
Guidelines to follow the introduction of an infrastructure in a specific environment.

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Abstract

This short paper proposes a new research project, which has the aim to model the introduction of a high-tech infrastructure in a specific social environment. We discuss, first, the relation between human and technology; second, the pervasive dimension of technology in human's life; third, the use of ecological approach. Finally it is introduced a combination of both approaches (Participatory Design and Ethnography) to develop of a model able to explain the prior disused interaction and how it takes shape.

Author Keywords

Social Ecology, Cyborg, Participatory Design, Ethnography.

ACM Classification Keywords

H.5.m. [Information Interfaces and Presentation (e.g. HCI)]: Miscellaneous

General Terms

Human Factors; Design.

Introduction

This short paper proposes to point out the guidelines of a research project, which is intended to model the introduction of a new *high-tech* infrastructure in a specific

social environment. These few pages introduce the frame to follow through this research project: to understand the interconnection between environment, high-tech infrastructure, and citizens we suggest the use of the emerging ecological perspective of the Human Computer Interaction (HCI) paradigm. Today, policies¹ encourage sustainable practices in relation to economics, education, and urban and ecology agenda as well. The development of urban areas is often translate in introducing new infrastructures which change, modify and recreate the practices *in situs* because involving different actors and agents. In this work, we propose different levels to read the issue of introducing new infrastructure in a social environment. In the first section of the article we introduce the changes in our society due (also) by the introduction of new technologies. In the second section, we argue about possible steps and conditions to model a technologically dense environment

From HCI to a System Interaction

During recent years there has been a significant growing interest on the issue of *knowledge*, which can be considered, as Hakken writes [4], the result of processed information. Information can be processed, analyzed and used by Information and Communication Technologies (ICT). ICT had a great impact in the interaction between human and computer [8], and in the way to think and design environment, as well: human activities are disappearing behind complex technologies, even though are supported by technologies. Towards a multidisciplinary direction, the ecological approach takes into account an

¹A structured plan in this sense is the [Europe 2020](#), which considers various and interrelated fields of growth

environment where *personas*² act and interact in everyday life and in her/his own context.

Gibson [3] introduced the ecological approach discussing how people perceive the space around them. Gibson explains the *social ecology* as a system of different values, practices, technologies and people performing together in a specific environment. This means that the four elements described by Gibson are related together and work to achieve a common goal. Supporting this direction, Kaptelinin and Bannon [6] consider the ecological perspective to expand the paradigm of User Centered Design in order to underline the complexity of *space* where several high technologies, artifact, and social relation *perform* in the same time in a network.

This networking perspective leads the *computer discourse* though three different tricky aspects: (1) *persona* position; (2) a pervasive presence of technology in people's life; (3) the use of the ecological approach to understand the relation between human and technology in a specific environment.

A cyborg lens to observe HCI relation To understand and identify the complexity of the relation existing between Human and Computer, we propose the use of *Cyborg* as a theoretical lens.

The term *cyborg*, introduced by Clynes and Kline[1], refers to the extension of human self regulation by adding technological and artificial components. Here, the concept of cyborg underlines the extension of human intellectual ability through the use of ICT. In addition, following Haraway [5], the concept of cyborg emphasizes the unstructured relation between private and public activity:

²Borrowing the term of *Persona* from the Interaction Design, we consider as *personas* those people who have the specific attitude of using multiple kind of technological devices during their life

we are *cyborg* interacting with smart-devices and when invisible sensors surround the space.

Pervasive technologies in human's life *Dissolving* technologies, as Poslad [7] define technologies hide in the environment, usually require a human (explicit) interaction just to be configured, but then *personas* don't realize to interact with that. With *invisible technology*, computers are getting out of traditional places, are disappearing in the environment, and are generating a high-level-performing technology and dense environment. Because of the introduction of portable hardware and micro-technologies, social practices and the human perception of environment is changing[7]. Personas are always connected each other using various devices and can create a virtual infrastructure, providing a non-stop and invisible information interaction between *human-network* and *devices-network*.

The use of ecological approach As emerged in the section above, the environment changes and triggering the debate about how technology, *persona* and environment are interacting together. Focusing on system and relations, this discourse is known as *ecological approach* and argues about the influences of the external world in people's actions and, on the opposite, about the influence of people's actions in the external world. This theoretical view integrates concepts and perspectives coming from different disciplines and underlines different elements of social relation including three sets of environment:

- **physical** - geography, architecture, technology, ...
- **social** - culture, economics, politics, ...
- **subject** - actors, agent, objects,

In this approach, subject are those entities active and involved in the interaction with specific technologies and

artifacts, in a specific environment. Through the ecological approach, every unit of society is mutually interdependent, and interdependent in a network of mixed relations and the main role of technologies in the environment is enhance and redesign the space by the users [6].

How to model a dense-tech infrastructure

The previous section described the complexity of observing the relation among persona, technology and environment. Therefore, because of this *tricky* relation, it can be useful to develop a model that enables to synthesize and simplify the phenomena. A model can be a *visual representation* of the actors and other elements of the object of study, and the set of relation and interconnection as well. To study how a new infrastructure takes place in a specific social environment, a preliminary observation is necessary, but then it can be useful to participate in the peculiar activities of the infrastructure.

We propose to use an ethnographical observation to provide a complete image about the use of the infrastructure, then the Participatory Design (PD) approach to understand the practices taking place in that infrastructure. In this way, to develop a model it is possible to use an inductive method starting from results coming from the ethnographical observation and from a Participatory Design activity related to an active infrastructure.

Data coming from ethnographic investigation

Ethnography collects data to sketch a general image of a phenomena and of narrow aspects of that phenomena, as well. The ethnographic method includes different strategies and techniques to extract information: interviewing people; observe and/or participate in the dynamics characterizing the phenomena; collecting and

analyze text or picture - including information in the web. In this study related to organization, environment and technology, as Fele [2] writes, the ethnographical observation emphasizes the complexity generated by the use of technology in a specific environment, and using this methodology it is possible to perceive the users of the infrastructure point of view.

Data coming from Participatory Design Developing a model we need to understand the dynamics characterizing a phenomena. As emerged from the paragraph above, the ethnography helps researchers to adopt the point of view of others, but it doesn't stress relations and *dialogues* between the actors. Through the use of PD researchers can understand the *density* of a relation, or where the actors and elements stand in their network. PD and ethnography in this study are complementary, because of the possibility to achieve different and complementary data about the phenomena observed.

A work-in-progress project To apply the described approach, we propose to consider the MUSE as a case study. The (infra)structure of MUSE is going to be open in the city of Trento in the end of July 2013. MUSE stands for MUuseum of SciencE, a new museum with the pursue to unite science and nature with technology and socio-ethical issues. Because of technological nature of this new infrastructure, we would analyze (at least during the first six month of activity) how it is perceived by city, citizen, institutions, like MART (Museum of ART) or University. To capture this perception it is possible to proceed along two complementary paths: on one side collecting data from everything regarding the MUSE, for example newspapers, events, on-line discussion, statistics about visitors, but also talking and observing those who are involved or interested in this infrastructure; on the

other side participating in-directly and/or directly *inback-office* activities. Abstracting the data and the results coming from the study, it will be possible to develop a primary model which can show actors, interaction, subjects, connections, technologies.

Conclusion

The framework proposed in this paper includes aspects we should investigate to define a model. The model should enable to synthesize the interaction between human and computer in a specific environment, a technologically dense infrastructure. In order to identify the relation existing and acting inside of an infrastructure, it is proposed the use of two different but complementary approaches, the ethnography methodology, which deeply describe the situation, and the Participatory Design in order to understand better the relation and connection between the actors.

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