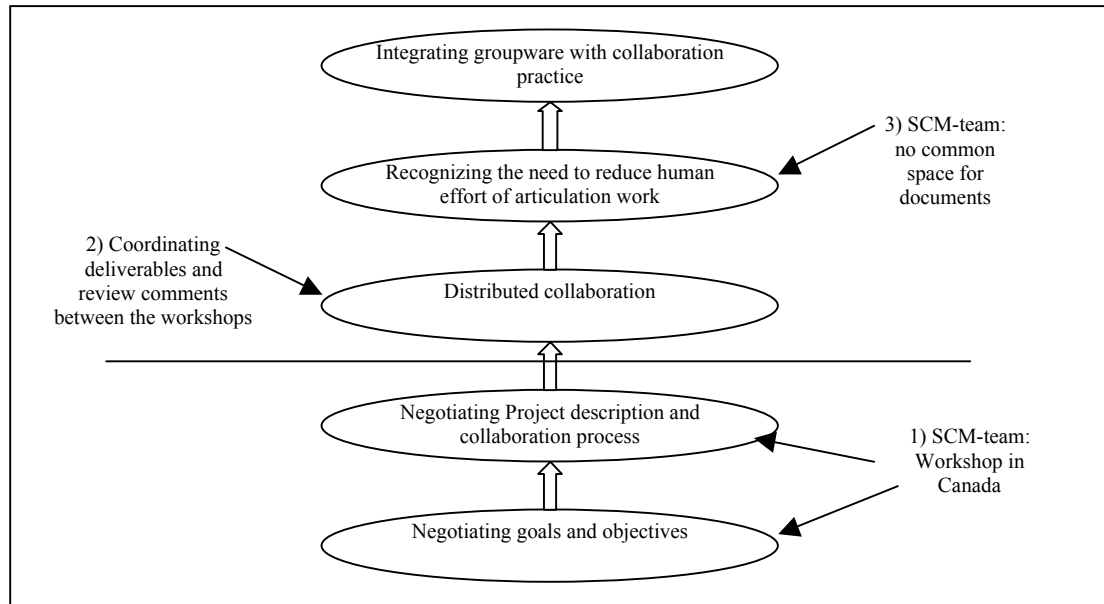
The collaboration process in the Configuration-team was formed by four regular one-week co-located workshops. In the first workshop, located in Canada, the team members negotiated a common interpretation of the overall objective ‘to develop and define a common high-level Software-Configuration-Management-process, which supports software development, customization, or maintenance projects’. The Configuration-team translated this general objective into a project definition with the following activities: ‘identify SCM-tools, select tools, and propose tools. Develop global deployment plan and strategy and pilot the endorsed high level process and tool.’ The Configuration-team also negotiated the collaboration process planning three regular workshops in Sweden, England, and the United States. They planned three releases of the process-descriptions, which were to be reviewed by all of the departments of GlobalTrans and piloted in Thailand between release two and three.



**Figure 5: The collaboration process in Configuration-team**

The Configuration-team had a negotiated joint enterprise and process plan prior to virtual mediated collaboration. The team used e-mail to support the coordination of deliverables and review comments between the workshops, but were not able to integrate Lotus Notes in the collaboration. They did however express a need to have all documents collected in one place. None of the members (including the project manager) had an overview of all documents, which resulted in extra articulation work for the participants. When searching for a specific document, the members would search their e-mail database, sort the e-mails by date, and then maybe find the right document. In this way, they recognized the need for reducing the complexity involved in their articulation work.

From the perspective of the model, the Configuration-team did succeed in becoming a Team of Practice. In the workshop in Canada, the team negotiated the joint enterprise, turning the objective into a common goal, while defining the collaboration process ahead of them. The team did experience actual practice throughout the different co-located workshops and in the mediated communication between these. Through this practice, the team developed a shared repertoire, both work and socially related. The Configuration-team did also experience difficulties surrounding coordination by e-mail and expressed a need for “something else”. The conditions prior to actual practice existed in the Configuration-team. When established as a Team of Practice, they step out of intentional practice and into actual practice ready for integration of groupware in their practice. Why did the Configuration-team successfully reach this level in the InterCon-model?



**Figure 6: Configuration-team in the model**

The most significant aspect in comparison to the Process-team and also the Coding-team was that the Configuration-team developed a shared repertoire both consisting of work- and social related aspects. In a group interview with two of the participants from Configuration-team, they expressed two issues connected to the social relationships between the participants, that both had an important influence on the establishment of the team as a Team of Practice. First a so-called 'smokers-net' had formed during the workshop in Canada. The smokers-net was two of the members' reification for going outside smoking cigarettes during the breaks. In the smoker-net, they would discuss and translate the more hidden agendas occurring in the workshop. Secondly they explained the atmosphere in the team as 'all this hugging and kissing', which was not usual for teams in the GlobalTrans organization. When the Configuration-team met around the world in the workshops or when doing the pilot, everybody brought gifts for each other. And in England and the United States, the team had been invited to dinner at each other's houses meeting team member's families. In this sense, the shared repertoire of the Configuration-team included both social and work related experiences. The social issues also affected the mutual engagement within the team. They were both engaged in the joint enterprise and each other. The Configuration-team was a virtual team with interdependency and synergy.

## 5. CONCLUSION

This paper contributes in three ways. First, the paper contributes with empirical in-depth data on two virtual teams, which is needed in IS research (Maznezski and Chudoba, 2000). Second, we introduce our InterCon-model explaining conditions important for integrating groupware in virtual project teams, which is needed in the ongoing research on the relationship between groupware technologies and changing practices (Karsten, 1999). Third, this paper proposes a theoretical framework: Teams of Practice, arguing for the importance of negotiating the joint enterprise, the importance of building a shared repertoire, and the importance of mutual dependency and synergy within virtual teams.

The aim of the empirical work has been to understand the collaborative practice within two virtual teams and to facilitate integration of groupware in these two teams. Through the empirical study, we learned that certain conditions must exist before integration of groupware can take

place. Literature studies of the concepts of Community of Practice (Wenger 1998) and Team collaboration (Ferrán-Urdaneta 1999) resulted in the proposed framework for describing virtual teams as Teams of Practice. By combining this framework with collaboration from within CSCW-research (Schmidt and Bannon 1992) and organizational implementation from IS-research (Majchrzak et al. 2000), we propose our model outlining four interdependent conditions answering the research question: What are the conditions for integrating groupware technology in collaborative practice within virtual teams? Being grounded in theory and developed in practice the model can be used by, both researchers investigating, and practitioners working with, integration of groupware support.

We argue that it is a critical pre-condition that a virtual team is established as a Team of Practice prior to actual practice. Virtual teams without a common practice in form of a joint enterprise cannot build a common understanding and hereby develop a shared repertoire of reifications for collaboration. Thus they experience difficulties in being mutual engaged in each other. Those teams will not be dependent on each other and will most likely not develop synergy. Without these aspects in the team attempts to integrate groupware to support collaborative practice will fail, simply because this practice does not yet exist.

Knowing the importance of Team of Practice and applying the InterCon-model to practice to establish whether a given virtual team is open for integration of groupware in their practice the next question is: how can we facilitate the integration process of groupware in virtual teams? In pursuing this question we also need more information on the nature of collaboration practice within virtual teams. We have not yet explored these questions but they are issues for further research.

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