

CHAPTER 1
IT for a Better Future.
How to integrate ethics,
politics and innovation

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Introduction

One can frequently hear stories about changes in the way we live caused by information and communication technologies (ICTs). One can frequently hear references to an information “revolution” which would seem to imply that such technologies fundamentally change the way we live (Floridi, 2007). The revolution metaphor is taken up and intensified by commercial interest, which emphasise the significance of changes of consumer products. Personal lives become more variable in some respects but also more constrained as more choices are offered and communication is increased.

The changes in technology and their consequences for social and individual lives can be of significant ethical relevance. This means that policy makers who want to take their role as representatives of the people seriously are well advised to think about what those ethical implications might be. This is particularly true on the European level where the Union is often described as a community of values. It would be desirable to embed these ethical values into technology and ensure that they are considered during all stages of the technology life cycle. At the same time, there is the well-established problem that ethical issues could be easily addressed early on during technology design and development but not enough is known about technologies then. Once the social and ethical consequences become clearer, the development of technology is often far advanced and its trajectory is difficult to change (Collingridge, 1981).

The ETICA project (Ethical Issues of Emerging ICT Applications) contributes to this complex mix of views and events. The paper briefly describes the approach and rationale of the project. It uses the findings of the project to develop a larger picture of emerging ICTs as well as the ethical issues these are likely to raise. On this basis the paper then looks at the way in which ethical issues are currently addressed in ICT research. It argues that there is a mismatch between the ethical issues one can reasonably predict and the ways currently used to address them. The paper concludes by outlining the recommendations that the ETICA project has developed and mapping them to the concept of responsible innovation. This will show how the ETICA project and its findings can contribute to a more responsible approach to innovation.

Emerging ICTs

It may be too obvious to state, but in order to avoid misunderstandings, it may nevertheless be necessary to underline that we do not know the future. The future is fundamentally characterised by being unknown and unknowable. But, of course, things do not stop there. Humans’ desire to know the future is probably as old as humanity. In addition, there are reasons to believe that some aspects of the future are predictable and, in fact, much of the organisation of societies is based on this predictability of the future. Commercial and administrative activities rely on recurrence of activities and usually rightly so. And to some degree this predictability extends to technologies.

It is not the purpose of this paper to go into much depth into some of the conceptual and epistemological issues that research on emerging ICTs raises. This was done in more depth elsewhere (Stahl et al., 2011). It is nevertheless important to give a brief definition of what is meant by the term “technology” in the context of the ETICA project. A technology in the ETICA sense of the word is a high level system that affects the way humans interact with

the world. This means that one technology in most cases can comprise numerous artefacts and be applied in many different situations. It needs to be associated with a vision that embodies specific views of humans and their role in the world.

A final preparatory statement is in order to delineate the claims that can be made by ETICA in the light of the uncertainty of the future. The best way of understanding the ETICA project and to provide a framework for interpreting its findings and recommendations is to see it as a technology foresight project (Martin, 2010). The idea is to move away from the idea of one determined future to a multiplicity of possible futures. A main purpose of this type of research is to explore possible futures with a view to identifying and selecting desirable ones that can then be pursued. As a final step, decisions can be made today that influence the outcome of the future options. The aim of foresight activities is not to describe one true future but to enlarge the choice and opportunities, to set priorities and to assess impacts and chances, and work towards a shared view of a desirable future (Cuhls, 2003, p. 98).

Identification of Emerging ICTs

In order to develop an understanding of the ethics of emerging ICTs and develop policy recommendations, the ETICA project started by identifying emerging technologies. This was done via a distributed discourse analysis of publications on emerging ICTs. The sources used in this activity were either governmental / funding sources or publications emanating from research institutions. The justification of this approach is that governmental and funding bodies have a strong impact on research agendas and can shape future research. Research institutions, on the other hand, undertake the research and know what is currently happening in research laboratory. Together, these two types of entities are therefore well placed to assess which research in ICT is currently happening and to which outcomes it is expected to lead in the medium term future, in 10 to 15 years.

The discourse analysis was undertaken using a grid of analysis that was developed by the ETICA consortium through a series of theoretical considerations and pilot data analysis exercises. It is important to understand that the analytical grid is not exclusively theory-led but emerged inductively from the data. The rules of analysis were not defined a priori but emerged from the engagement with texts and were then collectively inscribed in the analytical grid and its subsequent implementation in a bespoke online database. This grid of analysis is represented in the following figure.

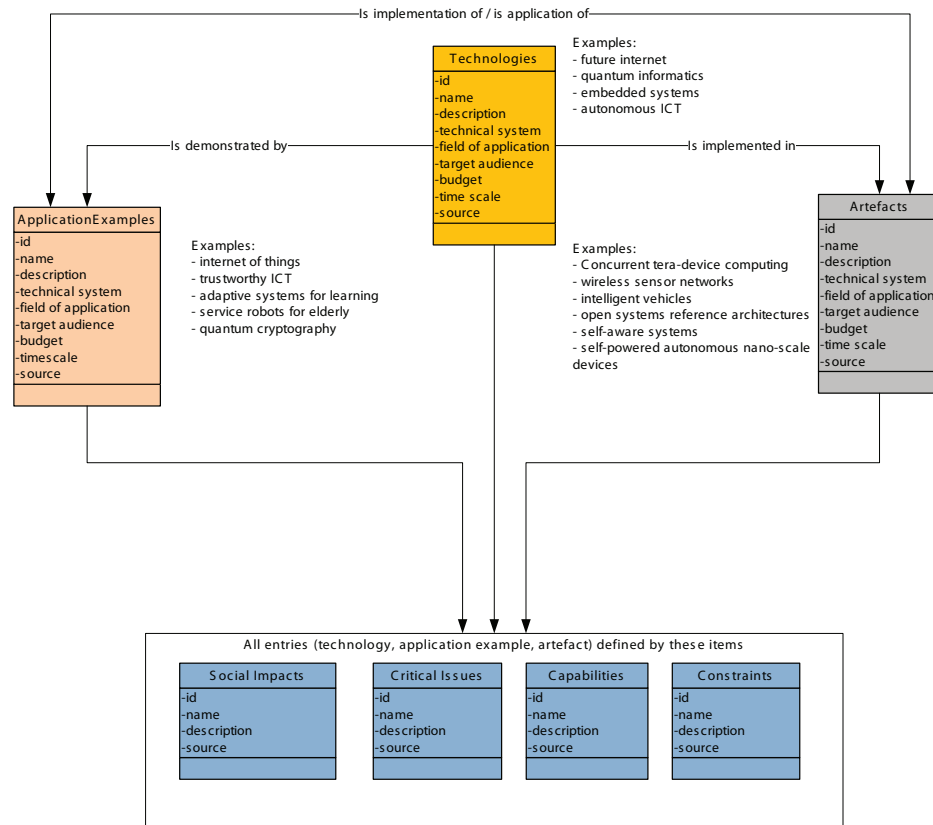


Figure 1: Analytical grid for discourse analysis

The consortium analysed 27 different documents worth analysing. The criteria for identifying and including documents were that they had to belong to one of discourses of interest to the research, they had to clearly discuss emerging ICTs, this discussion had to be sufficiently detailed to allow the collection of relevant detail about the technology and they had to be accessible to the consortium. Data collection was stopped when theoretical saturation was reached, i.e. when no more new items were identified.

The analysis of the texts led to the identification of 107 technologies and 70 applications. A more detailed look at the lists revealed that there was considerable overlap. It was therefore decided to group the technologies, applications and artefacts in a way that would correspond with the earlier definition of technology as a high-level and abstract concept that is sensitive to the way humans interact with the world. The aim was to identify those technologies that are at a high level of abstractness and that would cover the applications, artefacts and contributing technologies.

The initial list of 107 technologies was regrouped, ordered and categorised to allow the most important high level technologies to remain, whereas component technologies were subsumed into these high level technologies. This left a list of about 20 technologies.

Several rounds of discussion among project team members and consultation with external experts followed. These external experts were individuals who were knowledgeable in the individual technologies listed below. They were not members of the consortium and did not receive any remuneration for their involvement. Their main task was to critically review the descriptions of the technologies in order to ensure that these descriptions did not contain factual inaccuracies. During discussion within the consortium and with the external experts further technologies were eliminated because they were perceived to be applications rather than technologies, did not offer an insight in the underlying vision of the relationship of humans and the world or because they fell outside the ICT remit of the study. The end result of this process was the following list of technologies:

Affective Computing
Ambient Intelligence
Artificial Intelligence
Bioelectronics
Cloud Computing
Future Internet
Human-machine symbiosis
Neuroelectronics
Quantum Computing
Robotics
Virtual / Augmented Reality

Table 1: List of emerging ICTs

It is important to recapitulate what this list of emerging ICTs represents. It is the result of an analysis of two interlinked discourses on emerging technologies. The paper's claim is that these are reasonable and robustly determined candidates of ICTs that are likely to have significantly increasing social impact in the next 10 to 15 years. They are thus a good guess of what the future holds in stock and they serve the purpose of reflecting on which futures they will facilitate and which consequences this might require at present.

Shared Features of Emerging ICTs

For each of the technologies identified, the ETICA consortium developed a more detailed description that followed this structure:

- History of the technology and concepts
- Approximately 5 application examples
- Defining features of the technology
- Critical issues, i.e. ethical, legal questions; capabilities and constraints.

Space constraints preclude a recapitulation of justification and approach taken as well as a detailed description of these features. All relevant details are published on the project website www.etica-project.eu. It is important in the context of the current paper to briefly outline what the larger social implications of these technologies are likely to be. In order to develop a better understanding of these more general social implications, all features of all technologies were collected in a mind map. Each technology was represented as a node in this map. The node of affective computing, to take an example, would therefore look as follows:

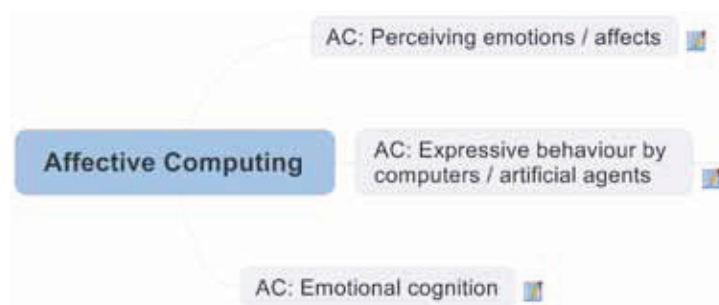


Figure 2: mind map of “affective computing”

Clicking on the notepad icon would reveal the full text description of the technology in question. For the first point, for example, this would read:

“Perceiving emotions / affects i.e. sensing of physiological correlates of affect). The principle here is that humans send signals that allow others to infer the agent’s emotional state. Such emotional cues may be with the agent’s control, such as tone of voice, posture or facial expression. They may also be outside the agent’s control as in the case of facial colour (blushing), heart rate or breathing. Humans are normally aware of such emotional cues and react easily to them. Most current technology does not react to such emotional cues even though they are part of the illocutionary and perlocutionary function of a speech act.”

This was done for all technologies, producing the following mind map:



Figure 3: Defining features of emerging ICTs

This overview was then used to regroup the defining features from individual technologies to more general social consequences or shared assumptions about humans and society they betrayed. The aim of this type of data analysis was to provide an insight into shared predictable consequences of these different technologies, which would allow for a broader description of the way a future society modelled on or involving these technologies would look like.

To pre-empt predictable but unnecessary criticism, we need to state that we are aware of the possible downsides of this approach. It uncritically accepts descriptions and features of technologies that are still under development. It abstracts from real uses and environments without considering the possible role of human agency, be it in strengthening, changing or resisting the different technologies and their consequences. Furthermore, it regroups features without deeper regard of the nature of the different technologies, which may lead to combinations of technologies that will never occur.

It is therefore important to reiterate what this categorisation is meant to represent, namely a view of current discourses on emerging technologies. These discourses are important in that they shape perceptions but also infrastructures and funding that will be used to promote the futures implied in them. Figure 4: Social and socio-technical implications of emerging ICTs should be understood as the attempt to graphically represent dominant discourses. Doing so helps us understand the content of expected technologies as well as their implications, which, in turn, is a condition of engaging in any attempt to change them.

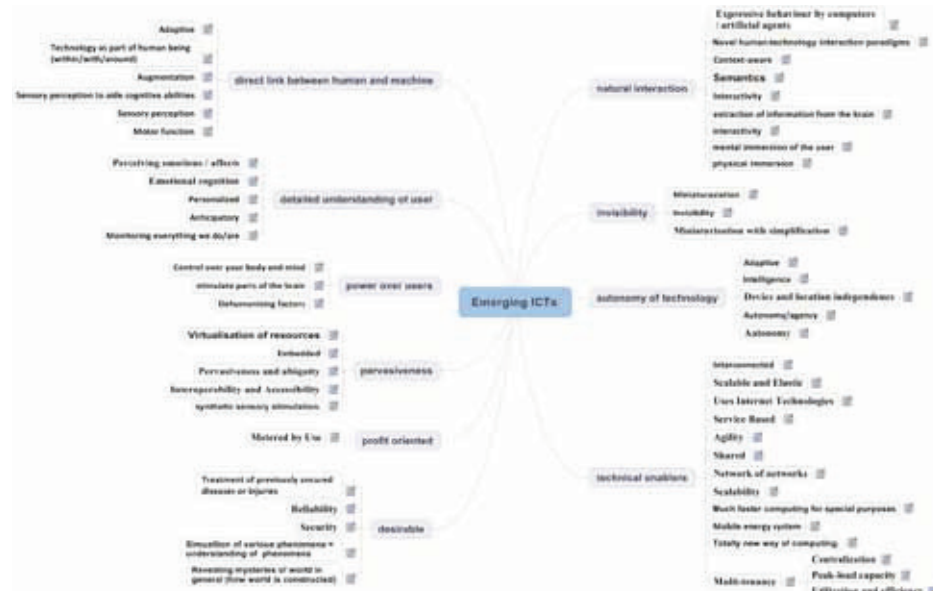


Figure 4: Social and socio-technical implications of emerging ICTs

Social Consequences of Emerging ICTs

Figure 4, above, deserves a closer look and interpretation. This section will therefore briefly explore each of the main term and spells out its relevance and meaning.

Natural interaction is core to many of the emerging ICTs. The idea behind it is to move away from specialist ways of interacting with technical devices such as mice, keyboards or screens to engaging with them in ways that users are more familiar with. The technologies use a number of ways of gathering information about the user which can be intentionally given information but also contextual information or personal information that the user may not even be aware of (as, for example, emotional states). The user will in many cases not even notice that she or he is interacting with technology which is deeply embedded in the user's environment.

One recurring aspect of this natural interaction is the invisibility of the technology. Technical artefacts recede to the background making it easy to forget their presence and interacting with users in numerous ways. A further aspect of the interaction is the direct link between humans and technology. This can either be physically implemented, as in the case of implants which can be inserted inside users' bodies and even brains. In many cases the direct link is less intrusive, for example when the technology continuously surveils the user. This direct link is not only an input device of technology but often has the purpose of supporting and strengthening the user and in particular those aspect of the user that are viewed as problematic. Technologies are described as adaptive and augmenting, giving users' greater reach of their natural faculties.

This direct link implies that the technology has a detailed understanding of the user whose needs, wants and preferences need to be modelled and interpreted correctly for the augmentation and direct link to be successful. This means that bodily, cognitive and emotional models of the users need to be embedded, which refers back to the natural and invisible interface between user and technology. In order for this to be possible the technology needs to be pervasive, i.e. embedded in a wide range of environments for the user to be able to profit.

As a consequence the technology will gain a significant degree of power over the user who will need to rely on the technology and embedded models to achieve the chores that technology is meant to help her or him with. In extreme cases, for example in neurocomputing, a direct link between the technology and the human brain can control not only people's actions but even their thoughts. But even in less intrusive cases, the technology can easily determine and circumscribe avenues of activity.

This power is linked to autonomy of the technology, which will be relied upon to make numerous decisions and act proactively in order to achieve its functions. The technology therefore needs to be context sensitive, mobile and intelligent. It correctly interprets the user's situation and acts accordingly.

It is important to note that as a general point the different technologies under investigation are described as positive and desirable in their use and consequences. They will allow a better understanding of all sorts of natural and social phenomena. Their aim is to help and support users, in particular in those cases where they find it hard to fend for themselves, e.g. in cases of disability or disease. In the above figure, several defining features of different technologies were collected under the heading of "technical enablers". These are aspects of the technologies that are deemed to be necessary to fulfil the functions of the technologies. For space reasons these are not investigated in more detail here, even though this would doubtlessly be an interesting further task. We will finish this brief attempt to outline the main socio-technical consequences of the emerging ICTs and move towards a reflection of the assumptions, beliefs and models that underlie them.

Ethical Consequences of emerging ICTs

While the general social consequences of emerging ICTs clearly point towards some ethical issues, a more detailed analysis of ethical issues was required in order to develop useful recommendations. This paper briefly describes the methodology used by ETICA, presents findings and synthesises them.

Identification of Ethical Issues¹

Research on ethics generally raises numerous conceptual questions, which are exacerbated by the application to emerging technologies. Moor (2008), for example, suggests that we need better ethics for emerging technologies. This raises the question of the

¹ For a more detailed description of approach and findings, please refer to deliverable D.2.2, Normative Issues Report, available from the ETICA website at www.etica-project.eu.

choice and justification of the ethical approach taken. Just as most technologies have a potential infinity of possible applications and thus a potential infinity of moral problems, there is now a huge number of ethical evaluations to contend with. One possible approach would be to decide on a particular ethical approach that is widely accepted, such as the mid-level ethical principles generally used in biomedical ethics (Beauchamp & Childress, 2008). This would leave open the question of the relationship to other ethical views and might lead to blind spots where the chosen ethical theory is not well developed.

The ETICA project therefore decided to take a pluralist approach that allows a number of different voices to be heard. This plurality, while running the risk of inconsistency, has the advantage of covering a broad range of issues and views and offering different interpretations. It was therefore decided to concentrate on the discourse of ICT ethics and, in the first instance, extract this field's views on the ethics of the emerging technologies. The chosen approach for ethical analysis thus mirrors the approach used in the technology identification part in that it relies on published work and thereby seeks to minimise injecting the researchers' biases into the analysis. This section first defines the field and then describes how it has been analysed to allow the identification of ethical issues.

The actual identification of the ethical issues of the emerging technologies identified earlier used several interrelated steps. It started with a bibliometric analysis of the discourse on computer and information ethics from 2003 to 2009. It used a bibliometric tool called VOSviewer (van Eck & Waltman, 2009; Van Eck & Waltman, 2006; Van Eck, Waltman, & van den Berg, 2005). This bibliometric analysis gave a heuristic starting point for possible ethical issues worth considering. It then used the descriptions of technologies as compiled in the earlier steps to explore whether any of the defining features of the technologies was likely to raise ethical issues. Similarly, the application examples were investigated with a view to their ethical relevance. For each technology an ethical analysis was created with the following structure: (1) discussion of defining features, (2) discussion of application examples, (3) bibliometrical analysis, and (4) concluding discussion.

Ethical Issues of Emerging ICTs

While the number and detail of ethical issues of the different ICTs varied depending on their level of progress and public visibility, the ethical analysis led to the identification of numerous issues. This paper lacks the space to discuss these issues individually but instead develops a general overview of these ethical issues. The methodology employed to do this mirrors the one described above for the social characteristics of emerging ICTs. A mind map was created that detailed all of the technologies and had one branch for each of the ethical issues identified. The full description of the ethical issue was available in the comment of the branch. The mind map tool allowed grouping the different ethical issues into more general categories. This allowed the development of a more abstract view of the ethical issues that the emerging ICTs as a whole are likely to raise.

Figure 5 shows a view of the categories ethical issues that emerged from this analysis.

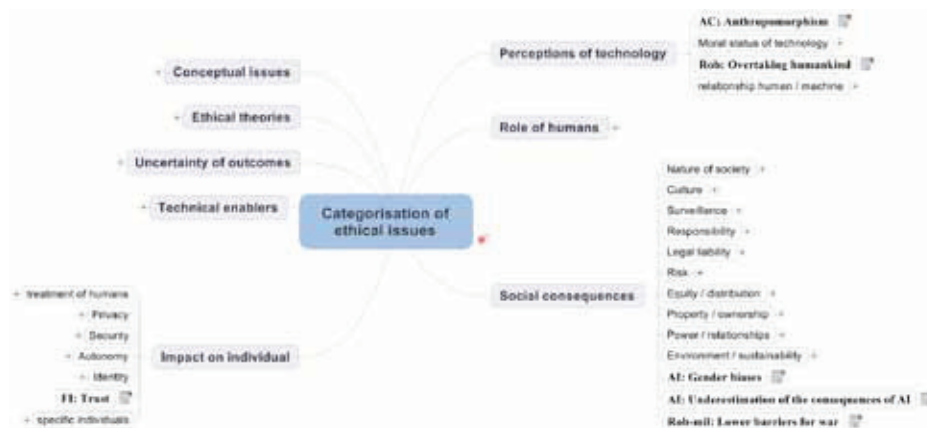


Figure 5: Categories of ethical issues of emerging ICTs

Looking these categories, one can find that some of them are not particularly surprising. Current problems are likely to persist in future ICTs. Notable examples are privacy, data protection and surveillance as well as issues of property, ownership and digital divides. While these problems will not disappear, they have been well recognised and there are institutions, norms and regulations that aim to address them.

It is important, however, to see that there are numerous ethical issues in the list above that are currently less visible and that we may not have good answers for. Many of these arise from the relationship of computers and humans and the consequences this relationship has on social interaction and society. Many of these issues also reflect the more general implications of ICT discussed earlier. One core issue has to do with the status of ICT and the way humans view themselves in relation to such technology. It is expected that ICT will continue to become more and more autonomous and less obvious in its interaction with humans. This raises the question of the agency of technology and thus of the moral status of machines. Numerous current examples of ICT research go in this direction, where ICT-enabled devices make autonomous decisions, for example in healthcare or search and rescue situations. These decisions will undoubtedly have moral qualities but it is unclear how they are to be evaluated.

As one consequence of this increasing autonomous agency of ICT, there is a possibility that our view of ourselves will change. Weizenbaum (1977) predicted this development more than three decades ago, but it may now become social reality. The impacts that emerging ICTs can have on the individual are thus far-reaching. They relate to the way we see and thus treat humans. Autonomous ICTs requires us to rethink our own autonomy and thus our identity. What this will mean in detail for society is not clear. It stands to reason, however, that the potentially fundamental changes arising from new technologies will not only create new risks, liabilities and responsibilities but may change the very fabric of society. Changes in the way we work, engage in political activities and leisure will raise questions about appropriate rules and regulations. They will create winners and losers and therefore lead to conflicts that need to be addressed.

Responsible Innovation for ICTs for a Better Future

This very quick overview of the ethical issues of emerging ICTs as identified by the ETICA project should render it clear that current technical developments have the advantage of significantly affecting the way we live. They will have positive and negative consequences and implications that should be addressed as early as possible. The main mechanism of integrating ethics into ICT research and development on the European level is that of ethics review. This mechanism relies heavily on bio-medical ethics. It has the advantage of providing clear guidance and precedence in some cases, notably those related to direct medical intervention. At the same time ethics review is structurally unable to address most of the more interesting issues outlined above. By relying on informed consent it focuses on the individual and neglects social changes. It is premised on the belief that the research itself is morally good and desirable, which may be true in many cases in medicine but is not obviously true in technical research. It is furthermore mechanistic and relies on an ethical issues list, which can give the misleading impression that ethics can be reduced to a pre-defined set of issues.

The concept of responsible innovation can therefore be interpreted as an attempt to provide a broader and more holistic framework in which ethical, social and legal issues can be addressed. It will most likely include established ethics review procedures but it needs to go beyond them. This section will contextualise ETICA findings and recommendations in a framework of responsible innovation by first outlining the concept of responsibility and then demonstrating how the ETICA recommendations will facilitate a more responsible approach to innovation.

The Concept of Responsibility

Responsibility can be defined as a social construct of ascription. Etymologically derived from the response, the answer, responsibility implies a communicative structure. This communication implies that there is something (the subject) that has the ability to answer. The subject needs to answer for something (the object) and it needs to answer to something (the authority) on the basis of a distinct set of rules or guidelines. There are numerous further conceptual aspects of responsibility ascriptions. There are different types of responsibility that affect the authority and the underlying rules. Moral responsibility (Wallace, 1998) differs from but is often related to legal responsibility (Hart, 1968), for example. Role responsibility tends to be related to both moral and legal. A further important aspect is the temporal dimension (prospective versus retrospective).

This paper does not have the space to develop a detailed theory of responsibility (for an overview see (Fischer, 1999), for an application to technology see (Lenk & Maring, 1991) and to information systems see (Stahl, 2004)). It only uses the main components of the concept of responsibility to explore how the findings of the ETICA project can be translated into practical recommendations that have relevance for the development of ICTs. In order to do this, two more remarks are important. First, we understand responsibility as an attempt to achieve socially desirable outcomes. This means that if responsibility is ascribed to a subject (e.g. a software developer, a company, a government) this implies that there will be positive or negative sanctions (i.e. rewards or punishments) that will contribute to a particular outcome, such as, for example, user involvement or less environmental impact. Second, it is important to realise that responsibility ascriptions always take place in concrete situations

and are always entangled in a complex web of different ascriptions. The individual software engineer, for example, will have responsibilities towards her company, role responsibilities as a member of a professional body, legal responsibility as a citizen, moral responsibility as a member of different communities etc. While it may be analytically desirable to disentangle these responsibilities, they always co-exist in practice.

Responsible Innovation and its Limits

Before this very brief background of the concept of responsibility, we can now ask what responsible innovation can mean. In the European context, the term needs to be interpreted taking the policy background into account. Europe needs economic growth to address many of the challenges that it is facing. However, growth needs to be conducive to other policy aims. The President of the European Commission therefore states that Europe needs smart, sustainable and inclusive growth (European Commission, 2010). Innovation in science and technology is seen as a key enabler of these policy aims. ICTs form an important aspect of this strategy, as can be seen from the Digital Agenda for Europe²

The term “responsible innovation” represents the aim of using innovation in science and technology (and beyond) to achieve these policy aims. In accordance with the earlier discussion of the concept of responsibility, the term here stands for the aim to achieve desirable outcomes. Innovation is not seen as an aim in itself but a contributing factor to the overall good. Sustainability and social inclusion are two of the values that need to be considered in innovation.

Achieving such responsible innovation is a complex task. It entails the definition and enforcement of a large number of interlinking responsibility ascriptions. These will cover numerous subjects which will be held responsible for different objects, using different mechanisms and leading to different sanctions. This section briefly discusses some of the problems that responsibility ascriptions face in the area of emerging ICTs. Emerging ICTs are a core area of responsible innovation given the cross-cutting nature of such technologies and the strong influence they can have on innovation in other disciplines and across society as a whole.

For the sake of simplicity of the argument we will concentrate on the subject of responsibility for emerging ICTs. We distinguish two main sets of subjects: On the one hand there are policy makers who are responsible for the framework of responsibility. Their main responsibility is a type of higher level responsibility, something that could be called a meta-responsibility or a transcendental responsibility. This is the responsibility for providing the conditions that facilitate specific responsibility ascriptions during the technology research and development process. On the other hand there are subjects involved in this process itself, such as companies, individual researchers or technicians, but also society at large and its representatives. These subjects will be responsible for individual technologies and their consequences in a range of different ways.

In the following sections the paper discusses the recommendations of the ETICA project and contextualises them in this framework of responsibility. It first outlines recommendations for policy makers and the for other subjects involved in the ICT innovation process.

² http://ec.europa.eu/information_society/digital-agenda/index_en.htm, accessed 28.02.2011

Recommendations for policy makers

Policy makers have an important role to create the regulatory framework and the infrastructure to allow ethics to be considered in ICT. If emerging ICTs are to be developed in a responsible manner that allows identifying and addressing the social and ethical problems outlined above, then a framework and infrastructure for the development of responsibility needs to be provided. Such a framework should cover at least the following three main areas of policy activity:

- Provide regulatory framework which will support Ethical Impact Assessment for ICTs
- To raise awareness of the importance of ethics in new ICTs
- To encourage ethical reflexivity within ICT research and development
- To provide appropriate tools and methods to identify and address ethical issues
- To address the wide range of current and new ethical issues arising from ICT, modelled along the lines of environmental, privacy or equality impact assessments
- To allow ICT professionals to use their expertise in emerging ICTs to contribute to ethical solutions
- To raise awareness of ethical issues regarding animals and environmental issues
- To proactively consider legal solutions to foreseeable problems that will likely arise from the application of future and emerging technologies

Overall, this set of recommendations addresses the institutional framework that will be required for further subjects to recognise responsibilities and develop mechanisms of discharging it. The idea of an “Ethical Impact Assessment for ICTs” was chosen because it provides precedent from areas of the environment, privacy, or equality. Such a framework is required to provide incentives to engage with issues of responsibility in innovation and emerging ICTs. It will thereby encourage discourses that will lead to the development of specific responsibility ascriptions.

- Establish an ICT Ethics Observatory
- To collect and communicate the conceptual, methodological, procedural and substantive aspects of ICT ethics
- To provide a community-owned publicly accessible repository and dissemination tool of research on ICT ethics
- To give examples of approaches and governance structures that allow addressing ethical issues
- To disseminate past and current research ethics and ICT including relevant work packages and deliverables and relevant National Ethics Committee opinions
- To facilitate the Ethical Impact Assessment
- To provide an early warning mechanism for issues that may require legislation

While the first recommendation aimed at providing a procedural framework for identifying and addressing ethical issues in ICT, this set of recommendations aims to provide a set of content required for actual responsibility ascriptions. The work undertaken by the ETICA project, for example, provides important pointers towards possible ethical issues to be considered. Individuals involved in technical development are often not experts in these matters. A shared repository of ethics-related theories, practices, methodologies etc. is a necessary condition for the successful ascriptions of responsibilities and the related sharing of good practice.

- Establish a forum for stakeholder involvement
- To allow and encourage civil society and its representations, industry, NGOs and other stakeholders to exchange ideas and express their views
- To exchange experience between to develop ethical reflexivity in the discussion
- To reach consensus concerning good practice in the area of ethics and ICT
- To build a bridge between civil society and policy makers

This final recommendation for policy makers points to the necessity of institutionalising important discourses that allow civil society and other stakeholders to engage on a content level with the policy as well as the technical community. Such a forum is required to ensure that responsible innovation covers not only specific technical interests and perspectives but is allowed to reflect broader societal concerns. In terms of a theory of responsibility, the forum contributes to the definition of the object of responsibility: what is it that should be achieved and what does responsibility need to be ascribed for?

Recommendations for Industry and Researchers and CSOs

Industry, researchers and other individuals or organisations should adhere to the following recommendations in order to be proactive and allow innovation to be socially responsible. If the institutional framework, background, repository and societal discourses are there, then the conditions will be favourable for the incorporation of ethics and reflexivity into technical work and application usage.

- Incorporate ethics into ICT research and development
- To make explicit that ethical sensitivity is in the interest of ICT users and providers
- To distinguish between law and ethics and see that following legal requirements is not always sufficient to address ethical issues
- To engage in discussion of what constitutes ethical issues and be open to incorporation of gender, environmental and other issues
- The points of this recommendation aim to ensure that specific responsibility ascriptions are realised within technical work. It furthermore aims to sensitise possible subjects of responsibility some of the difficulties of discharging their responsibilities
- Facilitate ethical reflexivity in ICT projects and practice
- To realise that ethical issues are context-dependent and need specific attention of individuals with local knowledge and understanding
- To simultaneously consider the identification of ethical issues and their resolutions
- To be open about the description of the project and its ethical issues
- To encourage broader stakeholder engagement in the identification and resolution of ethical questions.

This final set of suggestions aims to ensure that the different subjects of responsibility realise that responsibility is not a pre-determined and fixed structure. Possible objects of responsibility are context-dependent and need to be interpreted in the particular situation. Interpretive flexibility of technology requires the participants in a technology development project to collectively engage in the initial definition of ethical issues to consider, but also to continuously review this initial definition and engaging with stakeholders involved in other stages of the technology development process.

Conclusion

This paper has outlined the main approach and findings of the ETICA project. It has given an abstract view of the social consequences and ethical implications of the technologies that were identified as emerging ICTs. It has then shown how these findings and the subsequent recommendations can contribute to an environment of responsible innovation.

Following these recommendations will allow for an early and pro-active engagement with ethics in future ICTs. While this cannot be a guarantee that all problems will be identified and solved, it is an important step towards ensuring that technology development is conducive to social ends.

The recommendations are also not the final step in the journey. If they are recognised as important and implemented then this will lead to numerous follow-on questions. Which form exactly should the institutional framework for Ethical Impact Assessments take? How is the ICT Ethics Observatory to be created and maintained? What form will the stakeholder forum take? How can the introduction of reflexivity into projects and organisations be realised and assessed? All of these are difficulty questions requiring further research.

For the moment, ETICA has shown that there are important ethical issues that we can expect to arise from emerging ICTs and that we currently do not have a good way of addressing them. This paper has outlined the main recommendations coming from the project and shown how they fit into the approach of responsible innovation. Implementing these recommendations will contribute to an approach to research and development of technology that is not only technically excellent but sensitive to ethical issues and thus contributes to the greater good of Europe and beyond.

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