Understanding how people work: experiences in improving healthcare practices in Italy

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ABSTRACT **- The increasing availability of new technologies in the computer science world, the growing complexity of working environments and the tendency of work dematerialization bring to the attention of sociological disciplines - but also to other research areas - how to sustain the cooperation in highly knowledge content works.**
In this paper we show how to combine different ad-hoc research methods, like CSCW (Computer Supported Cooperative Work), for the design of IT solutions in the healthcare domain. In particular, we explain how it is possible to refine, with theoretical and methodological adjustments and compositions of existing approaches, the process of understanding users experience. The results are design activities that maintain a better contact with the end-users. The approach presented has been successfully applied in a project for the integration of socio-assistive processes with mobile technologies in the Province of Trento, Italy. The focus of this work is on showing that along all the design phases of an artifact the designer should rely on multi-disciplinary knowledge and expertise (e.g. human-computer interaction, sociology, cognitive ergonomics, etc.) and even more important it should devise and design artifacts capable to sustain people in their working and daily life. The goal is to grant these artifacts are coherent with user-oriented requirements and working practices. We show it is fundamental to study the interactions among the people using the healthcare services and the technical objects they use to achieve this goal.

Keywords: **Practice-User Centered Design, situated work, co-constructed relationship, design-oriented ethnography, working practices, know-how in situ, *missing what* in the traditional analysis.**

1. Introduction

In the last decade we have seen the increasing use of research approaches for studying *objects* and how the tangible environment around them react to (*features in*) actions and perception of human beings with the intent to characterize such actions (1). Objects are considered here in a wide sense as any tangible and intangible "thing" that may be used, produced, perceived, expected by an individual during her daily activities: an artifact like a report or a presentation, a mobile phone, a laptop are all examples of objects.
A key role is played by the unstoppable development of new species of objects inside the information and communication society that are good candidates for the applications of these studies to tailor and ameliorate them based on the observed results.
The problem many design groups should deal with today, is the gap between (i) concrete needs and hidden needs of users, and (ii) the needs to be solved with an innovative technological solution as perceived by designers.
This leads us to a question that for sociologists is expressed as: *where is the work going?* Instead, from a computer science perspective the same question becomes: which are the "*missing what"* in the work practices that nowadays determines failures of technological products? The major interest is in understanding how, it is possible to find out all these missing what that is, all the objects and actions in the world of work emerging in the social relations at work, through an ethnographic study. The intent is to characterize the relationships emerging from observations of the behavior of individuals with their speaking manner and gestures used while interacting with others.

There are different sociological approaches based on the use of qualitative research (the ethnography) in particularly complex working context. Though the CSCW (Computer Supported Cooperative Work) is basically centered to design, it is gaining interest to interpret the use of the technologies and the modalities in which users are changing them. It is exactly from this point of interest that the ethnographic area has re-discovered a new line of studies. Instead, the PD (Participatory Design) makes the assumption that a multidisciplinary group of work is very useful in highlighting the interdependency among the priorities of the management, the working practices and the plurality of practitioners and the cognitive needs of developers devising the technological solutions to support human work. Finally, Workplace studies are the foundation of the "good" design as a rediscovery of the internal logic of the working practices (and the sharing modalities among the practitioners) as a prerequisite of the technological design.

This work is based on an interpretative and methodological framework starting from the assumption that work is a situated activity within a material and cultural context mediated by various elements: corporal, objects, technologies, rules of context, discursive practices and relationships derived from the context itself.

In this work we try to highlight the rediscovery of ethnographic methods, applied to different theoretical approaches, as a resource to be combined to the know-how of the developers in all the design phases of a technological artifact addressed both to specific cooperative working groups and to any other new product or innovative service. The starting point to keep in mind is: *in order to design an artifact addressed to a preconceived working environment it is necessary to perform a deep analysis of how people work, communicate and interact with each other*.

2. State of the art

The lack of knowledge of the context and design cycle represents an incentive for the study of work as a situated activity (2). According to this new vision the work is considered as a situated activity taking place in a context in which people and technologies collaborate and/or are in conflict and is realized by means of a set of discursive practices.

In this regard, organizational studies and the rediscovered ethnography are two natural pillars to design information systems capable to effectively support human work, that is how people work and not how people are "*supposed to work*" (3). We can summarize the modalities in which ethnography contributes to the design of the information and communication technologies as follow:

- *Ethnography supporting the design*: the ethnographic description of the work becomes input for the design process and this raises questions and requests of knowledge for a further descriptive study of the work and for the interaction with the participating subjects. Its activities flow in sequence and they shape each other. The results expected by the researchers from this modality of proceed is an improvement of the degree of acceptance of the new technology by the future users.
- *Ethnography "quick and dirty"*: this definition with an intrinsic negative meaning (that has substituted the term "rapid ethnography" of Donald Norman (4)), refers to one of the more controversial criteria in the classical ethnography: the long stay on the field. The usual question of any ethnographer during her work is: when the ethnographer can say to know enough the field under study? The answer depends on the capability of the ethnographer to collect only a limited but, at the same time, exhaustive quantity of information to avoid to lose herself in a flood of data coming from the work practices of the analysed field.
- *Ethnography evaluation*: it refers to the ethnography used with the purpose of evaluation with respect to the introduction of new technology. The topic of the evaluation is particularly sensitive and not only for the complexity of the evaluation's criteria but also because the traditional methods of evaluation are always more unsuitable for the current analysis contexts. In fact, classical approaches either are not applied at all or they work only at the surface and so they are not able to discover all the missing what (hidden work) that a participatory observation can deduce.
- *Ethnography as follow-up*: the study of context already considered in the past is particularly interesting because, more from a theoretical point of view than practical, it recognize the principle of temporality and the fact that working contexts change with time due to new technologies. This is an important principle also for the practical purposes of design, because it requires a flexibility in the artifact itself and a capability to evolve together with the users, or better, to co-evolve and co-change with users on the their interrelated relationships and with time.

This scenario motivates a change in the logics used to analyze the work and the necessity of a transition from an analytical-prescriptive method (decomposing the work in single tasks and actions) to an interpretative and descriptive method. The intent is to understand in a comprehensive way the meaning of the work both "visible" and "invisible" (hidden and intrinsic in the relationships composing the situational territory in which the work originates).

3. Work analysis in healthcare

In the rest of the paper, we present the lessons learned from the application of our analysis approach to a local research and development project named MOPAL (Mobile Palm for Assisted Living). The intent of this article is to show how a multi-disciplinary approach applied to the analysis, design and development of the technology proceeds in parallel with the constant interaction between developers and end-users.

In this case study the end-users are the *domiciliary nurses* taking care of patients that are not completely autonomous or just discharged from the hospital that need assistive services directly at home. The goal of the project is to provide an electronic system to manage documents which are currently maintained on paper with considerable manual effort.

The reasons to choose this project are twofold: on one side there is the central role of documents in the daily activities of domiciliary nurses; on the other side, the interest of managers of the nursing home services in a collaboration that allows to understand which are the specific technologies required to support the transition from the paper to the electronic form in the more effective and painless way as possible.

In order to satisfy the goals above researchers and managers created a working group composed by different actors more or less connected to the artifacts and practices to be investigated. In our reference scenario the working group is composed by the general director of the hospital managing the nursing home services, the director of the nurses of the local service, the head nurse of the Nursing Home Centre and the operators working directly with the patients that is the domiciliary nurses.
In the initial phases of the project a researcher spent some time both in the office (where the more "bureaucratic" work is performed) and at the patient's homes where the nursing assistance is provided. The idea was for the researcher to become familiar with the environment and identify the places and working instant in which the technologies could be crucial.
We can summarize the whole research approach in this project as follow:

- The researcher started to conduct a series of open interviews or participant observations. In particular, the researcher followed for many days the nurses during their whole day of work. The goal is to investigate the nursing practices in details to highlight the missing what of the traditional task analysis. Specifically, the goal is to discover the role of the nurses and the relations with the other individuals and technical objects the nurses are in relation with to carry out their work. The results are re-elaborated into narrative documents that are presented to the group of developers to explain them the context in which the new technology should operate, the people that will use it and the problems the technology should answer.
- In parallel with the participatory observations the researcher collected some official documents from the nursing centre. In that way she reconstructed an official version of the activities to compare later on with the real vision she observed each day.
- By means of meetings with the researcher and the developers we arrived to the formalization of the requirements. The results (affinity diagram, activity diagram, use cases, component diagram) allow to identify the skeleton of the activities performed by a nurse and the general shape of the new technology.
- The next step is to validate these formalization by means of brainstorming and focus group with two group of nurses (without the directors of the hospital and Nursing Home Centre). This activity is very useful also to validate the initial prototypes of the systems with the users. These prototypes are generated by the researchers from the focus groups that have restricted and validated the scenarios and formalized the requirements proposed by the group of researchers taking into account as guidelines the data collected by means of the ethnographies.

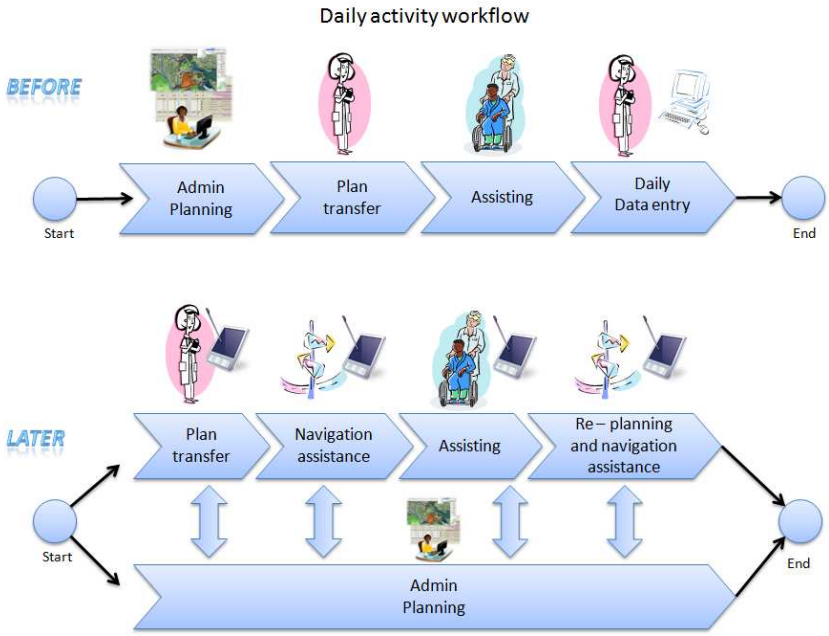
From the brief summary above it is important to keep in mind that the design activity has been anchored to the professional life of the community of practices the technology should address.

4. Results

Below is shown a table (5) with the advantages and disadvantages on the collection of ethnographic data in relation to the work of data collection and design of a prototype:

Method	Used to	Data type	Advantages	Disadvantages
Interview	Explore certain issues	Some quantitative data but mainly qualitative data	The interviewer can guide the respondents if necessary, encourage contact between developers and users	Require time. An artificial environment may intimidate the respondents
Observation on the field	Understand the context of users activities	Qualitative	Observe the real work can get a view that other techniques do not offer	It takes a long time. It involves a huge amount of data
Documentation study	Learning about procedures, regulations and standards	Qualitative	It requires no effort from users	The daily work could be different than those outlined in the procedures
Focus group and workshop	Collect different points of view	Some quantitative data but mainly qualitative data	Emphasize areas of consent and conflict, encourage contact between developers and users	May emerge dominant figures impeding the dialogue of other actors

This experience appeared to be useful because it highlights the importance of a theory and approach to situated work and the nurse practical knowledge. At the same time, it allows a first-hand on the usefulness of the practical application of this knowledge to develop technologies to support human work.
The technology design has thus acquired a situated nature: instead of designing from nowhere (in the sense that it was conceived independently of the uses and real users), there is a switching to a design logic that is situated and contextual, which requires a thorough knowledge of the working environment as ecologies of humans and non-humans working together.
The picture below demonstrates how an interactional system between humans and not-humans works within a cooperative working process, for the entire duration of the working day. With this paper, we want to show how it is necessary to have invisible technologies along all the working steps and not only for some phases like in the traditional planning and data entry activities as in the current scenario (see the "before" flow in the picture).



From the example above, we recognized the need of new methodologies based on ethnographic analysis in the analysis, planning, design, prototyping and finally, development and release of new technologies to support business environments technologically dense.
The centrality of the design characterizes the CSCW research as the design of systems supporting cooperative work will use the resulting understanding of the work to redefine groupware systems, that is, software that enable people to work together with the help of computer, mobile phones, tablet PCs and other recent technologies.

What we want to underline in this work is the need to expand and implement together different methodological approaches to the design of artifacts. In fact, in the example shown, it emerges that a CSCW approach is not enough alone, and must be accompanied by at least the Participatory Design methodologies, which focus on extending the use of ethnographic data by recording, specific forms of displaying of the work, scenario building, prototyping and mock-ups. In short, it is suggested to combine different data sources to arrive at a schematic representation of the work (as opposed to a basic de-contextualized understanding) that are based on the ability to understand situated cooperative work. So the material describing the situated work processes, both narrative and technical (UML), is essential in the shared construction of an artifact. This is because it allows the negotiation of knowledge about situated work within the research group (the exchange of information among sociologists and technicians) and between the research team and end users of the system.

5. CONCLUSIONS AND FUTURE WORK

It should be recognized that research on the work as situated activities provided a partial response to IT problems, in relation to analysis, design and development of technology. Sociology, has re-discovered its tradition of qualitative studies on the field, and by collaborating on multidisciplinary applied analysis, was able to provide models and innovative solutions. What is needed is to spread the notion that workplaces are socio-technical contexts, and that human and non-humans are inextricably related. In this paper we saw how a truly holistic approach to services at which we want to give a response of improvement, needs help from all theoretical and methodological fields: the CSCW points mainly to system design and then analysis of the cooperative work is functional to it; the Participatory Design

qualifies mostly for the active involvement of workers in the design of technologies and the emancipatory function of themselves; the Workplace studies focus instead on understanding the social organization of the work and subordinates the technological design to the same working practices. Combined together, these methodologies give a good response to traditional methods of task analysis. What becomes important, therefore, is not so much what you do in terms of work, but how you do it, what sense and what relations are established with it. In that way the work is increasingly seen as a complex interaction.

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