From "i" to "u"

Re-engineering the information society

Petra Ilyes[1]
April 2008[2]

Environments for new technological opportunities

Standard views in technology and society have focused often either on questions of impacts of technologies on societies or, conversely, on the social shaping of technologies. The common understanding today is that research will have to look at the interplay between these settings or dynamics. Put simply, technology is not conceived any more as unidirectionally effecting culture and society but as itself inherently cultural and social. This perspective calls for concepts suited to capture complex processes in which reality is seen to be constantly realigned.

The basic notion is that science and technology are both change agents and subject to change. In this view, general patterns do not emerge from a master process or from central control, but from "aggregates of localized interactions and decisions" [Thacker 2004]. Things are interconnected in complex ways instead of simply effected in linear ways [Rip 2002, 6]. For instance, from the perspective of evolutionary theory, new institutions and new technologies emerge when technological changes are deployed economically in interactional mode [Nelson 2003]. Recent research has emphasized the role of governance and management of science and technology in society with a co-evolutionary perspective [Institute for Governance Studies, n.a.], defining co-evolution as "the linked evolution of two (or more) dynamics" [Rip 2002, 10].

The concept of co-evolution has been employed in studies of technology and politics to acknowledge the dynamics of systems constantly interacting with, and shaping each other [Tsekeris 2007]. Public and private technology planning and implementation is a promising field for investigating the interaction and co-constitution of technologies and societies. I suggest that

[1] Department of Cultural Anthropologie and European Ethnology, University of Frankfurt am Main. Email: ilyes@em.uni-frankfurt.de

[2] Paper for the international research conference "I4—Interactivity / Information / Interface / Immersion", Research Network "Anthropology of the Medial / FAME-Frankfurt", 26-28 September 2007, University of Frankfurt am Main.

technology policies or programs can be conceived of as agendas of "world-making" [Escobar 2000; Tsing 2000] directed at creating an environment or a world that will accommodate novel technologies. I define world-making as a dynamic, iterative process. The concept of world-making, then, touches on issues of how processes of governance and management co-evolve with science and technology development. Visions, implementations, infrastructures, and technologies are central to world-making processes. Take the case of the implementation of the *information society*. To begin with, the information society has been a central vision in political agendas since the 1990s. With the advent of novel technologies, the original model of the information society of the early 1990s gradually expanded, acquired additional features, and became reconfigured:

- The early model of the information society was the "i" model. Its key feature is "information". Information was conceived as the new major production force in globalizing knowledge economies [Bell 1973].

- The "i" model was soon extended to become the popular "e" model. The key feature here is "electronic networks". That is, the increasing capacity to circulate and remotely manipulate digital data became central features of "digital capitalism" [Schiller 1999].

- The next extension occurred with the increasing availability of wireless mobile technologies. The key feature of the "m" model, then, is "mobility" [Rossel et al. 2006].

- Recently, a paradigm shift has been observed [ITU Telecom World 2006; ITU Internet Reports 2006], postulating the extension of the information society model toward the model of the "*Ubiquitous* Information Society" [Wu/Tseng 2006]. The key feature of the "u" model is "ubiquity".

However, new technological developments alone cannot account for those reconfigurations, but research and development planning, and influential dominant societal discourses, among others, must also be considered as essential aspects. The standard view, though, is rather based on models of unidirectional effects in logical consecution than on co-evolving dynamics. The *International Telecommunications Union*, e.g., suggests that "The next step in the digital revolution is digital ubiquity" [ITU Internet Reports 2006, 22]. The European agenda proclaims the ubiquitous information society as "the next overall phase of the information society" [i2010]. Obviously, the "u" has gained significance in technology discourses:

> "The world seems to be getting into the boom of U or Ubiquity, shifting from the mega-trend of E or Electronic in the last several years [...] Nowadays, the word U seems to be combined to everything. You can easily see such words as u-Society, u-City, u-Commerce, u-Business, u-Learning, to name a few" [UN/CEFACT 2005].

The policy of Japan's *Ministry of Internal Affairs and Communications* (MIC) emphasizes ubiquity in its current agenda: "The National ICT Strategies in Japan Are Evolving from 'e' (Electronic) toward 'u' (Ubiquitous)" [MIC website, n.a.]. Korea announced the implementation of a "U-World" [Korea IT Times, n.a.] along with "U-Life" [Songdo, n.a.]. And the EU's "Roadmap to the future" informs that "[t]he U-society-topic is [...] part of the European Union's i2010 information society strategy" [Huovinen 2006, 2].

The common notion underlying the current u-agendas is that change is the "very foundation of the new digital world", representing "a constant driving force" that will "require continuous adaptation and rapid response" [ITU Internet Reports 2006, 24]. The emphasis on change in discourses about information technologies is nothing new. Since the 1990s, an urgent impetus calling for massive and rapid changes in the context of the economy-wide deployment of IT has been conspicuous. Social change is posited to be necessary in order to benefit from the new technologies: "we are led to believe that, if we hope to extract the collective benefit from new technologies, we shall have to make certain changes in the way we behave" [Leiss 1992, 64].

The message in the 1990s was that the implementation of information technologies will have substantial social benefits. For example, the US-American *Agenda for Action* from 1993 emphasizes that "[t]he potential benefits for the nation are immense", promising "solutions to pressing social problems" through the development of a national information infrastructure [NII website].[3] The promise of the u-society does not differ greatly from previous promises of the information society. At the European Commission i2010 Conference in 2006, an EU representative stated: "My vision of the ubiquitous information society is one in which ICTs become seen as making things better" [Reding 2006]. The MIC website for a Japanese u-society emphasizes the "Potential of ICT to Resolve Social Problems" [MIC website, n.a.]. A news bulletin on European u-initiatives reports on new "solutions de-

[3] This notion points to the standard model of a "technological fix". The concept of "technological fix" has been used by anthropologists to explore the idea of solving social problems with technology. A "technological fix", then, reduces problems of a non-technical nature to a technological problem [Layne 2000, 492].

signed to make everyday life easier" [EE Times Europe 01/23/2007], chiming in with research and development initiatives celebrating a ubiquitous world where intelligent agents will assist citizens at every moment in their daily lives [Starner 2002].

In order for a society to benefit from new technological opportunities, an environment must exist that allows novel technologies to function. This environment will not simply emerge from new opportunities, but is laboriously designed by heterogeneous actors. In his case study of a plan for introducing the electric vehicle in France in the 1980s, Michel Callon finds that the development of the new technology alone was not considered sufficient by the engineers. Additionally, it was deemed necessary to create a "social universe" that would accommodate the new technologies [Callon 1987, 84]. Innovations, Callon explains, first appear "in a world unprepared to receive them" [Callon 2007, 147]. New technologies must be made socially acceptable in order to facilitate "cohabitation" [ibid.].

Creating a social universe or environment for the new technologies to function can be conceived of as a world-changing, future-making process [Tsing 2000, 328ff.], and as world-making activity. With this approach, *world* can be conceptualized as a complex product, into the making of which must be invested. Looking back at the 1990s, one finds evidence for the validity of this perspective. It was a time of huge capital investments into physical infrastructures world-wide [Schiller 1999, 2] that would allow the new information and communication technologies to function. Also, "soft" infrastructures were implemented. Examples include new legislation at supranational levels, which was needed to regulate the interconnection of different national telecommunications systems [Berger 2000], and a "culture of change" [Stiglitz n.a.], that is, a social climate facilitating the willingness to accept, adapt to, and bring about change in order not to be cut off from an emerging globally configured world.

Anthropological approaches for studying things "u"

Clearly, many heterogeneous actors are involved in this process. And most importantly, they are mixing in "diverse configurations that do not follow given scales or political mappings" [Ong 2005, 338]. Anthropologists attend to the interplay, interaction, and co-operation of such actors, focusing on relations between institutions, conventions, representations, methods, practices, bodies (be they human or artifacts), etc. Dynamic processes are discerned in which new technologies emerge from particular conditions, and, in turn, produce new conditions, that is, solutions continually interact with their settings.

What I am arguing in this paper is that technological innovations and dominant discourses continually transform each other. As one example, take the enactment of the model of high adaptivity, evolvability, self-configuration—not just in the emergent field of network computing but also in dominant social and economic discourses about flexibility and change which are clearly associated with the characteristics of new information and communications technologies: (re)configurability and (re)programmability. The cultural logic of (re)configurability and (re)programmability is permanent change, which is represented paradigmatically in the new information technologies.

A central methodological issue here, for anthropologists, is to determine what kind of data can be collected, and how they can be collected, as well as how to conceptualize the units of study. These units may differ substantially from traditional anthropological research objects as they are neither bounded groups nor territories but, rather, distributed and processual units. Some useful conceptualizations for such kinds of units—e.g. *socio-technical system/ensemble*, *actor-networks*, *assemblage*, *agencement*, *complex human-technical meshworks*—are available from a range of interdisciplinary research fields. They all point out that new hybrid socio-material practices are both restricted and facilitated by existing practices [Law/Singleton 2000, 766].

Anthropologists who explore settings of technology development and implementation often have to engage forms of research that differ from standard understandings of ethnography [Collier/Ong 2003, 425]. I suggest that for the study of such types of settings the term "technography" may be useful.[4] Anthropological technographic research includes a number of central concepts, particularly

- the concept of *following the actor* [Latour 1987; Marcus 1995] (where actors may be both humans and non-humans, including models, innovators, key categories, system builders, definitions, standards, users, etc.). Researchers "follow" these actors in order to see how they interact, how, where, and which technologies are developed, implemented, and used;

- the *multi-sited* concept (distributed processes at diverse and multi-local sites). It is not directed at rendering a "holistic representation" of a system. Rather, multi-sited ethnographic research emphasizes strategies for following connections, associations, and relationships [Marcus 1995];

[4] The term "technography" was introduced 1996 by Bob Anderson [Anderson 1996], a scholar in Human-Computer Interaction research, and has been introduced recently to German sociology of technology by Werner Rammert [2007].

- the concept of *agencement*, defined as "a combination of material and technical devices, texts, algorithms, rules, and human beings" [Callon 2007], and *assemblage*, where "assemblage is a heterogeneous collection of elements—scientific practices, social groups, material structures, administrative routines, value systems, legal regimes, technologies of the self, and so on—that are grouped together for the purposes of inquiry" [Collier/Ong 2003, 422];

- the concepts of *co-construction* [Callon 2007], *co-constitution* [Introna 2005], *co-evolution* [Faßler 2008], and similar concepts, with a sensitivity to ongoing dynamics, and the ways specific paths of development are facilitated, as well as with a "sensitivity to what is contingent or in motion in the present without suggesting a progression to some fixed state or new structural formation" [Collier/Ong 2003, 423];

- the concepts of *agency* and *performance*, with a focus on material-discursive alignments of actions and settings: "Agency is not an attribute but the ongoing reconfigurings of the world" [Barad 2003]. Phenomena, then, are conceived as dynamic (re)configurings of the world, open-ended practices, "perpetually open to rearrangements, rearticulations, and other reworkings" [ibid.]. Reality is not just described but produced by its description [Callon 2007].

U-Visions

After having sketched some possible anthropological approaches to the study of the interplay between technology and society, I will now take a closer look at some of the current u-visions, and point out how the approaches presented can be applied.

The u-roadmaps of the European Commission, of the South Korean government, and of the government of Japan are among the most well-known examples for agendas that strongly promote the model of a ubiquitous information society.[5] The central concepts of these three agendas are outlined in the following list.

- While the European Agenda "i2010" promotes the "i" in its name, the "i" here does not represent the term of "information" alone, but also

[5] The US government has similarly formulated visions of a ubiquitous information society with the *Agenda for Action* in 1993 but does not promote "ubiquitous" as a key term [NII, n.a.]. There are also u-agendas in other Asian countries, notably Singapore, Taiwan, and China [Wu/Tseng 2006; Murakami 2006].

refers to the categories of "interactive", "innovative", "intelligent", "inclusive", "integrated", etc., all of which are relevant in the European vision of a ubiquitous information society [ICT in FP7, 2006], denoting a material-discursive alignment in a co-evolutionary process of technology planning and implementation. The central argument is that ubiquitous technologies play a major role in encouraging novel and innovative ways of doing things, which in turn is seen as the "only way to increase the productiveness of our societies" [Huovinen 2006]. Additionally, these technologies are supposed to help create and establish a shared "EU identity" [Wu/Tseng 2006].

- The u-Korea vision "IT839"[6] is a policy by the Korean *Ministry of Information and Communication* to implement a "ubiquitous world" [Let's go to U World, 2005-04-18] which, in turn, is supposed to drive economic and technological development [Wu/Tseng 2006]. The strategy focuses rather straightforwardly on "positioning Korea as one of the global IT powerhouses" [NIA's 20th Anniversary]. The *National Information Society Agency* of Korea (NIA) spells out the national priorities: "As the architect of the history of Korean IT, NIA will uncompromisingly push forward to build a ubiquitous society for the future" [NIA, n.a.].

- "[U]-Japan is aimed at addressing the issues of ubiquitous technologies, rather than the mere promotion of informatization" [ITU Telecom World 2006, Forum briefing note]. The u-Japan Policy extends the "u" from "ubiquitous" to a broader understanding by emphasizing the categories of "universal, user oriented, and unique" [Masahiro 2005]. It presents itself less technology-centered than "social and welfare-oriented". It accentuates the human-centered aspects of the new technologies, and claims that u-technologies will help "resolve social problems". It sees them as "a social fulfillment tool", helping to "create a new lifestyle by developing convenient ICT services in every part of life." [Wu/Tseng 2006].

These agendas share the assumption that the ubiquitous future is immanent, and that u-services and u-technologies will soon pervade people's everyday lives:

> "The concept of the 'U-society', the Ubiquitous Information Society, refers to the next overall phase of the information society, in

[6] The numbers in "IT839" refer to eight services, three infrastructures, nine equipment fields [World ICT Summit 2005].

which people's ways of life and work will be based on their having ICT services that are available at all times and in all places" [i2010, 2006].

I think it might be argued that such statements are descriptions with performative consequences, i.e. they are politically performant [Law/Singleton 2000, 767].

Characteristics of U-Technologies

In order to better understand the technical underpinnings of these supranational and national government agendas, I will sketch briefly some of the specific characteristics of ubiquitous information technology and ubiquitous computing. As a relatively recent field, ubiquitous computing is still largely in a process of being defined. Ubiquitous computing is closely associated with the idea of smart devices and sensing, proactive environments. The u-Japan agenda depicts the characteristics of ubiquitous technologies with the "4A vision" [ITU Telecom World 2006, Hong Kong]: "Anything–Anyone–Anywhere–Anytime" [Shimizu 2007]. It is acknowledged that "[t]he U-World paradigm refers to a substantial relational change between people and computers" [Korea IT Times, n.a.] because computation "moves beyond the traditional confines of the desk", and is distributed "across a variety of devices, which are spread throughout the physical environment and are sensitive to their location and their proximity to other devices" [Dourish 2001, 15]. These devices are purported to

- be equipped with "digital intelligence" [UIC-07, 2007]. This means, among other things, that they are adaptive, context-sensitive, and proactive[7];
- be "invisible" [Weiser 1991], because they are seamlessly embedded in everyday environments and objects, that is, they are "non-invasive"—not obstacles—in everyday practices, and thus allow "natural" interaction [Greenfield 2006, 11f.];
- demand only little intentional user input. Rather, input is provided, for instance, via sensor data in sensor networks [Internet of Things 2008];

[7] Context-sensitive computing emphasizes the role of contextual information for the development of self-managing systems as well as for the development of dynamic cooperation and collaboration between devices in order to carry out distributed, autonomous tasks [Pervasive 2007].

- help organize the integration of physical and computer-generated worlds [Internet of Things 2008].

The idea of internet technology reaching into the "real" world of physical objects has been around for several decades, and has become well-known through the concept of the "internet of things", where "physical world" and "cyberspace" are supposed to be tightly integrated [Internet of Things 2008]. In the "u-society", computing is envisioned to be ubiquitous, embedded in everyday environments and objects, thus "making computational services so pervasive throughout an environment that they become transparent to the human user" [Abowd 1999]. The basic idea is "to have intelligence built into the things we already use" [Dillon 2006]. According to technical experts, technologies such as RFID, wireless communication, realtime localization, and sensor networks are, in fact, already deployed in commercial projects, and mobile internet access, wireless communication technology, wearable communication equipment, bluetooth, etc. are now available in many places, facilitating pervasive computing [UbiComp 2007; IEEE Pervasive Computing April-June 2007]. Conferences and congresses specializing on u-technologies conjure up a "smart world", claiming that,

> "[b]y embedding digital intelligence in everyday objects, our workplaces, our homes and even ourselves, many tasks and processes could be simplified, made more efficient, safer and more enjoyable. Ubiquitous computing, or pervasive computing, composes these many 'smart things/u-things' to create the environments that underpin the smart world" [UIC-07, 2007].

The "smart home" or "home networking" is a well-known case in point. Applications in this domain are increasingly perceived as a commercially promising field. For instance, in 2001, a US magazine for micro-electronics predicted: "Home-networking hardware is bound to become one of the most active areas in the technology industry during the next several years" [Micro Times 03-09-2001]. "Home networks" are described as combining

> "telecommunications, broadcasting, construction, appliances and software solutions together to link everything in a home and connect it with the rest of the world. Sensors and chips embedded in devices around the home sense, process and exchange information to create the ultimate in convenience" [World ICT Summit 2005, 10].

Among the appliances that have gained some notoriety is the "internet-enabled refrigerator". Prototypes are equipped with a screen, such that the fridge can be used like a conventional desk computer for email, watching TV, etc. But it also keeps record of what is inside the fridge, and checks for expiry dates of the products inside. These data can be accessed remotely, e.g. by cell phone while shopping at the supermarket, or automatically sent to a supplier who delivers the products needed [World ICT Summit 2005].

A big-scale deployment of u-technologies are so-called "u-cities". A u-city is conceived as "an intelligent next-generation city based on ubiquitous technology, such as RFID and wireless Internet technologies" [Anttiroiko 2005, 75]. The Korean "ubiquitous city" *New Songdo*, also referred to as "u-Songdo", has drawn some attention. On their website, the new city's developers explain their vision: "We build experiences, interactions, a way of living [...] The challenge of [...] Songdo City is to fashion a successful urban environment for the 21st century" [Songdo U-Life, n.a.]. Clearly, these are experiments in building the "social universe" in which the emerging u-technologies can function.

The *New York Times* in 2005 depicts the Songo-enterprise as one of the biggest real estate development projects worldwide, to be finished by 2014. The new city is so designed as to facilitate the exchange of data between all central information systems like private homes, health institutions, business, administration, etc. Computers will be embedded into all buildings and streets. This digital urban infrastructure is projected to become a future test environment for new technologies as well as for the evolution of a new lifestyle. A top representative of *New Songdo City Development* emphasizes that research has to be conducted in order to find out how citizens put the new technologies to actual use: "We'll be doing marketing and ethnographic research, digging deeper", as cited by the NYT. Allegedly, students of a US-American university have been commissioned to submit ideas for "u-life" [The New York Times October 5, 2005].

New arenas of informed materiality

It is frequently argued now that software-based systems have become part of practices of everyday life over the past thirty years [Dodge et al. 2007], forming the background of many everyday settings: "Small bits of hardware and software are now part of the hum of everyday life, working away silently on their calculations in all manner of unexpected locations" [Thrift 2004, 58]. A new layer of "active object environments" is emerging, constituting an "informed materiality", and "orchestrating a new reality" [Thrift 2005, 471], a "technoscape" with new practices and styles of thinking and living

[Escobar 1994, 217]. Increasingly, "computationally intensive environments" form the "infrastructural logic of knowing and living the world", changing the "background of being" and the "way the world is disclosed" [Thrift 2003; Thrift 2005, 469, 471]. Arenas of new "technoscientific infrastructures" co-evolve in which "market, law, code, and norms compete for hegemonic control over the rules of play" [Fischer 2005, 55].

New environments provide both new opportunities and challenges. Citizens (now defined as "users") must be equipped with basic competencies in order to be able to benefit from the new opportunities. They are expected to accept "to play the part proposed for them" [Callon 2007]: "As always-on digital access becomes the norm, users must learn to manage a new digital lifestyle" [ITU Internet Reports 2006, 24]. The young founder of a new "microblogging" service suggests that "[i]n five years time being hyper-connected will become a necessity to be an active participant in the social world [...] Being-hyper connected will become a precondition for citizenship" [BBC News 2007/05/09].

Seen from an anthropological perspective, new technologies co-evolve with new "technosocial orders" [Ito/Okabe 2003, 27] through processes of material-discursive alignments. Hard work and many resources are invested into producing the social universe in which new technologies can function. Massive investments in physical infrastructures and human-made environments are made. Interfaces, protocols, and standards are developed in order to integrate "cyberspace" and physical world. Trust in the new technologies must be built. Networks of heterogeneous materials co-evolve in processes of heterogeneous engineering trying to overcome resistance of their mobilized parts [Law 1992, 2] by deploying strategies that will create complex configurations of stability and calculability [ibid., 7].

What I think this outline of the paradigm change from "i" to "u" reveals is that there is a co-evolution of technology with new arenas governing the knowledge society. Obviously, in order for a new "u-world" to emerge, heterogeneous actors need to connect and interact, e.g. public agendas, infrastructures, system builders, laws, technology research and development, databases, models, users, concepts, investors. They all collaborate to create technology development, institutionalization, internationally agreed-upon standards, universal definitions, trust, normalization, etc., co-constituting the "ecosystem for the new networked machines" [BusinessWeek June 21, 2004].

One way of looking at this emergent world as an anthropologist, then, is that a technological future is always in the making, being continually implemented and institutionalized by a variety of actors. Hence, there is intense social and cultural work going on. Technology agendas are part of world-making processes directed at constituting a world that will accommodate new technological developments as well as new users. Discourses, artifacts, social universes, users, etc. co-evolve, and are reconfigured and respecified in the process. At the same time, they coproduce, and help stabilize, both emerging technologies and a new social universe—the ubiquitous information society.

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