

Slow tech: bridging computer ethics and business ethics

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Abstract

Purpose – This discussion paper focuses on a notion of information and communication technology (ICT) that is good, clean and fair that the authors call Slow Tech. The purpose of this paper is to introduce the Slow Tech approach in order to explain how to create a suitable bridge between business ethics and computer ethics.

Design/methodology/approach – The paper's approach is discursive. It provides a viewpoint. Its arguments are based in an examination of literature relevant to both business ethics and computer ethics. Justification is produced for the use of Slow Tech approach. A number of potential future research and application issues still to be investigated are also provided.

Findings – Slow Tech can be proposed, and used, as a bridging mechanism between companies' strategies regarding computer ethics and business ethics. Three case studies illustrate the kind of challenges that companies have to tackle when trying to implement Slow Tech in concrete business context. Further study need to be undertaken to make progress on Slow Tech in applied, corporate settings.

Practical implications – ICT companies need to look for innovative, new approaches to producing, selling and recycling their services and products. A Slow Tech approach can provide such insights.

Social implications – Today's challenges to the production and use of good, clean, and fair ICT, both conceptual and concrete, can act as incentives for action: they can further applied research or encourage social activism. Encouraging the study, and the application, of Slow Tech provides a first step in the potential improvement of a society in which information technology is totally embedded.

Originality/value – The value of this paper is not only for academics and researchers, but also for practitioners: especially for personnel working in ICT companies and for those involved with designing, developing and applying codes of conduct at both European and globally.

Keywords IT policy, Case study, Business case, Global IT management

Paper type Viewpoint

1. Introduction

Around the world, both small businesses and large corporations are facing challenges in acting responsibly when producing goods and services that serve society, the economy and environment. In order to cope with these challenges, many companies are preparing corporate social responsibility (CSR) strategies. Among examples of such companies are those involved in the information and communication technology (ICT) market (called here either ICT companies or ICT firms). These companies can be described as the main providers of the technologies that are shaping society, and are likely both today and in the future to have significant social and environmental impacts.

This discussion paper suggests that ICT firms should begin an in-depth examination of their own businesses, and identify the ethical, environmental, and social impacts that are the direct result of their own goods and services being on the market. Such an approach is important for ICT companies to evaluate the appropriateness of their CSR strategies. Customer profiles are starting to change: consumers who are sensitive and aware are beginning to ask for transparency and



consistency from the producers whose products they buy. As a result, ICT firms should ideally be among the first, lead set of companies to develop an applied form of ethics – a computer ethics – that questions the various challenges created by computers. The concept of Slow Tech can facilitate such a careful, ethical approach among those ICT companies that want to design, develop, produce, and sell ICT that is good, clean, and fair.

This paper therefore introduces Slow Tech as a concept: it describes its origins and its relationship with Slow Food. It introduces a short overview of the roles of computer ethics and business ethics. It outlines the current production approaches of ICT companies, before presenting an argument that applying Slow Tech as an idea could help companies to improve the coherence and consistency of their own stance on social responsibility. The paper concludes by describing three cases that relate of specific companies, and highlighting the challenges that are implicit in them beginning a new Slow Tech way of thinking and acting. It also sets out some actions for next steps, particularly in the fields of study and research.

2. Slow tech, slow food and other slow forms of philosophy

The term Slow Tech have been around for more than a decade. Originally, Slow Tech approaches were not specifically related to ICT. They emerged from two directions (Hallnäs and Redström, 2001; Price, 2009): first, they were about the creation of periods of reflection and mental rest (Hallnäs and Redström, 2001) and, second, they focused on reliable engineering practices (Price, 2009).

Since 2010, however, the Slow Tech concept has been proposed as fitting particularly well the ICT setting (Patrignani, 2010; Patrignani and Whitehouse, 2013; Whitehouse and Patrignani, 2013). In this third approach, Slow Tech is not described as being a technology that “goes slow”; rather, it is proposed as a form of twenty-first century quest that can be pursued by companies in the ICT industry to achieve ICT that is good, clean, and fair. Using this third approach, Slow Tech is intended to be an enabling mechanism that can encourage companies to focus holistically and innovatively on an approach to technology that covers the three aspirations of goodness, cleanliness, and fairness. It is put forward as a concept that can encourage ICT firms, policy makers, consumers, and society to reflect on the social and environmental impacts of ICT (Patrignani and Whitehouse, 2014). Its core premise is to articulate a good, clean, and fair approach that focuses on all stages of the ICT value chain (the material sources, the hardware produced, efficient operation, and the end of life of the equipment used).

These three main characteristics of Slow Tech – that the technology involved should be good, clean, and fair – are terms inspired by the Slow Food movement which originated in Italy (Petrini, 2007). The original, and continuing, philosophy of this food-based movement is on the whole value chain of food: food must be good (of good quality and healthy, e.g., in its re-discovery and use of old recipes), clean (in its attention to environmental sustainability), and fair (in its focus on the rights of farmers) (Petrini, 2007, 2011). When these ideas are transposed to the world of ICT, they mean instead that good ICT is based around notions of human-centeredness, user involvement, participatory design, enjoyment, aesthetics, and the creation of a balance between work and home life. Clean ICT means taking into consideration environmental impacts (from materials production, energy consumption to *e*-waste). Fair ICT implies taking into account the conditions of workers throughout the entire supply chain.

Other slow forms of philosophy

Even if Slow Food was originally based on a particular Italian school of thought, it is possible to understand the values on which Slow Tech was founded in a much wider, societal context. Purely as examples, the works of at least two twentieth century philosophers are pertinent to the ideas of Slow Tech. As background, work by both Charles Taylor (1991) and Jacques Ellul (1954) is explored briefly here. The work of other philosophers and ethicists and the relationship between Slow Tech and both business and computer ethics are assessed in more detail in Section 3 of this paper.

First, contemporary users of ICT devices, in particular those who rush to acquire the latest fashion in smart phones every 12 months or less, provide clear examples of people who experience the malaise of modernity referred to by philosopher, Charles Taylor, in his Massey Lecture (1991). Taylor argued that the modern concept of self-fulfilment is based on a culture of narcissism. This culture is responsible for a consumerist approach to life that is characterised by a loss of sense. According to Taylor, to be maintained, the promise of self-fulfilment needs to be harmonised with social commitment. Thus, Taylor focused on a number of problems implicit in contemporary societies, especially the loss of meaning due to the abstract and mono-dimensional vision of individual identity typical of liberalism. To give a meaning and purpose to human lives, Taylor proposed instead to emphasise the importance of ties with the community. Social relations are important in the context of community, and it is community that can offer importance and meaning to ethical choices: thus, people share together values about what is right and what is wrong. In this philosophical context, a Slow Tech approach offers a way to give meaning to ICT development and usage, by taking into account its impact on human beings, the environment, and the fairness and justice of the supply chain. Indeed, although these ideas often pre-date Taylor's writings, and some community approaches to software design – particularly in Scandinavia – are more than 20 years old (Ehn and Kyng, 1987), some echoes of his thought can be perceived in recent ICT-related movements that focus on free software and open hardware: thus, there should be no more individual do-it-yourself referred to in Huang (2010) as DIY. Instead, activities should be undertaken based on the philosophy of do-it-with-others. The co-working spaces of ICT makers described by Huang (2010) are good examples of such a community approach.

Second, similarly, Slow Tech can also be associated with Jacques Ellul's (1954) reflections on the effects of technology on society. Ellul argued that technologies can encourage human beings to concentrate overly on means (processes). If they do this, they lose the sense of both the underlying goals and the purposes of their actions. Ultimately, Ellul argued that, in this way, people lose their freedom. Instead, he proposed the need to rediscover a sense of limits so as to achieve an authentic repurposing of freedom: the ethics of non-puissance (Ellul, 1954, 2014).

Slow Tech as an approach focuses in a similar way to these two schools of thought on the effects of ICT on society and asks people to explore the notion of human limits.

3. Computer ethics and business ethics

The domains of computer ethics and business ethics developed in somewhat different directions after the end of 1970s. Some commentators might argue that these two branches of ethics share commonalities simply because they reflect different aspects of ethics. In their parallel evolution since the 1970s, the ethical frameworks in these two domains of computer ethics and business ethics share some similarities: they focus on stakeholder collaboration and the co-shaping of technology and society by people themselves. This section of the

paper examines the synergies between the two forms of applied ethics and proposes a bridge between them. This bridge-building is aimed at resolving dilemmas that might exist practically in certain companies when the corporations' various business ethics and computer ethics codes of conduct or codes of behaviour need not only to be read alongside each other but also to be implemented concretely in practice.

Computer ethics

Since the 1930s, proposed by a number of philosophers and social scientists (e.g. Mumford, 1934; Ellul, 1954, 2014), both a criticism of technological determinism and the suggestion of the need to reflect on the relationships between technology and society, have emerged. In terms of the early development of computer ethics, Norbert Wiener was the first scientist to reflect on the social and ethical impacts of computers, with his recommendation to shift "from know how to know what" (Wiener, 1950). His colleague, Joseph Weizenbaum, described the risks related to the use of computers for military applications (Weizenbaum, 1976). Since the introduction of the term, computer ethics (Maner, 1980), and its definition as a discipline (Moor, 1985), there has been an evolution in this field of ethics. While computer ethics is a form of applied ethics, it concentrates on the end-uses of ICT and the social and ethical implications of this use. In its origins, it did not question the role either of ICT or of ICT companies, although the actions of both lie at the very core of the information technology development process.

The work of Deborah Johnson, in the 1980s, was fundamental to recognising the co-shaping of society and ICT: "[...] technology is not just artifacts, but rather artifacts embedded in social practices and infused with social meaning" (Johnson, 1985, p. 16). This new way of thinking about society and ICT in combination with each other enabled ICT systems to be conceived as socio-technical systems, and the circumstances in which technology and society shape each other to be emphasised. As a result, members of society should have the opportunity to steer technology developments in new and different directions: directions that are good for society.

Slow Tech is able to help further with this notion of co-shaping. It can create a positive, potential enlargement and enhancement of the scope of computer ethics, by encompassing the entire ICT value chain. Slow Tech offers the opportunity to cover the development process of ICT, not only the use of the technology. Looking at ICT while wearing a pair of Slow Tech "glasses" permits an overview that ranges from the extraction and processing of raw materials, through ICT manufacturing processes and applications, to the responsible renewal, recycling, and disposal of equipment and waste. Whereas many consumers often do not care where computers come from or where they are sent at the end of their lives, advocates of Slow Tech emphasise that it is now time to include these multiple aspects of the value chain into the area of computer ethics. Such a comprehensive approach would be especially applicable to the ICT companies that are the main actors involved in ICT design, development, manufacturing, and sale.

Business ethics

Business ethics is "[...] the applied ethics discipline that addresses the moral features of commercial activity" (Marcoux, 2008). It provides answers to difficult questions about the purpose of the corporations: how, and in whose interests, ought the corporations to be governed?

While business ethics was developed as a discipline only relatively recently, it reflects the existence of an increasingly strong debate about the role of corporations in society. On the one hand, shareholders' theory argues that the purpose of the corporation is very simple, it is to maximise profit for company's shareholders (Friedman, 1970, pp. 32-33). On the other hand, stakeholders' theory suggests that businesses ought to be managed in such a way that they achieve a balance among the interests of all stakeholders; the purpose of the corporation is as a joint service to its stakeholders (Freeman, 1984).

Business schools – working along the same lines as Freeman's (1984) ideas – are now questioning the traditional vision of economy as a “cold” mechanism that is out of human control. According to recent thinkers, economics must have a sound purpose: to provide goods and services for human well-being (Nelson, 2006). The strength of the concept of the maximisation of shareholder value may be even be lessening somewhat: some corporate experts now argue that concentrating on maximising short-term results is damaging to companies since it may push their managers towards irresponsible behaviours (Stout, 2012). Maximising value over only the short term is no longer emphasised as strongly as it used to be. By not simply looking at a short-term return on investment, the optimisation of shareholder value can instead take place over a longer period of time.

4. CSR

Until relatively recently, business schools did not propose the joint investigation of computer ethics and business ethics. Rather, discussion in the business domain was, in the main, dedicated to company policy: this approach is called CSR. CSR can be seen as a form of corporate self-regulation. It should not be associated with legal norms, even if it is linked to regulation as “a built-in, self-regulating mechanism that ensures compliance with prevailing legal and ethical standards and international norms” (Wikipedia, 2014a). When CSR includes all the entities and individuals affected by a corporation, it is perceived to be in line with stakeholder theory as developed by Freeman (1984). It enables a more holistic picture of a business than does shareholder theory described by Friedman (1970), by including in its concepts employees, consumers, communities, and the environment. The proponents of CSR argue that the approach also reinforces the strength of the business, by concentrating on profits that are made over the long-term.

At least two policy bodies support a focus on CSR in the business environment. On the one hand, the European Commission (2011) defines CSR as “the responsibility of enterprises for their impacts on society”; this 2011 policy document also states that, to fully meet their social responsibility, enterprises:

[...] should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders (European Commission, 2011, p. 6).

On the other hand, the International Organization for Standardization (ISO) proposes an interesting framework, that is useful to companies willing to start to focus on CSR. Globally, the work of the ISO offers a means of encouraging the CSR needed on the part of ICT companies (ISO, 2010). The framework proposed by the ISO includes principles, practices, and core subjects: the principles of social responsibility (accountability, transparency, ethical behaviour, respect for stakeholder interests, respect for the rule of law, respect for international norms, respect for human rights); fundamental practices

of social responsibility (recognising social responsibility, stakeholder identification, and engagement); and social responsibility core subjects (human rights, labour practices, the environment, fair operating practices, consumer issues, community involvement, and development) (ISO, 2010). While these guidelines are – by their very character – voluntary, international and large-scale corporations are nevertheless starting to use them as a basis for the design of their CSR strategies.

5. ICT companies and CSR

ICT companies are more and more important in contemporary society: they have a major influence over the shaping and co-shaping of the digital world. Their impact, thank to the internet and web, now has effects even at a global scale. Morally, this means that they have a growing responsibility to society as a whole. Exploring, as a first step, the direction that ICT companies are taking to bridge business ethics and computer ethics, and to apply CSR approaches, is important. As a second step, explored in section 6, it is crucial to examine the added value of taking a Slow Tech approach when undertaking such a process.

As with any other type of business, ICT companies, should be aware of their own business ethics. Given the specific sector in which they operate (i.e. ICT), they also need to explore their own computer ethics. Taking such a dual stance on both business ethics and computer ethics will facilitate an holistic approach to CSR on the part of ICT businesses. If an ICT firm develops a coherent CSR strategy by using the triple bottom-line approach of “profit, people, planet” (Spreckley, 1981; Elkington, 1997; ORSE, 2010), then computers – or ICT in general – should be incorporated in a company’s analysis of its own corporate behaviour.

The ICT market includes such products as hardware, software, networking devices, ICT services, Web services, social networks, and e-commerce sites. The market is one of the most important at the global scale: in 2013, its value was around 3,700 billion USD and was still growing at about +4.2 per cent (Gartner, 2013). After several corporate mergers, the few remaining international ICT firms are now global giants. Table I shows the 2013 revenue of the largest ICT companies (Forbes, 2014), together with references to their CSR strategies.

For these large ICT companies, their CSR strategy are becoming a critical success factor for their performance and operation. For these business giants, the need to act with consistency and transparency in terms of their corporate behaviour is beginning to be more and more important *vis-à-vis* their investors and customers, and has a direct impact on their financial results. The publicly available documentation of the largest ICT companies (cited in Table I with documentation available as per mid-2014) indicates that, for most of them, however, CSR relates simply to fairly generic activities that affect their various (local) social concerns and the funding of charitable initiatives. In fact, the companies report very few activities that have a direct impact on their responsibilities in the ICT sector, i.e., activities that are responses to the social and environmental challenges posed by their own ICT products and services.

Some of these ICT companies have developed their own codes of conduct. For example, the Electronics Industry Code of Conduct, a non-profit corporation established in 2009, states that it “was established to ensure worker safety and fairness, environmental responsibility, and business efficiency” (EICC, 2012, p. 1). Few positive, comparable results, in terms of company activity, can however be demonstrated due to the lack of international standards, low level of commitment, and the absence of verification and enforcement mechanisms (Martinuzzi *et al.*, 2011).

Company	Revenue (\$bn)	CSR public documentation
Samsung	208.9	Sustainability report (Samsung, 2013)
Apple	173.8	Supplier responsibility (Apple, 2013a); facilities (Apple, 2013b)
HP	112.1	HP 2014 Living progress report
IBM	99.8	Corporate responsibility report (IBM, 2013, 2014)
Microsoft	83.3	Citizenship report (Microsoft, 2013)
Sony	78.2	Annual report 2013 business and CSR review (Sony, 2013)
Amazon	74.5	Amazon Smile (Amazon, 2013)
Google	59.7	Who we are – corporate social responsibility (Google, 2013)
Intel	52.7	Corporate social responsibility report (Intel, 2013, 2014)
Cisco	47.9	Corporate social responsibility report (Cisco, 2013)
Oracle	37.9	Corporate citizenship report (Oracle, 2013)
SAP	22.3	SAP integrated report (SAP, 2013, 2014)
Facebook	7.9	No official CSR-related report or documentation could be located. A 2013 <i>Wall Street Journal</i> article announced that the CEO of Facebook was in the process of co-organising a political advocacy group to address social issues (Rusli, 2013). The lack of a CSR strategy is surprising since, by September 2012, Facebook managed a social network of more than one billion users (Fowler, 2012)

Table I.
Corporate social
responsibility reports
in 2014 – main
ICT companies

Source: List produced by the authors based on published revenue figures (Forbes, 2014); \$bn is 1,000,000,000 USD

More specifically, the emerging sector of online stores has been scrutinised from an ethical perspective, with controversial results: in 2013, Agag and Elbeltagi (2013) claimed that “[...] ethical problems like security, privacy, reliability, non-deception and corporate social responsibility on [sic] Internet are core issues that limit the growth of online retailing”.

Due to the treatment and processing of their ICT services, goods and devices and their specific accountability towards society and the planet, ICT companies, should take a number of steps that move beyond the traditional CSR reporting typical of other businesses. In addition, they should incorporate a computer ethics strategy in their CSR activities. Besides its positive effects on society and the planet, encompassing such a strategy will help the companies themselves in terms of their long-term performance, growth, and profitability.

6. Slow tech as a bridge: good, clean and fair ICT

For ICT firms, Slow Tech can be seen as a tool for bridging the two fields of computer ethics and business ethics. However, how precisely can Slow Tech (which is good, clean, and fair ICT) help ICT companies in their definition of their triple bottom line on profit, people, and planet (ORSE, 2010)? In Figure 1 provides an illustration of Slow Tech as a bridge between computer ethics and the classic CSR triple bottom lines, embedded in business ethics.

Whereas computer ethics concentrated traditionally only on the use of ICT, Slow Tech – with its proactive computer ethics approach – widens that view to explore the whole of the ICT value chain. Slow Tech and business ethics each concentrates on a trio of concerns: Slow Tech focuses on the notions of good, clean and fair, whereas business ethics is oriented to the bottom lines of profit, people, and planet.

Merging their views, good ICT can be related to the capacity to make a long-term profit; clean ICT to consideration for the planet; and fair ICT to caring for the people that work along all points of the ICT value chain. A short overview of each of the notions of good ICT, clean ICT and fair ICT is explored next.

Good ICT and profit

Good ICT can enable financial sustainability to be maintained through the development of ICT that is human-centred. Core requirements for the ICT companies at the design phase are: human-computer interaction, participatory design, and design-for-all or design using an inclusive approach.

In order to make their products and services desirable, ICT firms need to invest continually in innovation. In the ICT world, this implies an investment in knowledge-workers: in these companies the work is based on knowledge intensity, human capital, and investment in research and development (Martinuzzi *et al.*, 2011). ICT companies need to attract talent from many different locations around the globe, and for their personnel to be members of collaborative networks that include universities and research centres. In 2015, contemporary research agendas might include areas such as: Big Data, Intelligent Systems and Decision Support Systems, Cloud Computing and Internet of Things, Information and Knowledge Management, Organisational Models and Information Systems, Mobility, and Human-Computer Interaction.

Clean ICT and planet

Especially for large ICT companies, creating a bridge between clean ICT and the planet means undertaking an in-depth analysis of the impact of hardware, from its design to its use and disposal.

The ICT sector can play a fundamental role in developing the domain of clean tech: “any product or services that improves operational performance, productivity, or efficiency while reducing cost, inputs, energy consumption, waste, or environmental pollution” (Wikipedia, 2014b). Several international studies over the past several years have investigated the enabling of the low carbon economy in the information age (GeSI, 2015). When taken up by the ICT sector, the notion of clean ICT can assist the survival of the planet in various ways, by:

- working to dematerialise the consumption of conventional fossils fuels and how non-renewable materials can be minimised;
- focusing on proper communications campaigns and by supporting new lifestyles and cultural changes in the long-term;

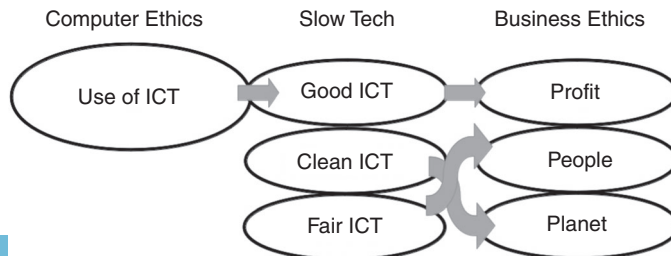


Figure 1.
Slow tech as a bridge between computer ethics and business ethics

- developing devices that are recyclable-by-design, that have an extended lifetime and are easy to repair; and
- investigating rebound effects.

There are, of course, a number of rebound effects that should be borne in mind. The first of these is related to resource and energy consumption, green-house gas production, and *e*-waste; the second relates to the impact of the continuing use of ICT, de-materialisation, *e*-procurement, tele-work, transactions speeds, and transparency; while the third effect is associated with the use of ICT by a large and growing number of users, which has an impact on both their productivity and their well-being and lifestyles (Yi and Thomas, 2007). Thus, the long-term sustainability of ICT requires more dedicated research, since there is ultimately a risk that the positive and negative effects of ICT may counterbalance each other: the speed of the development of ICT may induce more material and energy consumption and the generation of more *e*-waste (Hilty *et al.*, 2006). Practical examples investigating these kind of implications have been undertaken in the field of electronic notebooks replacement, with an emphasis on the importance of production rather than use (Prakash *et al.*, 2012).

Fair ICT and people

Fair ICT means that ICT firms need to create transparency in the supply chain with regard to its employees' working conditions and their human rights. ICT companies need to ensure that human rights are respected, for example, in all the mining sites that are the main sources of the materials – such as coltan and the rare-earths – used to build their computer equipment, components, and devices (Vazquez-Figueroa, 2010). The respect of human rights, health, and safety of working conditions in all of a supplier's manufacturing and assembly plants are mandatory.

Fair ICT companies should ideally not lock their users and developers into “silos” as a result of the use of proprietary formats and application programming interfaces (Madrigal, 2012, p. 1). The growth of the open data, open software, and open hardware movements, with their openness and transparency of technology, are three examples of Slow Tech fair ICT practices.

As an outcome of applying the Slow Tech approach, fair ICT companies will be able to design a complete stakeholders' network. The stakeholders covered will include not only those that are easily visible when the firm's products and services are released onto the market, but also those involved in the extraction and processing of raw materials, and in the manufacturing of the ICT products. Thus, key questions for all the other stakeholders in the ICT value chain include where the technology itself originates as well as its social and environmental costs. Being able to ask, and answer, these kinds of questions openly and transparently will initiate an approach to an innovative ethical, social and environmental ICT that is not only a fair ICT for the twenty-first century but is also good and clean.

7. Case studies

Is it possible to achieve a bridge between business ethics and computer ethics? Are there real-life companies able to move towards Slow Tech? This paper proposes three cases: one historical and two related to existing companies. The first two are based in Italy – thus providing a further link with the origins of the Slow Food and the Slow Tech movements – the third one is based in the Netherlands.

Olivetti

The historical case study is that of Olivetti, the company directed by one of the twentieth century's most important Italian industrialists and visionaries: Adriano Olivetti (Ivrea, 1901-1960). Olivetti, the company, developed high-tech devices but also focused on innovation, production, profit, solidarity, social responsibility, and beauty, all inside the parameters of a single corporation. Some examples of the firm's developments include: in 1959, the first mainframe computer based on transistors, the Olivetti ELEA 9003, designed by Ettore Sottsass, one of the most famous designers of last century; in 1965, the first personal computer, the Olivetti P101, designed by the architect Mario Bellini (*The Wall Street Journal*, 1965); and, in 1962, the Olivetti Electronic Center building, located between Torino and Milano, designed by Le Corbusier (Olivetti, 1959). Olivetti's dedicated attention to people was demonstrated by its construction of a real community around its factory, in which beauty and quality of life were placed centre-stage. Olivetti was an ICT company that was capable of achieving both good and fair products in the framework of a strong CSR strategy.

Loccioni

Loccioni is a small, contemporary, Italian company that has developed a strong CSR strategy and maintains a deeply ethical approach to the design of its ICT products.

One example of the company's products is APOTECaChemo, a robotic application for hospitals that it created in 2010. This robotic arm system prepares the very precise pharmaceutical dosages needed for cancer treatment. It produces careful, exact weightings of all the pharmaceutical ingredients needed to treat severely ill patients, and it manipulates those substances in a way that ensures a high level of safety for all the people involved in the process:

[...] The manual preparation of cytotoxic drugs has a high possibility of dosage errors with serious consequences for the patient and high professional risks for those who remain exposed to carcinogens of cytotoxic drugs. Patients are protected by humancare high-tech solutions that recognize the active ingredients [...] The tracking system of all phases, based on a barcode, allows a perfect integration between the department and the oncological pharmacy service [...] (Loccioni-Humancare, 2015).

APOTECaChemo was developed through the contribution and participation of nurses and clinicians employed in several local hospitals in the east of Italy. Their medical staff gathered together in a dedicated user forum. The product is now used in many hospitals around the world. Thus, Loccioni is a solid example of an ICT company whose participatory design, care for the environment, and strong sense of CSR means that it always puts people at the centre of its strategies and activities.

Fairphone

Fairphone is a social enterprise, that was established in 2010 (in Amsterdam, the Netherlands), with the goal of building a movement for fairer electronics, that started from a smart phone called a Fairphone. The enterprise took on board a strong transparency approach towards the phone's supply chain in order to explain the connections between people and products. It addressed the entire value-chain, from the perspectives of mining, design, manufacturing, and life cycle. It adopted an ethical approach to the ICT industry in all the life cycles phases:

- mining (using materials that support local economies in and minerals coming from conflict-free countries);

- design (emphasising longevity and repairability, so it is easy to open and repair the most commonly broken parts of the phone; supplying open source repairing guides; and designing elements based on open software principles);
- manufacturing (by ensuring fair working conditions to workers in factories);
- life cycle (by maximising use, re-use and safe recycling); and
- social entrepreneurship (focusing on social values and transparency towards consumers).

For company, Fairphone, has already sold more than 60,000 Fairphones and is supported by 39 employees, of 20 different nationalities (Fairphone, 2015). Even if 100 per cent fairness, in term of the treatment of its employees is impossible, the adoption of each of these principles is a step in the right direction. Like Loccioni, Fairphone, provides a good contemporary example of a Slow Tech approach.

8. Conclusions, challenges, and next steps

This paper argues that Slow Tech can provide a means of looking at ICT in a more holistic manner, by taking into account the extent to which the creation and sale of ICT products and services can be characterised as good, clean and fair. It indicates how a bridge can be built between good ICT and profit, clean ICT and planet, and fair ICT and people. The Slow Tech approach provides a specific business opportunity for the computer industry, particularly for ICT companies. The main challenge for ICT firms, when they examine and test their business ethics in the context of their CSR strategy, is to develop an appropriate set of computer ethics. Slow Tech can thus provide a tool for developing a more robust and comprehensive business ethics framework for the ICT industry. It can enable firms to construct a computer ethics strategy, which examines the end-uses of computers while simultaneously questioning the technology itself. Ultimately it shows that profit can still be made when companies begin, or continue, to act in a generally sustainable, but also financially sustainable way.

Challenges

Of course there are many challenges implicit in building this bridge between business and computer ethics. First, Slow Tech mean thinking more holistically, more aesthetically, more sustainably, more democratically in an organisational sense, and ultimately less opportunistically, less egotistically, and with less short-termism. These conceptual shifts may prove to be exacting regardless of how long an ICT company has been in business but perhaps specifically for some of the more recently established ICT corporations. Second, in practical terms, the impacts of the 2008 world-wide economic crisis could shorten the long-term view of many ICT companies. It could remove their motivation to maintain a sound approach to business ethics based on a solid understanding of computer ethics. Third, some corporations may be unwilling to stretch themselves to go beyond the purely legal. How can corporations extend their efforts in a positive and constructive manner, in terms of commitments to society and the planet, beyond simply the legal requirements? One way is that companies may come to realise that the pressures under which they are placed by different stakeholders will surely grow: whether those stakeholders are users, computer professionals, managers or owners, or policy makers. All of these categories of stakeholders could attempt to steer markets in more appropriately moral directions, encouraging demands for more corporate and industrial transparency. Fourth, if all the

major ICT firms were to use a Slow Tech approach, they might simply, some observer would argue, avoid losing market share. Someone critics may argue that the market requires only cheap products, and that consumers are not yet ready to pay more, in particular, for clean ICT: cheap products are a business opportunity only if they increase the market. One of the most recent, global-scale, and extensive surveys demonstrates the contrary (Nielsen, 2014). Consumers' sensibilities are changing. From 2011 to 2014, the percentage of users ready to pay more for products manufactured by companies with a committed CSR strategy grew from 45 to 55 per cent.

Next steps

This discussion paper is merely the launching of a challenge in relation to the potential growth of a Slow Tech approach on the part of contemporary ICT companies. Further research steps are clearly needed in relation to Slow Tech. For example, how companies respond to the questions posed in this paper: What kinds of internal processes are needed inside ICT companies? How can firms interpret and address the three spheres of goodness, cleanliness, and fairness? How can they interact with the full range of stakeholders whom their products and services affect – from design to manufacturing, and from sale to use to disposal or re-use – more closely and intensively? Today's challenges to the production and use of good, clean, and fair ICT, both conceptual and concrete, can of course act as incentives for action: they can further applied research or encourage social activism. Encouraging the study, and the application, of Slow Tech is a first step in this direction for the potential improvement of a society in which information technology is totally embedded. The approach can be of particular use for ecologically minded people who produce and use information technology.

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