The Multidisciplinary Design Group in Vienna

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ABSTRACT

This showcase paper describes the research of the Multidisciplinary Design Group, Vienna University of Technology, over the course of more than 20 years. It discusses this research and the contributions to CSCW resulting from it, under four headings: work practices in health care; studies of design practice and development of supporting technologies; coordination work and technologies; and gender studies, identifying the 'factors' that shaped the group's engagement in specific projects and the analytical frameworks they developed in collaboration with international cooperation partners.

Author Keywords

CSCW research, health care, architectural design, coordinative artifacts, collaborative practices, ethnography, interaction design, gender

ACM Classification Keywords

K.4.3 Organizational Impacts, H5.m. Information interfaces and presentation.

General Terms

Design, Human Factors

INTRODUCTION

The Multidisciplinary Design Group, which was founded in 1987, is part of the Institute of Design and Assessment of Technology, Vienna University of Technology (TUW). It is an interdisciplinary research unit within a traditional computer science faculty, which brings together expertise in sociology, ethnography, psychology, and computer science for the study of work practices and organizations, as well as the design of supporting technologies. The major intellectual project of the group is to achieve a deeper understanding of (collaborative) work practices and technology use in fields as varied as health care, architecture and urban planning, and other professional

contexts. As diverse as the group's research topics may appear, they have a common focus on material practices in different professional and organizational contexts, in particular on how cooperative practice reproduces the diversity of its environment in the form of the multiplicity of 'small worlds' of professions and specialties. The group has strong links to the Participatory Design Community. In much of its work it is also applying a gender perspective.

Core members of the group are Ina Wagner (head of the institute) and Hilda Tellioglu. Since 1987 members of the group conceptualized, acquired funding for, and managed *eight* large, interdisciplinary, international and *five* large interdisciplinary national research projects, as well as several smaller projects and employed over 20 senior and junior research fellows; to mention in particular: Andrea Birbaumer (psychology), Lisa Ehrenstrasser (product design), Gammon (sound specialist), Martin Kompast (education), Valerie Maquil (computer science), Kresimir Matcovic (computer science), Thomas Psik (computer science), Karin Schneider (computer science), Wolfgang Spreicer (TUI design), Marianne Tolar (business informatics and sociology), and Mira Wagner (fine arts).

As Austria is a small country and CSCW research is not so well represented, the group has always had to look for international cooperation partners. Due to the support of the European Commission and other funding bodies it had the opportunity to engage in collaborative activities with research groups across Europe and beyond. Of particular importance for their work were and are collaborations with: Ellen Balka (Simon Fraser University, Canada), Liam Bannon (University of Limerick, IRE), Tone Bratteteig (University of Oslo, NO), Pelle Ehn (Malmö School of Art and Communication, SE), Giulio Jacucci (University of Helsinki, FI), Kari Kuutti (Oulu University, FI), Giorgio De Michelis (University of Milano-Bicocca, IT), Dieter Schmalstieg (Graz University of Technology, A), Kjeld Schmidt (Copenhagen Business School, DK), Carla Simone (University of Milano-Bicocca, IT), and Jean-Jacques Terrin (Ecole nationale supérieure d'architecture de Versailles, F). Collaboration with the institutes for architecture of the Academy of Fine Arts and the University of Applied Arts in Vienna, as well as cooperation with architect Rüdiger Lainer allowed for amongst other things long-term ethnographic immersion in architectural design and planning activities.

The following paragraphs outline research performed in four areas: studies of work practices in health care; studies of design practice and development of supporting technologies; coordination technologies; gender studies.

WORK PRACTICES IN HEALTH CARE

The group's research on computers in health care dates back to the late 80's when Ina Wagner conducted a series of small studies in Austrian hospitals, co-authoring a monograph 'Das computerisierte Krankenhaus' (1991). This was followed by field studies on computer use in French hospitals conducted by Karin Schneider as part of her PhD thesis, funded through project COMPPFLEGE (De-Centralized Computer Applications in Hospital Wards, funded by Jubiläumsfonds of the Austrian National Bank, 1990-91). It provided insight into the complex nature of collaboration in hospitals. Information sharing under different technological regimes and work organizations was examined with special attention to the role of different types of screen-based records. The need for supporting local practices, professional distance and the different worldviews of the medical and nursing staff and administrators was stressed (Schneider & Wagner 1993). Furthermore, the impact of nursing classification systems was investigated, examining tendencies - such as disembedding, multiple links and new terrains, universal representations and imagined worlds - and their political uses in the local and more global contexts hospital work is embedded in (Wagner 1993 and 1995).

The next project COTERM (Computer-supported Time Planning in a Surgery Clinic; funded by the Austrian Research Fund, 1990-1993) analyzed the social and cultural complexity of timing. Its main conclusion was that time is a social phenomenon of intense subjectivity, its planning through allocation, sequencing and synchronization made difficult by a high degree of temporal ambiguity, a plurality of priorities as well as a high degree of contingency (e.g. emergency cases arriving, a patient's condition deteriorating). One important consequence of this finding was that time-management in a surgery clinic is not a pure scheduling problem. The approach Egger & Wagner (1992, 1993) argued for was to bridge organizational segmentation and to support a culture of transparency and sharing (see also Wagner 1994).

Hilda Tellioglu participated in a project commissioned by the central hospital administration of the City of Vienna on the introduction of PACS (digital imaging and archiving technologies) in a large clinic. As part of the project a series of small comparative studies of PACS in three other hospitals (in the UK and Denmark) were conducted (Lundberg and Tellioglu, 1997; Tellioglu, 1997, 1998; Wild, Peissl & Tellioglu, 1998). She and Ina Wagner made use of the language of space, regions, and boundaries for identifying some key CSCW issues that may be addressed in spatial terms. They asked how to use systems such as PACS, RIS and HIS for enabling more fluent transitions and boundary crossings within the highly regionalized physical space of the hospital. In their conclusions they point at architecture as an inspirational resource for thinking about spatial qualities and cooperative work (Tellioglu & Wagner 2002). Designing visual relations and flexible zoning into physical spaces are just two examples of this cross-disciplinary thinking, which was inspired by the group's collaborations with architects. This approach is described in more detail in Lainer & Wagner (1998), where a specific vocabulary for talking about collaboration is introduced: transformation layer, intermediate space, vista and social transverse. It is used for analyzing people's needs for places and boundaries on the one hand, for boundary crossings and the adaptability of spaces to temporary and unforeseen uses on the other hand.

The most recent research in area of health care was carried out as part of project 'Action for Health' (2004-2007), funded by the Canadian SHRC and directed by Ellen Balka, Simon Fraser University, which brought 25 individual projects together. The 'Austrian case study' examined variations of work practices and artifacts in three oncology clinics in Austria, with a view onto understanding the tensions between local work practices and global concerns. Ina Wagner was co-leader responsible for work practice research and ethical issues in this research project; Marianne Tolar carried out the fieldwork as part of her PhD thesis. Several papers resulted from this research. The general focus of an analysis carried out in collaboration with Kjeld Schmidt (Schmidt et al. 2007) was on documentation practices in two of the three clinics that are tightly connected to the coordination of tasks between individuals and organizational units. A more specific focus was on the artifacts used and on the material setting with its arrangements of rooms, computers, and other material resources. There were both striking commonalities and striking differences in the work practices of the two settings. The paper discusses how we may conceive of the relationship between ethnographic studies and systems development and suggests that a way out of the dilemma might be found in developing an analysis of the 'higher-order' practices of endless combination and recombination of artifacts, formats, notations, etc. that are found across such sites.

The topic of local variations was taken up in a paper with Ellen Balka and Pernille Bjorn (2008), which has been awarded 'best paper' at the CSCW 2008 Conference in San Diego, CA. Drawing on ethnographic case studies conducted in six healthcare settings in two countries (Austria and Canada) it develops a typology, with the aim to help systems designers and other stakeholders identify possible sources of local variations of work practices in health care settings. The typology includes elements that have been identified by studying the larger organizational and institutional issues surrounding HIS, including the political and policy-making context. This research reaches beyond workplace studies but is complementary to them in

important ways, as it helps identify some of the 'forces' that shape and constrain work practices.

(STUDIES OF) DESIGN PRACTICE

A second area of persistent interest of the group is design work. Ina Wagner has made salient contributions to the understanding of architectural practice, based on 12 years of fieldwork, where she studied architecture in 'real settings' (in contrast to the mostly cognitively oriented studies, based on lab experiments, in the field of 'design studies'), with a focus on collaborative practices and on artifacts, their persuasive nature, their materiality, as well as their representational and coordinative functions. This research started as part of a small national project TECHKUL (Information Technology in the Arts. A Pilot Study of Changing Work Practices and Professional Cultures, funded by the Austrian Research Fund, 1993-95). In this project Martin Kompast and Ina Wagner carried out fieldwork studying the conception of an architectural project as well as computerized lighting design in a theatre. This was followed by several years of immersion in ongoing work at Architekturbüro Rüdiger Lainer in Vienna as well as a series of in-depth interviews with architects in other Austrian and French offices so as to corroborate that, with variations, the practices we observed are common practices. This fieldwork forms the basis of the group's long-term joint research with Kjeld Schmidt, at the core of which is the analysis of 'ordering systems' and 'information infrastructures' in support of coordinating work in large-scale complex settings as part of a sociological theory of cooperative work. Ordering systems are immensely composite practices, consisting of interrelated artifacts, classification schemes, notations, nomenclatures, standard formats, validation procedures, schedules, routing schemes, etc. (Schmidt & Wagner 2004).

In the period from 1996 to 1999 Hilda Tellioglu and Ina Wagner set up two national projects on collaboration practices in architectural design that involved several architectural studios. The first of these projects (funded by the Austrian Innovation and Technology Fund), focused on cooperative planning activities in mixed teams of architects, building specialists and producers of building elements. The second project (funded by the Austrian Federal Ministry for Education, Arts and Culture) had 'flexible standardization' as its topic, studying possibilities of computer-supported integration of design and production. A prototype called *CoPlan* supporting coordination between distributed professionals in architectural planning was developed and evaluated (Tellioglu, 2000). *CoPlan* was based on Web and database technologies to create a common information space between planners and producers.

Based on ongoing ethnographic immersion in architectural design and planning as well as the experiences of these small projects, the notion of 'open planning' was developed, which looks at multiplicity and 'openness' as main characteristics of design work (Lainer and Wagner 2002). On the level of method, openness requires organizing work as an informal, fluent process. On the conceptual level the focus is on fuzzy concepts, preliminary specifications, and on working with contradiction and constraints. There are some good reasons for maintaining openness in a design project: there is a desire by the designers to expand the solution space so as to see things differently and to keep a design open to novel and surprising solutions; at its core, design work is about cooperating with others, mobilizing their imagination; designs are often complex, which makes it difficult to define and fix details of the design in a simple linear process (Wagner 2004).

Most of the group's own design work has been embedded in the context of EU funded technology development projects and has focused on supporting collaborative design work in urban planning, architecture and interaction design. These projects allowed the group to immerse themselves in experimental, creative, and participatory practices, directed at bridging the social worlds of practitioners and those of engineers, with a focus on understanding use situations of technologies and their appropriation by practitioners.

The group's engagement in research 'bringing ethnography to design' started with EU funded ESPRIT project DESARTE (The computer-supported design of artifacts and spaces in architecture: landscape architecture, 1996-1997 and 1999-2001). Main cooperation partners in this project were Dan Shapiro and Monika Büscher (University of Lancaster), Preben Mogensen (Aarhus University), and the architectural studio of Rüdiger Lainer in Vienna. The observation that lied at the heart of DESARTE and its vision for an electronic support environment for designers and architects was a tension between ways of seeing, using, and organizing materials, the limitations of physical objects in physical space, and the potential of visualization, communication, and data storage technologies. We explored this under the metaphors of *Wunderkammer* and *Manufaktur*. The prototype of *Wunderkammer* is an inhabitable multi-media archive, collection support, and view generator. Users can place inspirational objects - images, sketches, 2D or 3D scans of samples and objects, sound, and video - in a metaphorical space of cities and landscapes. They can navigate in this space and explore it, search and collect material, and generate different modes of viewing it. The *Wunderkammer* is created interactively and used collectively. It in the first place serves as a space for building the 'landscape of one's (or a collective's) mind'. As such it should primarily augment the associative base for the design process, through offering access to a wide range of inspirational objects. It is also a reservoir, from which to draw material for constructing a representation of a project for a particular audience, which needs to be convinced of the design concept, particular spatial qualities, choices of material, etc. (Büscher et al. 1999a, Kompast et al. 2000). The *Manufaktur* is an early prototype of a 3D environment that provides a digitally enhanced work

setting, the organization of which will emerge from use by practitioners. It is based on an analysis of the ways in which materials, many of them graphic and visual, are assembled, arranged and manipulated as an integral aspect of architectural design work (Büscher et al. 1999b).

This research was continued within EU IST project ATELIER (Architecture and Technologies for Inspirational Learning Environments, 2001-2004). This project aimed at making a contribution to our understanding of inspirational forms of learning and to building augmented, mixed media environments. To the field of ubiquitous computing and HCI the ATELIER project has contributed with a rich variety of interaction components (Binder et al. 2004); to CSCW research an analysis of design practice, as a deeply collaborative and open process. Ina Wagner in collaboration with Giulio Jacucci explored the performative aspects of design work, exploring new and additional possibilities of creating connections between spaces (e.g. a field site and the studio), of integrating mixed representations within a space, and of navigating a remote space in ways that are integrated with the physical environment of space and artefacts (Jacucci & Wagner 2005). They also examined the contribution of materiality to creativity in collaborative settings, exploring the ways in which it provides resources for persuasive, narrative and experiential interactions (Jacucci & Wagner 2007). The understanding of design practice developed within the ATELIER project is the topic of a book '*Design Things'*, co-authored by Thomas Binder, Pelle Ehn, Giulio Jacucci, Per Linde, Giorgio De Michelis, and Ina Wagner, to be published by MIT Press (forthcoming).

The most recent design project the group engaged in is EU IST project IPCity (Integrated Project on Presence and Interaction in Mixed Reality, 2006-2010). The mixed-reality technologies, which were developed by the group were shown at the *European City of Science exhibition* in the Grand Palais, Paris (Nov 14-16, 2008), where hundreds of people, among them many children, built mixed reality scenes using the *ColorTable,* a tangible user interface (Maquil et al. 2008). This was a participatory design project developing participatory tools in support of new ways of experiencing and contributing to the city.

The *MR-Tent*, with at its center the *ColorTable*, provides a very specific collaborative setting. It is a mobile urban design laboratory, which can be transported to an urban planning site, and where collaboratives of 'stakeholders' (including concerned citizens) can interactively augment real city scenes with audiovisual scenes to illustrate, debate and experiment with different design possibilities. It is a collaborative tool with at its heart a tangible user interface. Several papers resulted from this project. Its main analytical achievement is a multimodal analysis of stakeholders' creative co-constructing and debating urban scenes, with a focus on the language of body (position, gesture, gaze), imagery, and sound within a layered space of physical elements and projections (Wagner et al. submitted paper).

Analysis focuses on three key concepts for the understanding of embodied interaction: spatiality, hapticity, and representation, and reflects on the benefits of a fine-grained multimodal analysis for the design of collaborative (mixed reality) technologies (see e.g. Maquil et al. 2007, Wagner et al. 2009).

A focus of the IPCity project was on tangible computing and interaction design. In their PhD work Valerie Maquil and Lisa Ehrenstrasser have merged the perspectives of interaction design and product design. They analyze video material from situations of real use for understanding the details of token design (materials, shapes), workspace organization, and workflow, and have formulated guidelines for the design of complex tangible user interfaces with a large number of physical objects (see Maquil 2010).

Some of this research has been included in the book '*Exploring Digital Design*' (Wagner et al 2010), which results from a close cooperation with Tone Bratteteig (University of Oslo)

COORDINATION WORK

Under the topic of coordination work we describe those parts of the group's research that have a specific focus on specialized coordinative activities, such as for example, networking (Clement & Wagner 1993); configuration management; the usage of specialized coordinative artifacts (Tellioglu, 2010c); the design and development of prototypes and coordination mechanisms in support of architectural planning; as well as methodologies for designing coordination support. Some of this work takes up issues of spatiality, arguing that CSCW needs to take account of the regionalized character of 'real world' communications by offering tools for creating a corresponding multiplicity of communication spaces (see e.g. Clement & Wagner 1993)

A common interest of the group in coordination work dates back to an early EU-COST A4 Project SOCU (Software Cultures. The Influence of Work Organization, Management Style and Occupational Culture on Systems Designers' Approaches in a Cross-Cultural Perspective, 1993-95). The aim of this project was to look into the work practices of software developers. The research network consisted of Lucy Suchman's group at Xerox Park, Dan Shapiro (Lancaster University), Kjeld Schmidt, and Andrew Clement (University of Toronto). Three publications resulted from the group's research in this context. Using case-study material from three small software development teams, Tellioglu and Wagner (1997) analyzed the regionalization of 'design spaces', attempting to understand problems and practices of cooperative work in such spaces. They looked into 'configuration management' as a practice and into the supporting software tools. Their concern here was how to develop practices and tools that support cooperation across multiple organizational and social boundaries while simultaneously being 'respectful of

regionalizations'. They also used the case study material to identify sources of heterogeneity and to understand how these are oriented to within the practicalities of design work. In Tellioglu and Wagner (1999, 2000) they analyze the qualities of the places in which design work takes place (regionalization, neutrality, specificity) and explore in how far these places allow membership in multiple worlds.

The notion of configuration work was taken up years later in several joint publications with Ellen Balka (e.g. Balka & Wagner 2006, nominated for best paper at CSCW06), where they discuss configurability as a form of appropriation work. They suggest that making technology work requires an awareness of the multiple dimensions of configurability carried out by numerous actors within and outside of the organizations, in which new technologies are introduced in efforts to support cooperative work. Through discussion of the introduction of a wireless call system into a hospital, they provide an overview of these dimensions – organizational relations, space and technology relations, connectivity, direct engagement, and configurability as part of technology use and work - and suggest that in increasingly complex technological and organizational contexts, greater attention will need to be focused on these dimensions of configurability in order to make things work.

(Re)using ethnographic fieldwork in a radiology department, Hilda Tellioglu developed a coordination model for collaborative work called *Coordinated Work Environment* (Tellioglu, 2002). This model, which builds on the notion of 'communities of practice', contains an assembly of organizational units with a specific structure, pursuing different goals. It is populated by actors, work practices, and artifacts. Coordination work is defined by interdependencies of work practices, which can be prerequisite, simultaneous, or by means of sharing resources. Coordination between communities of practice is established through interactions between them by using artifacts from object worlds. Interactions are of different kinds: interactions for action, possibilities, clarification, and orientation. Further on, Tellioglu introduced a coordination mechanism called *CoMex*, which is a system to coordinate the execution of tasks accessing coordinable entities (Tellioglu, 2004). *CoMex* uses coordination rules to describe the temporal and logical order of tasks performed in a cooperative work setting. These rules coordinate semantic dependencies between work activities carried out by different users. She also evaluated the system in a real environment.

How to design coordination work is methodologically described in the approach *Coordination Design* (Tellioglu, 2006). It is interdisciplinary and builds on engineering techniques, namely requirement analysis and modeling, as well as ethnography. *Coordination design* proceeds in several steps: contextual inquiry, task analysis, domain modeling, rule creation, and deployment of coordination rules. It is participatory, contextual, situated, object-oriented, model-driven, and rule-based.

More recently, Hilda Tellioglu followed up this earlier research studying different coordination theories and approaches, as well as revisiting previous ethnographic case studies. She identified specific types of coordination: time-based, product-based, process-based, and problem-based coordination (Tellioglu, 2010b). These types are instantiations of a coordination typology. The characteristics of these coordination types can be specified in terms of coordination work practices (relation between planning and execution, decision-making, distribution of work), impact factors (interdependencies, resources, output, flexibility, success criteria), and coordination mechanisms (protocols and artifacts).

Investigating Enterprise 2.0 issues from the coordination point of view resulted in *Coordination 2.0*, which is a framework to support coordination in enterprises (Tellioglu, 2010a). It combines artifact-based and oral coordination, as well as organizational tools with Web 2.0 technologies, trying to answer the question how coordination work on a larger scale can be supported: by extending the varieties of coordination mechanisms; opening up connectivity on formal and informal levels; offering easy use and user configurability; and integrating private and professional exchange between people. A tool based on a questionnaire has been developed to capture the coordination qualities of a work group in terms of direct/indirect, explicit/implicit, dynamic/static, situated/predefined, informal/formal, detached/coupled, individual/cooperative coordination aspects. It is used to calculate the ratio C2.0 to show the degree of artifact-based or oral coordination needed in the work group studied.

Tellioglu and Wagner collaborated with Gianni Jacucci and Gian Marco Campagnolo (University of Trento, Italy) in EU-IST Project MAPPER (Model-based Adaptive Product and Process Engineering, 2006-2008), carrying out ethnographic fieldwork in three manufacturing companies in Italy, Poland and Sweden. They looked into how virtual enterprise models of product, processes and other enterprise aspects can be supported by active knowledge models providing re-configurability by users; how modeling can be established in enterprises in useful ways; and what impacts modeling can have on organizational structures, work processes and understanding of coordinative work activities in a distributed work environment. Based on this fieldwork, which included an automobile manufacturer and a car parts supplier, Schmidt et al. (2009) describe how practitioners in engineering design strive to transform their work practices so as to be able to cope with complex interdependencies across global production networks. As a key feature of these budding coordinative practices, practitioners are trying to build computational 'models' of the 'design space' of their enterprise. The paper examines the difficulties practitioners face in developing these models, concluding that existing technologies of modeling are very flexible when it comes to building models in a piecemeal fashion and then connecting them, just as they offer the flexibility

of choosing different modeling approaches and notations. However, the current modeling environments are lacking when it comes to expressing the relatedness of models from different perspectives.

GENDER STUDIES

The group has also studied gender issues in a variety of contexts. Ina Wagner carried out one of the first studies of office automation world-wide (see e.g. Volst & Wagner 1988), followed by research on women in unskilled occupations in Austria (Lechner et al. 1991). In project 'Women in Innovative Firms – Case Studies on Environment, Work Practice, Qualifications and Coping Strategies (in cooperation with the University of Technology in Cottbus, Germany, funded by the Deutsche Forschungsgemeinschaft, 2000-2002) Andrea Birbaumer, Marianne Tolar and Ina Wagner studied professional women in architecture, in the financial services, and in multimedia companies, using ethnographic observation and narrative biographical interviews as methods (Wagner & Birbaumer 2007). In EU project WWW-ICT (Widening Women's Work in Information and Communication Technology, 2002-2004), Birbaumer, Tolar and Wagner looked into the work of women in a variety of computing professions, comparing findings across six EU member states. While this research focused on women's career biographies in these fields, it also produced insight into work practices and collaboration issues in a large number of work settings (altogether 7 case studies and 29 biographical interviews in Austria), which are analyzed in e.g. Birbaumer et al. (2004). Wagner, together with Ruth Wodak (Lancaster University), analyzed successful female careers, defining *successful performances* as comprising material and discursive events that are simultaneously pieces of text, instances of multi-modal discursive practice, and instances of professional material performance (Wagner & Wodak, 2006).

Hilda Tellioglu in cooperation with Martha Weber has developed a curriculum for unemployed women in Lower Austria, called telm@ (Tellioglu & Weber, 1998). Based on an empirical study in the region (conducting interviews with key actors of nine representative companies, with unemployed women as potential trainees, and with some regional experts), telm@ was designed with a focus on electronic data processing and telecommunication. The main goal of the curriculum was to provide these women with knowledge and skills in computer science that enable them to use computers, networks and telecommunication in their future daily work on the one hand, to become professionals in the field of computer systems, working e.g. as system administrators, telecommunication and network specialists, IT consultants or trainers, Internet providers and IT vendors on the other. Over 12 years telm@ was successfully offered 6 times to more than 90 female trainees.

POSITIONING THE MULTIDISCIPLINARY DESIGN GROUP

Working in a small European country in a highly interdisciplinary field, the group had a rather marginalized position at its beginnings, not only geographically but also professionally: in a hardcore computer science department within an even more hardcore engineering school. This turned out to be both constraining and enabling. Firstly, there was a particularly strong motivation to move out and create a network of international collaboration partners. Secondly, as we know from feminist theory, 'marginalization' may also offer the chance to assume positions beyond the 'mainstream' that may appear unusual at their time. It strengthened the group's interdisciplinarity, motivating it to integrate the perspectives of a diversity of disciplines in their work, merging knowledge from the sociology of work, gender studies, product design, architectural design, and the fine arts with CSCW research.

There are several factors that have shaped the group's research and design activities. Firstly, immersion in design work (mostly architecture) as participant observers has stimulated interest in the role of artifacts in collaborative work, as well as nourished the group's focus on issues of spatiality and materiality in both, their analytical and their design work. This focus, which includes an interest in haptic interfaces, the use of space, and interaction design, will be further developed in the coming years.

Secondly, long-term research engagement in highly complex settings with numerous distributed actors, such as health care and architectural planning, has spurred sustained attention to coordinative activities in such settings across organizational, professional and sometimes national boundaries, and, again, to the role of specialized artifacts and practices, such as IDs, codes, notations, formats, classification schemes, etc. We could say that this research focus grew out of continued exposure to work in complex distributed settings.

We should also mention a long-term commitment to exploring ethical aspects of technology support in sensitive settings, such as health care, which has been strengthened by Ina Wagner's activities in European and national ethics committees and resulted in several publications (e.g. Wagner, 2001; Balka et al., 2007).

Finally, the group's engagement in practices of participatory design in both, research and teaching has heightened attention to 'technology use', including the issue of configurability to changing use. It also has led the group to adopt participatory, creative and experimental methods in how technologies are conceived, designed and evaluated in real settings of use.

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