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BOUNDLESS COLLABORATION - DISTRIBUTED CONCURRENT DESIGN IN AN INTER-REGIONAL COLLABORATION BETWEEN EMERGENCY AUTHORITIES

C. A. Nyström, V. R. Asproth, T. Persson Slumpi and H. Olsson

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1. Introduction

System development projects are knowledge-intensive and often collaborative in nature. Collaboration is however becoming increasingly challenging due to a globalization trend in system development practice [Kotlarsky and Oshri 2005], [Faßbinder and Henz 2009] and in software development practice [Holmström et al. 2006], [Conchúir et al. 2009]. The challenges can be illustrated by the distances identified [Ågerfalk et al. 2005] and applied [Holmström et al. 2006]: temporal distance, geographical distance and socio-cultural distance. However it seems to be the case that focus often is on the relation between distributed development teams and not as much on the relation between distributed developers and users. In the Scandinavian tradition of systems development the user has had a strong position [Bjerknes et al. 1987] and still has [Iivari and Iivari 2011]. The question is if the distribution in which development teams as well as users are distributed raises particular challenges that are not addressed by for example the user-centred approaches studied by Iivari and Iivari [2011]. One might argue that user centred approaches and methods applied in systems development projects in general might be transferred into distributed projects. It is also obvious that the increasing distributed and/or virtual collaboration in general, demands suitable methods and models which restrict the problems with such collaboration. Many of the problems within distributed system development projects are the same with distributed collaboration in general. In this article we will explore the application of a user centred method originally developed to promote physical interaction, in a distributed systems development project. The obvious choice of method would have been one of the established methods discussed by Iivari and Iivari [2011]. However our choice fell on a method that is not commonly used in systems development settings, namely distributed concurrent design. Distributed concurrent design is a further development of concurrent design. The main idea in concurrent design is to gather experts of different kinds (like users), provide them with necessary technical infrastructure, in order to discuss and penetrate a problem as thoroughly as possible and develop a design specification that all involved can agree upon [Øxnevad 2000]. Research on concurrent design or distributed concurrent design in a systems development setting is difficult to find which indicates that the method is rather new to the systems development community. However, as distributed concurrent design has a potential to support collaboration in systems development projects, it is highly relevant to put it up for a test. The aim of this article is to evaluate how distributed concurrent design worked during collaboration in a distributed systems development project. The focus in this paper is on how the collaboration worked and not so much on the details of the designed system. The project was a distributed collaboration between emergency authorities in Mid Sweden and Tröndelagen in Norway. The aim of the project

was to make digital geographical information available through a "demonstrator" to emergency response units on both sides of the Swedish-Norwegian border in order to improve the conditions for collaboration. The research approach has been a mix of methods – a multitechnique approach.

2. Theoretical background

In this section we present the concept distributed concurrent design and **different** forms of collaborative and distributed work. Finally evaluation in general is discussed.

2.1 The concept distributed concurrent design

As was mentioned in the Introduction, focus in this study is on Distributed Concurrent Design. However, Distributed Concurrent Design departs from the Concurrent Design methodology [Egir and Rosendahl 2007], and is really the Concurrent Design methodology used in a distributed setting [Nyström et al. 2012].

Concurrent Design as methodology was originally invented by NASA as a solution to limited budgets that complicated collaboration – reduced travel costs. The Norwegian Knut I Øxnevad has developed the methodology further [Øxnevad 2000]. The concurrent approach is as such not new. The same ideas and philosophical foundation can for example be found in Concurrent Engineering [Strand 2012]. In Strand [2012] it is also stated that Concurrent Design and Concurrent Engineering have been viewed as two sides of the same coin or that Concurrent Design is an early phase of Concurrent Engineering.

There are three main elements in Concurrent Design, People, Process and Tools (PPT model[1]). People in the model consists of ***customer(s)*** who makes decisions and monitor the process, a ***facilitator*** who also is the prime responsibility to ensure that communication and practical details works according to plans, ***project manager and team members,*** different kind of experts and stakeholders depending on the aim with the collaboration [Egir and Rosendahl 2007]. Tools are for example the software the participants use at their respectively office, computers, etc. Also the meeting room in which the collaboration takes place in is crucial in concurrent design. The room should be equipped with the computers the participants use but also with screens where the content on any of the computer could be displayed. It should also be equipped with the basic interior of a conference room.

The difference between concurrent design and distributed concurrent design according to these elements, are that the collaboration in distributed concurrent design take place in a distributed setting. Access to well-functioning and supportive tools is essential for the outcome of the collaboration in order to distribute necessary information and support communication between the participants. The room should however not be of great importance for distributed concurrent design. Over time frameworks for conducting different types of concurrent design projects have been developed. One illustration is the framework for ***concurrent e-learning design*** developed by Storvik et al. [2011].

According to this framework there are mainly five main activities in concurrent design projects:

1. Situation analysis is carried out during the first session. Documentation of goals, background, decisions, and limitations.
2. Possibilities are identified and listed during the second session
3. Possible solutions for the work are identified and discussed
4. Solution design
5. Finishing of the design

Every session is planned to last for about 3,5 hours and is manned by a multidisciplinary team. All participants should have necessary pre-knowledge and be empowered to take decisions so the process can run as smooth as possible. Before each session, the goal with the session should be clearly outspoken and accepted. It is also of great importance that a plan for each session is developed and followed. If something unexpected happens, the session should be summarized and the work ends. The work is however not conducted in the sessions only. A considerable amount of work is conducted between the sessions. For example it is necessary to prepare data collecting, answering remaining questions from the last session and other issues of importance for the session to come, in advance. There are ***two "living" documents*** which are present in all sessions. The first document is the "***action***

[1] The original idea of the model is unknown. There are several authors that use the model.

list" where all tasks and activities necessary for the progress of the sessions are listed. The second document is the "***decision list***" where all common decisions are documented. The two documents are created in the beginning of the project and should be available for updates within and between the sessions. All actions should be marked with Identity, description, date, stop date, person in charge, state: registered, open or closed. Examples of actions could be "*booking of room for the next session*", "*interview with person in charge for the existing IS*" and so on. The decision list function in the same way with the difference that it will content the decisions made during the sessions. Examples of decisions could be: "*Approved first version of the interface*", "Dropbox *is chosen as the tool to share documents*". All decisions and results from discussions should be documented and made available for all participants. One thing important to highlight is that depending on the special context, the sessions might be modified in order to suit the local models or methods used.

2.2 Collaborative and distributed work

Already in the mid 1980s there were workshops arranged to find out how computer science could help people work together. In that connection the term Computer-Supported Cooperative Work (CSCW) was established [Greif 1988]. Before that the term groupware was used. The definition of groupware is *intentional group processes plus software to support them*, which means that it will be used to support group processes [Johnson-Lenz and Johnson-Lenz 1981]. Greenberg [1989] among others, make a distinction between the two terms stating that "CSCW can also be considered as a scientific discipline guiding the design and development of groupware in a meticulous and appropriate way".

As computer technology evolves many different software tools for supporting cooperative work are possible to use. It could be said that often it is not one single groupware used, but a set of different tools. There are many different ways to categorize tools. One way is to categorize according to time and space. An application can be synchronous, asynchronous or both and at the same time, considering the space, it can be in the same or in a different one [Penichet et al. 2007]. Another way of categorizing is by process. Penichet et al [2007], citing Andriessen [2003]: "Erik Andriessen goes beyond and extends even more Johansen's original classification, with five possible groups of ICT processes: Person interchange processes: communication. Task oriented processes: cooperation, coordination and information sharing. Group oriented processes: social interactions".

Penichet et al [2007] has elaborated a number of questions to ask to determine the functionality of systems for collaborative work: Are the users helped to collaborate to attain a goal? Do they share information? Do they work with it? Can it be used as a communication method? Are users informed about anything? Do they inform themselves using this tool? Does it coordinate processes and persons? Is the tool used in real time? Is it suitable to use it pre-recorded? Is it suitable to use it in the same physical space? Can the tool be used in different spaces? Feast [2012] has in a study, investigated social processes in design activity through exploring professional designers' perspectives on the significance of collaboration in their work. Findings from his study, shows the importance of mixing different stakeholders perspectives, the importance of collaboration as a social activity, importance of communication, and commitment about common goals.

The design process, which is a key element in any systems development process, is a knowledge-intensive and collaborative task. Many research initiatives have been taken to develop technologies or infrastructure to assist designers in a computer-aided design environment. Some of them intend to help designers collaborate or coordinate by sharing information through formal or informal interactions. Others supply frameworks for managing conflicts between design constraints and assist designers in making decisions. [Zha and Du 2006]. Many information systems have been built to support the collaborative design modeling and decision-making process [Zha and Du 2006]. According to different purposes and use, these systems can be grouped [Li et al. 2004]: Collaborative product data/information management systems, Network-based collaborative design systems, Process-cantered collaborative design and workflow management systems, Conflict detection, management and resolution systems for collaborative design, Flexibility and security focused collaborative design system. Interoperability approaches in heterogeneous collaborative design systems. There are, of course, systems that fall into more than one of these categories. The systems, focused on the needs of

collaborative design, can assist designers during the design process. Zha and Du [2006] summarize the requirements for network-based collaborative design tools as follows:

1. "A common framework enabling designers to capture, store and retrieve knowledge efficiently and effectively throughout the design process.
2. Computer support that supplies clear and complete design knowledge, and also facilitates designer intervention and customization during the decision-making activities in the design process.
3. Mediation of the information flow between participants and support for a heterogeneous computing environment.
4. An open environment so that models from new participants can be added, allowing the design model and tools to evolve with the design problem.
5. A means or mechanism for encapsulating expert knowledge or know-how using an object-oriented approach, comparing design solution alternatives and supporting the decision-making process.
6. Embodiment of a decentralized architecture that the coordination between design participants and models is not centrally modeled or controlled."

3. Background and context

The systems development project studied concerned the development of a demonstrator (database, client front end, and server back end) within the project Gränslös Geografisk Information II (GGI-II), which is funded by Interreg / European Regional Development Fund (ERDF). The aim of the project is to make digital geographical information available to emergency response units on both sides of the Swedish-Norwegian border in order to improve the conditions for collaboration. The demonstrator should, beside a seamless map across the border, contain information about available resources such as ambulances and fire brigade equipment, but also other possible equipment and houses that could be used as shelters. The project is coordinated by the county administrations of Jämtland (Sweden), Nord-Trøndelag (Norway), and Sør-Trøndelag (Norway), and includes external supporting partners in the local police, fire and ambulance emergency organizations. There is an urgent need for different stakeholders and authorities to collaborate according to undesired and sometimes even critical occurrences, such as floods, derailments, missing people and so on. Collaboration in border districts is a challenge with respect to coordination, management and utilized resources. Another project, Gaining Security Symbiosis (GSS), has developed a system for scenario creation, training and evaluation of the training with a special focus on communication between actors responsible for managing emergencies in the border region in Sweden and Norway. The GSS project has also carried through three cycles with development of scenarios, training and evaluation. This project is also funded by Interreg / European Regional Development Fund (ERDF) and is coordinated by Mid Sweden University.
The two projects, GGI-II and GSS have worked together very closely. The GSS project has used the map demonstrator developed by the GGI-II project but also evaluated the demonstrator in real use.
The management of the project contacted the Mid Sweden University for assistance in the development of the demonstrator. The university was at that time part of an ongoing project in which concurrent design as method were tested in different settings and contexts, for example in a distributed setting. The parties involved in this project, were the universities on the Norwegian side of the border and Mid Sweden University. The same parties became also involved in the system development project so the choice of method was not so complicated though it was known among several of the future participants – at least from the universities. The department could hence offer assistance both with a method -distributed concurrent design- and technical expertise in geographical information systems, databases, and web design.

4. Method

4.1 Evaluating Collaboration in Distributed Environments

From a research point of view collaboration in distributed environments has been approached with both quantitative and qualitative techniques. Several researchers are applying a single technique for

collecting empirical material as for example [Thomas and Bostrom 2008], [Montoya 2009], [Johnson et al 2009]. A few are applying a multi-technique approach as [Bjørn and Ngwenyama 2009], [Karpova et al. 2009], [Persson and Mathiassen 2012]. Interviews, surveys, and questionnaires seem to be the most frequent applied techniques while few are using observations, field notes, video recordings and the analysis of board postings as techniques. This indicates that studying distributed collaborative work is a complex task and that the choice of technique/-s must be adapted to the aim of the study and the context/setting.

4.2 Research approach

As the aim of this study is closely related to the cornerstones in concurrent design – the PPT-model - there are several different things to be studied with the focus on processes, stakeholders and used tools. Hence we argue that a multi-technique approach would generate best insights. We follow the example of Bjørn and Ngwenyama [2009] and apply document analysis, field notes, and observations. Also surveys might generate important insights so we added this to the list of techniques applied in the evaluation of this project. Documents that have been analyzed were primarily the decision list and the action list. These documents were published in Google Docs, a document production and managing software for synchronous writing and documentation and also for information spreading as the produced documents also were shared in Google Docs. Other documents that also were published in Google Docs and that we gained access to were the documents produced by the participants. Before the first session with the purpose of setting the scene for the project the participants stated their view of the project, the result, etc. in documents in Google Docs. During and between sessions the participants also produced documents on, for example, the content of the database, this was also documented in Google Docs. We have also gained access to some e-mail correspondence between primarily the facilitator and the other participants.We have been attending meetings in which the sessions were planned and as observers in all sessions, both in one of the physical room (Physical room 1 in 4.2 below) and in the virtual meeting room. The activities in the virtual meeting room have been recorded as this is a feature that conference software Adobe Connect offers. Besides recording the activities in the main virtual room we also have taken field notes during the sessions and the meetings as a support for the memory. The sessions were initially planned to be evaluated primarily through observations and surveys. Thus a rather ambitious survey was developed for session 1. However, almost none of the participants responded to this survey. For the record it is important to take that the participants had been issued to respond to several different surveys before session 1 concerning different aspects of their participation. Additionally, the introduction of concurrent design that took place the same day was also evaluated through a survey. Our interpretation of this is that the respondents became “survey-tired” so we changed our approach and relayed more on observations for session 2 and session 3.

4.3 Use of model

The PPT-model is in this research used as the analytical lens focusing on people, processes, and tools. The reason for choosing this model is the symbiotic relation between concurrent design and the model. Hence, the concepts are central in the work/sessions we have studied and accordingly a natural choice as an analytic tool.

5. Results

5.1 People

The people involved in the collaboration project were representatives and experts from local police, fire and ambulance emergency organizations; technological experts on GIS, databases, and web development; the facilitator and observers/evaluators of the process as well as of the intended result of the project, from both Sweden and Norway. One crucial part of DCD is that all experts are attending each session. In the project studied this was not the case. All experts from both countries attended the first session. This fact should indicate that there was an interest in the project hence the conditions for

the process to succeed were good. For the second session many experts attended, but several of the Norwegian participants were missing. In the third session very few experts attended.

5.2 Tools

The main tools for this project were Adobe Connect and Google Docs. As the participants in this project were not dependent on any other specific hardware or software they only needed standard PCs with headsets and cameras to access Adobe Connect and Google Docs for the sessions. Additionally tools like e-mail were used for communication and Doodle was used as an aid to schedule the sessions and other meetings. Even though this was a distributed project, physical rooms played a significant role. For Session 1 the participants were gathered in two physical rooms, one in Sweden and one in Norway. For Session 1 the participants in one of the rooms - Physical meeting room 1 in Figure 3 below – used individual computers, while in the other room - Physical meeting room 2 - the participants shared one camera and a conference microphone.
The configuration of the participants was different for Session 2. In Session 2 experts participated both in the physical meeting room as well as virtually. They all accessed the virtual meeting room through individual computers.
For Session 3 the configuration was yet different compared to the previous sessions. This time the physical meeting rooms played no role at all as only the facilitator and the observers of the process were present in that room. The other participants participated from respectively office or such.

5.3 Process

The process was structured according to the framework of Storvik et al. [2011]:

1. Situation analysis. Session 1
2. Possibilities are identified and listed. Session 2
3. Possible solutions for the work are identified and discussed
4. Solution design
5. Finishing the design specification

However some adjustments were made to adapt to the time schedule as well as to the goals of the project. Normally a distributed concurrent design process does not go pass the design of the specification, but in this project it was decided that the design should be implemented at least as a prototype. The development of the prototype started directly after Session 1 and the following sessions were more or less planned to validate the prototype and provide additional information to keep the systems development process going.
Prior to the first session the participants needed to be trained in the method. The training was kept very brief as an introduction provided in Google docs and a more thorough introduction related to Session 1 by the facilitators in the two physical rooms.To give the work a head start, as was mentioned earlier, the participants were asked to provide some information prior to Session 1 concerning for example their view of the project and what the outcome of the project should be. This was documented in Google docs but as many of the participants where new to Google docs, the facilitator needed to assist. However, much of the information was provided very close to Session 1, hence it did not give the process the intended head start.
The aim with Session 1 was to make a situation analysis. The work was meant to be documented in the action list and the decision list. The participants had however problems to reach any consensus what the "demonstrator" were all about. One view was held by the participants in room 1, and another in room 2. The disagreement concerned whether to focus on the database (the information) or the interface (presentation). The first view was held by participants that lacked the information in order to discuss the presentation. The second view was held by participants that had worked pretty much with what type of information that should be available. This issue was not solved and the session more or less came to a halt. However the two main groups were issued to discuss what information they would find useful and communicate this with the technology experts primarily so the process could move on.
Because of the inability to come to any decisions, Session 2 was divided into two sections. The first section (morning) was directed to the work with the presentation of information and the other (afternoon) was directed towards the work with the database.

The session started with the facilitator presenting the incomplete "list of decisions" documented during the first session but not decided upon. These decisions were discussed and confirmed. Next the technology experts demonstrated the work with the interface where a clickable map had been developed. All the participants could "run" the interface in Firefox during the session. This first version was discussed and a document in Google docs was created and completed with possible "occurrences", desirable "data" and "functions". It was also possible to chat "group-to-group" or in private with the expert responsible for the interface. The decision list was updated according to what happened in this session. In the end of this first part the facilitator summarized the about 30 ideas that had emerged. The ideas were both on a higher level but also quite detailed such as: "be able to create a bookmark in order to zoom in a special area", "possibilities to print (or create a PDF-file) a screen-shot or a marked area on the map", "when you click on a fire station (in the map) or similar, information about contact persons, and the size of the emergency force should be available, and what Emergency service centre they belong to".
The second section started with a demonstration of how complex it could be with shared data in a database. The participants were split into subgroups representing the different stakeholder who worked together to specify information. The subgroups documented their discussions and results in different ways. Some of the groups had categorized their results, while others just had identified concepts. It was a desire that the subgroups worked on and structured the documents further.
The third session aimed to generate choice of solution for the "demonstrator" – both according to the interface and the underlying database. The session started with a short position briefing regarding the interface. The interface was basically finished but the underlying database should be complemented with both attributes regarding the tables and data (actual content).
The ***activity*** in this session was to complete the tables in the database according to attributes. ***Decisions*** to be made concerned necessary and desirable attributes. When this work was finished, the remaining work was to build the database and the interface so data could be added. The web designer demonstrated the principles with a database scheme where the different tables were visualized. In order to explain how the tables in the database functioned, the web designer demonstrated the skeleton of the different tables in Excel. After this demonstration, questions occurred if they were going to complete this work during the session which was believed as not realistic – the work had to be continued afterwards with instructions from the web designer so they could continue and complement this work after the session.

6. Discussion

The aim of this article was to evaluate how distributed concurrent design worked during collaboration in a distributed systems development project. In order to do so we have to take a look at the goal of the project, which was to create a demonstrator. Starting with the ***people part*** of the PPT model, the philosophy behind distributed concurrent design is highly "people-centred", hence it supports user participation in systems development projects. The study showed that many users were involved in the project. In distributed concurrent design the importance of the participants attending all meetings is also stressed. Unfortunately, the project suffered from people not being able to participate to the desirable extent. To some extent all participants were kept up to date through the documents produced and the recordings of the sessions in the main virtual room. However, the absent participants' contributions were missed, hence hampered the process somewhat. It also became difficult to have continuity in the work when only few could participate in all sessions. In fact for session 3 not all areas were represented by experts and no area had experts from both countries hence there was no discussion. Having a method that is user-cantered is of great importance, but if the users do not exercise their potential influence over the process and attend meetings the user input will still be missing.
Continuing the discussion with the tools part of the PPT-model, we could conclude that the tools used (Adobe Connect, Google docs, Doodle, Excel, and e-mail), drawing on the work of Penichet et al [2007], helped the participants to some extent to collaborate by supporting the creation and sharing of information in real time both within the same physical space and in different spaces. The tools used also falls into Zha and Du's [2006] definition of network-based collaboration as they mediated the

information flow supported the design decision process, etc. The participants particularly found Adobe Connect to be of great value as communication support. On the other hand, the participants had initially difficulties in publishing their information in Google docs. In Session 2 when there were subgroup discussions, Google docs was not the choice for documenting these discussions. Instead the "note" function in Adobe Connect was used. During the last session a few documents that the participants were supposed to fill in were created in Google Docs, hence it became natural to work with them in that setting. This signals that perhaps Google Docs is not the best choice or that the participants needs more time to get used to the tool. In discussion with colleagues about the PPT model as a lens, it has been argued that the "tool" part of the model is not of such importance as it used to be, depending on the fact that the technology has become less important while it had been developed and improved over time. We are not so sure that this is true while the findings from the project, shows difficulties in the use of the tools as well as the importance of choosing the "best" tools and introduce them in a good way.

The tools used also hampered the collaboration between the stakeholders – people in the PPT model - to some extent. For example, the distance between the participants was not bridged but to some extent reinforced by having two physical rooms in which the participants gathered for the first session. This created an ***identity distance*** where the participants in room 2 were filmed by one camera while participants in room 1 had one camera per person. The picture transmitted from room 2 was hence of a unit, a sub-group. This also created an ***in-group/out-group problem.*** The important group identity including all participants was never achieved. Instead two sub-groups emerged, one in each room. This was clearly illustrated by one of the participants in room 1, when at the end of the session, repeatedly during discussions including all participants referred to the participants in room 2 as *"them in Norway"*. "Them" was a clear act of distancing, even if it was not intentionally. The facilitators were also perceived as loyal to *"their sub-group"*. The unintential creation of two sub-groups prohibited to some extent the participants to act as individual experts and instead they became part of a group. The loyalty to the group hence could have hampered the experts' input.

In the ***second session there was only one group and a couple of virtual participants***. At this session the tensions between the groups was not evident. Instead the virtual participants might have felt a little bit left out. This was not something that was communicated but it is a potential risk especially when the facilitator and the project leader are part of the group in the physical room. The third session was more or less ***completely distributed*** and from a power perspective this is more optimal configuration than the other two. However, rather few participated in this session and there was a very limited need for interaction at all hence complete distribution was not put to the test and potential problems and difficulties did not surface.

A ***communicative distance*** was also identified partly due to some language problems in combination with technological shortcomings which interfered in the communication. It stood clear that some of the Swedish participants had problems understanding the Norwegian participants. These language problems were intensified by shortcomings of the transceived sound and image. The shared microphone in room 2 which captured all what was said by the participants in that room resulted in low sound quality. Additionally, incoming sound was received through loudspeakers, which resulted in cuts of the streaming sound when incoming sound interfered with outgoing sound. The picture of the unit transmitted from room 2 made it hard to see who was talking. In session 2 and 3 the sound quality was good, hence one can conclude that individual microphones are preferable over shared ones.The two first sessions became some sort of a ***hybrid between physical and virtual meetings*** which in the first session created tensions between the groups, and in the second session possibly created tension between participants. To avoid unnecessary tensions between groups or participants a fully distributed configuration is preferable. Unfortunately this was not fully tested in this project.

Andriessen [2003] identified five different ***processes*** or functions that could appear in cooperative work. These processes/functions could all be found in our study: ***Person interchange processes: communication.*** In all observed sessions all participants communicated, ***Task oriented processes: cooperation, coordination and information sharing***. These functions occurred in all three sessions, ***group oriented processes: social interaction***. This was maybe the process and function that was least present. The group did never became "one group with a common goal". This became clear already in

Session 1, where there was a divide in the understanding of what should actually be achieved during the sessions. The first session was supposed to establish where the project departs from and where it is heading. This is of such importance that one might argue that this actually could be ***divided into several sub-sessions*** if necessary. Hence it is of great importance that ***the time frames are not too narrow***. In the project studied the complexity and the time needed to reach some sort of agreements in this session were underestimated or viewed as less problematic than it really was. It was clearly indicated that the participants had radically ***different views*** of what the project as such would deliver and how to get there. The importance of agreements and common goals is also discussed in the article of Feast [2012, p. 225] where he concludes: "developing a shared interpretation of the design problem or a common goal has been identified as a significant factor in the success of collaborative work. Besides the project participants and the facilitator at least two observers and evaluators of the project were present in all the sessions. The presence of external observers might have affected the project group's process, but probably not to that extent that it crippled it.

7. Conclusions and further research

The conclusion to be drawn is that distributed concurrent design as method can support collaboration in systems development projects. However the following matters must be considered: The participants need to be fully *committed;* Participation must be on equal terms; The tools cannot be allowed to hamper the process; The *point of departure* must be or become outspoken, anchored and accepted; Not to narrow *time frames*. There must be enough time to complete the work in and between the sessions: There must be a *known way of communication* – both within the sessions but also between the sessions Further research on distributed concurrent design in systems development projects can concern:

- How can distributed concurrent design as method be fully integrated into user-centred systems development methods?
- How could the collaboration be distributed without missing the advantages with the collaboration room?
- How does the degree of distribution influence the interaction, collaboration result and the feeling of group-in-group-out?

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Professor, PhD, Viveca Asproth
Mid Sweden University, Computer and Systems Science
Akademigatan 1, SE-83125 Östersund, Sweden
Telephone: +46 70 2905387
Telefax: +46 63 165700
Email: Viveca.asproth@miun.se