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Sustainable Information Society

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INTRODUCTION

As a development goal, a sustainable information society is emerging at present, with the aims of sustainability and an information society as its converging elements. This article introduces the conceptual elements of sustainability and the information society, while bringing to the surface underlying normative issues. Further, a series of opportunities is presented on how to develop towards such a promising approach. Finally, examples of using information and communication technologies (ICTs) from the ‘Memorandum Sustainable Information Society’ are discussed. That publication was recently released by a working group of the German Society for Informatics. The memorandum provides a valuable source of the role modern ICT is playing on the road to a forward-looking society which is based on increasing use of ICT on the one hand, while at the same time it meets the fundamental sustainability criteria of human, social, and ecological compatibility on the other hand.

SUSTAINABILITY: FROM AN ENVIRONMENTAL AND DEVELOPMENT POLICY TERM TO THE GOAL FOR A LONG-TERM LIVEABLE FUTURE

Sustainable development has its roots in environmental and development policy. As such, sustainable development mirrors the efforts of the international community to meet the recent social, economic, and environmental challenges we are facing today, for example, among others, population development, food, health protection, combating poverty, and global environmental problems (Jorissen et al., 1999).

Although the idea and concept had a number of predecessors in the 1970s (Harborth, 1993), the term “sustainable development” first became popular in the wake of the so-called “Brundtland report” of the World Commission for Environment and Development in Stockholm in 1987 (Hauff, 1987). This conference

was initiated under the banner of the United Nations (UN) and guided by the Norwegian prime minister Gro Harlem Brundtland. International leading experts prepared a comprehensive program of recommendations for the above mentioned global problems. The “Brundtland report” was a turning point of the environment and development policy at that time, in that the assumption of industrialization in developing countries seemed no longer tenable without a profound rethink of the lifestyles and consumption levels in industrialized countries.

The “Brundtland report” created the foundation for the current understanding of sustainable development. In a nutshell, sustainable development aims to create economic living conditions that enable all the Earth’s population to satisfy their needs today, without compromising the ability of future generations to satisfy theirs. This brings two concepts of justice into play (Eckardt, 2005): firstly, *intragenerational* responsibility concerning all humans alive today, and secondly, *intergenerational* responsibility for the relationship between today’s and future generations. Sustainable development must be regarded as a normative concept in the sense that it reposes on the two ideas of justice mentioned above: though there is no formulation of an explicit goal, sustainable development promotes a vision or a “regulative idea” in the sense of Immanuel Kant, on how all human beings could lead a decent life today and in the future. Furthermore, it discusses the minimum conditions that *should* be respected for this aim.

Sustainable development was included in the United Nations’ action program for the 21st century, the so-called “Agenda 21,” at the Conference for Environment and Development 1992 in Rio de Janeiro to serve as an orientation for subsequent measures regarding social and economic aspects such as population dynamics, reduction of poverty, health preservation, conservation and management of natural resources, and stakeholder dialogues. Since then, sustainable development is regarded as the unifying aim for a long-term globally livable future. The Summit for Sustainable Develop-

ment at Johannesburg 2002, the “Rio+10 Conference,” confirmed the global standing of the aim of sustainable development.

Sustainable development does contain a *regulatory* dimension as well: any decision making at local, regional, national, or global levels must be implemented in such a way that any costs are not borne by uninvolved parties, future generations, or nature. In other words, the three criteria of environmental integrity, social justice, and economic quality should always be respected (Zwierlein & Isenmann, 1995), and by all social actors, be it individual persons as well as groups or institutions (e.g., families, universities, companies, or countries). This regulative idea underscores the processual character of sustainable development, that is to say, providing guidance, but not an explicit goal.

In Germany, the roots of the concept of sustainable development are believed to come from ideas of 18th century forest management, whereas the concept’s etymological origins can be traced back much further, to the 12th century (Grober, 2002). Two-hundred-and-fifty years ago, revenues of forest owners collapsed when more and more forests were cleared. This led to the insight of only cutting as many trees in the future as would be newly planted. Thus, by respecting an economic principle of conservation of capital, forest revenues were stabilized for long-term benefit.

Not just the concept of sustainable development, but also its current interpretations have its roots in forest management (Ott & Döring, 2004). *Strong* sustainability stipulates living solely off the interest of natural capital. The latter must be preserved in its total amount, non-renewable resources should not be utilized and renewables only to the extent of their regeneration rates. On the other hand, adherents of *weak* sustainability want to keep constant the sum of natural and human capital only, allowing therefore substitution of natural by human capital.

THE TWO GLOBAL TRENDS OF SUSTAINABILITY AND INFORMATION SOCIETY

The development towards an information society is the second global trend influencing our modern industrial society in its combination of technical progress, economic growth, and social change (Müller-Merbach, 1998, p. 6):

- *Technical progress* is marked by innovations, especially in information and communication technologies. Digitalizing, miniaturizing, development of user interfaces, and system integration progress rapidly and lead to the amalgamation of computer technology, telecommunications, consumer electronics, and new media. The resulting applications become examples of “pervasive computing” (its consequences are discussed in Hilty, Som, & Köhler, 2004; Hilty et al., 2005a).
- The industrial sectors of ICT and multimedia, among them chip manufacturers, hardware and software developers, and information service providers, can be counted among the biggest growth sectors worldwide. They are an important part of future *economic growth*.
- Use of modern ICT and information services lead not only to changes in the way work is organized and carried out, they exert a strong influence on social models of consumption, individual lifestyles, leisure pursuits, and accelerate *social change*.

The UN world summits on the information society, in Geneva in 2003 and in Tunis in 2005, can be taken as proof of the strong political interest in this phenomenon touching the entire human society.

Rapid ICT development contributes to technical progress in many domains. ICTs facilitate professional work and can render daily life more pleasant in many ways. Further, ICTs can provide unique opportunities for sustainable development (cf. resources of the Technical Committee on Computer Science in Environmental Protection, 2006; further: Hilty, Seifert, & Treibert, 2005b; Waage, Shah, & Girshick, 2003; Rautenstrauch & Patig, 2001), for example, helping to dematerialize economic processes and therefore reduce material and energy throughput (Teitscheid, 2002).

However, increasing use of ICTs does not automatically contribute towards sustainable development (Schauer, 2000, 2003). Its rapid progress and ubiquitous use create new problems for individuals, society, and nature. Thus, we need an ethical understanding of its promises and risks on the one hand and a political implication on the other hand in order to render our developing information society (Woesler, 2005) compatible with the aim of sustainability.

Electronic waste, high consumption of resources for the manufacturing of PCs, and the consumption of

energy by the Internet are only a handful of indicators (cf. *Journal of Industrial Ecology*, 2002; von Geibler, Kuhndt, & Türk, 2005) for the danger of accelerating unsustainability brought about by the development of an information society. There is a need to discuss and develop integrative approaches, for example contributions from informatics (Rolf, 1998; Hilty & Ruddy, 2000; Möller & Bornemann, 2005), social sciences (Grossmann et al., 2002; Orwat & Grunwald, 2005), economics (Schneidewind, Truscheit, & Steingraber, 2000), and administration (Deutscher Bundestag, 1998; Forum Information Society, 1998; Angrick, 2002; Radermacher, van Dijk, & Pestel, 2000) in order to bring together in a systematic manner policy discussions on information society and on sustainable development.

Doing so might enable humanity to benefit from the opportunities ICTs can offer for a sustainable information society, while managing the associated risks (opportunities and risks are discussed, e.g., by Radermacher et al., 2000; Hilty et al., 2004, 2005a).

AN ETHICAL FOUNDATION FOR A SUSTAINABLE INFORMATION SOCIETY

Ethics as a theory of moral acts asks the question of how *individuals* may lead their lives successfully (Spaemann, 1989). With regards to its aim, ethics can be seen as a way of reaching a state of happiness via a path of virtue. Ethics is thus a manner of cultivating oneself. A pursuit of a successful and happy life, however, must include an interest in others, humans and non-humans, in the *social* and *natural* world surrounding the individual. Ethics then becomes a question of justice, benevolence, and assuming responsibility

(Spaemann, 1993). We can regard ethics as an attempt to evaluate our moral experience in a normative manner. Table 1 provides an overview of the domain.

The responsibility of an ethical actor consists of justifying and legitimizing his or her decisions to act or not act vis-à-vis third parties that are subjected to a decision's consequences. Here, an "ethical gap"—an incapacity to see an act's moral dimension—manifests itself the very moment when power differences come into play. This "Einstein dilemma" dates back to the great physicist deploring our mastery of perfect (technological) means, but utilizing them without being able to provide a clear aim. In other words, there is an imbalance between sophisticated technico-economic *applied knowledge* and still quite rudimentary *ethical knowledge* providing an orientation for the first (Mittelstraß, 1992). We could say that "we are technical giants and ethical dwarves at the same time" (Zwierlein & Isenmann, 1995, p. 38).

Normative aspects such as questions of power and of justice play a decisive role in the development of an information society as well (Zwierlein, 1998; an up-to-date overview is provided by the *International Journal of Information Ethics*, 2004; Capurro, Wiegerling, & Brellochs, 1995). The traditional ethical questions arising from the development of ICT such as data protection, security, freedom of opinion, and intellectual property rights are complemented by new themes: digital divide (Capurro, Scheule, & Hausmanninger, 2004), gender issues (World Bank, 2004), rebound effects (Binswanger, 2001), and cultural diversity (Beckett, 2004), among others.

The information society's political vision (cf. e.g., BMA, 2002, 2003) has normative implications as well (Isenmann, 2001), in the creation of specific re-

Table 1. Ethics—An overview

	Ethics: Comprehensive theory of practice (moral actions)	
Focus	Individual: Human	Community: Fellow human being, creature
Issue	Good life	Justice
Objective	Happiness	Benevolence
Approach	Virtue	Responsibility
Effects	Personal (inner world): What makes an actor good?	Social (civilization), ecological (nature): What makes an action good?
Criterion	Human compatibility	Social and ecological compatibility

search funding programs that tie up funds that are no longer available for other competing types of projects. The normative perspective becomes clear when the central question of “what kind of technology do we need for living in what kind of world?” is tackled in the development of an information society, taking into account the consequences of ICT for humans, society, and nature.

ICT as a technical means is in need of a normative orientation (Mittelstraß, 1992) and an understanding of technological decision making (Rohbeck, 1993). As such, modern ICT would be conceived and used in adequation with computer power and human reason, the title of an important book by Joseph Weizenbaum (1976). Any ethical reflection, however, must remain powerless if it is considered only as a means of resolving a crisis, as Schefe (2001) warns. A much more fruitful implication of ethics in research, science, and teaching places it at the heart of a prevention strategy (cf. e.g., Behrendt, Hilty, & Erdmann, 2003), as the philosopher Hans Jonas (1984) suggested in his book, *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*.

Mere appeals to an idealistic conscience are bound to fail, though. The consideration of specific professional ethics (Hausmanninger, 2003), ethical guidelines for ICT-related associations (Berleur, Ducenoy, & Whitehouse, 1999; Gesellschaft für Informatik, 2004), and codes of conduct for ICT professions (Berleur & Brunnstein, 1996; Schefe, 1995; Wedekind, 1987) needs to be complemented by a discussion of how a sustainable information society can become real. The memorandum of the association “Nachhaltige Informationsgesellschaft” (Sustainable Information Society) is a good example of a document working for the creation of a coherent set of policy measures for that goal.

THE MEMORANDUM “SUSTAINABLE INFORMATION SOCIETY”

The professional association “Nachhaltige Informationsgesellschaft” (Sustainable Information Society) was created as a working group of the German Society for Informatics in the year 2000 by Michael Paetau, Bonn, and Lorenz M. Hilty, St. Gallen. Its aim is to combine research and policy making on the two global trends of sustainable development and on the information soci-

ety. The association’s members are of the opinion that the development of an information society is strongly influenced by modern ICTs, unfortunately without due respect to sustainability criteria.

The “Memorandum Nachhaltige Informationsgesellschaft” (“A Sustainable Information Society Doesn’t Come About by Itself”), published in 2004, provides a synthesis of the association’s work so far. It aims to clarify the contribution ICT can make towards sustainable development (Dompke et al., 2004). First of all, the opportunities and risks of ICT development are considered with respect to sustainable development. This *inventory* forms a basis for practical recommendations and “good practice” examples for selected domains. The role of this memorandum is to push the envelope further and to consolidate the existing dialogue. The document is addressed to members of the scientific community, including teachers and students in all kinds of educational establishments, as well as to political and corporate decision makers.

We present here a two-dimensional grid of criteria for showing the complex relationships between ICTs and sustainability: these comprise the fundamental criteria for sustainable development set against three different levels of impact of ICT development.

The fundamental sustainability criteria comprise the following three dimensions:

- **Human Compatibility:** Individuals should not suffer damages from development. Their personal dignity must be respected.
- **Social Compatibility:** Relationships of people with one another and the resulting society should not be infringed. Individual participation in our communities needs to be protected and supported.
- **Ecological Compatibility:** The natural environment must not be irreversibly damaged, and our life support systems must be protected.

These three criteria reflect the fundamental relationships of humans with their surrounding environment (Isenmann, 2001). They are an expression of the ethical implications (cf. Table 1) and cover the major themes of sustainable development. The three perspectives include the widely discussed three categories of economic, environmental, and social development—the “three pillars of sustainable development” (cf. e.g., Deutscher Bundestag, 1998).

The impact of ICT on individuals, society, and nature is classified according to three different perspectives:

1. **effects of ICT provision**, e.g., use of resources and energy in the manufacturing, use and disposal of ICT hardware;
2. **effects of ICT use**, e.g., energy savings from process optimization or commuter traffic reduction as a result of telecommunication; and
3. **systemic effects**, e.g., rebound effects as a reaction to efficiency gains, changes of economic structures, institutions, and consequences for individual lifestyles.

The combination of the three sustainability criteria and the three levels of ICT impact results in a 3x3 matrix. The memorandum discusses all nine fields, in the form of a description of the *status quo* and practical recommendations for attaining a sustainable information society.

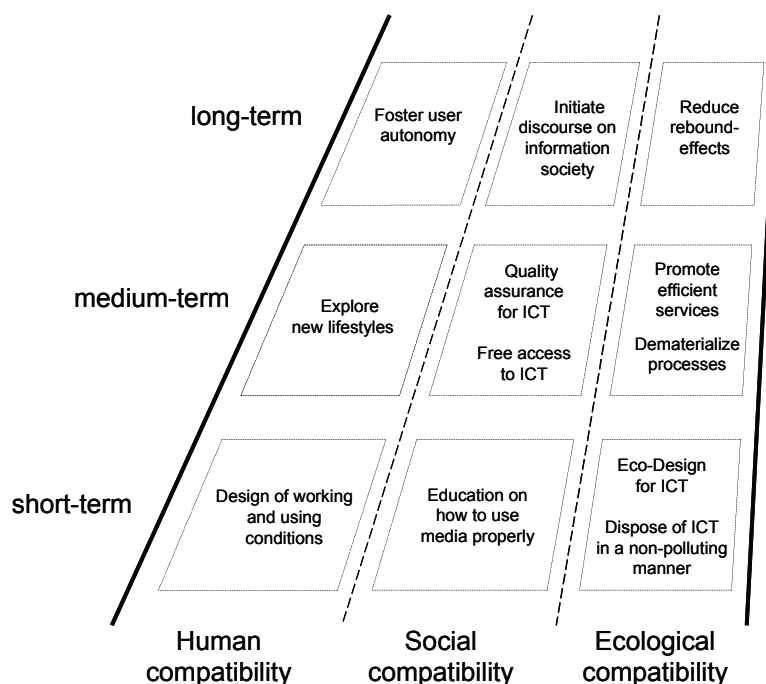
For the domain of *ICT provision*, covering all measures for the creation and maintenance of ICT infrastructure, the three main recommendations are:

- All aspects of ICT provision should be scrutinized with regard to their impact on *human working conditions* (human compatibility).
- Evaluating the quality of ICT provision should include social factors, among them *free access* to make use of the opportunities they offer (social compatibility).
- Lastly, ICT must be manufactured, used, and disposed in a manner that respects *ecological criteria* (ecological compatibility).

The *use of ICT* concerns all aspects of social life, ICT at the workplace, as well as for household use and entertainment. The following three recommendations apply:

- ICT use should always promote the *users' autonomy*, and technical dependence must be avoided that degrades people into objects of ICT (human compatibility).
- A democratic and mature use of ICT requires users to be adequately competent not just in the technical use of ICT, but also in the *critical reflection on their usefulness* (social compatibility).

Figure 1. Roadmap of a sustainable information society



- The development of resource-efficient ICT-based services (replacing products) is an important part of good ICT use. The necessary production processes need to be *dematerialized* (ecological compatibility).

Apart from the direct effects of provision and use, ICT leads to a number of *secondary effects* separated in space and time from the first. The following three recommendations need to be considered:

- Research must be undertaken on the *new lifestyles* brought about by ICT, so that changes in human behavior are better understood (human compatibility).
- A *societal discourse* on the information society needs to be established and institutionalized, comprising a critical discussion on the aims and development paths (social compatibility).
- Lastly, *rebound effects* must be neutralized so that the achieved efficiency gains and possible resource savings are not offset by other, wasteful ways of using ICT (ecological compatibility).

From a perspective of short-term, medium-term, and long-term measures to be taken, we can classify the above recommendations into a framework of priorities with respect to their importance and time requirements (Möhrle & Isenmann, 2005). This matrix describes activities that must be tackled immediately or in the short term, others that have a more medium-term timeframe, and lastly long-term aims (see Figure 1).

Such a matrix, resembling a roadmap, can provide a concise overview of important milestones on the way towards a sustainable information society.

CONCLUSION

Can we create a sustainable path towards an information society? Even if we leave our personal convictions aside for the moment, we can see clearly that ICTs do not just bring about new opportunities, but also new problems. Whether in a prudent or in an optimistic way, we need to be able to manage those opportunities and risks of ICTs. On the one hand, fears need to be taken seriously and accepted as indicators for risk, without giving in to pessimism and panic (Röglin, 1994). On

the other hand, the opportunities that ICTs offer merit exploitation and not a categorical refusal.

According to the first World Summit on the Information Society held in 2003 in Geneva, the potential for synergy of sustainable development and an information society has not yet been recognized: the lack of “digital visions” is deplored (von Damm & Schallaböck, 2004). An essential requirement for a sustainable information society, however, must be an ethical consideration of relevant criteria, an appropriate scale for ICT application, and their implementation. An ethics for a sustainable information society will be based on compatibility with individuals, communities, and nature. Modern ICT, a powerful development vector for technological progress, economic growth, and social change, will play a key role in the development towards a sustainable information society. Only if the discourse on information society is combined with the discourse on sustainability will it be possible to avoid negative effects of ICT on humans, society, and nature. The challenge consists of winning the hearts and minds of ICT experts and decision makers for sustainable development.

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KEY TERMS

Ecological Compatibility: A fundamental sustainability criterion emphasizing that nature must not be irreversibly damaged, and its life support systems must be protected.

Ethics: The theory of moral acts dealing with how individuals may lead their lives successfully. The aim

of ethics is the way of reaching a state of happiness, via a path of virtue. As a pursuit of a successful and happy life, ethics includes an interest in the social and natural world surrounding the individual. In total, ethics is an attempt to evaluate the moral experience in a normative manner.

Human Compatibility: A fundamental sustainability criterion stressing that individuals should not suffer damages from development. Their personal dignity must be respected.

Information Society: An approach of a post-industrial society characterized through the rapid progress and ubiquitous use of information and communication technologies in many domains, be it lifestyle, private consumption and industrial production of good and services, professional work, or governmental affairs and administration.

Social Compatibility: A fundamental sustainability criterion highlighting that relationships of people with one another and the resulting society should not be infringed upon. Individual participation in our communities needs to be protected and supported.

Sustainability Criteria: The fundamental requirements that must be taken into account for any decision making to approach sustainability. The fundamental sustainability criteria comprise the three dimensions of human compatibility, social compatibility, and ecological compatibility. These dimensions include the widely used “three pillars” of sustainable development.

Sustainability: A normative concept with the aim to create economic living conditions that enable all the earth’s population to satisfy their needs today, without compromising the ability of future generations to satisfy theirs (short form of sustainable development).

Sustainable Information Society: A development goal with the aims of sustainability and an information society as its converging elements. As a concept it brings together in a systematic manner the policy approaches on information society and sustainable development, finally to benefit from the opportunities ICTs can offer for sustainable development, while also managing the associated risks.