

Ubiquitous Computation and Organizations

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This article intends to identify and characterize the main problems and tendencies in the ubiquitous systems integration in society, regards all kind of organizations. Offers a "panoramic view" of the area and in the way as several techniques, developed in different disciplines, can be combined to solve complex problems. As an historical perspective also some illustrations of approaches are supplied.

Lately the computation can be divided in two great tendencies: the one of mainframes, with many people sharing a computer, and the one of personal computers, with a computer for each person. Nowadays the number of people that uses PC is larger than the number of people that share computers. The next stage will be the one of the Ubiquitous Computation, with many computers, built-in in walls, pieces of furniture, clothes, cars, etc, sharing with each one of us.

Keywords: Ubiquitous computation; Organizations; Information Systems, RFID.

1. Introduction

The last years of the computation can be divided in two great tendencies: the one of the mainframes, with many people sharing a computer, and the one of the personal computers, with a computer for each person. Nowadays the number of people that uses PC is larger than the number of people that share computers. The next stage is the Ubiquitous Computation, with many computers, embedded in walls, pieces of furniture, clothes, cars, etc, sharing with each one of us.

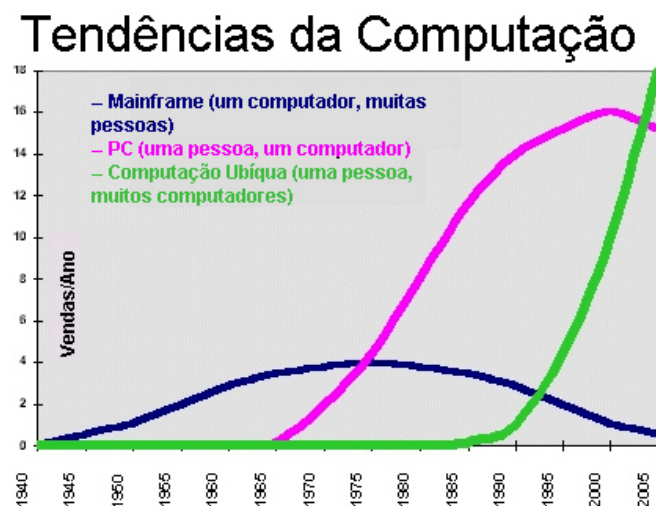


Figure 1. Tendencies of computation

The term ubiquitous computation was suggested initially by Mark Weiser [1], "*the real power of the concept [of Ubiquitous Computing] comes not from any one of these devices; it emerges from the interaction of all of them*", to describe the idea of turning the computers ubiquitous and invisible. The objective is to go besides the "friendly interface" and far away from the virtual reality. The idea is to make all the work without never work directly with the computers. Simply improve the interfaces make the obstacle (computer) an obstacle easier to use.

Let us consider the writing, maybe the first information technology: the ability to capture a symbolic representation of the spoken language for the long term storage made the information beyond the limits of individual memory. Today this technology is ubiquitous in the industrialized countries. Not only books, magazines and newspapers contain written information, but also traffic signals, posters, packings, labels, etc. The constant presence of these products of the "literary technology" doesn't request attention, but the information is always available. It is difficult to imagine the modern life in another way. To the opposite, the digital information technology, is (still!?) far away from turning part of the atmosphere.

2. Involved Technologies

In this section we will discuss the technologies included in the term Ubiquitous Computation.

Movable computation

If the objective is not to force the user to go to the computer, an alternative is to miniaturize the devices, so that these can be transported easily (or dresses), while the user is moved freely. This is Movable Computation, and it implicates in several aspects:

1. Movable computers
To do the computers and small interfaces; to supply energy; to create interfaces to adapt to the size of the device and continue friendly; to invent new interface devices for movable computers.
2. Computers Wearable
A special case of movable computers, design to be uses handless, could use sensor (cameras and microphones), and convenient forms of keyboards.
3. Connections Wireless
Continuous connection wireless to the network (through Bluetooth, IEEE 802.11, GSM, or other forms); that allow maintaining the service in operation with the devices in movement.

Intelligent atmospheres

Another way to avoid physical user interaction with the computer, is the devices ability to operate at distance, so that the user doesn't need to be physically close of them. The "intelligent atmospheres" are created through the combination of several elements:

1. Hands-Free interfaces
Such technologies as voice recognition, liveboards, and other interfaces, together allow the user to interact, even if physically distant of the devices. With these technologies, the devices can be installed permanently at a room, allowing that while the person is moved in/out, and keep interacting with them.
2. Conscience of Context
Besides the explicit interaction with the user, the atmosphere can count with sensors that detect what happens and what people do in general. If this information be acquired somehow and made available, then the devices have an idea of what is to happen around the user. This calls her context conscience.

3. Adapt Intelligent

When an atmosphere possesses context has change ability, can also have automatic behaviours activated by certain events, without any explicit human interaction. This action is called "intelligent atmosphere." If the only way to interact with the atmosphere goes through of those automatic behaviours, we are then before a "Invisible Computation."

Ubiquitous computation

When the movable computation and the intelligent atmospheres are used together, the whole potential of the ubiquitous computation is reached. This way, becomes possible many interesting sceneries, which could not be reached through the movable computation or of intelligent atmospheres separately.

Disaggregated computation:

A dynamic reconfiguration of the interface devices. For instance, the possibility of a presentation changes from a monitor to another in the room. The "computer" is a group of several linked devices, that you/they are actually united to different computers in the net.

Position Sensitive computation the Position:

Make the interaction with the computers change, while the people are moved. For instance, to create an automatic guide of trip in a museum, or automatically to move working environment for the closest monitor, while a user moves for the room [2]. These actions require use of positions sensors to the user, as well as systems of labels electronics [3] or visual location for cameras.

Augmented reality:

When the computers wearable are combined with the information and position sensors, the relevant information to the user can be put upon to his vision of the world. This is called "augmented reality", unlike the "virtual reality", where only the information generated by computer is visualized.

Sensitive Objects:

Associate physical objects the some information. This is the concept of "Phicon" (Physical Icon), that is, to associate meaning to any object, then it can be given the other person or moved, etc.

Problems in the future

Some aspects in relation to the ubiquitous computation should be treated carefully

Privacy:

The proliferation of sensors and context models will store great amounts of information regarding the activities of each person. The more we wanted the system automatically help us, more information we will have to supply. But those information can contain data that we don't want to share. How will we allow that some systems use this information while other no?

Complexity:

As more things happen automatically, more confused the system can be to users. How do we take advantage of the capabilities of the system without overloading users?

Expansibilities:

Systems of ubiquitous computation are composed of multiply hardware and software parts, from different proveniences. How achieve that all parts work committees in all levels?

Safety:

If everything is linked, how to prevent attacks from no-authorize programs or hardware?

3. Social analysis and opportunities of investigation of different granularity (individual, it teams, organization)

We also have concerns about aspects of individual, his team behaviour and at the level of the organization, when we are before the ubiquitous computation.

The Information Systems can be defined as a group of elements or components interrelated that collect, store, process and distribute data and information with the purpose of giving support to the activities in organizations, all they will have to adapt and to give continuity to their functions (figure 2).

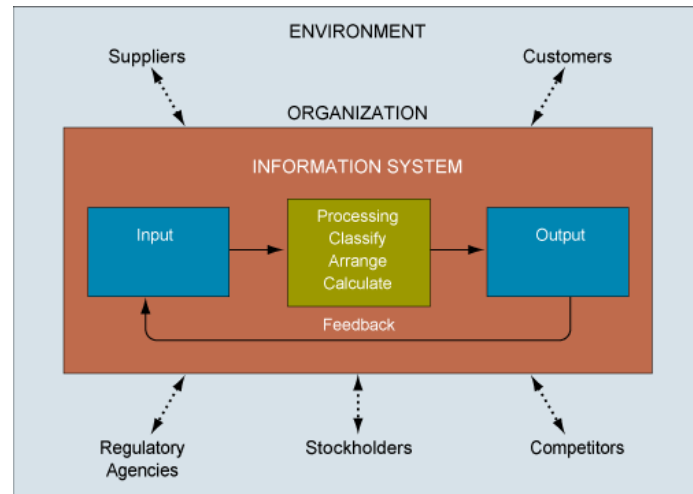


Figure 2. Functions of the ITSELF. [4]

The works can, today more than never, be accomplished anywhere at any moment. Workers, companies, customers can share information through the ubiquitous computation. As employees and companies more frequently interact with portable devices, it is necessary to establish the limits of what is work and not.

Like this, computational tools, technology, can be quite useful to the administration of a company, if bounds are respected. Such limits concern the fact that machines give support in the decisions, but they don't decide.

Ubiquitous computation can be analysing from different levels.

In this levels are some investigation opportunities, we elaborated a synthesis in the following table:

Tab. 1 - Social aspects in Ubiquitous Computation [5].

Level of Social analysis	Subjects of Investigation
Individual	<ul style="list-style-type: none"> • What social norms do the coming of the ubiquitous computation challenge? • How can supervise employees' in dynamic and rich atmospheres in technologies? • How redefine the actions in ubiquitous computation?
Team	<ul style="list-style-type: none"> • How does the teamwork can adopt and adapt to the ubiquitous computation? • How virtual teams work be more efficient? • How will social interactions redefined for the ubiquitous computation?
Organization	<ul style="list-style-type: none"> • What new organization forms and business models can be accomplished with the ubiquitous computation? • How defined social limits in fertile atmospheres in technology? • How redefined can organizations be in ubiquitous computation?

Conclusion

The ubiquitous computation and the organizational systems of information are very demanding areas, in which enormous investments of I&D have been made along the last decades, being also areas that offer constant opportunities and challenges. Although the specific techniques to use in each in case they are dependent of each technological stadium, they exist some general beginnings that you/they will stay, allowing to speak to us of generic methodologies of systems integration.

In an investigation perspective, this theme offers a good opportunity to do "bridges" among several disciplines, taking the investigators to do a synthesis of what learned in those areas.

Finally refer that integration systems doesn't regards only technological solutions interoperability between technologies and sub-systems but an understanding social-organizational aspects.

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