ORIGINAL PAPER DOI: 10.13135/2384-8677/4039

Slow Tech: Towards an ICT for the Anthropocene Age

Norberto Patrignani[1], Diane Whitehouse[2]
[1] Politecnico of Turin, Italy and Uppsala University, Sweden
[2] The Castlegate Consultancy, UK

Abstract
Information and Communication Technologies (ICT) are shaping our society and planet with unknown impacts and are definitely an integral part of the Anthropocene Era. The entire ICT supply chain should move towards a more systemic view of the infosphere. This paper proposes the concept of *Slow Tech* as a *heuristic compass* for finding new directions in the design of future complex socio-technical systems, by paying attention to ICT that are *good*, *clean*, and *fair, socially desirable*, *environmentally sustainable*, and *ethically acceptable*.

Key words: ICT, Slow Tech, Anthropocene

ISSN 2384-8677 **DOI**:http://dx.doi.org/10.13135/2384-8677/4039

Article history: Submitted November 02, 2019. Accepted December 02, 2019. Published December 21, 2019

Citation: Patrignani, N. & Whitehouse, D. (2019). Slow Tech: Towards and ICT for the Anthropocene Age**.** *Visions for Sustainability,* 12: 35-39.

Competing Interests: The authors have declared that no competing interests exist.

Corresponding Author: Norberto Patrignani, Email: norberto.patrignani@polito.it

Introduction

The social and ethical aspects of ICT have been investigated ever since the beginning of the computer era and an increasing number of individuals have contributed insightfully to the foundations that underpin Slow Tech.

Starting in the 1930s, techno-determinism was already being investigated critically by certain researchers (Mumford, 1934; Ellul, 1954). Yet it was Norbert Wiener, a professor at MIT in the 1950s, who is considered to be the founder of the discipline of *computer ethics*. Wiener was the first person to open up the debate about the impact of computers on society and the risks of unemployment due to automation (Wiener, 1950). Another fundamental contribution came from Joseph Weizenbaum in the 1970s. Weizenbaum underlined the difference in the time dimension between computer and humans, and the risks of delegating certain human functions to machines: "... the question is not whether such a thing can be done, but whether it is appropriate to delegate this hitherto - human function to a machine" (Weizenbaum, 1976, p.207). In the 1980s, *computer ethics* became officially a discipline of study (Maner, 1980). In 1985, two leading researchers both proposed very different views of this new branch of investigation. James Moor proposed a *policy vacuum* approach, in which *computer ethics* was described as a way to fill the gap between technology and society (Moor, 1985). Deborah Johnson proposed a more proactive approach based on the concept of computers as *socio-technical systems*. For her, technology was not neutral, but rather both technology and society co-shape each other (Johnson, 2009). Since the turn of the century, many other scholars have contributed to this new field. Some focused on the daily work of computer professionals (Gotterbarn, 1991) or on the ethical dimension of ICT projects (Rogerson, 2009), and others concentrated on the more theoretical foundations of computer ethics (Bynum, 2000; Floridi, 2014).

This paper starts from the contribution of Deborah Johnson. It takes the view that technology is not neutral. It results from the many complex interactions human beings have with society and is a consequence of human choices - an artefact embedding values.

Slow Tech: a good, clean, and fair ICT

In the work of Johnson, ICT neutrality is deeply questioned. If computers are complex socio-technical systems and technology and society co-shape each other, then computer professionals have both the opportunity and responsibility to interrogate the premises of the design so that they can steer their use in appropriate directions. Yet which is the right direction? The Slow Tech approach starts to play an important role as a *heuristic compass* that can help guide computer scientists in their design activities.

We presented our first article about Slow Tech in ICT in 2013 at the *International Conference on the Social and Ethical Impact of ICT* in Kolding, Denmark (Patrignani and Whitehouse, 2013). The main concepts of the approach were explored in greater detail in our book *Slow Tech and ICT* (Patrignani and Whitehouse, 2018).

Slow Tech as an approach is explicitly inspired by the philosophy of *Slow Food*, the Italian - now worldwide - movement that introduces three basic principles that apply to the whole food value-chain: food must be *good* (based on good quality, healthy, and prepared according to time-honoured recipes), *clean* (by reducing its environmental impact to as low a level as possible), and *fair* (be respectful of the rights of farmers) (Petrini, 2007). Similarly, the *Slow Tech* approach starts by taking into account the limits of the planet and the limits of human beings. ICT have now reached such a rate of pervasive dissemination that they are shaping society and the planet in a scary way. Technology is now one of the main challenges of the Anthropocene era - the era where human beings and their artefacts have an immense impact on the planet and ecosystems, thereby underpinning climate change.

Slow Tech can thus be defined as a *heuristic compass*:"*...* a new starting point for systems design: ... based on a long-term view of the desirability and social importance of technologies, their environmental impact and sustainability, and the fairness and equity of the conditions of workers" (Patrignani and Whitehouse, 2014).

***Good* ICT**

A *good* ICT is simply "*socially desirable*", that is, projects and applications are developed starting from human needs, and the technology is human-centred. According to Richard De George: "Computers and information technology should help and serve people and society. Where they do not, they should not be passively accepted" (De George, 2003). For example, inundating human beings with data and information and without the opportunity of turning it into knowledge by means of actual experience, stresses human attention capacity to the limits (Maffei, 2014).

There are several activities that can help to produce good ICT and there are a number of educational, design, safety, and economic aspects to achieving it. Since human beings can survive only by filtering this tsunami of bits, the task for

education systems is to provide the next generations of people with the skills and competences for *digital wisdom.* Another fundamental principle for a *good* ICT is that of *habeas data*: people have the right to know about their digital identity, how it is managed, and to have control of its storage and processing, including *the right to oblivion* (EU, 2019). Privacy-by-design should be the norm for any ICT project. *Design-for-all*, or the *Universal Design Principles* should also be the norm of a *good* ICT, which implies equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, size and space for approach and use (CFUD, 2019). A good ICT is designed in accordance with the Participatory Design approach in which users collaborate with designers in joint teams (Nygaard, 1996). *Good* ICT should also help human beings to use *less* ICT and find the right balance in time between online and offline (Fasoli, 2019). *Good* ICT must be safe, and this is particularly important for technologies where software (and its fragility) plays a central role (Rogerson and Gotterbarn, 1998; Gotterbarn, 1992). Finally, to maximize the innovation possibilities of ICT and its contribution to the economy, technologies should be open and thus based on *open software* (Stallmann, 1985), *open hardware* (OHWR, 2019), and *open data* (ODH, 2019).

***Clean* ICT**

A *clean* ICT is simply *environmentally sustainable.* However, awareness of the *limits to growth* on a finite planet, which started with the groundbreaking report of the Club of Rome (Meadows et al., 1972), does not consider the ICT world. Yet ICT is no longer in the realm of clean innovation. As a consequence of the volume of its power consumption, its contribution to the greenhouse effect is now reaching 4% of CO_2 emissions. This is due to the more than four billion connected users and the cloud computing business models based on gigantic data centres (Belkhir and Elmeligi, 2018). Nevertheless, ICT could contribute to the ability to face the challenges of climate change through de-materialization. Improvements in the efficiency of many technical processes provide the opportunity of decreasing CO_2 global emissions by more than 10 Gton by 2030 (GeSI, 2019).

More research is needed in order to understand the complexity of the global impact of ICT. For example, it is only recently that investigation has begun into the materials (minerals, such as rare-earths) needed for manufacturing electronic devices, the electricity required for powering the gigantic cloud computing data centres, and the growing mountain of e-waste sent to Africa (Patrignani et al., 2011; Bernhardt and Gysi, 2013).

At the current growth rate in cloud computing data centres and with the Internet of Things, when billions of ICT devices will be connected, the ICT industry will, by 2020, have surpassed both the aviation and shipping industries with regards to CO_2 emissions. By 2025, this industry will absorb 20% of the world's electricity (data centres, with one-fifth of the Earth's power consumption and will become the largest global energy user). By 2040, ICT will be responsible for 14% of total emissions (Marques Lima, 2017; Vidal, 2017).

A *clean* ICT should therefore address these challenges by minimizing the extraction of new materials (e.g. by recycling and repairing devices), by reducing considerably the power consumption of ICT, ensuring the use of renewable energies, and stopping the export of e-waste to Africa and south-east Asia. Each of these measures need the collaboration of a wide range of stakeholders: of users (by improving their purchasing selective criteria), designers (by innovating the ICT supply chain incorporating the repairability-by-design rule), and policy makers (by introducing strict norms for the release of new products onto the market, if they are not recyclable, repairable, and not accompanied by a strict Life-Cycle-Assessment) (Andresen et al., 2014).

The ICT of the Anthropocene era should immediately seek to enlist a *circular economy* approach. Many researchers are now focusing on these aspects for reducing the impact of ICT and facing the climate change challenge (ICT4S, 2013). Indeed, the concept of *limits* as recently been introduced into the ICT domain for investigating the impact and the environmental, material, energy, and social limits of ICT. The area of "computing within limits" is now becoming critical for the future of ICT itself (LIMITS, 2019).

***Fair* ICT**

A *fair* ICT is simply one that is *socially acceptable.* The ethical issues underpinning *fair* ICT focus on the working conditions of people who produce these electronic devices. Indeed, among the many vulnerable stakeholders of the ICT world, these members of the workforce are often forgotten. Nowadays mostly located in the south-east Asia, every day these workers produce the devices used by the rest of the world. A *fair* ICT should pay attention of their working conditions, their human rights, dignity, and lives. In many countries - for example, in the mines in Africa where they are extracting the minerals essential for the ICT industry, child labour is the norm (OECD, 2004). It

is only recently that the working conditions of the personnel that produce with their own hands the billions of smartphones on the international market have been described (CLW, 2018; Condiffe, 2018). When launching a new generation of electronic gadgets on the market, the ICT industry, users, and policy makers should all seriously consider the *fair* side of ICT.

Conclusions

The ICT industry is now playing a fundamental role in the Anthropocene era and is now the *platform* for the many dimensions of people's lives. ICT is having a huge impact both on humanity and on the environment.

It is therefore the responsibility of users, ICT providers, and policy makers to steer the entire *infosphere* towards a more systemic view. At all stages and phases of the entire supply chain of data, information, and knowledge, people and players should be more aware of the complexity of the background societal, economic, and ecological context, including both human society and the planet (Carayannis et al., 2010). Data should not be taken out of context just for processing. Rather, it should be seen as *an imperfect representation of reality*, an attempt at *understanding the patterns and processes of interdependency in complexity*. As Nora Bateson suggests, it should be seen as "warm data" (Bateson, 2019).

As part of this trend, *computer ethics* should evolve towards an even more *proactive* ethics, a more *close-to-the-world* discipline, capable of *making a difference*. Ethics in itself should develop away from being an abstract set of rules to a reflection capability for everyday living in-the-world, it should become an *ethics of praxis.* As suggested by Varela, it should be a *project of being* rather than a *system of judgement*, a goal of expertise and wisdom (rather than a matter of rules that are universally applicable (Varela, 1999).

In the Anthropocene era, *Slow Tech* could become the *heuristic compass* that indicates promising directions for future ICT, by presenting us with just three simple questions: is the technology g*ood*, is it *clean*, and is it *fair*?

References

Andersen O. Hille J., Gilpin G., Andrae A.S.G. (2014) Life Cycle Assessment of electronics, IEEE, https://ieeexplore.ieee.org/document/7046212.

Bateson N. (2019) *Warm Data*, https://norabateson.wordpress.com/2017/05/28/warm-data.

Belkhir L., Elmeligi A. (2018) Assessing ICT global emissions footprint: Trends to 2040 & recommendations, *Journal of Cleaner Production*, Vol.177, 10 March 2018, Elsevier.

Bernhardt A., Gysi N. (2013) (eds) *The World's Worst 2013: The Top Ten Toxic Threats*, Blacksmith Institute, Green Cross Switzerland.

Bynum T.W. (1999) Keynote at AICE99, *The Foundation of Computer Ethics*, Computer and Society, June 2000.

Carayannis Elias G., Campbell D.F.J. (2010) Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate To Each Other? A Proposed Framework for a Trans-disciplinary Analysis of Sustainable Development and Social Ecology, International Journal of Social Ecology and Sustainable Development, 1(1), pp. 41–69.

CFUD (2019) Center for Universal Design, *Universal Design Principles*, North Carolina
State University College of Design.

CLW (2018) *China Labor Watch: Amazon profits from secretly oppressing its supplier's workers, An Investigative Report on Hengyang Foxxconn*, June 10, 2018,
www.chinalaborwatch.org.

Condiffe J. (2018) *Foxconn Is Under Scrutiny for Worker Conditions. It's Not the First Time*, New York Times, June 11, 2018.

De George R.T. (2003) *The Ethics of Information Technology and Business*, Blackwell Publishing, p.ix.

Ellul J. (1954) *La technique ou l'enjeu du siècle*, Armand, Paris.

EU (2019), *European Union, Complete guide to GDPR compliance*, https://gdpr.eu/

Fasoli M. (2019) *Il benessere digitale*, Il Mulino.

Floridi, L. (2014) *The Fourth Revolution. How the Infosphere is Reshaping Human Reality*, Oxford: Oxford University Press.

GeSI (2019) *ICT Solutions for 21st Century Challenges*, Global e-sustainability Initiative, http://smarter2030.gesi.org.

Gotterbarn D. (1991) A "capstone" course in computer ethics, in (eds.) Bynum et al. (1991) *Teaching Computer Ethics*, Research Center on Computing and Society, S.Conn.State Univ.

Gotterbarn D. (1992) *Software Engineering Ethics*, in Encyclopedia of Software Engineering, ed. John J. Marciniak, John Wiley & Sons, Inc.

ICT4S (2013) *Proceedings of the 1st International Conference on Information and Communication Technologies for Sustainability, ICT4S 2013*, ETH Zurich, 14-16 February, ETH Zurich, University of Zurich and Empa, Swiss Federal Laboratories for Materials Science and Technology, available at: 2013.ict4s.org.

Johnson D.G. (2009) *Computer Ethics*, 4th Edition, London: Pearson.

LIMITS (2019) *Workshops on Computing within*

Limits, computingwithinlimits.org.
Maffei L. (2014) *Elogio della lentezza*, Torino: Il Mulino.
Maner W. (1980) *Starter Kit in Computer Ethics*, Helvetia Press.
Marques Lima J. (2017) Data centres of the world will consume 1/5 of Earth's power by 2025, *Data Economy*, 12 December 2017.
Meadows D. H., Meadows D. L., Randers J., Behrens W. W. III. (1972) *The Limits to Growth. A report for the Club of Rome's project on the predicament of mankind*, Universe Books.
Moor J. (1985) What is computer ethics? *Metaphilosophy*, October.
Mumford L. (1934) *Technics and Civilization*, Harcourt.
Nygaard K. (1996) Those Were the Days, *Scandinavian Journal of Information Systems*, 8(2):91-108.
ODH (2019) Open Data Handbook, https://opendatahandbook.org.
OECD (2004) *Organisation for Economic Cooperation and Development, Illegal Exploitation of Natural Resources in the Democratic Republic of Congo: Public Statement by CIME (Committee on International Investment and Multinational Enterprises)*, www.oecd.org.
OHWR (2019) *Open Hardware Repository*, https://ohwr.org.
Patrignani N., Laaksoharju M., Kavathatzopoulos, I. (2011) Challenging the pursuit of Moore's law: ICT sustainability in the cloud computing era, *Politeia*, Vol.104, pp. 45-55.
Patrignani N., Whitehouse D. (2013) *Slow Tech: Towards Good, Clean, and Fair ICT*, in T. W. Bynum, W. Fleischman, A. Gerdes, G. M. Nielsen & S. Rogerson (eds.), *The Possibilities of Ethical ICT*, Proceedings of ETHICOMP 2013, International Conference on the Social and Ethical Impacts of Information and Communication Technology (pp. 384–390), Print & Sign University of Southern Denmark, Kolding.
Patrignani N., Whitehouse D. (2014) Slow Tech: a quest for good, clean and fair ICT, *Journal of Information, Communication and Ethics in Society*, 12(2), pp.78-92, Emerald Group Publishing Limited.
Patrignani N., Whitehouse D. (2018) *Slow Tech and ICT. A Responsible, Sustainable and Ethical Approach*, London: Palgrave MacMillan.
Petrini C. (2007) *Slow Food Nation: Why our Food should be Good, Clean and Fair*, Milano: Rizzoli Intl. Pub.
Rogerson S. (2009) The Ethics of Software Development Project Management, in (eds.) Bynum T.W., Rogerson S., *Computer ethics and professional responsibility*, Oxford: Blackwell.
Rogerson S., Gotterbarn D. (1998) The ethics of software project management, in G.Colleste (ed.), *Ethics and information technology*, Delhi.
Stallman R., (1985) The GNU Manifesto, *Dr. Dobb's Journal of Software Tools*, 10(3), p. 30.
Varela F.J. (1999) *Ethical Know-How: Action, Wisdom, and Cognition*, Stanford: Stanford University Press.
Vidal J. (2017) Tsunami of data could consume one fifth of global electricity by 2025, *Climate Home News*, 12 November 2017.
Weizenbaum J. (1976) *Computer Power and Human Reason: From Judgment To Calculation*, New York: Freeman.
Wiener N. (1950) *The Human Use of Human Beings*, London: The Riverside Press.