Chapter 3
Ubiquitous Computing in the Cloud: User Empowerment vs. User Obsequity

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ABSTRACT
This chapter analyses the evolution of the Internet, shifting from a decentralized architecture designed around the end-to-end principle with powerful mainframe/personal computers at each end, to a more centralized network designed according to the mainframe model, with increasingly weaker user’s devices that no longer have the ability to run a server nor to process any consistent amount of data or information. The advantages of ubiquitous computing (allowing data to become available from anywhere and at any time regardless of the device) should thus be counterbalanced with the costs it entails (loss of users’ autonomy, concerns as regards privacy, and freedom of expression, etc.).

1. INTRODUCTION
The advent of Internet and digital technology drastically changed the way people act and interact in everyday’s life, in both personal and professional settings. Indeed, with the Internet, work, family and social life are becoming increasingly intertwined, sometimes even blurring into each other. The office does not longer consist exclusively of a place for work, but is increasingly used by people dealing with personal matters, via e-mails, instant messaging or social media. Conversely, professional activities extend throughout the day - either at home or at the office during lunch break, while traveling, or in the evening after a long day of work, people do not hesitate to check their e-mails and, if necessary, to complete their work. This naturally implies that people must be able to access their personal or professional files from anywhere and at any time, without direct access to their computer. Thus, in most developed countries, the Internet has become a necessity.

Ubiquitous computing is an attempt to answer emerging users’ need for ubiquity. Without trying to resolve any specific business or technical problem, it represents an effort to elaborate new opportunities based on pervasive computing and connectivity (Bell & Dourish, 2007).

Nowadays, computing has become an integral part of everyday life – yet, it is much less visible than before. Technological advances in the computing industry are such that electronic devices
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can be embedded in the environment in a way that is almost transparent to end-users (Weiser, 1991). Recent developments in Information and Communication Technologies (ICT) encouraged the deployment of compact users devices that communicate with powerful servers and distributed data-centers in order to mediate and support many daily activities (Lyytinen & Yoo, 2002). Personal computers, laptops, tablets or even mobile phones are turned into “intelligent devices” able to provide innovative services and applications to satisfy emerging users’ needs in ways that could hardly be foreseen even just a few years earlier. Indeed, thanks to the Internet, any device - with limited computing resources - can potentially provide access to a world of information that was previously only available to a limited number of people connected to a given network.

This chapter analyzes the social, technical and legal implications of ubiquitous computing in the framework of cloud computing - distributed network architectures designed to provide computing resources as a service. After providing analysing the pro and cons of these new technologies, the chapter will address the implications that cloud computing might have on the interests of Internet users, whose autonomy is being increasingly impaired by the regulatory policy of large cloud operators.

2. BACKGROUND AND LITERATURE REVIEW

Definition of Cloud Computing

Cloud computing constitutes a new delivery model for IT resources based on the concept of utility computing – a model whereby computing resources are no longer sold as a product, but rather provided to consumers as a service. Although the term is nowadays used to refer to a large variety of online platforms, regardless of their technical attributes (Plummer, et al., 2008), cloud computing specifically refers to distributed online platforms that provides configurable computing resources, dynamically, according to actual needs (Vaquero, et al., 2008). The National Institute for Standards and Technology (NIST) defines cloud computing as any online platform that relies on ubiquity (broad network access), virtualisation (resource pooling), scalability and elasticity (automatic re-configuration of resources) to provide on-demand (user-centric) metered services (pay-as-you-go).

Depending on the type of resources they provide, cloud computing platforms can be subdivided into three distinct categories: Infrastructure as a Service (IaaS) is a model whereby hardware resources (such as processing power, storage capacity, or network bandwidth) are provided for consumers to decide how to best put them to use; Platform as a Service (PaaS) is a model whereby users are provided with a specific framework or programming interface on which they can deploy their own applications; whereas Software as a Service (SaaS) is a model whereby consumers are only given the possibility to use particular software or online applications through an online interface which is generally accessible through a Web browser.

While cloud computing technologies are designed to allow users to access their resources from anywhere and at anytime, the actual degree of accessibility ultimately depends on type of cloud that one refers to. Namely, it is useful to distinguish between four different deployment models: public clouds, which are generally operated by one specific organisation that makes the infrastructure or the services it provides available to the general public, private clouds which are generally meant solely for the purpose of providing an infrastructure or a service to one specific organisation; community clouds which are intended to provide an infrastructure or services shared amongst several organisations that share similar goals or concerns, and, finally, hybrid clouds which combine two or more clouds (be them public, private or community clouds) into an aggregated structure.