INFORMATION TECHNOLOGY AND COMMUNICATION SYSTEM DEVELOPMENT: INFORMATION AND KNOWLEDGE

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Summary

There is an Internet access facility on (almost) everybody's computer screen (and, soon, TV screen, telephone screen, etc.). The question must therefore be raised, what is information? In what sense do the new information and communication technologies (ICTs) enhance, or obstruct "communication"? A brief characterization is offered—taking the Internet as our focus—of conflicting tendencies in the evolution of computer based (or digital) technologies of information production, management and diffusion as forms of communication, business practice, power structures and conviviality in our "global village" societies. Then we make a rapid appraisal of the tremendous potential, sometimes illusory, of the new ICT for enhancing responses to environmental problems. The interest here is not limited to technical applications such as management of data,

on-line classroom delivery and glamorous real-time simulations. It extends to the inter-subjective and political dimensions of the sharing of different perspectives on a problem, reciprocal learning and the empowering of local action in wider political and geographical contexts—so-called direct democracy for the governance of common property environmental resources. Yet, if the new technologies can have revolutionary potential for sustainability objectives and the ideals of an open and just society, it is equally true that the Internet and other digital information processing technologies have revolutionary potentials for new (and old) forms of fraud, surveillance and covert security operations, mass propaganda and manipulation. The paper concludes with a brief discussion of checks and balances that may increase the chances for the new ICT to work in favor of, rather than against, improved social justice, political accountability and environmental quality.

1. Introduction

The new digital information communication technologies (NICT) would seem a unique resource potential in the service of governance for sustainable development. They hold out boundless possibilities for rapid, cheap transmission of information, of all sorts, from one person to another, from one side of the planet to the other. Processing capacities will make possible instantaneous translation from one language to another, maybe not just of written or printed documents but also of spoken communications?

Yet, for those who envisage a civilized future society and environmental quality as well, the question is posed: How to renew the capacity for judgement, competence, conviviality and common sense in our overdose of information?

There are ever-increasingly powerful search engines (e.g. www.google.com). But this is not enough. The sheer exceso of bits and bytes in our digitalized universe, reinforces the worry of those, such as T. S. Eliot in his *Choruses from "The Rock"* who ask the old question, "where is the wisdom we have lost in knowledge, where is the knowledge we have lost in information"?:

> *The endless cycle of idea and action,*
> *Endless invention, endless experiment,*
> *Brings knowledge of motion but not of stillness;*
> *Knowledge of speech but not of silence;*
> *Knowledge of words, and ignorance of the Word.*
> *All our knowledge brings us nearer to our ignorance,*
> *All our ignorance brings us nearer to death,*
> *But nearness to death no nearer to God.*

We must first of all be clear in what sense, or senses, we are speaking of "information" and "communication." This will be the object of a short reflection in Section 2.

In Section 3, we focus on the socioeconomic dynamism, and the governance tensions that arise, in the ICT "revolution" unrolling in front of our eyes. The Internet is the most visible manifestation of this boundless potential for "being connected." Assessing ICT's

potential returns us to old problems in political philosophy and social organization, concerning the tension between forms of authority, liberty and solidarity.

We discuss in Section 4 some of the positive potentials that innovations with ICT currently present, in the fields of environmental decision support, interactive learning and citizens' participation in policy debates for the governance of common property environmental resources.

However, the ICT is a very polyvalent force, which as easily lends itself to mass propaganda, mass manipulation, and covert operations, as to convivial utopias. So we return, in Section 5, to a discussion of checks and balances that might be desirable if the new ICT is to be a creative potential in a context of improved social justice, political accountability and environmental quality, rather than reinforce the oppressive degradation of nature and of human nature alike.

2. Information and Communication

The French daily newspaper *Libération*, on 26 July 1991, recounted a news item, about a dolphin found dead on a western France beach, having suffered from intestinal blockages due to swallowing plastic. A marine science expert found, in the dolphin's stomach, more than 30 different fragments of plastic—supermarket bags, chocolate wrappers, sachets from fishing gear, and so on. She offered the explanation that dolphins eat a lot of small squid, and that a plastic bag floating in the water can appear, to the dolphin, as a squid.

This example highlights an enormously important epistemological first principle. It is erroneous to speak of information as "out there," somehow having an objective and independent existence. Knowledge, as a consciousness in life, is a process of cognition, which involves sensory apparatus of a living material being, an organism. Ordered molecules on a Pentium hard drive are not knowledge; everything depends on the process of receiving and interpreting the stimulus from the "outside world"—or, in more psychological and sociological terms, the way in which a person experiences and responds to an event.

If I were a dolphin, how could I validate my knowledge, in order not to die? In our contemporary information society, how can we, humans, absorb, sift, and find our way in the sheer excess of "information" that clutters up our ears, eyes and other sensory apparatus?

Personal and inter-subjective understanding (and misunderstandings), is to be distinguished from the sort of knowledge obtainable through measurement of physical processes. Predictive modeling based on empirical calibration and logic of deductive explanation, is undoubtedly important. But the real challenges of our Information Society are elsewhere. For people to live together, meanings must be shared and communicated. But as social philosopher Serge Latouche has remarked, the dialoguing that gives rise to social knowledge, is rather like conversation between deaf people. Even if we share the same data, we may not share any purpose.

The challenge is to realistically assess the prospects to develop the new ICT as authentic components in civil society, for learning and deliberative procedures for decision support, policy definition and evaluation—in such ways as might encourage people to work together and build "common" futures, rather than living exclusively in privatized fractured formats of reality and virtual reality.

The pace of present and prospective future technological innovation is screen-boggling. Hi-tech companies are experimenting with nano-technologies and cyborg interfaces that will alter habitual cognition and human relations beyond repair. Smart cars will not only improve energy efficiency (and deny the driver the capacity to express his/her ego needs), they will advise about your blood alcohol level and deprive you of the capacity to be a drunken nuisance to others. Sophisticated eye-wear will make Superman's X-ray vision seem archaic and, together with portable telephone and implanted microphones, will permit the wearer to operate a full two-way Internet video interface with sight and sound while walking in the street. Material needs will be delivered by automatic vehicles to your automated apartment door, based on TV-screen push-button automatic shopping. (And, if you go too far beyond your credit rating, the automatic surveillance systems will send the men in white coats to take you away...) Within all this, we have extraordinary prospects of information sharing in a novel "social partnership" for sustainability:

- Scientists can learn to use the Internet in order to make glamorous and persuasive communications of their newest findings, with or without the caution of traditional peer review.
- Disaffected citizens can, equally, use the Internet in order to dispute or abuse a scientific or public authority whose advice or actions they do not like.
- Firms and corporations can get "closer" to their customers, through providing product and service catalogues on the Internet, and also through providing direct-dial (or e-mail) avenues for customer feedback. They can design their services and information so as to better resonate with the life-worlds of their customers in their households (or in their increasingly virtual worlds), for example to show how their production processes are environmentally clean and friendly, to show how their commercial success is reconciled to ecological commitments.
- A farmer can represent his (or her) farm management procedures on a spatial grid, and cross-reference this decision support and documentation system with a variety of information available along other dimensions, such as regional statistics, sectoral performance parameters, environmental regulations and options for entering into conformity.
- Territorial and national authorities can use website presentations in order to explain to citizens the nature of the services that the taxes provide. Calculate and pay your taxes with a simple on-line Tax-Demon cooked up by your friendly Inland Revenue Department. Or, have a look at the improvements in road networks proposed by your regional authority (a map with a zoom can show in multi-color the progress of past and future upgrading works).
- The citizens, in their turn, can convey back to the public authorities their appreciation, or lack of appreciation, of all that is being done, and can send by Internet their alternative schemes.

The prospects for an enhanced and democratic exploitation seem without limit. But so are the prospects for nuisance, confusion and simple apathy. How could we take prospect for convivial outcomes seriously, given the flagrantly pacifying and antisocial tendencies of much video-screen entertainment? Well, since ICT ineluctably is becoming the dominant medium of inter-subjective communication, and inter-subjective communication generally speaking is constitutive of shared social meanings and social purposes, one might seek—by hard work and the pure force of will—to turn fatality into conviviality. Dialogue amongst people with diverse and partly irreconcilable experiences of reality is a part of life's normal and unavoidable richness. The question to be explored is the possibility of ICT as a medium of reciprocal appreciation amongst "stakeholders," an appreciation that—if rules of basic hospitality are observed—can permit a type of public policy as the maintenance of an enigmatic *common real ground* for everyone's virtual realities. Maybe the virtualities of the new ICT can facilitate a real voyage-in-common, collectively affirmed?

3. The Internet and the Varied Forms of Public Good

… And in the naked light I saw,
Ten thousand people maybe more,
People talking without speaking,
People hearing without listening,
People writing songs that voices never shared, no one dared
Disturb the sound of silence.
Fool said I, you do not know,
Silence like a cancer grows.
Hear my words that I might teach you
Take my arms that I might reach you,
But my words like silent raindrops fell
And echoed, in the wells of silence.

(from Paul Simon, ***The Sounds of Silence*** (1964))

3.1 Post-modernity's Great Freebee: the Internet

The Internet originated within one nation state, the US, but now is a "web" whose linkages go, like the spidery lines on a road-map, from every place to every other place, along fiber-optic highways and modem/telephone line by-ways, all over the world. Because it permits any user to make their own links and to develop their distinctive forms of expression, it seems eminently democratic (even if the email and file attachment formats cope more readily with digital information and accent-less English characters than with, say, French or Cyrillic or, still less, Arabic and East Asian idioms).

This combination of great malleability, decentralization and omnipresence inevitably generates contradictions. An initial impetus behind development of the Internet, was the US military goal to ensure capacity for worldwide secure communication via robust alternative channels. Now that it is up and running, it is everybody's show! There are no consistent (nor enforceable) rules about privacy of information, for example, names and addresses of persons engaged in E-commerce or inscribed on networks. Nazi-inspired race-hate material is put on display in the US (under guise of liberty of expression), and

is accessible everywhere despite being deemed illegal in some European countries who lived through the horrors of the Holocaust. Sophisticated developments of "encryption" technologies that increase security of information transmission, can boost the development of-based commercial transactions; they would also permit criminals, defrauders, terrorists, and secret intelligence services to go about their communications business (funds exchange, strategic operations planning, etc.) with impunity. The US government has banned the use of "high end" encryption technology that has been developed within its territorial jurisdiction. Yet it is probably only a matter of time before these techniques (or their equivalent) become available, for licit and illicit uses.

We see the tensions that multiply between state authority, political freedoms and personal liberty of expression and of action, crime and perversity, individual, community and national security (and so on). The Internet is a remarkable phenomenon of "open-access," an (almost) free-for-all. Just as a portable telephone is now an option for "everybody," so a web connection is at (almost) everybody's fingertips—as long as there is somebody to pay for the PC or laptop, for the modem or cable connection, for the on-line fees, and so on. Yet, the heavy pressures of electronic commerce, and the preoccupations of state regulators (national security, crime-busting, public morality) weigh down on this wonderful new conviviality. Furthermore, the sheer scale of the Internet development will generate a savage tension between permanent innovation hysteria (on the part of those seeking commercial, political and strategic advantages), lock-in due to the systemic rigidities of prior (often incremental) decisions, and inertia due to the unwillingness and inability of most users to keep up with the latest new gadgetry.

3.2 A Fourfold Typology from Cultural Theory

The above short discussion hints at a very great variety of motivations and user groups clustered around the new information technologies. We will exploit here a typology, developed with anthropological Cultural Theory, of four different forms of social solidarity.

Current public policy debates are marked by strident conflicts between those in favor of a "free market" and those who insist on putting fetters on the market (in the national or public interest, of course). Some insist on a maximum of individual liberties (such as free speech for criticizing the frauds and excesses of their governments, or the personal security right of carrying guns). Others insist that liberty for the fox is death for the chickens. Deregulation of markets is nothing other than a specific type of economic, moral and political regulation, based on (*inter alia*) strong rules and enforcement procedures (laws, courts, police, etc.) about private property and rights to engage in commerce without "interference" by others.

The Cultural Theory typology made by Michael Thompson and his colleagues starts with the observation that *markets* affirm a type of equality, being a large space of *individual* opportunity, but under conditions of competition (which means that an individual or group's real opportunity is tempered by their economic means). By contrast, governing *hierarchies* (of whatever sorts) institute various forms of inequality (of status, of access) and set limits on market competition. This suggests the

identification of two other permutations: the affirmation of equality without competition, which can be termed *egalitarianism* (and which militates strongly against forms of social exclusion), and the acceptance of inequalities of opportunity and status under conditions of competition, which the Cultural Theory calls *fatalism*.

The Internet, as it currently exists, has many attributes of a "public good." Textbooks of economics distinguish *private goods* from *public goods* on the basis of two attributes. Private goods have high excludability and low jointness of consumption. The classic example of a public good is a lighthouse: once it is there, anyone can use it (low excludability) even if they have not contributed to construction and operation costs (the so-called free riders) and, it is just as bright for the one-hundredth boat as for the first one (high jointness of consumption). Following our two-by-two approach to typology, we identify two other forms of non-private goods. These are *club goods,* characterized by high jointness and high excludability, and *common pool goods*, characterized by low or limited jointness and low excludability (such as a limited inshore fishing).

These four kinds of goods can be correlated with the four social solidarities identified above. Markets are naturally aligned to private goods; hierarchies can provide public goods; egalitarian arrangements (within a group) can provide for a socially acceptable sharing of common pool goods; and the attitude of fatalism on the part of large chunks of the population permits the stable provision of club goods. But what becomes obvious, is that there will be arguments and power struggles over the category into which different classes of goods and services are or should be placed.

Goods do not simply fall into one or other of the categories, rather they get "captured" (or, conversely, liberated) by different forms of regulation. Social life is marked by a never-ending struggle between the four solidarities, each one managing to keep some classes of goods securely in its domain, and all of them doing what they can to ease or pry or appropriate the strategically most important and/or less firmly attached goods away from their present anchorages, and into preferred alternatives. Individualists will typically seek to "privatize" common pool property (e.g., tradable fishing rights) and to "deregulate" the public sector so as to reduce state provision of public goods (privatization of radio and TV, telecommunications, postal services, education, prisons, etc.). Egalitarians, by contrast, will seek wide stakeholder access and citizen participation in broadcasting, in the governance of schools.

3.3 The Social Construction of Information and Communications Technology

Satellites and glass fiber cable networks, juxtaposed with tradition telephone circuits, plugged into dispersed computer hardware with customized software and ancillary devices, now support a huge diversity of electronic mail systems, on-line data bases, electronic forums, direct buying and selling, interactive video/television screening, exchanges of personal ads and messages, intimate "chat" rooms, teleconferencing, public opinion feedback, etc. Depending on the design and technology concepts employed, these can be made more-or-less excludable and more-or-less joint (or "non-rival") in consumption. But different social classes have very diverse interests—commercial, political, ideological, moral—in the degree of excludability and jointness of use/consumption. So we see an incessant tug-of-war.

Satellite-based television, telephone circuits and Internet communications are key dimensions of current "globalization." Electronic advertising and "demonstration" may be an extremely powerful force of social homogenization (the Coca-Cola society, Kentucky Fried Chicken in west Africa just as in Dallas Texas, instantaneous transmission of hairstyles and new fashions of footwear across the ether, and so on). The Internet permits, within the confines of its digital electronic interface modes, a powerful expression of local diversities, creativity and innovation. Immense processing capacities of modern computers, combined with sophisticated electronic and visual surveillance, open up perspectives of aggressive secret policing, invasion of privacy and authoritarian social control. Decentralized and autonomous exploitation of Internet capacities for quick circulation of information, is a weapon of transparency and co-ordination, enabling civil resistance to oppressive state procedures and enabling pressure to be placed on unscrupulous activities of businesses large and small. Strong actors and interests will, in all these regards, seek to mold the ways that the different forms of access to and provision of "information" can develop. Conflicts will break out where, for example, government agencies seeking to secure revenues from publicly controlled telecommunications, may be at odds with business interests who are attracted by the commercial potential of privatized radio, video-transmission, E-commerce and television, who are in turn at odds with egalitarians arguing for the public interest in non-commercialized broadcasting and/or free provision of wavelength and Internet byte access to citizens and to minority groups.

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The Internet is its own definitive source of auto-referential information. For an "explanation" of its labyrinthine logic and the interminable problem of (non)validation of information at any site, one is advised to read The *Library of Babel* by Jorge Luis Borges (written long before the WWW). There follows a (very small) selection of websites offering environmental information, critical perspectives and discussions on the new ICT:

- http://gstgateway.wigsat.org/internet/ [The site of Women in Global Science and Technology, including mailing lists on gender, science and technology and globalization themes.]

- http://Loka.org [The Loka Institute, Amherst, Massachusetts, a non-profit organization "dedicated to making research, science and technology responsive to democratically decided social and environmental concerns …".]
- http://ta-www.jrc.it/ulysses.html [Website presenting work on the ULYSSES project (Urban LifestYles, SuStainability and integrated Environmental aSsessment), a 3 year program of research and communication funded by the DG-XII of the European Commission whose central theme was "the exploration of the interface between Integrated Assessment Models (IAM) and citizens as part of an Integrated Assessment (IA) approach," with reference to climate change.]
- http://www.c3ed.uvsq.fr [Includes presentation of the "Tetrahedral" Framework for the organization of knowledge, as developed within *The DICTUM Project* at the C3ED, Université de Versailles-St Quentin-en-Yvelines.]
- http://www.educ-envir.org [A website run by the collectif Français pour l'éducation à l'environnement, listing sites, mostly Francophone, dealing with environmental education.]
- http://www.gaia.org/thegen [The Global Eco-village Network, promoting linkages around the world of individuals and organizations committed to ecologically sound and convivial society.]
- http://www.globenet.org/adome and http://www.adome.org [Sites of the organization ADOME (L'Association pour le Développement des Outils Multimédia appliqués à l'Environnement), which operates a website and CD-Rom based environment information catalogue/search framework.]
- http://www.mtroyal.ab.ca/critical_visions/ [Presenting critical reflections on the potentials, for better and for worse, of the new information technologies.]
- http://www.northern-college.ac.uk/departments/educational_studies/JimEwing [Website access to work by Jim Ewing and colleagues exploring potentials for on-line interactive distance learning for schools in rural areas of the UK.]
- http://www.openhouse.org.uk/virtual-university-press [Virtual University Journal.]
- http://www.shu.ac.uk/services/lc/cmeweb [A research group concerned with evaluating the potentials and hazards of new ICT.]
- http://www.wigsat.org/ofan/ [The Once and Future Action Network, an international consortium of gender, science and technology organizations promoting the contributions of women to humane futures.]
- http://www.vivendi.com [Site of the multi-national company Vivendi which, starting in France in the nineteenth century as Générale des Eaux, is now a worldwide conglomerate uniting water, energy services, transport, cleaning and real estate, telecommunications, multimedia and ICT commerce; *see also* www.vivendi-environnement.fr and www.havas.fr]

Biographical Sketches

Professor Martin Paul O'Connor was born in 1958 in Christchurch., New Zealand. Professor O'Connor studied physics and humanities in his native country, and in Paris. After completing his Ph.D. in economics (entitled "Time and Environment"), at the University of Auckland in New Zealand, he was for several years, a Lecturer in economics at the University of Auckland. He then took up a professorial position in 1995, at the University of Versailles St-Quentin-en-Yvelines (UVSQ), in the western suburbs of Paris. He has research degrees in physics, sociology and economics, and specializes in interdisciplinary work in ecological economics theory, development theory, environmental policy, and social sciences epistemology. In New Zealand, during the 1980s, he was active in a range of critical and consulting studies including public policy, environmental and social impact assessments, energy and banking sector studies, in parallel to academic teaching and writing. Since 1995, as Project Manager at the C3ED Research Center, he has participated on numerous French and European studies in the environmental valuation, green accounting, scenario studies, integrated assessment, risk and water governance fields. He is a member of the editorial advisory boards for the Journals: *Capitalism Nature Socialism* (*CNS*) and *Environmental Values*, and currently edits the interdisciplinary *International Journal of Water* (*IJW*, published by Inderscience). With colleagues, he is active in the development of international teaching networks, notably through the 3E-SDP (European Ecological Economics and Sustainable Development Policy) program, including North-South cooperation.

Michael Thompson is a social anthropologist (B.Sc., London; B.Litt., Oxford; Ph.D., London). He has studied some exotic "tribes," e.g., the experts who build computer models of the world's energy systems; the scientists who develop new household products for the Anglo-Dutch multinational, Unilever, and the

engineers who try to assess the risks inherent in the technology for liquefying and transporting natural gas, to mention only three. Though the subject matter is highly specialized, the persistent contentions within each of these tribes—over what is technically possible, socially acceptable and morally justifiable—is deeply political. Hence his current focus: the democratization of decision processes that, because of their high scientific content, have tended to be seen as merely technical.