

## Essay

# I don't know what I'm doing

*The designer's responsibility with regard to behaviour in complex socio-technical systems*

### Abstract

This essay deals with the question how a designer of a technical element of a complex socio-technical system should deal with moral responsibility. As it can be hard to determine a moral norm and to predict the effects of certain design decisions, the answer cannot be answered straightforwardly. Moreover, it is questionable whether technological developments can be guided in the first place, or whether they are deterministic on society. We identify the problems and chances around these issues, by using the expansion of the telecommunications infrastructure in South Africa as an example. It will be made clear that in this case, there are several unique opportunities for conscious thinking about the moral consequences, and adapting design decisions to influence them.

### Introduction

Since the abolition of the apartheid era in South Africa, there is a strong drive for the introduction of technologies from abroad. Under the umbrella of universal service and universal access policies, it is the idea that large parts of the black population must have access to basic infrastructure facilities like water and electricity. Telecommunications – ranging from the ability to instantiate simple calls to browse the web via a broadband communication – is included here, too. Mind models that relate the availability of communication facilities to economic growth and hence prosperity are imported from western countries. If one looks at the cultural aspects of life among the black population, it is questionable whether the introduction of these technologies will not alter their life to an extent that goes far beyond a mere change in the way people communicate.

Consider the implications of the changes in telecommunication abilities in today's world. E-mail is not only a substitute for other ways of communication; we have to process much more information than we did before. It also blurred the difference between work and private life, and makes hierarchy less important because access barriers seem to vanish. Personal appointments are less hard, as the details can be dealt with by mobile phone. The Internet makes it possible to meet new people on the other side of the world and stay in touch with them. Did anybody foresee these consequences? And if so, can anybody be held responsible for the impact of these technologies? Should the difficulty in answering this question mean that nobody has to take responsibility? What should we do now that we know some of the long-term consequences, and we have to the opportunity to take them into account when helping South Africa's population?

This paper will deal with the question how an engineer, the designer of a technical part of a system, should deal with the moral consequences of developments that take place in complex socio-technical systems. These are systems that consist of social (groups of people) as well as technical elements; think about a communication system that includes people who want to communicate electronically, as well as the technologies that are being used and the attitudes towards using them. The paper will not deal with the tensions that can arise in (hierarchical) organisations, but consider the engineer to be any individual, organisation or combination of them that is responsible for a single part of the design of the complex system. Concepts from ethical and policy literature will be explored and applied on the South African telecommunications case, for the purpose of illustration. In the end, the goal is to clarify the moral questions that arise, and to propose some fruitful ways of dealing with a designer's responsibility.

Up until now, in the scientific literature little synthesis has been undertaken to present an integrated, normative view on the problem of complex systems. In the field of human-computer interaction, the concept of Value Sensitive Design integrates the moral aspect in the designing process (Friedman, 2001, p. 112), but the idea has not been developed for broader use. A final discussion that is

unfinished is the one about technological determinism. The reciprocal influence of technology on society is extensively debated (for a bundle of essays, see Smith & Marx, 1994), but no conclusions regarding the responsibility of a designer – a small cog in the big system – have been drawn.

### **Problem field**

The central question is how an engineer should deal with the moral side of consequences that follow from certain developments in socio-technical systems. The doctrine of the establishment of passive moral responsibility (Zandvoort, 2005, p. 109) can help here. This concept is about when responsibility could be attributed when the consequences of a certain act will only manifest themselves a certain period after the cause has occurred. In this case, the cause is a design decision and the consequence a change in the socio-technical system. Three criteria of the doctrine are applicable to our case at hand.

1. In order to be passively responsible for a certain effect, a norm must have been transgressed during the action, which has led to the undesired consequence.

This criterion is very difficult to establish. What is the norm? It is very hard to establish hard and universal norms when it comes to the consequences of technology. The way people live has always been subjected to change, that very often is a consequence of people's own choices. As change per se could not be rejected, it is very hard to distinguish between desirable and undesirable effects of technology. Two main questions come into play here. The first is: Who decides about the norm? Followed by a second one: Is there a tension between individual (or local) and collective (or global) optimisation? In other words: Is the sum of desirable acts and consequences still desirable? A second criterion that should be evaluated is:

2. Is there a causal connection between the design choice and the moral consequence?

Here, the issue at stake is whether technological development can be guided by conscious design decisions. Technological development often reinforces itself, and sometimes seems independent from societal needs. Is it an autonomous development, or can it be steered, and if so, in what way?

3. Could the negative consequences reasonably have been foreseen?

As socio-technical systems are inherently complex, it may be very difficult to oversee the consequences of a certain design decision. The way in which that decision affects the system's behaviour is dependent on numerous external factors, which can be hard to predict. Moreover, these systems are often characterised by non-linear behaviour, which means that a small change can have disproportionately large consequences. The question remains what can be expected from a designer, who is faced with this uncertainty.

We will address the questions derived from the application of the criteria in the following sections. First, we will deal with how a norm can be established. Thereafter, the possibilities to influence the effects of technology on society will be investigated, and to finalise the exploration, the unpredictable element of socio-technical systems will be discussed.

### **What (or who) is right?**

We already discussed that it is difficult to work with hard, rigid norms regarding the consequences of design decisions. Suppose that the effect of widespread accessibility of telecommunications in South Africa is similar to those in western countries. Then what is desirable, weighed with the advantages of a growing economy, higher personal efficiency, and increased health care?

The most ethical thing to do seems to let the people involved decide about whether they want to adopt the technology, with all its desired and undesired effects. A concept that is often used is that of informed consent. This means that the people who have to decide will first get informed about the consequences of the different options. However, this is not so easy in practice. Who should be asked? The future users are a heterogeneous group, including young and old, strongly religious and a-religious people, educated and non-educated, low-, middle- and high-income groups, people who

already have experience with modern communication equipment and people who have not... How should be dealt with different decisions? In a one-person-one-vote system, majority voting can be used, but maybe a meritocratic system is preferable, because not everyone has the right reference points to make the decisions.

Furthermore, the telecommunication issue is embedded in a network of other issues, like financing arrangements from the World Bank and other development aid institutions, which require a certain economic reform that includes the establishment of a modern telecommunications sector. This means that a stand-alone consideration of the issue is extremely difficult. Of course the unpredictability of consequences, which will be dealt with later on, also imposes a real barrier to the execution of the informed consent concept. If one does not know for sure the consequences of the various options, then should risk be assessed? Regardless of the ways in which this is possible, people will have different conceptions of risk and the choice will always be subjective.

Faced with all these obstacles – and these are still only some theoretic ones – one may be tempted to conclude that it is simply impossible to establish the norm. In some cases, it might be possible to have clarity. But is it still needed to ask people about the consequences then, or are they that obvious that the designer can make a choice for himself? It seems justified to conclude that the informed consent principle is not very helpful in our situation, and that only in obvious cases – when technology clearly attributes to apartheid-like discrimination, for instance – the norm is clear, too.

Still, the question remains what the role of the designer should be. Despite all the complexities in the decision making process, the designer often has more insight in the consequences of his decisions than the people who are going to use it. This is due to the simple fact that the designer may have had experiences before with the same technology, that he does have more in-depth knowledge and hence a better insight into its functionality. Moreover, the designer can ask the question before the general public can do it. In general, the latter will only react when the consequences will manifest themselves, whereas the designer can do this while still being in the design process. The designer clearly is not omniscient about the consequences of his decision, but he has at least a responsibility to communicate this uncertainty and inform users and society in the best possible way about the (moral) risks.

Therefore, the designer's responsibility in this respect can be defined as asking the question at the right moment, and spreading information to the people involved, so that at least a process of decision-making can be started on time.

### **Does technology determine society?**

Much has been said about the influences of technology on society and vice versa. It is not the question whether there are influences, but in which way they are working. Most relevant for our discussion here is the question whether technological developments and their influences on society can be directed. A good overview of the different answers to this question is given in (Bimber, 1994). We consider the nomological account (given laws of nature, there is only one possible future, not shaped by any social norms) as overly simplified, as they neglect any possibilities for human interference. Also, the unintended consequences account, which says that the consequences can never be known, seems being caught up by reality. A simple illustration can be given by our own running case: we can use past experiences to extrapolate future consequences; whether these are accurate is questionable, but at least they provide some information. A third perspective being discussed by Bimber is the social constructivist account, which states that technology is shaped by social norms and choices made in the interaction between people. This may be true, but can never explain the whole story, as is illustrated by our example of communication technologies having effect on the way people interact.

The normative account is more attractive in general, and specifically for our case, too. This account states that "(...) technology can be considered autonomous and deterministic when the norms by which it is advanced are removed from political and ethical discourse and when goals of efficiency or productivity become surrogates for value-based debate over methods, alternatives, means, and ends." (Bimber, 1994, p. 82) In other words, technology is not deterministic per se, but will become so if society does not keep conscious control and directs it with moral norms.

A useful addition to this each view, which takes dynamism into account, is the concept of technological momentum (Hughes, 1994). This states that it is easiest to shape technology in its early stages. Its development will get more and more autonomous as more factors come in and the technology will get its own dynamics. "A technological system can be both a cause and an effect; it

can shape or be shaped by society. As they grow larger and more complex, systems tend to be more shaping of society and less shaped by it.” (Hughes, 1994, p. 112) External pressures may provide another window of opportunity to change technological development.

We would like to add that deliberately implementing a technology in a society offers these opportunities for conscious influence too. It may be true that technologies like Internet and e-mail are that mature, that their development is hard to direct from a social point of view. However, in South Africa, major decisions still have to be made about how to use these technologies, or maybe adaptations of it. Hence, in the South African socio-technical system on telecommunications, the technological component is not mature yet. In Hughes’ concept, we should carefully consider the technology in its context. This provides a clear answer to the second criterion on responsibility. Designers are able to influence the development of the system. It is important not to lose the window of opportunity, and to think about the moral consequences right now. The relative low development level of large parts of South Africa can turn out to be an advantage in this consequence. As the market is not able to bring (especially internet) technologies to the people at a western-like speed, the government has a high influence with its regulations and subsidisation policy. Therefore, the moral side can be discussed in public, and explicit decisions can and should be made.

### **What will happen?**

The third and final criterion to establish passive moral responsibility is that the consequences could reasonably have been foreseen. One could state that socio-technical systems are that complex, that it is hardly possible to foresee the consequences of a small design act. This may only be true in two situations. In the first one, understanding the system requires so much information and processing capabilities that it simply is beyond the power of a human or organisation to comprehend. On the contrary, one could say that several techniques are available to reduce the complexity and make abstract (mind) models of a system so that its behaviour can be understood. Where more perspectives are needed, one can make use of groups of people with different backgrounds. Thus, it is not very likely that this argument still holds. Another counterargument is that it may be true that precise predictions are difficult, but this leaves open the fact that the general developments (megatrends) and/or their predictability can be estimated within certain bandwidths. In the European Union’s environmental policy, the precautionary principle is leading when making decisions under uncertainty. This states that “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” (The Rio Declaration on Environment and Development, 1992) In a recent report, the European Environmental Agency made twelve recommendations for dealing with the precautionary principle in practice (Harremoës, 2001, p. 193). Most of them are hard to carry out for a designer, as, for instance, it is unlikely that he will start scientific research to get more insight into the consequences of his actions. Nevertheless, the principle indicates that also soft indications should be taken into account. The problem here is to determine when such an indicator gives an ‘early warning’, as it cannot be scientifically proven. If one looks at the way the international community deals with the greenhouse effect – where the precautionary principle is used, because scientists are still squabbling about its consequences – the issue seems to be important because the possible consequences are very high. A trade-off between consequences and the probability of occurrence seems to exist. Hence, the concept of risk may be quite usable, as this is often used as the product of effect and probability. Still, it is hard to establish the probability of a certain hypothesis. This will always include a subjective opinion from scientists, policy makers and maybe even the general public. After all, the precautionary principle is something that can be a consideration of a designer. The moral discussion about the rightness of the precautionary principle is left aside. We simply observe that the principle is widely accepted nowadays (Harremoës, 2001, p. 14).

Another situation may arise when the system is behaving in a non-linear way. The structure of the system may be such that small changes can have disastrous consequences for its final behaviour. This is a characteristic often perceived in complex systems. If we look at the South African case, it is also not unlikely that non-linear structures are present. For instance, the adoption of certain technologies or the choice for a certain vendor is subject to the so-called network tipping effect. This means that the network (for instance, a mobile operator) which has the largest initial user base, although it may only differ slightly from its competitor, may attract most users because of the fact that this enables the most

users to communicate with each other. Of course, this is a positive feedback cycle, but note that it can be triggered by only a handful of initial users. The butterfly effect, as this 'small act-large impact'-notion is often called, seems to be a valid reason for stating that future behaviour is difficult to predict. It should also be noted that the butterfly effect most of the time is about long-term consequences. On a smaller time scale, the effects of certain decisions can be well foreseen; it also does not exclude intervention later on, when the first (negative) effects become manifest. So, after all, it can provide an excuse for discarding some responsibility because of unforeseeable consequences, but only with regard to the long term.

From all this, we can conclude that initial uncertainty does not always relieve the designer of the duty to gather more information, involve more people, and be cautious on indicators for the risk of negative consequences. Non-linear behaviour is always just a part of the story, and cannot be used as an excuse for not knowing any consequences.

## **Conclusion**

We discussed the difficulties arising from the three criteria to establish passive moral responsibility. When a norm is clear, the design decision did lead to the negative consequence and the consequences could have been foreseen, responsibility is relatively easy to establish. There can still be difficulties in assigning this undirected responsibility to particular organisations or individuals, but that question is beyond the scope of this essay.

However, we have seen that very often the application of these criteria give rise to much more questions, which can almost never be answered in a straight way. We have seen that whereas the informed consent principle may not be directly applicable in complex cases like our South African one, a designer has the unique position and hence the obligation to feed information to start a professional or public discussion on the moral consequences of his decisions. Although the norm often is hard to establish, this approach leaves room to all stakeholders to contribute their view and transfer the decision making to the public arena.

We have answered the basic question of whether technology does indeed determine society, and as such may give rise to moral questions. Most perspectives agree that this influence is present. We elaborated on the nuanced view of technological momentum, and stated that in South Africa there is a window of opportunity, now that the socio-technical system is still in its infant stage.

The uncertainties of the developments in the system give rise to the difficulties around the third criterion: Is it possible to predict the consequences of decisions? In general, this can be very difficult due to the complexity of the system, which may make it less understandable, and its non-linear structure. The positive side is that in South Africa, one can make use of learning experiences with the same technologies abroad. Uncertainty will still be a problem, but not to the extent that a designer cannot make reasonable forecasts about the possibilities of certain morally (un)wanted consequences. And where uncertainty exists, one can consider using the precautionary principle, especially when there is support for this in the professional or public opinion.

After all, complex socio-technical systems give rise to many problems, but several factors that increase the ability to influence its development have been identified. For the South African telecommunications policy, these opportunities should be grasped to increase the social benefits of the technology. In the end, it is not the technology as such that is being promoted, but the positive consequences for the economy and personal well-being. These consequences can be enhanced by carefully thinking about the moral impact of changes in the socio-technical system. Beforehand. With a strong role for the designer, whose main duty it is to feed a professional or public discussion about the moral aspects of the technology he is working on. Whereas we identified the designer as any identity that contributes to the technical part of a system, this duty can be attributed to an organisation, a group of organisations or a group of individuals. Because of the loyalty designers have to their profession, and the fact that this role is profession-bounded, this role can practically be fulfilled by professional organisations or professional codes. A parallel with the medical sector can be made, in which it are doctors who are ultimately responsible for the consequences of their deeds, within certain cadres set by their professional organisation, and with the oath of Hippocrates in mind. These organisations can also facilitate broader discussions about general trends, not specific to an individual designer. But at last, it is the individual designer who encounters certain possibly negative moral consequences who has to initiate actions so that a discussion about them can be started. Moreover, in

those situations where no full information is available, the designer has to make use of other options than simply neglecting the moral issue. By researching, up to what can reasonably be expected in terms of time and money, and by using the precautionary principle.

Morality has never been about obvious decisions. But, too, this has never meant that it should be left aside for that reason.

### **Literature**

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