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Interactivity and the Information Society Technological Imaginary

Myriam Diocaretz

Sobre el papel mediador de las nuevas tecnologías en la sociedad de la información en cuanto espectro de zonas significantes que transgreden muchos dominios tradicionales. Para acercarnos a las condiciones y contextos de la implementación, producción y usos de la tecnología de información y comunicación, se observa el juego recíproco entre las transformaciones tecnológicas y culturales. Examinaré un segmento de la trayectoria de los cambios transformativos cuya implícita o explícita "interactividad" recibió como parte del *imaginario tecnológico de la sociedad de la información*. Mediante la crítica cultural que contextualiza las prácticas sincrónicas específicas dentro de los discursos sociales de los escenarios del futuro cuasi-política y políticamente orientados de la Unión Europea, seguiré el itinerario de lo interactivo en relación a la construcción social del usuario, y mostraré que mientras la visión de la sociedad de la información de hoy puede tomarse como limitada y camino hacia conclusión, la visión transformativa alternativa de la "Inteligencia Ambiental del Mañana" intensifica la interacción humano-a-humano, y por lo tanto retorna a ella en un nuevo contexto de la existencia del *modopost-PC* en la vida diaria.

The mediating role of the new Technologies in the Information Society of the conditions and contexts (IS) comes under scrutiny as a spectrum of signifying zones that transgress many traditional domains. For a closer view of the conditions and contexts of the implementation, production, and uses of Information and Communication Technologies (ICT) it is useful to look into the interplay between technological and cultural transformations. I will examine a segment of the trajectory of the transformative changes which implicitly or explicitly "interactivity" has received as part of the *technological imaginary of the Information Society*. Through a cultural critique that contextualizes specific synchronic practices within the social discourses of quasi-policy and policy-oriented EU scenarios for the future, I will pursue the itinerary of the interactive in relation to the social construction of the user and I will show that while the vision of "IST today" is already seen as limited and on its way to conclusion, the transformative alternative vision of "Ambient Intelligence Tomorrow" stresses the human-to-human interaction, therefore returns to it yet in a new context of *post-PC mode* of existence in daily life.

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We are in the midst of a techno-economic paradigm shift leading to major transformations in economy and society, a shift which has brought, among others, the crossroads known as eCulture in which major sectors find themselves assembled in novel clusters around the entire digital content creation value-chain, and given a boost through the content and knowledge technologies of 21st century initiatives. While this *paradigm shift* still seems too abstract to many, we can find some evidence through a close look at the ways in which we "read" a digital text online, we "view" it, print it. If it is one of our own texts, we can rewrite it or create updated versions online each day if we wish; a number of online scholarly journals also allow updates; moreover, one sees radical changes in the way re-

[1] The present article has its origin in two lectures by the author: "The Culture of Interactivity in the Information Society Technological Imaginary","Interactive Culture: Colloquium: culture and online information", 23-24 June 2005, Nantes France, ERBAN Regional Beaux Arts School of Nantes, and "The Intertextual Factor in the Technologies of Immersion: Exclusionary and the Participatory Interplays","Interactivity of Digital Texts Conference, University of Münster, Germany", 20-22 May 2005.

searchers can publish articles in institutional pre-print servers and make them accessible to the academic community while waiting for acceptance, a period which can be still be of at least half a year for the peer-review process to reach a conclusion, and a longer period until the subsequent publication.[2] Current experiments with e-books include a purchase option that designs it to self-destruct once its ten-day programmed reading deadline comes. For those who are "connected",[3] it is possible to forward a multimedia message or cultural object to one or to thousands of human and non-human recipients across the globe. In short, there are many examples of how we live our daily lives now, of the way in which we do things that we would not be able to do earlier without the new Information and Communication Technologies (ICT).

In ten years of ongoing internet expansion, even the 'new' communication models have followed patterns of constant renewal, which is characteristic of the "culture of change" in which Information Society progresses, and we in it. By the same token, value systems and beliefs, human interaction and communication, and our basic daily lives are constantly mediated by the new technologies which gradually gain a larger and more diverse role. This is especially true for ICT, which I would characterize as *temporary technologies* by definition, which are operational through unstable media.

In such context, rather than centering on the technology itself, I choose to discuss the conditions and contexts in which ICT have been adopted, as a mutual relation of influence and of evolution in interventions that reveal the *techno-social imagi-*

[2] I have explored this specific phenomenon in: Diocaretz, Myriam, "Scientific Publications in the Knowledge Age: Some Notes on Impact and Access from a Researcher's Desk," Publicatie No 4 2003. http://www.unimaas.nl/publicatie/2003/pub4/scientific_publications.htm University of Maastricht.

[3] It is fundamental to keep in mind that still there are millions that do not have access to the new technologies for communication and information purposes. The Digital Divide field addresses such challenge.

nary that has driven us to a readiness for change, as communication and interaction patterns are transformed. Therefore, for a closer view of the conditions of the implementation, production, and uses of ICT it is useful to investigate the interplay between technological, cultural and societal relations. In the last ten years, the communication paradigm has been stirred by a threefold technical deployment and cultural relational environment: the *human-to-human* that precedes the digital practices, the *human-to-machine* interaction which also precedes the digital technology but then becomes more specific, and the *machine-to-machine* actions that grow to be increasingly pervasive through intelligent agency. It is important to mention that as these horizontal relations become intertwined through further mediating agents such as interfaces and intelligent agents, there is a generation of multiple correlations.

Interactivity is not a new term, but it re-entered the social discourses of the digital age in the computer-based decade of the 1980s (McMillan 2002a; 2002b), and since then, it has been a focus of attention not only in new media studies, social communication, software design, artistic production, but also in European Union prospective visions, technology innovation and development frameworks. What I call the "culture of interactivity" consists of sustained practices that are collective as well as individual, and arise from a mutual transfer between technology and the uses which emerge in the process. I will examine a segment of the trajectory of the transformative changes which implicitly or explicitly "interactivity" has received as part of the *technological imaginary of the Information Society*.[4]

[4] The term Information Society has become the standard concept to refer to our present decade of the New Millennium. One typical and simplified definition reads as follows: "The information society is a term used to describe a society and an economy that makes the best possible use of new information and communication technologies (ICT's). In an Information Society people will get the full benefits of new technology in all aspects of their lives: at work, at home and at play.

The term "imaginary", first introduced specifically in relation to technology in film studies (De Lauretis *et al.* 1980) refers nowadays partly to Lacan's notion of the "imaginaire", as a vision, a set of representations, articulation or enactment of ideas of wholeness and fulfillment. The "technological imaginary" (Lister *et al.* 2003) unfolds as these ideas are conceived as reflections *about* technology, and in the present essay it addresses specifically the Information Society and the ideas about what it is not but can or should be; it also concerns its *other*, its 'better' or idealised self. In such representation, interactivity surfaces projected onto the technologies as a socially oriented notion born of both *demand* and *desire*.[5]

In new media perspectives there is relative agreement that interactivity has been be comprehended, from a broad-spectrum, at least at two levels: One is the ideological, which privileges the users as consumers and situates them in the market scene, and the second one is the instrumental or functional, which deals with what interactivity actually "does" (Lister *et al.* 2003, 20).

While there exist many definitions of interactivity from which typologies and classifications are established, the debate is open because very few seem to agree on what it actually constitutes. At a basic level, interactivity can be said to be triggered when you click the mouse, and something happens —yet what is precisely that which happens is the subject of contention. If an individual is online in front of a screen and clicks on

Examples of ICT's are: ATM's for cash withdrawal and other banking services, mobile phones, teletext television, faxes and information services such as the internet and e-mail. These new technologies have implications for all aspects of our society and economy, they are changing the way in which we do business, how we learn an how we spend our leisure time." http://www.isc.ie/ [accessed by the author on 13-8-2005]

[5] In the context of the technologies of the present/future, the phrase "demand and desire" has been applied to the LivingLabs concept by Jarmo Suominen, in "Living Labs Concept," Kingston University, 13 May 2005, "Introducing Living Labs" (MOSAIC T4.2 Strategies Case: Living Labs Concept) http://www.kingston.ac.uk/~ku07009/LivingLabs/PapersAndSlides/Day1RichardEnnals.pdf

a hyperlinked text, or an entry in a database, or in an interface with automatic features, one key question may be: how much of the content is modified by the act of "clicking" and in what in kind of activity is the individual engaged, cast in the role of "user". Is it reading, viewing, playing, listening, or creatively authoring an object?, or is s/he doing all of these simultaneously? Most importantly, to assess if there is any interactivity, one needs to ask what kind of intervention is this "user" able to explore, experience, and enjoy.

In the first half of the XXth century, the term interactive was used in reference to computers to describe the amazing function[6] of "being able to intercept a computer run" at a time when computers were as large as a room. In theory, Vannevar Bush's pioneering essay "As We May Think" (Bush 1945 in Wardrip-Fruin and Montfort 2003, 37-47) gave us a vision of the first interactive desk, the Memex, which inspired Douglas Engelbart to create the first mouse and keyboard (Wardrip-Fruin and Montfort 2003, 35). In 1960, J.C.R. Licklider perfected a programme which "allowed the operator to interact with the machine for the first time."[7] Soon after, in 1964 at MIT, Weizenbaum created the chatterbot system called Eliza, conceived as the first virtual psychiatrist, a predecessor of the present chat boxes and interactive dialogue interfaces.[8] Also of historical interest is the small programme "Put-That-There" designed by the Architecture Machine Group.[9] In the 1970's we have the first instances of interactive fiction, such as the text-game called "Adventure" by Will Crother and Don Woods, and the

[6] Saul, Shiralee, "Computers and the development of interactivity," 1999, last updated February 2001 http://www.labyrinth.net.au/~saul/essays/02computer.html [accessed by the author on 13-08-2005]

[7] Licklider, J. C. R. "Man-Computer Symbiosis," in Wardrup-Fruin and Montfort 2003: 74-82.

[8] The Eliza application is still available online in several websites, and is included, for instance, in the CD-ROM included in Wardrup-Fruin and Montfort 2003.

[9] Ibid.

interactive video art by Lynn Hershman, Lorna and Deep Contact. By that time the hypertext introducing non-linear writing took the interactive to a dynamics of multiple relations with different sources of content, and along the way created the technology-determined non-linear reader. These examples establish an important parameter of development of the interactive, integrated within the human-machine relation, and they inaugurate the progressive capacity of humans to intervene in the programmes so that the machine collaborates by responding to human needs. Some of these early inventions anticipate the machine's capacity to learn, which later led to Artificial Intelligence. On the creative domain, "interactive fictions" appear as a new hybrid genre, introduced in the 1970's —first a set of digital texts without visual elements, with some gaming features—, and later, it becomes a term applied to storytelling scenes in a novel, to refer for example, as in a recent study, to events that "can never be removed from their frame without forcing a large-scale revision of the framing narrative" (Halevi-Wise 2003, 2) The relationship between literary narrative and interactivity in electronic media has become another innovative field, as developed, for instance, by Ryan (2001).

Among the scholarly exercises to trace a particular trajectory of the notion of interactivity, three frameworks that prove helpful for a better understanding of its development have made their way into established critical practices, and the first two have taken precedence as a method of explanation of interactivity's historical evolution. The first one sees a teleological continuity in interactivity's progress; therefore it builds upon and reflects the conceptual master principles of a historical or evolutionary tradition; the other starts from the technical domain that sets interactivity in the new media context—without necessarily acknowledging a direct link with the past, and therefore looks for the instrumental innovation factor, and privileges a more technology-driven, digital perspective from the onset.

A third approach that has emerged is based on Bruno Latour's theories proposing that in scientific inquiry it is important to outline the emergence of an event in its multiple relations, and not just to explore one categorical development. Such constructivist approach allows us to take the contextual territories of a given event. I believe that all three approaches can contribute to insights into the impact of digital processes as they affect society. By way of introducing a fourth approach, I shall explore a combination of Latour's perspective in his book *We Have Never Been Modern* (Latour 1993) and the proposed 'actor-network-theory', with an additional premise derived from M. Bakhtin; the latter refers to an understanding of culture as a dialogic social phenomenon. From this framework, a viewpoint that examines the Information Society technological imaginary framework beyond its purely theoretical intention can be developed to investigate and map out its representations; it is from this perspective that I reflect upon some blueprints for policy and implementation, as a vision which supports and shows the ways to the future directions of the Research &Development fields of information society technology. Therefore, I shall proceed in this direction. Setting my brief conceptual review within the epistemological arguments of the pre-digital age, we recall that Mikhail Bakhtin (1929-1930, 1977, 136) introduced the term "verbal *interaction*" to refer to the act of discourse also "in the form of a book," that is, in written and printed form, as being always —or inherently— engaged by the preceding verbal acts, and in this way, written discourse as verbal interaction is seen as an integral part of an ideological discussion of a larger magnitude.[10] Discourse, Bakhtin goes on to say, responds, refutes, confirms, anticipates potential responses and objections, and looks for support. Bakhtin's context was both the written word and the act of discourse—rel-

[10] "…l'acte de parole sous forme de livre est toujours orienté en fonction des prises de parole antérieures […] ainsi le discours écrit est en quelque sorte partie intégrante d'une discussion ideologique à grande échelle".

evant to verbal art and ideology, with the dialogical as the core of such interplay. Indeed this concept has become a convincing springboard for Bakhtinian perspectives that equate the cyberworld and the internet to discourse. While it is not my intention in the present essay to expand on or review these arguments, it is important to stress that part of the Bakhtin Circle's writings provide great potential to explore communication in the digital age and cyberculture. I shall define further my position in the context of interactivity, particularly because I will show some elements of the dialogic in the conceptualisations of the Information Society imaginary through relations that would be functioning as intertexts and through interdiscursivity respectively. These two concepts were lucidly distinguished and defined by M.-P. Malcuzynski (1989; 1992, 53). Intertextuality, as Malcuzynski showed, initially quoting M. Angenot's definition (1982, 106-107), is the "circulation and transformation of ideologemes"; the latter notion, ideologeme, stems from M. Bakhtin's critique and is further and later defined by J. Kristeva to develop her theory of the intertextual space ("espace intertextuel") (Malcuzynski 1992, 63). Thus, as discussed in *Entre-Dialogues avec Bakhtine ou Sociocritique de la [Dé]raison Polyphonique*, and in previous and later essays, Malcuzynski unequivocally set the record straight about the source of Kristeva's notion of intertextuality which lies in Bakhtin's founding idea of the dialogic. Kristeva's notion referred to the internal dynamics of a text, since she first described it as the interaction of texts produced within a single text, so that every text is the absortion and transformation of other texts. From such background, in the 1980's I proposed the intertextual factor in poetic discourse,[11] a factor that is not limited to interaction in a single text but which functions as a dynamic of relational interpretations and concepts, and which triggers new interpretive contextual transformations. Some decades later, and

[11] Diocaretz, Myriam, "The Poet and the Alien Text," in *The Transforming Power of Language: The Poetry of Adrienne Rich*, Utrecht: H&S, 1984:31-50.

in an environment quite different from the humanities, I am recovering these relational and conceptual transactions because they are fully instrumental in facilitating a deeper understanding of the dynamics of the Information Society, especially given the relationships among specific documents of the social discourses articulating the technological imaginary in its panopticum from the present into the near future, such as the years 2010 and 2030. Therefore, the method I apply in the present essay is meant to investigate a trace of the intertexts woven in the discourses around "interactivity" in the IST context, through a cultural critique that contextualizes specific synchronic practices within the social discourses of *quasi-policy* (i.e. in a USA recommendations report) and policy-oriented European Union *scenarios* for the future. For this purpose, I will pursue the itinerary of the interactive in relation to the social construction of the *user* of technology, and I will show that while the vision of "Information Society Today" is already seen as limited and on its way to conclusion or obsolescence by its initiators, the transformative alternative vision of "Ambient Intelligence Tomorrow" stresses the human-to human interaction, therefore returns the central attention to the human, yet in the new context of *post-PC mode of existence* in daily life.

From the 1970's to the present there is an important textual interrelation that has contributed to transform the collective expectations and the development of interactivity in Information Society. Technology develops not only in the labs but especially outside of them, in the sites of debate and creativity, through visions of what it can and should be, and is thus a product of cultural preconditions for change.

I call the reports that will be discussed here *quasi*-policy because although they are not "directives" or official regulatory documents, they operate as influential actors in the process, presented as "recommendations", or "scenarios for the future".

They are not resolutions or mandates, yet they perform a function which is no less important than the regulatory end-products or institutional mandates, and they are no less important than policy itself because they precede and support the formulations, the choices, and the directions undertaken in the political and economic decision-making processes. These *quasi-objects* constitute support-measures as crucial avant-textes, therefore they belong in the realm of policy discourses and implementation initiatives. In short, they are instrumental in carrying out the technological imaginary which resurfaces and manifests itself in different forms in our society and concretely in daily life, from feasibility studies, to prototypes, to funded-projects, to actual end-product in the market. The process, as I describe it, explains, among others, how from notions of "convergence," we now witness a market trend in which a great number of citizens in different countries have a mobile phone with multiple functions, such as digital camera, video, voice recorder, music receiver, email and Internet. In other words, there are types of documents that hold a key function as "quasi-official reports" proposed to identify and formulate technology-oriented roadmaps for the future, and which pave the way for institutional processes in the cycles of Information Society policy-design, including the stages of conceptualisation, with a goal towards a potential or actual implementation of technology in everyday life. In other words, they are roadmaps being followed to make the technological imaginary materialise and reach us all. Along these lines, we can also reflect upon the larger institutional and ideological implications of the "ubiquitous" [the "everywhere ever-present phenomenon"] which interactivity inhabits in the present —and the position held by interactivity in the *invented* future or rather, in the future invented in order to direct scientific technological co-operation and to facilitate decision-making in funding projects for technology development.

The last five years have been prolific in prospective studies planned towards the development of the Information Society in the European Union (EU). Of special relevance are the Information Society studies formulated to convey specific business, industrial models, and technological requirements, research implications and opportunities, all of which use the years 2010 and 2030 as collective technological imaginary and social horizon. Some of these "EU" visions originate from previous 'texts' often building up from consultation dialogues, and similar activities. This is particularly relevant to the notions of interactivity and the creation of entities such as 'virtual humans', as well as to "ambient intelligence".

A look at the immediate context of the innovation-related funding in Europe will show, for instance, in the European Commission records, that 210 projects were started in 1997 and 1998 under the Telematics Plan, corresponding to the Fourth Framework Programme of 1994 to 1998. The European efforts were focused on telematics applications in four main areas: 1. services of public interest (administrations and transport), 2. telematics for knowledge (research education, training and libraries), 3. telematics for improving employment and the quality of life (urban and rural areas, healthcare, the elderly and disabled, the environment), and 4. horizontal Research, Training & Development activities (language engineering) and support actions (integrated applications for Digital Sites). In this context, the basic requirement of interactivity is quite limited, and in fact is almost absent; thus, there is a gap between this period and the next EU Frameworks in which interactivity appears at the forefront. Tracking down this apparent leap-frog event, we find out that the current EU programmatic emphasis on ambient intelligence develops not from the immediately preceding frameworks but from elsewhere. Within the competitiveness race and the freer circulation of knowledge it should not be a surprise that the intertextual link takes us directly,

among other key sources, to the national research & development outline of the USA's Department of Defense, that sets an agenda in 1997 for a closer working relationship between the entertainment industry and defense. The report I am referring to is the now familiar *Modeling and Simulation: Linking Entertainment and Defense*,[12] prepared by the Committee on Modeling and Simulation: Opportunities for Collaboration Between the Defense and Entertainment Research Communities, Computer Science and Telecommunications Board, National Research Council. Unambiguously, this was a joint initiative with the industry and academic research centres to assess the potential ways of mutual support and cooperation for cost reduction, and for a common-ground and "apparent commonalities." The research agenda already referred to technologies for immersion, networked simulation, computer generated characters, and tools to create simulated environments.

In the entertainment industry, up to the 1990s, modelling and simulation development had been positioned towards the technologies for immersion systems that made it possible for players to "enter and navigate simulated environments", a method that, as stated in the 1997 report, was also a main activity for soldiers using the Department of Defense immersive technologies. Early forms of these technologies were devices such as the "locomotion platforms" (1997, 2) "unobtrusive bodysuits" used for warfare analysis, training and strategy for the Department of Defense, while for entertainment it concerned the design of animation entities in film and video. A common goal then was a recommendation to share approaches which would encourage the creation of "more engaging simulated experiences while minimizing the technical demands placed on the system itself." (1997, 2) Interactivity figures as

[12] Library of Congress Catalogue Card Number 97-68732 International Standard Book Number 0-309-05842-2 Washington, D.C.: National Academy Press, 1997, http://www.nap.edu/readingroom/books/modeling [accessed by the author first on 5/7/2003 and on 14-08-2005]

an implied principle for the technologies of immersion since the purpose was, although they are not mentioned explicitly, to facilitate *inclusion* in these environments, thus to create *participatory* designs, that should be, ideally, covert from the user perspective. At this stage of the evolution of IST social discourses, the term 'digital" does not occur often; instead, one finds mainly references to "computer-generated" characters, which referred indistinctly to "characters" representing humans or to other entities, and objects programmed and designed to inhabit these virtual environments for the purpose of producing "compelling" experiences.

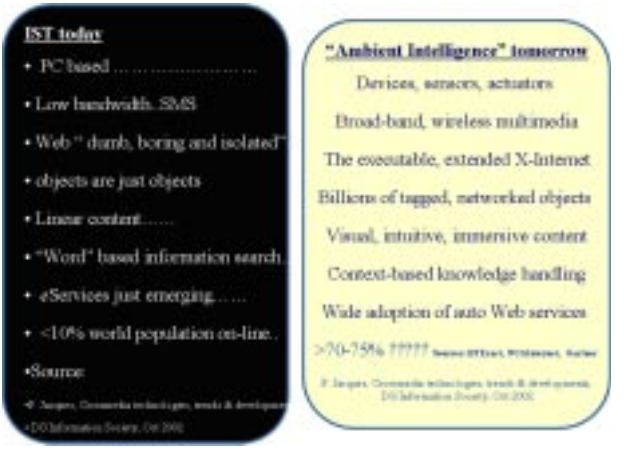
Noteworthy is the insistence on the need to create "more interactive tools" that would go beyond the mouse and keyboard, equipped with more "dynamic features", which were then said to be limited to, for example, doors opening (1997, 8) —and, I imagine, doors closing as well; however, there was equal emphasis on the need for "computer-generated forces and autonomous agents" (1997, 9) that were "not directly under the control of a human participant in a simulation." In general, the predominant *functional participatory features* for interactive acts up to this period and even up to now, have been *choice*, *control*, or *manipulation*.

In this sense, the interactive principle of actual control was an illusion confined to the closed environment of the simulation, with a new complexity that went beyond the either/or feature of *exclusionary or inclusionary actions* from the human participant's perspective. Furthermore, the chapter "Setting a Common Research Agenda" (1-33) puts the accent on the need for *experiential* rather than *cognitive* user interfaces in technologies for immersive simulated environments, and on effects with minimal intrusion, such as the "ideal tracker", meant to be "untethered but also unobtrusive."

In the 1997 report there is no overt extended discourse on interactivity as such in the sections about the technologies for

virtual presence, but rather a frequent reference to the *act itself*, included in allusions to interfaces that "allow the players or participants to enter and *interact* with Virtual Environments including avatars of human representation of non-existing people, with computer generated characters that "can modify their behaviour automatically" and which can learn.

From 1997 onwards, the entertainment industry, particularly games, film and music have developed beyond the expected, and the Internet has facilitated the invention of new networking modes and participatory models, bringing about revisions of interactivity. I move now to my next stream of reasoning which draws attention to a series of transformations interactivity has gone through, partly reflected in new modes of enunciating the desirable new technologies, which start out to a certain extent from the relationships between human agency, content technologies and knowledge technologies established in the last five years, and which have been placed at the foreground in the EU, especially since 2002. From 2001, the Directorate-General Information Society roadmaps were already leading towards a more complex content infrastructure, one in which interactivity is refocused, redeployed, and in which it changes from being a single feature to a more diffused, distributed set embedded in a new technology framework: namely, a vision that unfolds from the early dictum that content originates from different sources, and must be distributed over different channels, in different contexts, for different audiences, and must be displayed on a convergence of devices; above all, it formulates the shift at a macro-level from "Information Society Today" to "Ambient Intelligence" tomorrow:



Implicit here we will find the changing conditions of what will be expected of interactivity as a dynamic factor in the production of digital objects. Significantly, this road-mapping into everyday life recurs as an intertextual factor in a number of scenario-building reports and EU policy statements. In this comparison, IST digital objects are shown in sharp contrast, —shifting from "linear content," writing and reading and text-based information search, voice (mobile) and micro-scale— moving towards the new IST in FP6 and FP7 vision, which instead, requires 'surrounding' interfaces, using all the senses (intuitive), context-based knowledge handling, wireless full multimedia, nano-scale, and worldwide adoption. A preamble to such vision had emerged in 2001, particularly in the scenarios consistently created to describe "what living with Ambient intelligence might be for ordinary people in 2010" —authored by the ISTAG group[13] (Dicatel *et al.* 2001) —responding to a EU social imaginary where we are moving to "environments in

[13] *ISTAG. Scenarios for Ambient Intelligence in 2010*, Final report, compiled by K. Dicatel, M. Bogdanowicz, F. Scapolo, J. Leijten, & J. C. Bugelman, February 2001, IPTS-Seville.

which humans interact with each other, and so […] emphasis is on support for human interactions."

The main objectives of the European Commission vision and paradigm are to strengthen the technology use and build the knowledge society for all,"[14] and aims for "an Ambient Intelligence that provides natural and enjoyable interactions with IST applications and services."[15] *Ambient Intelligence* has been defined from the start as a technology concept that must be "ubiquitous, user friendly," requiring the minimum effort to get things done, ideally with a switch off option, controllable, predictable, and different from purely interactive environments (Dicatel *et al.*, 2001, 13). As proposed, Ambient intelligence, "stems from the convergence of three key technologies: Ubiquitous computing, Ubiquitous Communication and Intelligent User Friendly Interfaces.

Within this technology development, pervasive computing becomes a medium to introduce a crucial innovation for interactivity: currently envisioned as part of the 'post-PC life', that is to say, our daily lives where other devices replace computers, it appears in less explicit instances of formulation, yet it comes into sight as omnipresent, transformed into an array of expected embedded features and applications. Moreover, in the 2010 scenarios with plausible scenes of everyday life the authors announce a significant change of normative technology design, from interactive to *pro-active:* "The vision of Ambient Intelligence assumes a shift in computing from desktop computers to a multiplicity of computing devices in our everyday lives whereby computing moves to the background and intelligent, ambient interfaces to the foreground. Related shifts are put

[14] *Multisensorial, Multilingual Interfaces and Virtual Environments,* Report of the IST Program Consultation Meeting 10, Brussels 26-27 April 2001 experts from the industry, user associations, research organisations, briefed on FP6, and on ISTAG scenarios PCM10 report [10/05/2001]

[15] *Ibid.*

forward in the FP6 IST Workprogramme for 2003-2004." (Friedewald & Da Costa 2003, 7) In this considerable shift while the interactive was human-centered, the proactive is pervasive and human-supervised. Such change from desktop computing to devices follows the key accompanying directive of *convergence*, which has appeared in numerous texts defining the new technology since 2000. Therefore, it is my contention that scenarios in technology innovation are more than mere fictional narratives that represent plausible futures. As explained earlier, in the IST context they have a key role in providing situations of the *collective desirable future*, which in turn, are translated into guidelines for technology development. In other words, they begin as a fictional narrative but their purpose and end-result are far from that. By way of illustration, in addition to new experiments and Research & Development projects, in 2001 there were products already in existence that represented exemplary ways in which Ambient Intelligence could be embedded in everyday objects: among others, we can mention LingWear, consisting of wearable language supports for tourists and visitors in foreign language environments, or the virtual meeting room called the Meeting Browser (Friedewald & Da Costa 2003, 7). Another ambient intelligence object of experiment is the "perfect partner or virtual assistant", consisting of a portable, foldable or holographic, multi-sensorial, non-invasive entity (PCM10 Workshop 2001, 10). Actually, the scenarios and these new products correspond to a vision that has inspired other more recent experimental products such as the paint made from electronic dust particles to control the room's temperature or a painted wall that may become a screen. With recent developments these early examples would no longer qualify as Ambient Intelligence but rather as 'wearable technology", "robotics," and equivalent types of 'products'. However, these prototypes are often rightly considered as models in the agenda of the IST technological imaginary, in which "the political land-

scape now makes Ambient Intelligence a specific goal." (PCM10 Workshop 2001, 8)

There are key obstacles towards the realisation of such vision, and crucial questions are particularly relevant to the notion of interactivity: "A key attribute of the Ambient Intelligent landscape is the vision of autonomy of systems, avoiding the need for the user to control every action. This is typified by the contextualized personalized information systems that deliver the right information at the right moment through adaptive multipoint, multi-channel communications mechanisms." (PCM10 2001 WorkshopP8) From the core technologies and main challenges identified, I underline the following: Control and dependability, where the leading question is phrased as follows: "how do you ensure that the users stay in control of the ambient experience devices when they want to control them, or how do you ensure that users can relinquish control or permanently terminate a relation with the devices when they want to?". The next challenge concerns learnability and user enhancement: "How can *ambient experience devices learn from interactions* with the user? What areas the user may need help with? How can this be achieved without enforcing a stereotypical view of the shortcomings of the end user? (PCM10 Workshop 2001, 8)

It should be noted that in this technological imaginary shift, interactivity is fully assigned functions that should be performed by the machines and systems, with the goal to better understand and adapt to human behaviour, together with a "better understanding of human/human interaction and human/machine interaction." (Dicatel *et al*. 2001, 11) Thus, the human-machine interaction is going through a reversal of ground rules to become machine to human interaction on the one hand, and to be conceived to support human-to-human interaction. Such vision, understandably, places the user at the centre, and point the future directions towards a design of technology for the people, "rather than making people adapt to the technolo-

gy" (Dicatel *et al.* 2001, 8). In short, the current trends in technology requirement, concur in the belief that Ambient Intelligence should interact with people through interface perception, context awareness and self-awareness, including retrieval-emotive contexts, adaptivity, personalisation and control.

Based on ISTAG reports of 2001 and 2002, the subsequent 2003 concept of Ambient Intelligence for the technological road-mapping of possible future developments remains defined as "a vision of the IS future where the emphasis is on user-friendliness, efficient and distributed services support, user-empowerment, and support for *human interactions.* People are surrounded by intelligent intuitive interfaces that are embedded in all kinds of objects and an environment that is capable of recognising and responding to the presence of different individuals in a seamless, unobtrusive and often invisible way" (Friedewald & Da Costa, 2003). In 2005, science and technology are already experiencing the major shift from micro scale to nano scale, and from text-based information search to context-based knowledge handling, as shown in the illustration shown earlier; through the semantic web, among other new technology, digital objects are gradually becoming what we can call *digital knowledge contexts.* Such contexts will constitute both enhanced entities not only in the cyber world accessible through the Internet, but also in tangible, physical worlds. Currently, there are socially oriented trends within technology that aim at developing a clearer understanding of our surroundings with the future technologies. These will be defined and perceived as a new sociology of space —in contradistinction to the sociology of urban space—, where the individual's world is constituted by mobility in between home, road, work, city, and where some devices will service the body. This area is known as "Body Area Network" (BAN) consisting of interfaces management (Ditlea 2000; Van Dam *et al*. 2001; Riva *et al.* 2003). The BAN will involve the interaction of the human body with

the devices s/he comes across being worn as clothes, jewellery, etc., the body's relation and interaction with devices in a small space (i.e. the car) or a room or fully ambient-intelligent spaces (indoors or outdoors); the social implications are not without puzzles, since already in LivingLabs such as those in Finland there are questions about the most important space, which is the private one in a totally networked social community. Therefore, just as until 2001 we had the Local Area Network (LAN), Wide Area Network (WAN), Metro Area Network (MAN), there is an increasing need to define the 'new' zones of interactions such as those related to the body. In addition to the BAN, a related but different one has been denominated the Personal Area Networks (PANS) (Ditlea 2000; Van Dam *et al*. 2001; Riva *et al.* 2003).

In the programmatic thread which I have followed, interactivity is no longer a single or simple feature. Most importantly, technology continues to develop, and so do the constructs and implications of what is desirable as part of the social construction of the 21st century information society citizen —as user. For the assessment of the notion of *interactivity* in the 2010 and 2030 or any other year for that matter, neither the monological inclusionary nor one-channel feature concepts are sufficient any more. It is good news that the systems and technologies of our immediate technological future are anthropomorphically described as "sensitive, responsive, interconnected, contextualized, transparent, intelligent." Although increasingly embedded, interactivity is not disappearing. We need new conceptual contexts from our culture-oriented 21st century perspectives, with multi-actor frameworks. By way of conclusion, a few remarks are necessary to summarize the implications of the changes around interactivity in the Information society technological imaginary: First, interactivity's role has been shifted so that it can help to improve human to human interaction; it has been assigned more 'responsibilities' and more control, in contrast to human agency;

the human user 'seems to want' less control as an improvement of ease of use; it may become a much more entangled net of decentered interconnected functionalities, inserted in what I wish to call a web of New Area Networks (NAN both of actual technology and in the IST technological imaginary.

A dominant view in socio-technical relations refers to the experience of interactivity as primarily an individual act. Relevant questions remain which need to be explored further, since we need to ask, for instance, how much of the human response that intervenes in an environment (virtual or not) is guided by cultural commonalities, and to what extent are we shaped by collective cultural values which are embedded in our social beings; how is the cultural web within each "user" of technology intertwined with each individual capacity and desire for personal choice? In the interactivity domain, how much of manipulation, control and choice does the individual have and want, and how do we analyse these notions, with which criteria and for what purposes.

Both as a concept of socio-techno semiosis, and as a core feature in the instruments of innovation and technology development in Information Society policy, interactivity is progressively becoming embedded within a new array of principles that intervene in the social construction of our daily life, designed within the new nano-cogno-bio-info programmatic frameworks of the Information Society, which is, to a large extent, our collective and shared immediate future.

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