Internet Science for Strategic Planning

Žiga Turk
University of Ljubljana, Faculty of Civil and Geodetic Engineering, Jamova 2, Ljubljana, Slovenia

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Abstract: The rapid development of information and communication technology (ICT) is perhaps the most influential driver that is fundamentally changing the world and the societies we live in. ICT is (a) changing the communication fabric that is linking the elements of societies together and is (b) automating human routine work. The latter is enabling automation and creating an abundance of food, industrial products and information. This abundance is pushing the value creation towards the creation of new knowledge and meaningful (rather than only functional) products and services. Information, knowledge and meaning are the three key commodities of the modern economy. Innovation and creativity are key processes creating these commodities. The two activities are very significantly supported by information and communication technologies.

ICTs are politically acknowledged on several levels of future planning: in R&D programs, development strategies, future studies and visions. However, a scientific base for all this is lacking. The interaction among ICT, innovation and society at large is a subject of research projects such as EINS and spawning the birth of a new interdisciplinary science, Internet Science - that is studying the interaction between information technology and society.

1 INTRODUCTION

The history of humanity shows a very clear trend that an increasing number of people is involved in the information professions - that is, the result of their work is an information; not an agricultural or an industrial product. They are sometimes referred as "knowledge workers".

The growing number of the knowledge workers vis-a-vis industrial and agricultural workers is a quantifiable indicator of society's transition from agricultural or industrial society into what is called "the information society". The growing contribution of the information/knowledge/meaning to the value of a product is another indicator of the transition of the society from the material towards the informational.

There are some who are charting the trajectory forward; from information society towards knowledge society and society of meaning (Pink, 2006) or emphatic society (Rifkin, 2009). However, from the perspective of analysing processes and technologies these are very similar to information society.

The key commodity in the information society is information. Information is created, communicated and consumed. All these processes are supported by media, tools and technologies. For example, an old technology for communicating information is sending around paper. A modern way is using what we call ICTs by which we usually mean the electronic and digital tools and services.

Communication technology has, too date, undergone two major and two minor revolutions (Turk, 2009):

- The first minor revolution was the invention of paper, clay and other writing media thousands of years BC.
- The first major revolution was the democratization of this invention by the introduction of cheap paper and printing press in Europe some 500 years ago.
- The second minor revolution was the invention of electronic communication like telegraph, telephone, radio and TV in the late 19th and early 20th century.
- The second major communication revolution was the democratization of electronic communication of texts, sounds and videos using the internet.

While the impact of the minor revolutions was significant, it was limited. The impact of the major revolutions brought paradigm shifts to society as a

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whole.

The ICTs are a key enabling technologies of the so-called knowledge triangle, which includes research, education and innovation, the three key activities of the "information (or knowledge or meaning) society".

Better linking of the three apexes of the triangle has been one of the goals of original as well as of the Lisbon Strategy (European Commission, 2009). The goal of that strategy was "to make Europe the most competitive and dynamic knowledge based economy in the world". It was based on the Schumpeterian assumption that innovation is the key driver of economic growth, and placed a big emphasis on innovation, research and the knowledge economy. The Bologna reform of the European Universities that was taking place at the roughly same time addressed the education apex of the triangle. A strong impetus towards the innovation union was also the Aho Report (Aho, 2006).

2 ICT IN POLICY PLANNING

2.1 Programs and Strategies

The ICT is broadly understood as a political development priority, in the EU at least since the Bangeman Report (European Union, 1994). ICT was prominently represented in the Lisbon Strategy. In the Europe 2020 strategy, Digital Agenda for Europe (European Commission, 2010) is one of the seven flagship projects. "The overall aim of the Digital Agenda is to deliver sustainable economic and social benefits from a digital single market based on fast and ultra-fast internet and interoperable applications."

In Project Europe 2030 (Reflection Group, 2010) the economic importance of ICT is well understood: "The EU must strengthen the Single Market against temptations of economic nationalism and complete it to include services, the digital society and other sectors, which are likely to become the main drivers of growth and job creation in a market of 500 million users and consumers" … "Digitalisation is increasing the scope for outsourcing, and the ICT-revolution may give ample scope for growth in productivity for decades to come." Also, the broader impacts of the ICT are mentioned: "The availability of multiple entry points through which citizens can engage with the legislative process should provide the EU with the legitimacy and flexibility it needs to address the challenges arising from globalization in a digital, interdependent, network-oriented and open society" … "… more systematic use of digital resources for e-governance". Role of ICT in research was also acknowledged by the European Council (2009).

2.2 ICT in Foresight Studies

ICT is one of the most vibrant sectors of the economy. It is therefore a subject of interest of the financial sector. Also, since the sector is advancing so rapidly it is opening up new issues with respect to regulation.

The European Internet Foundation made some predictions of the Industry by 2025 (European Internet Foundation, 2009). For 2025 they predict the "world driven by mass collaboration". But warn: "By 2025, the "digital arms race" between those intent on harm and those collaborating to prevent it will have become a central feature of our justice and law-enforcement systems".

A high level group prepared Future Internet 2020 (European Commission, 2009a) vision: "By 2020 the Internet will be both laid out as public infrastructures and dynamically created by the objects connecting to one another. We need to see the Internet of the Future as this seamless fabric of classic networks and networked objects. The content and services they facilitate will be all around us, always on, everywhere, all the time. It will lead the way to opportunities we never knew existed: new ways of working; new ways of interacting; new ways to be entertained; new ways of living. Next to these future applications today's Internet will look clunky and primitive. For instance, multimedia applications will move towards the bandwidth of human perception and beyond."

The bandwidth of human perception is estimated at 500 Mbits/seconds which is easily met today by the fiber to the home technology. Due to the limitations of the human body there will be no need for faster individual connections.

Several projects on the future of the internet take place in the EU, the US and beyond. Towards the Future Internet Project (Forge et.al., 2009) identified four possible future scenarios: "1. Smooth Trip - the rise of the internet economy as a whole life and work style - a middle road in contrast to more disruptive scenarios. 2. Going Green – internet technologies are used to combat growing environmental challenges. 3. Commercial Big Brother – a heavily commercialized consumer platform. 4. Power to the People – a forum for democracy and freedom."

The Paradiso Project (2011) had an objective "to explore how might or should our societies evolve in the next decades (a probable paradigm shift) and to derive from this analysis how can Information and Communication Technologies (ICT), and the Future Internet in particular, contribute to making this future better."

Internet technologies are perhaps most speculated about. Gartner invented and keep publishing the so called Gartner Hype Cycle that is showing technology maturity levels. They are also making shorter and medium term predictions (Gartner, 2010) of the industry.

There is no mention of the ICT in the "The World in 2025 Report" (European Commission, 2009b). The "Transformed World" (National Intelligence Council, 2008) report mentions possible technological leapfrogging of the developing world, internet as means of spreading propaganda and organizing NGOs, ubiquitous computing, role of ICT in warfare.

2.3 Visions of ICT

The various visions of ICT development are largely influenced by the fact that the industry keeps progressing according to Moore's law. Roughly doubling capacity and speeds every 18th months. This means an order of magnitude, tenfold, increase in less than 5 years. No other industry follows this cure, but an increasing number of industries are hooked on this curve by getting digitized: photography, music, movies, books, media … anything that is information.

Zittrain (2008) paints a worried picture that the future of the Internet may be as a number of closed networks dominated by commercial players like Apple and Facebook instead of an open collaboration platform. He writes: "In the arc from the Apple II to the iPhone, we learn something important about where the Internet has been, and something more important about where it is going. The PC revolution was launched with PCs that invited innovation by others. So too with the Internet. Both were generative: they were designed to accept any contribution that followed a basic set of rules (either coded for a particular operating system, or respecting the protocols of the Internet). Both overwhelmed their respective proprietary, non-generative competitors, such as the makers of stand-alone word processors and proprietary online services like CompuServe and AOL. But the future unfolding right now is very different from this past. The future is not one of generative PCs attached to a generative network. It is instead one of sterile appliances tethered to a network of control." but concludes "Our fortuitous starting point is a generative device in tens of millions of hands on a neutral Net. To maintain it, the users of those devices must experience the Net as something with which they identify and belong. We must use the generativity of the Net to engage a constituency that will protect and nurture it. That constituency may be drawn from the ranks of a new generation able to see that technology is not simply a video game designed by someone else, and that content is not simply what is provided through a TiVo or iPhone."

Among the works on the impact of the internet on politics and democracy, Morozov (2010) stands out with a cyber-realistic view that Internet does not necessarily bring democracy and freedom as some cyber-utopians would claim.

Kurzweil (1998) predicted in 1998 for 2009: "Personal computers with high-resolution visual displays come in a range of sizes, from those small enough to be embedded in clothing and jewellery up to the size of a thin book. Cables are disappearing. Communication between components uses short-distance wireless technology. High-speed wireless communication provides access to the Web."

Kurzweil (ibid.) for 2019: »A $1,000 computing device (in 1999 dollars) is now approximately equal to the computational ability of the human brain; Automated driving systems are now installed in most roads. There are widespread reports of computers passing the Turing Test, although these tests do not meet the criteria established by knowledgeable observers.«

Kurzweil (ibid.) for 2029: »A $1,000 (in 1999 dollars) unit of computation has the computing capacity of approximately 1,000 human brains; There is almost no human employment in production, agriculture, or transportation. Basic life needs are available for the vast majority of the human race. There is a growing discussion about the legal rights of computers and what constitutes being "human. Machines claim to be conscious. These claims are largely accepted."

And, finally, for 2099: »There is no longer any clear distinction between humans and computers; Life expectancy is no longer a viable term in relation to intelligent beings.«

3 ICT AND SOCIETY

The interactions are too numerous to analyse in this

context as the ICT penetrates all aspects of society. One report that stands out defines the impact of the ICT on freedom and security in the society as follows (Schermer and Wagemans, 2011): "Our modern-day Internet is an environment that allows for great freedom, but with freedom comes responsibility. If we want to keep the Internet an open, safe, and vibrant online environment, we must ensure that we take into account and protect the rights and interests of all members of society. The greatest challenge for Europe is to ensure the highest degree of (online) freedom for all."

The overall views on how important the ICT will be for the future society differs.

On one hand, Peter Drucker (2001) wrote: "All this suggests that the greatest changes are almost certainly still ahead of us. We can also be sure that the society of 2030 will be very different from that of today, and that it will bear little resemblance to that predicted by today's best-selling futurists. It will not be dominated or even shaped by information technology. IT will, of course, be important, but it will be only one of several important new technologies. The central feature of the next society, as of its predecessors, will be new institutions and new theories, ideologies and problems."

Similar is the conclusion by the National Intelligence Council in the "Global Trends 2025: "Many stress the role of technology in bringing about radical change and there is no question it has been a major driver. We—as others—have oftentimes underestimated its impact. However, over the past century, geopolitical rivalries and their consequences have been more significant causes of the multiple wars, collapse of empires, and rise of new powers than technology alone."

On the other hand Yochai Benkler (2006) writes: "Information, knowledge, and culture are central to human freedom and human development. How they are produced and exchanged in our society critically affects the way we see the state of the world as it is and might be; who decides these questions; and how we, as societies and polities, come to understand what can and ought to be done. For more than 150 years, modern complex democracies have depended in large measure on an industrial information economy for these basic functions. In the past decade and a half, we have begun to see a radical change in the organization of information production. Enabled by technological change, we are beginning to see a series of economic, social, and cultural adaptations that make possible a radical transformation of how we make the information environment we occupy as autonomous individuals, citizens, and members of cultural and social groups. It seems passe´ today to speak of "the Internet revolution." In some academic circles, it is positively naıve. But it should not be. The change brought about by the networked information environment is deep. It is structural. It goes to the very foundations of how liberal markets and liberal democracies have coevolved for almost two centuries."

Brynjolfsson and McAfee (2011) claim that we are yet to witness the most important impacts that the ICT will have on humanity. In the Moore's law they see its essential message – exponential growth – and compare the growth of the impact to the famous reward the inventor of chess was supposed to be given by the emperor of India. One grain of rice on the first square of the chessboard, two on the second four for the third … and so on.

Brynjolfsson and McAfee claim that we are still in the first half of the board where the reward, 2^{31} grains of rice, was quite manageable. But "as the technology moves into the second half of the chessboard, each successive doubling in power will increase the number of applications where it can affect work and employment." They pinpoint the source of this impact: "When businesses are based on bits instead of atoms, then each new product adds to the set of building blocks available to the next entrepreneur instead of depleting the stock of ideas the way minerals or farmlands are depleted in the physical world."

4 THE EXPECTATIONS OF FUTURE IMPACTS

The expectations of impact of ICT revolution on society are two-fold. The thesis is that it empowers the individual, the antithesis, that it empowers the state. We will propose the answer that both may be correct.

The thesis that technology empowers and brings freedom to individuals is called by Morozov and others "**the techno romantic view**". It is based on the assumption that ICT lowers the lowers transaction costs for people and that democratic availability of once exclusive technology puts relatively larger power into the hands of the people vis-à-vis the state. Democratic movements in Modova, Iran, Ukraine, Tunisia, Egypt, the tea party movement (USA), the OWS and the green movement (DE) are given as an example.

The alternative view is "**the techno-realistic view"**. The thinking is that ICT also lowers

transaction costs for governments. As the lives of the citizens and the work of the NGOs are increasingly digitized, it is easier to gather information, censor, and them crack-down. The internet architecture has a few spots that can be controlled if needed. As evidence, Cuba, China, Belarus, Iran and, recently, the NSA, are cited as an example.

The "**techno pragmatic"** view states that it depends. In democratic societies it empowers the citizens and NGOs while in totalitarian societies it empowers the state.

Regardless of the view, according to Scott's institutional theory institutions are social structures (wider term than organizations). They have the following basic aspects:

- regulative (setting and enforcement of rules),
- normative (values and social norms),
- cultural (interpretation of reality).

Because they are based on culture and values, institutions are very stable but they do change. Change of institutions (according to Tolbert and Zucker, 1983) is shown schematically in Figure below:

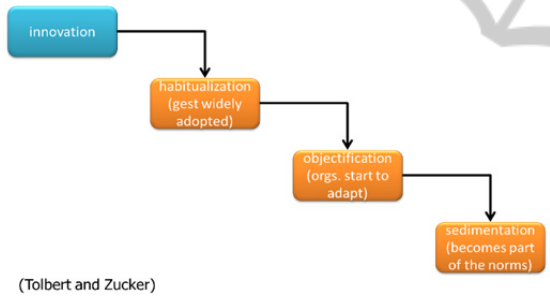

Figure 1: Cascade of change.

Historically it took centuries that the innovation of cheap paper lead to its wide adoption (as for books and newspapers). Businesses and individuals adapted accordingly. It took a few violent revolutions, however, some 300 years after the innovation of paper that the normative context (democracy, market economy) prevailed.

With the digital ICT much of the habitualization and objectification happened already. However, we are currently struggling even with the simple normative changes (e.g. copyright). Major changes to how society is organized are still to come. The study of this should be a major topic of the emerging internet science.

5 CONCLUSIONS

With respect to the impact of ICT on society, the author is convinced that Peter Drucker, the National Intelligence Council and others are wrong and that the cyber-utopians are right. The changes in the ICT will be one of the most important drivers of change of the future world.

To put an argument very shortly: for any cell of human society to work, its members must communicate. This holds true for families, businesses, local communities, states and countries as well as the globe as a whole. A change in communication possibilities influences these cells of society. The deeper the change, the larger the impact on societies.

The world has evolved into what it is – politically, economically, militarily, and culturally – around a material economy and analogue communication. Location mattered, borders existed. There is no such thing as distance and border in the digital communication world. Today, the digital economy is a small, but increasing part of the whole. What can be digitized – knowledge and meaning – constitute a growing share of the added value of products and services.

There are problems as to where and how to tax digital content, where and how should the digital nomads – people who work at a distance digitally – contribute to their social security, what "national" law applies for things that are somewhere in the internet, somewhere in the cloud; how to manage intellectual property rights for the kind of property where giving a copy to someone does not mean the giver is deprived of her own copy etc. Societal structures of the analogue world are not fit for the digital world any more.

The material economy of the 19th century largely took place inside a country. That county was a natural unit for rules, regulations and laws. The digital space is global. It will call for global rules and regulation. In the absence of which the actors that *can* play globally will rise in influence. This includes corporations as well as individuals. Which leaves us with the question of fair competition among and between those.

The author believes this change will be profound and will result in reinvention of all institutions of society. The process already started (as per Tolbert and Zucker) where citizens are free and where businesses must adapt in order to be competitive. The process is stalled where powerful institutions and legal frameworks are blocking change and leading to rigidities in society. In the next years and decades, much will depend on how change will happen in these areas – in highly governed and regulated areas of society that include public services, rule of law, education etc.

5.1 Towards Internet Science

Knowledge about this is needed on all levels of future thinking – from planning and strategies to forecasting and visions. A science that would provide an ontological, epistemological and methodological base is badly missing. It is a science that combines technologists with a clear understanding of where technology push and technology opportunity will be coming form, social scientists with an understanding of societal mechanisms, and humanities with a deeper understanding of the human being.

Internet science could fill-in this gap – if it becomes to computer science what urban planning and logistics are to civil engineering. Not developing the underlying technology on how to build the infrastructure but taking technological infrastructure for granted and studying how it can be used to improve the lives of people, create new businesses and interesting new work opportunities. The EINS network of excellence is making an important step in this direction.

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REFERENCES

Aho, E. (2006) Creating an Innovative Europe, Report of the Independent Expert Group on R&D and Innovation, http://ec.europa.eu/invest-in research/pdf/download_en/aho_report.pdf

Benkler, Yochai (2006), The wealth of networks : how social production transforms markets and freedom (1st ed.), New Haven, Conn: Yale University Press, p. 528, ISBN 0-300-11056-1

Brynjolfsson, Erik and Andrew McAfee (2011). Race Against The Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy, Digital Frontier Press.

Drucker, Peter (2001). The Next Society, The Economist, November 2001.

European Commission (2009). Lisbon Strategy for Growth and Jobs, http://ec.europa.eu/archives/growthandjobs_2009/

European Commission (2009a). Future Internet 2020, Visions of an Industry Expert Group, http://www.future-internet.eu/fileadmin/documents/reports/FI_Panel_Report_v3.1_Final.pdf

European Commission (2009b). THE WORLD IN 2025, Rising Asia and socio-ecological transition, http://ec.europa.eu/research/social-sciences/pdf/the-world-in-2025-report_en.pdf

European Commission (2010). Digital agenda for Europe 2010-2020 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF

European Council (2009). Future of ICT research, innovation and infrastructures - Council conclusions http://register.consilium.europa.eu/pdf/en/09/st17/st17190.en09.pdf

European Internet Foundation (2009). The Digital World in 2025, Indicators for European Action. http://www.EIFonline.org/

European Union (1994). Bangemann Report, Europe and the Global Information Society, http://www.umic.pt/images/stories/publicacoes200801/raport_Bangemanna_1994.pdf

Forge, S., Blackman, C., Popper, R., Guevera, K., Srivastava, L., Brown, I., Cave, J., and Miles, I. (2010), Towards a Future Internet: Delphi Survey Round 1 Results, A report to EC DG Information Society and Media, Oxford Internet Institute and SCF Associates.

Gartner (2010). Top 10 Strategic Technologies for 2011, http://www.gartner.com/it/page.jsp?id=1454221

Kurzweil, Rey (1998). The Age of Spiritual Machines: When Computers Exceed Human Intelligence, Penguin 0-14-028202-5.

Morozov, Evgeny (2010). The Net Delusion: The Dark Side of Internet Freedom.

National Intelligence Council (2009). Global Trends 2025: A Transformed World - The National Intelligence Council's 2025 Project, http://www.cfr.org/world/global-trends-2025-transformed-world--national-intelligence-councils-2025-project/p17826

Paradiso Project (2011). http://paradiso-fp7.eu/

Pink, Daniel H. (2006). A Whole New Mind: Why Right-Brainers Will Rule the Future, Penguin Books

Reflection Group (2010), Project Europe 2030, Challenges and Opportunities, http://www.consilium.europa.eu/uedocs/cms_data/librairie/PDF/QC3210249ENC.pdf

Rifkin, Jeremy (2009). The Empathic Civilization, Polity Press, Cambridge.

Schermer, Bart and Ton Wagemans (2011). Freedom in the Days of the Internet, Centre for European Studies, Brussels.

Tolbert, Pamela S. and Lynne G. Zucker (1983), Institutional sources of change in the formal structure organizations: The diffusion of civil service reform, *Administrative Science Quarterly*, vol. 30, 1983.

Turk, Žiga (2009). Communication Revolutions Change Civilizations: What to Expect from the Current One?, keynote paper, *6th International WEBIST Conference*, http://www.webist.org/WEBIST2010/Keynote_Speakers.htm

Zittrain, J. (2008) The Future of the Internet: And How to Stop it, Yale University Press, New Haven, CT, http://futureoftheinternet.org/download