Managing work at several places: A case of project work in a nomadic group of students

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ABSTRACT
This paper explores the collaborative and spatial practices of university students engaged in project work. Regarding students as nomadic workers, we attempt to elucidate how their activities are shaped by the lack of a stable and fixed location where work can be carried out. Drawing on data collected by means of ethnographic informed methods, we discuss how students manage their collaborative activities at different locations and how they use artifacts and technology in order to do so.

Keywords: Collaborative work, nomadicity, space and place, field studies, design process.

INTRODUCTION
Within Swedish universities students are often required to work in groups to collaborate on projects or to write essays. One trait, often characterizing students group work, is the lack of a stable and fixed location where project related activities can be carried out and accomplished. By regarding students as instances of nomadic workers, the research project “Nomad” aims at understanding and analyzing nomadicity in the context of their group work, with special regard to issues related to collaborative and coordinative aspects of their activities, to awareness and distribution of work. Similarly to other studies in the field of Computer Supported Cooperative Work (CSCW), traditionally devoted to understanding how people use tools and technologies in order to collaborate and communicate with each other (Bannon et al., 1989), our ultimate goal is to inform the design of technology supporting students’ group work, in particular to explore the role technology could play in such a setting. In order to pursue this goal, we are currently investigating how the lack of a stable place shapes students’ collaborative activities. More specifically, we seek to understand how students manage their activities at different sites, how they turn the locations they travel to into workplaces suitable for the tasks at hand, what strategies they adopt, and how they use tools and technology in order to do so.

Although students have always been nomads, we believe that the spread of portable and mobile technologies raises relevant analytical concerns on the relations between individuals’ use of technology and the given environment wherein interactions take place. Moreover, the increasing usage of such technologies contributes to the emergence of novel collaborative aspects of nomadic work that are worth exploring.

In the following sections of this paper, we will firstly introduce and discuss previous studies on nomadic work and highlight some relevant issues. Secondly, we will introduce a perspective on nomadic work that has emerged from our previous work, and elucidate how a notion of “place”, rather than space, can be used to further understand it. Finally, we will present a field study and discuss some design considerations stemming from our findings.

STUDYING NOMADIC WORK
As already mentioned, a significant characteristic of students’ group work is the lack of a fixed and steady location where work can be accomplished. Finding a locale to work, making sure that reaching it is feasible for all the group members, moving to it, occupying it, and adapting it to the task at hand are all essential aspects of their project work. In this regard, students are comparable to professional mobile workers (Bogdan et al., 2006) who travel, because of their job, to meet up with other colleagues or clients.

Until recently, most of the research on mobility has mainly been focused on technical aspects of work. By exploring different ways to provide connections, both to networks and desktop applications anytime and anywhere, some research efforts (Kleinrock, 1995) have illustrated the opportunities enabled by mobile technology to work on the move, independently from any physical locations and spatial constraints. Questioning this view, we approach nomadicity as an aspect of work occurring at different places, within different time frames (Wiberg et al., 2001) and which shapes the social interactions individuals engage in (Kakihara et al., 2001).

The analytical stand of situating nomadicity draws attention to aspects of work that might contribute to a more comprehensive understanding of what being nomadic means. In this regard, studying nomadic work encompasses a comprehension of:
• how places change work (Perry et al., 2001), with a special focus on how activities are managed at, and across several place;
• how work practices change places (Brown et al., 2003);
• the relationships between spatial practices and the accomplishments of activities within particular time frames;
• how nomadic workers manage their work at different locations, how they use technology and artefacts to cope with this situation.

Understanding “nomadicty”
In our previous work (Bogdan et al., 2006), we have proposed a notion of nomadicty centered upon the notions of discontinuities – that is changes occurring in the work settings, in the group work, in the group organization, in the physical environments, in the tools and the technology supporting work activities. These changes do not occur separately, but are indeed intertwined with each other. Spatial discontinuity, for instance, experienced while moving from a work location to another, is often interrelated with technology discontinuity. That means that, by moving to another locale, the technology used to carry out the task might change and, conversely, the choice of the site to work at might depend on the technology and resources available in there. Nomadic workers, more specifically the students who participated in our study, develop practices and adopt strategies to cope with this situation and manage their work at several locations. Thus, discontinuities seldom occur as unexpected breakdowns, but they are, on the contrary, foreseen and planned. As reported elsewhere (Bogdan et al., 2006; Rossitto et al., 2007), the students we studied often planned their work, the work site and resources to be used, in order to cope with this situation. The following example of a pair of students, working on a report at university campus, better illustrates this aspect of work. As only one of them had a laptop, in the beginning of their writing session, they decided that the one with her own laptop would have worked at the library cafeteria, where a connection was available, whereas the other would have sat in one of the computer labs and communicated with each other via instant messaging. They worked remotely until another working station was available in the lab where the first student moved to.

The episode mentioned portrays an example of discontinuity in the technology used, its relationships to the sites where the discussed activities were carried out and to the people present within them. In this section we have presented a notion of nomadicty elaborated in the context of our past work. In the following sections we will suggest how the concept of place can provide an analytical framework to make sense of the activities observed during the fieldwork discussed in this paper.

THE NOTION OF PLACE AS AN EVENT
Place, or rather the variability of places at which work is accomplished, is a relevant characteristic of students’ work. Place is a practical concern (Brown et al., 2003) not only for professional nomadic workers, but also for students who, similarly, plan and organize their group activities depending on the sites they travel to and will be working at. Choosing a location depending on the nature of the tasks to be carried out, the resources available within them and the peers involved, are all relevant facets of student’s group activities. In this sense, they do not just happen to be in one place, but they rather attribute activities, meanings and values to it.

In our view, a notion of place, rather than space or physical environment, is appropriate to analyze nomadic work. In fact, whereas space refers to the geometrical and structural dimension of a site, place encompasses the facets of human experience and activities within it (Tuan, 1975).

Aware of the vivid, ongoing debate on what constitutes a place, for the purposes of our work, we will draw on Casey’s phenomenological notion of place as an event, as something that has to be negotiated and constructed. According to Casey (1996), an important aspect of place is that, although stable and perduing in relation to its identity and essence, the same place may still be dynamic and changing in relation to a lived body, its movements within and across it. In other words, if a place may be understood for what it is by most of the members of a given community or group, their experience, its appropriation and use of it may differ depending on the people within it, the current activities, and their situated needs.

“A given place takes on the properties of its occupants, reflecting these qualities in its own construction and description, and expressing them in its occurrence as an event: places not only are, they happen” (Casey, 1996: 27).

In other words, a place does not just exist per se, but is rather embodied in individuals’ activities and experience of it through space and time. McCarthy and Wright (2005) have described this aspect of place by adopting a dialogical metaphor that explains the emergence of place as the situated outcome of a responsive conversation between place, self and technology.

The sameness between places does not merely derive from sharing the same physical locations, geometry, or structure. On the contrary, it emerges from the intertwining of other traits related to individuals’ lived experience of it, such as a psychological, a cultural, an historical and a social dimension. This lived dimension enables similar experiences and the engagement to activities of the same type. Maintaining an engagement to the same activity is the main challenge that students have to face when moving from

a site to another one and when working at, and across several locations.

THE CASE STUDY

The fieldwork, presented in this paper, was performed in order to understand how students manage collaborative activities - in particular designing and writing - taking place at several locations; how they use tools and technological artifacts in order to cope with this situation.

A course, including a design project, was chosen as a setting to perform the field study. Students attending the course were required to work in groups of four up to six members to design a prototype of computer support for collaborative work or learning. Furthermore, they were to write a report describing the prototype developed, the process of designing it and to justify the main design choices. One of the student groups in the course volunteered to participate in the study. This group was made up of four students: two undergraduate students and two PhD students. One of the two PhD students shared an office in our university building, whereas the other used to commute from another city, where he had his office.

In performing the study, we adopted an ethnographically-informed approach (Blomberg et al., 2003). The data were collected by means of observations and video recording of the group working sessions, by note taking and semi-structured interviews with every group member. Moreover, students were asked to keep a diary and to take pictures of the diverse sites wherein they worked. The diary contained some open questions in order to stimulate participants’ comments on unexpected changes of the workplaces, group members involved and on the tools used to support collaboration. The purpose of using photos was to stimulate and prompt discussions about the different environments and the activities carried out within them when the researchers could not be present. A debriefing interview was performed in order to gather more information about the diary and the pictures.

The fieldwork was conducted in order to gain an understanding of:

• What activities are carried out by students at different locales and why these are chosen;
• How the students turn the locations they travel to into places suitable for their work;
• How they manage work at and across several places;
• What tools they use and which strategy they adopt in order to do so.

The ultimate goal is to inform the generation of high level design concepts that would define the role that technology could play and the functionalities it could provide for work characterized by nomadicy.

FINDINGS

In this section, we will discuss a selection of the findings emerged from the field study presented in this paper. In introducing the results, we draw on Casey’s notion of place previously elucidated. Firstly, we will discuss how place happens, how it emerges from students’ interactions with the environment they inhabit, and how it is mediated by the technology they use: we regard this aspect as making place. Secondly, we will seek to highlight how places are managed, which are the strategies adopted and the tools used to overcome the problems deriving from carrying group work at several locations. As the data will show, place making and place managing activities are intertwined and not clearly distinguishable from each other.

Making place

We start our discussion by focusing on how place is made and on the diverse ways of transforming, negotiating and turning a site into an adequate (work)place. The use of technology and artifacts, the appropriation of resources within a given location, the rearrangement of elements within it, and the investment of a location with overarching activities are significant instances of place making.

Places, meanings and social relations

The students we have studied work at different locations, such as group rooms at the university library, lectures halls, cafeterias, open spaces within the university buildings, seminar rooms and homes. In contrast to other mobile work settings (Bartolucci, 2006), for which a correlation emerges between the use of specific tools (e.g a Digi-rod and a measuring tape), well defined activities (e.g measuring) and a certain class of places (e.g a building site), it is problematic to define a stable correlation between a given place and a typical activity accomplished within it. For instance, a final revision of a presentation may take place in a corridor outside a lecture hall, just before the lecture begins. On the other hand, a lecture hall – usually used for regular teaching activities – can also be used by students for disparate goals, such as organizing various group activities, writing a report, preparing a project presentation, etc. Sites to work at are not chosen randomly or merely because they are free and available, but also other reasons, peculiar to a social dimension of work, determine this choice. For the group we studied, for instance, the places where the meetings were held varied considerably depending on different factors, such as: the number of people participating, the presence of resources to be used during the working sessions (e.g. a whiteboard, a wide screen), the presence of other persons in a nearby area. The group discussed herein often met up in an open space within a university building, because the teacher supervising them had her office at a close distance and was, therefore, easily reached whenever help was needed.
The university main campus, with its several buildings and sections, is a rather vast physical infrastructure, central in students’ academic life. This is certainly due to the fact that most of the educational activities, such as lectures, meetings with supervisors, attending libraries and labs, take place there and students are, at times, already in nearby places. Furthermore, in a big city like Stockholm, the fact that the campus is located in a central area of the city makes it easier to reach for almost everyone living in the city, in a relatively short time.

“We almost never work at someone’s home. We all live in different parts of the city and the city is big, thus it could be too far to travel all the way […]. Besides, most of us live in small student rooms, it is not practical to meet in there if many people are working on the same task”.

For the students who participated in the field study, the main reason for traveling to a meeting place was to meet up with other peers in order to carry out, together, those parts of the group work which required negotiation and discussion. This would include, for example, defining the goals of the ongoing project, deciding what to include into a report, or a project presentation, writing together the conclusions of an essay, in order to avoid conflicting opinions. Places such as home were often considered to be more suitable for tasks that can be accomplished individually and that do not require thorough discussions with the others. On the contrary, some other locations, spanning from areas within the university buildings (open spaces, corridors, group rooms, classrooms) to cafes and fast-food restaurants, were regarded as suitable for working together with peers. For example, the students who participated in this study explained that when the deadline was approaching, they had an intense discussion on how they could complete the report as efficiently as possible. Thus, they consciously decided what sections of the reports could be written individually during the following evening, as they did not require any discussion. Besides, they deliberately postponed until the next meeting to work on those parts (e.g. the functions to include in the prototype and the scenarios used to illustrate them) which required discussion and common agreement.

As it emerges from this example, planning the division of work and the sequence of tasks is a relevant strategy to manage co-located work sessions and remote interactions among the group members. This conscious alternation of group and individual activities intertwines with a distinction between places more suitable for collaboration and places more suitable for individual work. Moreover, a preliminary condition for a site to be a suitable workplace is the presence of other people.

Accessing and sharing resources
Another characteristic of the nomadic work presented here is to provide the access to resources: namely working documents, references, artifacts produced throughout the project. Making sure that working resources are available and that everyone has access to them seems to be one of the students’ main concern when setting the stage for work related activities, when creating a workplace. This is a serious issue because the appropriation and the use students make of places, especially the public ones, are ephemeral. In fact, as the locales are also available to other people, working artifacts produced and used by the whole group (e.g. mock-ups, paper references, images) cannot be stored therein. Consequently, they have to be cleared out when the working sessions are over. The strategies adopted by each individual in order to overcome this problematic aspect of work are different. The student who used to commute, for example, used to select some articles and books to bring along, so that the whole group could consult them while writing the report. Before the work session arranged to finalize the report, the readings were grouped together by topic, organized in different piles and laid on a big table, situated in the middle of the room, so that they were within everyone’s reach. Another student, preparing for the same meeting, sent to himself, as an email attachment, the part of the report he had written the day before, so that it would be accessible from any computer at the university. At the same time, he brought his own laptop to the meeting, in order to have an archive of past assignments from which to draw inspiration in case of need.

Planning the availability of working material and resources is another important aspect of setting a workplace. Their access and use are not limited to an individual usage, but it encompasses the possibility to make them shareable by each group member.

Parallel activities and spatial practices
As mentioned in the previous section, one of the group meetings was held in order to complete the report. Nevertheless, while working on it (pasting the different parts together, connecting a section to the next and proofreading them), the four students realized that they needed to specify, in more detail, their design work and that it would be better accomplished by describing the main aspects of the prototype in a scenario. Thus, one of them kept on editing the text, two others moved to one of the whiteboards available in the room and worked on the scenario, whereas the fourth student went through the references to select the more relevant ones to use in their assignment.

Throughout the meeting, the students temporally worked on parallel tasks, distributed to different areas of the same room. The ongoing allocation of tasks, the combination of people attending to them and the artifacts used, the individuals’ distribution on the spatial dimension of the room changed continuously and dynamically. While the activities at hand were carried out separately, every student had a sufficient level of awareness of what the others were doing and was
prepared to shift task as soon as she felt that her own contribution could be constructive for what the others were doing.

Being present in the same place supported and encouraged changes in the combination of people and activities being carried out, the artifacts used and the individual’s distribution in space. This aspect of articulating and distributing work can be regarded as a way of accommodating locations to the current needs.

Managing places

By using the expression managing places, we refer to the way work at several locations is organized in order to enable an engagement to the activity at hand. Managing places encompasses the strategies students adopt and the tools they use to create a connection between a locale and another.

Bridging places

The previous discussion of the results has already shown some examples of how students manage work at several places. Planning their activities, the access and use of resources are significant facets of it.

The following episode further illustrates this aspect of nomadicity, particularly in regard to how places are bridged by moving artifacts from a place to another at which the next working session is planned to occur. During a meeting taking place in an open space within one of the university buildings, the four group members used a whiteboard to sketch their prototype. As the place had to be cleared out at the end of the working session and they could not take the whiteboard with them, one of students took some pictures of the whiteboard, by using the camera in his mobile phone, and promised he would send them to the others by email. Despite the agreement, he forgot to do so and during the following meeting the pictures were firstly offloaded to someone else’s laptop and then printed out in four copies, one for each student.

Consequently, the representation of the prototype, generated and used collectively by the whole group, turned into a personal representation more suitable for individual use.

Use of tools and technology

It is problematic to define, once and for all, what are the most representative technologies and tools used by students in the context of their group work. It could be said that these are used differently depending on the task at hand, the number of individuals involved in it and the particular location wherein work related activities take place. Email, generic groupware, instant messaging applications, pen and papers and whiteboards were used to support both the writing and the prototyping activities. Some of the findings presented have implicitly illustrated how these technological artifacts were used to manage the uncertainty of places. The use of mobile phones to store and bring along files, rather than keeping in touch with the other peers, constitutes an example. The fact that mobile phones were seldom used for communicative purposes was somehow a surprise to us. When participants were asked about this issue, they explained it was too expensive and that, because of this reason, they preferred to use instant messaging or email if they needed to talk to each other. Email was also a reliable medium to assure that documents (the text written for the report) would be accessible from anywhere a connection is available. Sending files to oneself, in the form of email attachments, is a strategy which was often adopted in order to make work more adaptable to several places. This same need is also inferable from the fact that during the co-located meeting held to complete the report, one of the participants brought along his own laptop as a repository for old essays to be used as inspirational material, rather than utilizing any of the applications available in it.

In the rest of this section we discuss, in detail, the use of an online conference tool, used by the students to physically bridge the different places they were located at. The use of this tool was suggested by the student who did not live in the same city as the rest of the group. The goal was to have an on-line meeting to brainstorm on the functionalities to include in the prototype and to sketch its different interfaces. The conference tool allowed more than two people to synchronously participate in the same conversation, whilst the video conferencing gave the students the feeling that the others were present and that they could talk to each other as if face-to-face. Moreover, the online tool provided a shared whiteboard to write and sketch on, the possibility to share documents and URLs, to upload and save working files and resources. The presence of a digital whiteboard, regarded as useful to take notes and jot down ideas, was one of the main reasons for choosing this tool. During the online meeting, as long as the suggested functionalities were only annotated, the tool seemed to be quite suitable. However, when the students tried to group them up in different clusters, it was not flexible enough to allow this second phase of the brainstorming and the final sketching phase itself.

“... It was exciting to try it out, I enjoyed it, but it was hard to communicate with each other and to design the prototype by using this medium [...]. Thus, we decided to meet face-to-face. We worked for four hours and most of the work related to the prototyping was done, while we did not manage to do much after working for two hours online”.

One of the problems which often occurred during this online meeting was that one of the group members got disconnected from the conference room several times. Thus, before restarting to work, the other members had to wait for him to get connected again. The quotation reported below illustrates this particular breakdown:
"One of the problems was that one of the group members had problems with the setup of his own local network, so every time the phone rung, he got disconnected and then we had to wait for him to connect again.”

Certainly, the fact that one of the students got disconnected when the landline phone rung can be regarded as a technical problem. Nevertheless, addressed in the context of the group work, it becomes an aspect of work related to its social dimension, as the same infrastructure is not available to everyone, or at least, not in the same configuration. Another similar issue regarding this matter is that one of the group members did not have a web camera, so that in the online conference room she was not as visually present as the others.

Moreover, although working documents and resources could be uploaded and stored in the conference room, this application was never used as a shared repository for the whole group. On the contrary, two of the group members experienced it as one more tool to keep track of.

“I assume there are some pictures there, but I’m not sure”.

After this first attempt, the online conference tool was put aside, as never completely appropriated by the group or integrated into its work practices.

**DISCUSSION AND REFLECTIONS FOR DESIGN**

In discussing our findings, we have attempted to illustrate the relations between these particular nomadic workers, their work activities and the places where these activities occur. Furthermore, we have tried to highlight the situated use of various technologies in order to manage places and working resources and to make them accessible and available whenever needed.

As pointed out elsewhere (McCarthy et al., 2005), portable and mobile technologies pose important challenges in understanding the relationships, the dialogue between individuals and space and how it is mediated by technology. This issue has been particularly relevant on an analytical level, in particular to understand how the subjects we have studied manage to keep an engagement to their current activities.

What does this entail on a design level? What is the role technology can play in supporting settings characterized by degrees of nomadity? We attempt to provide some answers to these questions by discussing a few design reflections stemming from the findings presented in the previous sections.

**Supporting co-located and remote interactions**

Available technology enables students to work remotely from different locations. In this paper we have discussed the specific use of an online conference tool that was meant to replace a co-located meeting. The use of instant messaging applications to exchange opinions while writing a section of the report, or to be simply aware of who is currently available are other relevant examples. Nevertheless, some of the activities studied, such as sketching and designing a prototype, rely on a high degree of physicality and on the fact that, in order to visualize several design alternatives, tangible artifacts are moved around and grouped together in different constellations. The writing activity can be demanding as well so that parts requiring a lot of negotiation and discussion are more preferably dealt with at the same location.

Our first design reflection is related to the role that technology could play in supporting both co-located and distributed work for this type of setting. As shown in the findings, the type of nomadity described here does not include work taking place during long distance traveling to new destinations. On the contrary, the work described usually occurs at places students are familiar with. These locales are often chosen instrumentally, because of the resources available within them. The choice to meet up and work at a location, rather than another, is not merely determined by the presence of a whiteboard or a wide screen, but also by the nearby presence of other people, such as a group supervisor. Sometimes the reason for gathering together at the library cafeteria, or at one of the library group rooms, is merely related to the fact that the students involved were already within the university campus to attend a lecture or other tasks.

We believe that any technology support should not be designed to replace co-located work with computer-mediated interactions, but rather to support both face-to-face work sessions and remote interactions.

**Integrating contents**

Students use various tools to accomplish their work. In this paper, we have explicitly referred to the use of emails, mobile phones and online conference tools. The use of instant messaging applications and generic groupware, the intertwinement of public (e.g. computers available at the university) and private technology (e.g. one’s own computer) constitute other relevant examples (Bogdan et al., 2006; Rossitto et al., 2007).

The heterogeneity of the tools used can sometimes result in a difficulty to keep track of which information is stored in each one of them. The quote, reported in the previous session, illustrates one of the students’ difficulty to remember if the documents, produced during the brainstorming of the prototype, were still stored in the online conference tool or not. The use of a mobile phone to take pictures of the whiteboard where the prototype had been drawn is another relevant example. Both events exemplify how the information relevant to the group work and the knowledge produced is scattered over several applications.

The quote in which a participant said that it was exciting to try out the conference tool, reveals that technological artifacts are sometimes introduced into the
group practices by one of members who has used it before. The students themselves explained that it can be difficult to convince the other peers to start using a new tool. This contributes, even more, to the heterogeneity and to the difficulty of getting used to them and integrating them into the personal work practices. Moreover, the use of these technological artifacts and their particular functions seems to depend on the place where work is carried out. At one occasion, for instance, a laptop was not actually used to write but as a repository of past works. Sometimes this choice is planned and thought through (sending documents to oneself as email attachments), while other times it is determined by the current situation and by the infrastructure available in the nearby surroundings.

Our second design consideration relates to the integration of existing technological artifacts in order to make comments, notes, working documents, pictures and storyboards shareable among different technologies and applications, not only among members of the same group.

Supporting knotworking
As shown in the data, being present in the same room does not necessarily entail to be actively involved in the whole set of activities being carried out within it. On the other hand, the combination of people attending to a specific task and the artifacts used varies considerably depending on the situated needs. Engeström (Engeström et al., 1999) refers to this aspect of work as knotworking, a changing orchestration of people and artifacts over trajectories of time and distributed in space.

Finally, our third design reflection is related to the execution, and the involvement in parallel activities facilitated by being present in the same space. Most of the technology available, enabling synchronous work, e.g. on-line meeting and conference tools, are based on the assumption that being present implies being active and attending to a specific task. Furthermore, they provide modest support for instant articulation and distribution of work among (working) units smaller than the whole group.

CONCLUSIONS AND FUTURE WORK
In this paper we have attempted to analyze the collaborative practices of students engaged in group work. We have highlighted the relationships between the group activities and the places they are bound to, with a central focus on how these relationships are mediated by the technological artifacts used by the group.

We are further analyzing the data collected during the fieldwork discussed in this paper. Furthermore, we are currently conducting participatory design workshops, in order to develop and prototype the design concepts presented in this paper.

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