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# Human Work Interaction Design for Pervasive and Smart Workplaces

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**Abstract**

Pervasive and smart technologies have pushed workplace configuration beyond linear logic and physical boundaries. As a result, workers' experience of and access to technology is increasingly pervasive, and their agency constantly reconfigured. While this in certain areas of work is not new (e.g., technology mediation and decision support in air traffic control), more recent developments in other domains such as healthcare (e.g., Augmented Reality in Computer Aided Surgery) have raised challenging issues for HCI researchers and practitioners. The question now is: how to improve the quality of workers' experience and outputs?

This workshop focuses on answering this question to support professionals, academia, national labs, and industry engaged in human work analysis and interaction design for the workplace. Conversely, tools, procedures, and professional competences for designing human-centered technologies for pervasive and smart workplaces will be discussed.

**Keywords**

Interaction design, work analysis, human-centered design, pervasive and smart workplaces, human-computer interaction

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NordiCHI '14, Oct 26-30 2014, Helsinki, Finland  
ACM 978-1-4503-2542-4/14/10.

<http://dx.doi.org/10.1145/2639189.2654838>

## **ACM Classification Keywords**

H5.m. Information interfaces and presentation (e.g., HCI).

## **Introduction**

The IFIP 13.6 Human Work Interaction Design (HWID) working group aims at establishing relationships between extensive empirical work-domain studies and interaction design [2]. Today, generic designs are applied to use-situations with very different purposes, as the same social software or games are used for both work and leisure situations. Thus, design shifts from design of a technology to design of various use-situations encompassing the same technological design. We find that there is a need to conceptualize, in HWID models, the relationship between work analysis and design for these new digital realities as well as for pervasive and smart workplaces. HWID also includes the study of how to understand, conceptualize, and design for the complex and emergent contexts in which HCI and work are entangled. HWID aims to increase the benefit derived from elements from both interaction design and work analysis knowledge, such as work analysis, prototyping, organizational change, computer supported cooperative work, human-computer interaction, and participatory design, by interrelating them and capitalizing on their individual concepts and empirical instruments [2, 3].

Several aspects influence the way humans work and the work itself [5]: for humans, language and culture, nationality, and education, skills, knowledge, background, emotions and cognitive abilities, contribute to define the profile of the users and their approach to individual and collaborative work; for the work, its goals, functions, available tools and content contribute

to delineate its characteristics and challenges. All these aspects directly affect the work analysis practice and the processes of interaction and information and communication technology design and their evaluation. Therefore, the scope of this workshop includes the promotion of the IFIP 13.6 Working Group on Human Work Interaction Design (HWID) among to the NordiCHI audience, following on a previous, very successful SIG that was conducted at CHI 2013 [4].

## **Background**

Human work analysis is traditionally focused on user goals, user requirements, task and procedures, human factors, cognitive and physical processes, and contexts (organizational, social, cultural). For instance, Hierarchical Task Analysis [1] and Work Domain Analysis [4] are used to study goal-directed tasks and to map the work environment constraints and opportunities for behavior. The study of human-computer interaction (HCI) has historically adapted work analysis methods such as hierarchical task analysis to the design of computer artifacts.

Ethnographic methods with an HCI perspective have also been used for design. These approaches focus on work as end-user actions performed collaboratively with other people in a field setting: the worker activity is seen as a social and organizational experience. In this context, human work analysis, user experience, usability, and interaction design are interlinked.

Supported by the continuous advances in pervasive technology, the workplace configuration is now pushed beyond linear logic and physical boundaries. This means that the workers' experience is becoming more pervasive. The traditional boundary of bodily and face-

to-face workplaces dissolves. Instead, new forms of work and collaboration emerge where synchronous and asynchronous interactions occur at different physical and digital levels. For example, for the next many years it will be increasingly common to work in new kinds of workplaces (people work sometimes at home, sometimes in the office, other times during travel or commuting), supplied by a strong use of evolving blends and merges of smart technologies. This increasingly pervasive character of workplaces and support technologies put on a trial some of the well known and proven work analysis methods as well as the design of the work processes and their interactive tools. Advances in pervasive technology have pushed workplace configuration beyond linear logic and physical boundaries. As a result, the workers' experience is increasingly *pervasive*. New enquiries should be carried out on new and not so-new forms of pervasive interactions and collaborations supported by a strong use of evolving blends and mergers of smart technologies. A few examples are Skype, Google Hangout, social networks, telepresence-avatars, chats, cloud services, location-based services, and more. The agency of workers is therefore shifting towards technologies that are increasingly smarter.

### **Objectives and Issues to be discussed**

The workshop will consolidate – in theoretical HWID models – experiences from empirical case studies of human work analysis and interaction design, and reflect on how these experiences have benefited in enhancing the user experience of a diversity of HWID systems, providing a set of effective methods and techniques for this purpose. The major outcome will be an enhanced HWID framework for studying new digital use situations and digital content.

An integrated body of findings illustrating through different case studies the combination of interaction design and work analysis in pervasive and smart workplaces should be achieved.

Regarding goals, this workshop's overall objective is to provide the HCI field with sound tools, procedures, and professional competencies for designing human-centered technologies for pervasive and smart workplaces. This includes the following objectives:

- Learning from participants' experiences in different work domains when applying work analysis to support the interaction design of pervasive and smart workplaces;
- Exploring how work analysis and interaction design have evolved, have to evolve, and can be made to co-evolve in order to support workers in pervasive and smart workplaces;
- Identify novel ideas, principles, and techniques for how interaction design for pervasive and smart workplaces can ensure high quality usability and user experience for workers.
- Addressing the sociotechnical gap in work analysis and interaction design, specifically the little understood gap between social requirements and technical designs. We know that artifacts such as requirements analysis reports, design models, or prototypes help bridge the gap, but we do not know if, how, and why this helps;
- Designing simple interactions for complex work domains. How to be heedful of other agents' intentions and plan, and how to align one's own with those of oth-

ers and with technologies in simple ways within complex work domains? Display and monitoring are traditional activities to support coordination, but this is not enough, and we need to know more about to humans can manage the workers' user experiences in pervasive and smart work places.

### Expected Participation

There has been a growing awareness about HWID from diverse groups of researchers in industry, labs and academia with an interest on empirical work analysis, HCI, interaction design and usability and user experience in work situations and in the workplace. We therefore expect that this workshop's participants will bring their varied expertise in techniques and methods for mapping the relations between work analysis and interaction design; and how work analysis can feed into the interaction design evaluation in pervasive and smart workplaces. With such backgrounds and concentrations, we trust that a noteworthy and impactful research agenda can be developed. We also expect to use that agenda in an enhanced HWID framework for studying the new challenges about work in a smarter century. We will strive to find funding opportunities and broader impact of this research, discuss the potential of establishing recurring workshops, and identify special issues of journals where research in this field can be published.

### Conclusion

The recent years have shaped new and extended definitions of the concept of work and workplace. Pervasive and smart technologies have pushed workplace configuration beyond linear logic and physical boundaries. As a result, workers' experience is increasingly pervasive, and their agency constantly reconfigured. This has

obvious implications for HCI. There is a real need for better analysis and design of interactive technologies that can provide HCI with sound tools, procedures, and professional competencies for designing human-centered technologies for pervasive and smart workplaces. Hopefully, this workshop will be a key step in this endeavor.

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