Building a joint information system

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Abstract

This paper discusses how a joint information system can be developed. The implementation was carried out in a project, doing final definitions and specifications, producing the information system and taking it into pilot use. The environment of the new collaborative information system is in the university world where student mobility is increasing. Student mobility means that students are enabled to choose studies from other universities to build their degrees in their home university. This information system will support the management of this movement in all Finnish universities. Nowadays there is no information system to manage this and without a demanding manual work it is not possible to get information about nationwide student mobility. Using this system the universities collaboratively build a new nationwide database of mobility. The project participants represented five Finnish universities, the Ministry of Education and the Finnish Virtual University. Furthermore, there were two vendors involved. Every interest group of the project had its own needs and interests and wanted to emphasise own purposes. This versatile member sample and the research aspect brought challenges to the implementation project and especially to the cooperation in the project that was to be carried out.

Keywords: *joint information system, CSCW, collaboration*

Introduction

This paper discusses the development of a joint information system. There is not much literature concerning information systems from the computer supported collaborative work (CSCW) approach. This paper expresses how the CSCW view became apparent in an information system development. This www-based information system called MoSu was to support the management of student mobility between Finnish universities in the times when www technology was spreading everywhere in common life and the amount of information was getting ever huger and time to manage it was getting ever shorter. In the next years MoSu will be in use, when student affairs offices in all Finnish universities will manage the process of student mobility. In addition, several thousands of students will use MoSu when applying for rights to pass courses in other universities as parts of their academic degree. Before that, MoSu was to be piloted.

The present project was a continuation on a work done by the Finnish Virtual University (FVU, 2001) consortium and the Oodi consortium (Oodi, 1995). Both the Finnish Virtual University (FVU) and Oodi were parties in the implementation project, Oodi giving consultancy when needed. They were though not the only parties but there were also four Finnish universities involved having their own interests and needs. The most important need in the project sense was the information system that was to help officials in student affairs offices to manage the movement of students who were building their academic exams in different universities. In addition to these universities, the project management was taken care in a fifth university. All of the parties were used to autonomy and some of them had long traditions in taking care of their own tasks.

At the end of the development the users were pleased with the system and its features. In addition, they didn't want to leave MoSu even after the piloting phase.

Framework

The new information system was a continuation of a pilot project owned by the Finnish Virtual University (FVU, 2001) and the Oodi development group (Oodi, 1995). The pilot project produced specifications for the process of student mobility and requirements for an information system to support it, and a demo of a user interface to be used in the information system that is now realised as MoSu.

The project manager of the MoSu project is collecting material for her thesis. She has participated in implementation projects in a factory environment (Halonen, 2003) and in a hospital environment (Halonen, 2004b) where five university hospitals were involved in taking into use a joint patient information system. The factory case was about replacing a manually maintained information system with an Access-software called CoatInfo (a pseudonym). With CoatInfo the factory workers could manage the coating process and in cooperation they collected the coating information to be used for quality purposes. Factory as an environment was very difficult because the hierarchy was so strict there. Blue-collars and white-collars worked separately, in this building in the very different floors. The hospital case consisted of a piloting phase of an information system (called PaRe in this paper) that was to replace a character-based mainframe system with a Windows-based client-server application. PaRe was going to be used in every five university hospital but they were going to be separate systems, having no interfaces between them. One difference between Oodi and PaRe was that Oodi is more tailored according to the needs of separate universities.

This implementation project of MoSu took place in circumstances where expectations and prejudice seemed to give extra degree of difficulty to this project (Diary 10 September, 2003). It gave more requirements to the project management. The literature gives aspects to consider when the role of interaction between the actors is emphasised (e.g. Covey, 1989). This was the case in the implementation project because the project was to be conducted by several universities and two consortia. Every actor had its own objectives and grounds to participate. Covey (1989) counsels the project manager to apply proactive thinking and to remember that a person is responsible of his or her own reactions and thoughts and that the project manager should not blame others of the decisions he or she has made.

Working together in one project means cooperation between several parties. One important party in this sense was the users who were going to use the information system. Literature emphasises the importance of users in many ways: users are really needed in the information system development because of their knowledge and experience of the subject. Newman and Robey (1992) present a social process model to guide research in the social dynamics of system development. The model expresses episodes and encounters involving both the users and the designers and because of the altering interaction between the parties, the model proves to be dynamic. Furthermore, changes in the social relationships are likely to appear especially in the encounters.

The FVU introduced its information system project (called FlexStu) where the purpose was to support student mobility and its management (Halonen, 2004a). This FlexStu was totally parallel and overlapping with MoSu and impeded the proceeding of MoSu in several ways. However, after increased collaboration between these overlapping projects, a fruitful solution was invented. The FVU decided to serve an application form that was going to be used in all Finnish universities instead of the different application forms of the distinctive universities. It took several months before the application found its final form and was accepted by all universities. In this phase the application was unified but not yet in electronic format. After that, the development of this application form was continued in MoSu and transferred electronic.

Sawyer and Southwick (2002) have studied temporal issues that are related to organisational change associated with the implementation of enterprise-wide information systems. They write that the increased number of involved parties implies the need for increased communication and coordination among these groups. The current case could be seen as an enterprise-wide information system, on one hand combining faculties and departments in one university and on another hand combining universities when they use MoSu.

Van der Aalst (2003) discusses interorganisational workflows that enable local autonomy without compromising the consistency of the overall process. He introduces an approach with three steps: 1) create a common understanding of the interorganisational workflow by specifying the shared public workflow, 2) partition the public workflow over the organisational entities involved, and 3) for each organisational entity: create a private workflow which is a subclass of the relevant part of the public workflow. This kind of situation was solved in MoSu by implementing steps 1 and 2 and letting universities carry their own processes in step 3.

Star and Ruhleder (1996) describe the issues in designing large information spaces when building a geographically dispersed, digital communication and a system for a community of scientists. This effort needed customisation and standardisation between organisations that were involved in the project. This kind on change was needed also between universities in the current study.

The current information system MoSu is a student information system that will serve as a tool for the people working in the student affairs offices in different universities and the students who want to apply for right to pass courses in different universities as a part of their degree in their home university. MoSu will be a supportive tool for computer supported collaborative work (CSCW) when officials manage nationwide student mobility. Schmidt (1991) states:" …. a CSCW system should provide facilities supporting users in appropriating, exploring, modifying, negotiating etc. – cooperatively and yet distributed – "community handbooks" that are openly incomplete and inconsistent. Providing support for distributed cooperative appropriation, circumvention, modification of the system is, perhaps, the toughest challenge in designing computer systems for cooperative work."

Churchill et al. (2001) define virtual collaborative environments (CVEs) as "online digital places and spaces where we can be in touch, play together and work together, even when we are geographically speaking, worlds apart. We can hang out, present alternative selves, interact with realistic and fantastic objects and carry out impossible manouvres. In CVEs we can share the experience of worlds beyond the physical." Further, the authors think that CVEs are normally graphical three-dimensional environments but it is not compulsory. Bochenek and Ragusa (2004) have studied virtual collaborative environments in their study about improving integrated project team interaction. They have identified success factors focusing on individuals, teams and systems that should be integrated into the virtual collaborative environments process. Moreover, the authors conclude that public- and private-sector organisations are seeking better methods for improving productivity and effectiveness in task accomplishment and that several organisations are committed to using virtual collaborative environments as an enabling information technology. MoSu is a kind of virtual collaborative environment when people interact separately, at different times when operating with student mobility.

Pipek (2005) has studied the field of collaborative information systems and CSCW. He has found the value of technology-related communication, demonstration and negotiation activities that aim to establish a shared understanding how a software can contribute the working. Pipek explored the problem of information systems research i.e. how to develop a situation in which information technology successfully supports human activities in a way that is perceived as an improvement compared to earlier situations. Further, he believes that the mutual shaping of the technology and organisational contexts resemble an ongoing design process that end users perform without participation of professional developers. However, this was not the case with MoSu but the developers were needed even when fulfilling the specifications of the information system.

Wenger (1998) introduces a concept of "community of practices" as a certain expertise in some area (like managing mobility of students) of work of people that represent that expertise. These people work closely day after day together formally or informally in order to reach some goals related to their common knowledge.

When in full use, MoSu will have thousands of users in all Finnish universities: officials in student affairs offices and students who want to study elsewhere. The student mobility from one university to another has been possible already for years but there has been no information system to support the management of the mobility. All of the Finnish universities signed an agreement in the summer 2003 that made the mobility possible between all universities and this was expected to increase the student mobility multiply. Moreover, Finland signed the Bologna Agreement (Bologna, 2003) where 33 European ministers agreed about unified educational degree system. In the future the student mobility is expected to overcome also the state borders after the Berlin Communiqué will come into force in 2010. Moreover, it is expected that unifying academic degrees also increases national mobility.

Research Method

Because the author is fully involved in the implementation project and she is acquiring research material for her thesis, reflection-in-action has been chosen to be the research method. The method enables the researcher to react on the current situations and make decisions that are grounded on the evaluation of the responses on the decisions. Action research as a research method in the university environment has been proven to be adequate also before (Heiskanen and Assinen, 2003). In addition, the personnel in the student affairs offices are targets of organisational change, also being involved in the project and influencing on its progress and outcomes. The author believes that the implementation project will offer a lot of material for a thesis because of its diversified nature. Schön (1983) describes the nature of problems in real-world and how the problems must be constructed from the problematic situations. This implementation project has so far shown some characteristics that may appear problematic in the future. Coghlan and Brannick (2002) encourage the practitioner to write out the feelings and personal experiences during the project with a view to describe his or her own actions. It helps to figure out the situation which affects on the actions and decisions made at that moment.

Action research is characterised by 1) its multivariate social setting, 2) its highly interpretive assumptions about observation, 3) intervention by the researcher, 4) participatory observation and 5) the study of change in the social setting (Baskerville and Wood-Harper, 1998). These characteristics are present also in this research.

Action research as a learning model offers the author a powerful tool. Action research consists of cycles that follow each other with an interval (Coghlan and Brannick, 2002). When doing action research there will be cycles in the beginning, during the progress of the project and at the end of the project. This paper presents the cycles overlapping when actions lead to further actions, affecting on the proceeding of the project.

Lallé (2003) introduces an actor-researcher as a management researcher and a practitioner, who on one hand works in an organisation and on the other hand generates new scientific knowledge. This actor-researcher approach describes the role of the author also in this project. In the same time the scientific knowledge will be judged by the university community when the results from the research will be published.

Kensing and Blomberg (1998) discuss the role of users when designing information systems. Furthermore, user participation varies from providing designers with experience from their work to actively participating in designing the information system, analysing the needs and possibilities. According to Kensing and Blomberg (1998), participatory projects typically have two main goals:

- developing and evaluating design practices that support more effective worker/designer cooperation and establishing the necessary conditions for cooperation within an organisation.
- designing and evaluating work and technology systems that support the organisation's work activities.

Covey (1989) writes that one should ensure that the plan conforms to the goal. If the final goal is considered in the very beginning, the project has better chances to succeed. Also Andersen et al. (2002) emphasise to keep the goal in mind when carrying out the project. According to Mason (2002), in the middle of all practice lies noticing. Noticing is necessary in order to act in a proper time, in response to the existing situation. Moreover, Mason (2002) suggests that every practitioner wants to be aware of possibilities, to be sensitive to the situation and to respond appropriately. These thoughts remind Goleman's (1995) notion about emotional intelligence.

In addition to using action research, case study is strongly emphasised in this research. According to Yin (2003) "using case studies for *research* purposes remains one of the most challenging of all social science endeavors". Furthermore, Yin (2003) characterises an exemplary case study by five features: 1) significance, 2) being "complete", 3) considering alternative perspectives, 4) displaying sufficient evidence, and 5) composed in an engaging manner.

The case is reported by bearing the idea of van der Blonk (2003) when he states that cases are written with a purpose that heads to the goal of the research project. He continues that the researcher is interpreting the case when writing it down. In this paper writing has also been very personal (van der Blonk, 2003) and the approach is linked with experiences of the researcher.

The study material consists of findings from literature and from empirical findings in the case. The convenience reason to this particular case was that the researcher had an access to it. Without forgetting the primitive ground for selecting this case it is essential that the case offers possibilities for learning and getting better understanding about implementation (Stake, 2000) and therefore it is a pertinent choice in this paper.

In addition, like Coghlan and Brannick (2002) suggest, the researcher has written a personal diary during her working. In qualitative research studies the benefit of diaries is realised when writing out the cases (Newbury, 2001). The purpose of personal notes is to facilitate the research process when they are used by the researcher, using recorded observations, thoughts and questions (Newbury, 2001). The approach is subjective and reflecting on the past of the researcher, relying on the remarks of Frankl (1963) when he states how our experiences and past have made us what we are. In this sense the approach is also interpretative (Walsham, 1993) because the approach is very subjective, the observations and findings reflecting strongly on the author's personal presence. Mason (2002) writes: "Writing autobiographical and other notes, keeping a journal, and mentally re-entering salient moments can assist professional development and be integral to research; they can also be carried out mechanically and ineffectively."

Van Maanen (1988) remarks that ethnographic field data are constructed from talk and action and thus they are interpretations of other interpretations and that they are mediated many times. These mediations are influenced – among other things – by researcher's own standards of relevance for what is of interest, by the queries that are performed, by the norms in the organisation culture, and by the researcher's presence on the scene as an observer and participant. Van Maanen continues that case studies are presented with differing styles like realistic, impressionistic, confessional, critical, formal, literary or jointly told. This paper presents its case realistic, pointing out some issues that appear typical to building collaboration.

Building Collaboration

The project parties were all strong institutions having their own culture, needs and missions. Universities in Finland have traditionally had a great autonomy and they are used to do their own decisions about doing things, concentrating on their own area of focus. In the long run the universities have developed their own information systems and related things to manage the daily work. Nowadays the collaboration is increasing because of the ever growing movement of the students. The amount of information to be moved from one place to another is getting ever huger and all this movement must be done in a limited time. The modern world demands changes in historical traditions with all the virtual possibilities also in the university world.

In addition to the traditional universities, there were two recently established consortia as parties in the project. The Oodi consortium was founded in 1995 and the Finnish Virtual University consortium was founded in January 2001. They both use the latest technology in their operations and head to future activities in order to extend their services as widely as possible in the Finnish academic world. The versatile interest groups and MoSu with a history (Heiskanen et al., 1998) predicted difficulties when building the collaboration. The decision about having two vendors instead of one produced both positive and negative outcomes and it demanded a lot of collaboration from project management and the owners of the project (Halonen and Heiskanen, 2005).

The collaboration was not possible without the help of technology like audiovisual meetings, www and email. It was important to notice that the additional noises and voices could hamper the interaction when using telephone. Somehow the telephone increased the loudness and hampered the meeting but the same amount of noise did not harm in any way when working alone, without having to concentrate on the person somewhere else.

Figure 1 describes the interest groups that were in relation to MoSu. In the figure there is the University of Helsinki (UH), founded in 1640. It is a wide-ranging educational university and it was the responsible university in the project, having applied funding from the Ministry of Education (MinEdu). Further, there are two other universities in the metropolitan area of Helsinki that also were piloting universities. Firstly, the Helsinki University of Technology (HUT) that is founded in 1849 and concentrated in areas with both scientific and technical importance. Secondly, Helsinki School of Economics (HSE), founded in 1911, aiming to produce new economic sciences and to offer education in the branch.

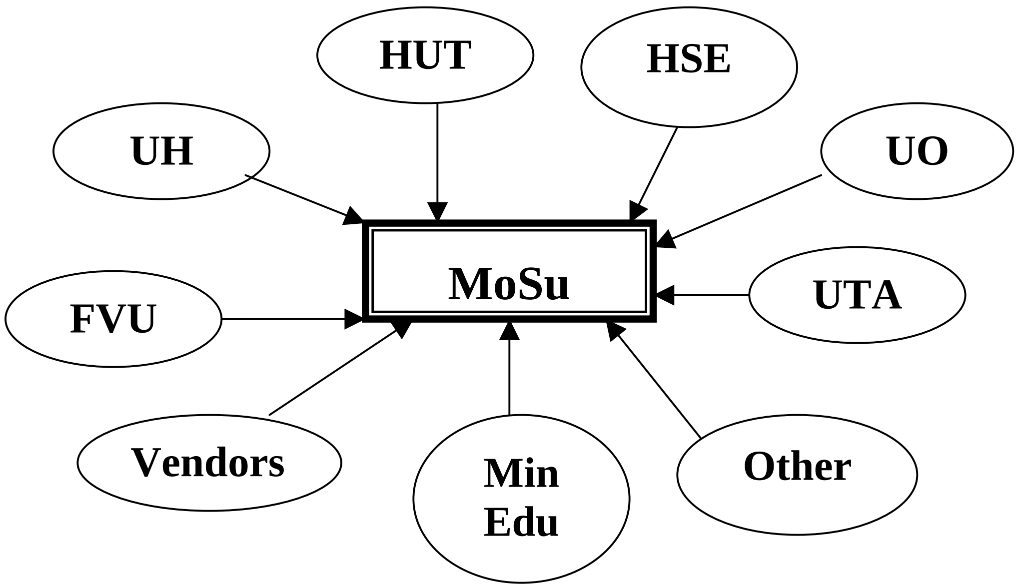

Figure 1. Interest groups and MoSu.

Because the three universities have Oodi in use, the University of Tampere (UTA) was acting as a process university and taking care of the "non-Oodi view". The project management was taken care in the University of Oulu (UO). Moreover, the Finnish Virtual University (FVU) was participating in the project with its nationwide ownership and two vendors that also influenced on the designing and development of MoSu. "Other" in the figure represents Oodi and other universities that influenced on MoSu via FVU, looking forward to getting it in use.

The FVU and Oodi having done the specifications predicted more forthcoming meetings and discussions where the final project goal and the milestones were to be under considerations. These meetings were very important for the future of the project and for the success of the implementation. In the future this information system was to serve all Finnish universities in supporting the management of student mobility between universities. The cooperation started already in 1995 when the Oodi consortium was founded by five Finnish universities. Nowadays the consortium has expanded including 13 Finnish universities. There has also been student mobility between universities since

1995 but the mobility has been modest until last years. After the JOO agreement coming into effect the movement was expected to increase and the cooperation between communication and information management was to be even more necessary.

Bodtker and Jameson (2001) describe conflict's emotional aspect and proclaim that there is no conflict without emotion. Emotion can be seen both in the verbal and nonverbal behaviour that people express. Emotion can be intentional or unintentional and it is bounded with the culture. Recognising an increasing conflict in the relationships between project people provides that emotions of the involved people are identified and thus the possibilities to manage the conflict are better. According to DeChurch and Marks (2001), managing conflict is strongly related to the success of the group performance. They even found that task conflict improved group satisfaction when it was managed with agreeable behaviour. Their foundation urges the project manager to find out the tools that need to be used when managing the conflicts that arise when proceeding with a project in cooperation.

This brings into the picture the human aspect of the people who are working together in order to contribute the information system to be developed and implemented. In addition to that, the functional model used to differ between universities and with the new information system the functional model was to be unified to some extent in all universities. Participatory design (Kensing and Blomberg, 1998) was essential in order to get a new model that would be accepted in every university that would take the new information system into use. The chosen research method is very subjective, enabling the researcher to observe the evolving situations and encounters in the meetings.

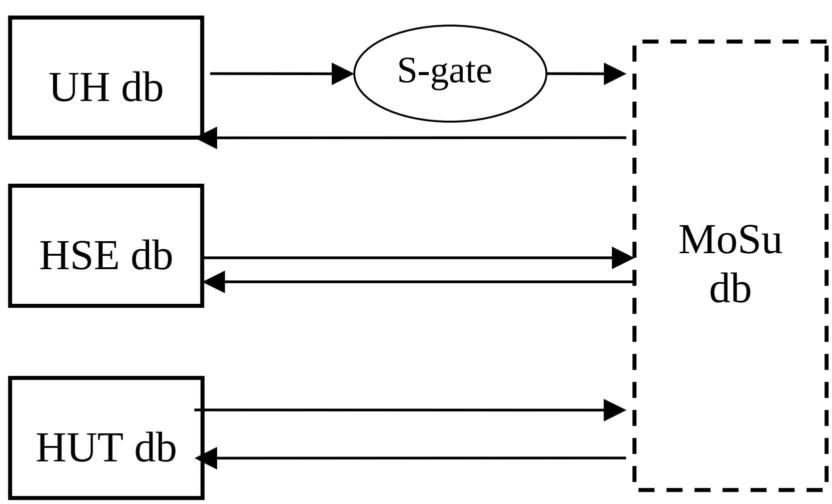

Figure 2. Interfaces between databases (db) in MoSu.

The new information system was planned using a Web-based format and it was going to be easily distributed to the forthcoming users. The universities had to be able to plan one information system including a common database to support their functions that had previously been carried out in their own way. Figure 2 describes the interfaces between the student information registers in MoSu.

The MoSu database (db) includes all information concerning student mobility in the universities that use MoSu (Fig. 2). The input of MoSu is the information about the students who want to study in other universities and their application forms including information about desired studies, added with supportive or rejective decisions made by the student affairs officials. The output of MoSu is the information about the students who have performed studies in the other university and their study attainments. The University of Helsinki (UH) uses Shibboleth (Shibboleth, 2005) technology (S-gate) when fetching data from its database to be used in MoSu. The Helsinki School of Economics (HSE) began piloting without Shibboleth and its users must log in locally in MoSu. Also the Helsinki University of Technology (HUT) started piloting without Shibboleth. Shibboleth was to help the exchange of information over organisational borders when reliable identification and authentication were important prerequisites.

Because all the information that was found in the electronic application form would be stored in the new database, also the laws of privacy protection had to be perceived. According to the Finnish legislation (Act 523, 1999), only expedient information may be gathered from persons. It appeared that is not axiomatic what the law meant in practice, leading to additional discussions about the relevancy. In addition, according to same legislation, persons are justified to know the information that is saved about them. This caused some annoyance among the student affairs officers: "*Damned, sometimes this principle of information visibility is ridiculous! There is interaction between officers that does not belong to others*." (private email 9th February 2005).

It appeared that the comments from MoSu were positive. In March 2005 an official called: "*It functions exactly as it should.*" The project manager got email in March 2005: "*This report is an excellent addition compared to previous situation. This kind of information was not available when the mobility was managed decentralised.*"

Discussion

This case was an information system project with the aim to produce and implement an information system to serve all Finnish universities in student mobility and support its management. MoSu was a project that needed participatory design (Kensing and Blomberg, 1998) definitely because the nature of the project was not only to develop an information system but to develop also the work related to student mobility. Some of the meetings were carried out by the means of video or audio, some had to be face-to-face depending on the issues at hand or the members participating in the meetings. It appeared that some people did not want to use video or audio meetings but preferred to physical presence.

In this research project the members were participating representing experience from their specific areas like student administration, student mobility or virtual university. The user involvement was taken very democratic despite the researcher being the project manager. However, it was not always easy to have the members in the project community to react and take responsibility as easily as the project manager had thought.

The approach of CSCW was not evident until the common database and its value were realised by the representatives of the piloting universities. The core idea was to get an electronic application form and to be able to follow its running in the mobility process. Also it was important to get existing information about the students to be reused in MoSu. So far there was no discussion about shared database. However, the technological approach expressed by the vendors clarified the role of shared database and the brainwork changed towards collaborative database.

The setting of MoSu resembled that of PaRe (Halonen 2004b) because there were many “owners” for the new information system. Every owner had developed its own ways of doing things and now they had to be able to develop a joint information system to support them all. Likewise, taking the new information system into use also meant changes in the workflows, even if in MoSu the local workflows were kept if possible. A common understanding of the interorganisational workflow (van der Aalst, 2003) was specified in order to enable the designing of a common information system. Further, the applications were handled according to the processes in the local universities (cf. step 3, van der Aalst, 2003).

The most important thing was to remember that there are human people working in every organisation and making plans and decisions. Working together means meeting these people, learning to understand their point of view and getting tasks done in cooperation. It is the conception of the author that the “win-win” principle introduced by Covey (1992) helped in forming the working circumstances productive both between the overlapping projects (Halonen, 2004a) and the piloting universities. When working together, all participants use the experience they have gained in previous projects (cf. Frankl, 1963) like project manager with her experiences from CoatInfo and PaRe or participants who were involved in the previous phase and now gave their experience to contribute MoSu.

Recognising the situation when conflicts were going to arise was essential in order to manage them. Bodtker and Jameson (2001) have noticed the role of emotions in conflicts and that was also seen in MoSu when the scale of the project was discussed. It was outstanding to state out the role of piloting before extending the information system nationwide. The idea of piloting did not hamper the final goal of a nationwide information system but enabled to implement a better system in the end. Despite solving the arising conflicts with discussion and interaction, the rationale of the disagreements were not straightened out. However, the development of the information system could be continued and finally MoSu was ready to be piloted.

It was a surprise to all project members representing the piloting universities to understand that using one information system in collaboration, the output would be one database, including all mobility and offering new possibilities to get information on different levels (departments, universities, nationwide) instead of getting information about student mobility in their local universities (Halonen, 2005). This common database produced new actions to student affairs offices and presumed changes to workflows in the offices. MoSu also enabled a new mobility community when the users worked promoting student mobility following Churchill et al. (2001).

Action research as a research method served the study, giving possibilities to act according to the changing situations in the project. The multivariate social setting (Baskerville and Wood-Harper, 1998) with several owners and backgrounds characterised the research from the first meeting. Further, the researcher intervened to the setting when e.g. increasing the collaboration between the overlapping projects. Participatory observation was emphasised when the student affairs officials participated in the designing and changes were made to the specifications.

In the first project meeting in June 2003 the goal of the project was put in words by the chairman: "*After three years these three universities will use an information system that supports the mobility of students, by default 1000 students*." It is the opinion of the researcher that the developing of MoSu is the answer to the problem (c.f. Pipek, 2005) of how to develop a situation in which information technology successfully supports human activities in a way that is perceived as an improvement compared to earlier situations when the human activities are connected with managing student mobility.

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