1. Introduction

Cybernetics, developed by Norman Wiener in the 1950s, can be regarded as the foundational discipline for Computer Ethics. (Floridi, 2015, p. 91) His new discipline covered many of the same topics that we would today regard as central to Computer Ethics. These include access to computers for people with disabilities, computer security, professionalism in computing, unemployment due to computing, automation and many more. (Bynum, 2016)

The term we use today, “Computer Ethics”, has its origins with Walter Maner (Maner, 1980; Bynum, 2016)

Today Computer ethics covers a broad range of topics including: security, privacy, copyright as in computer “piracy”, access to computing for the disabled, environmental impact and sustainability of computing system and research ethics etc. Of these, privacy, is currently the most discussed topic in the field. (Stahl *et al.*, 2016, p. 3,28)

Researchers can now use the principles of Responsible Research and Innovation (RRI) to manage the ethical considerations of how their research impact on society.(Eden, Jirotka and Stahl, 2013, p. 1)

1. Definition of Ethical Computing

According to the Cambridge Dictionary of Philosophy, ethics is “the philosophical study of morality” (Audi, 1999). Therefore, Ethical Computing relates to the study of morality as it relates to Computing. In simple terms, morality can be thought of as the study of what is right and what is wrong.

James H, Moor defines Computer ethics as “… the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology” (Moor, 1985, p. 266).

There are a few competing ethical theories used in Computer Ethics.

Firstly, we can classify ethical theories into a couple of categories. Consequentialism, Deontology and Virtue ethics. All of which are Normative ethical theories. In Consequentialism, whether an action is good or bad, i.e. ethical, depends on the consequences of the action. The most prominent consequentialist theory is utilitarianism. Which can be describes as doing the most amount of good to the largest amount of people. Deontology on the other hand hold that the intention of agent doing the action determines whether it is ethical or not (Stahl *et al.*, 2016, p. 4). Where in virtue ethics it depends on the individual character (Stahl, Eden and Jirotka, 2013, p. 812).

Another prominent theory is Luciano Floridi’s Information ethics (Stahl *et al.*, 2014, p. 812). Floridi’s theory is an ontology of information. Everything can be fundamentally seen as information with an emphasis on the relationship between information agents. (Ess, 2008, pp. 160–161) As Floridi puts it “moral actions are the result of complex interactions among distributed systems integrated on a scale larger than the single human being” (Floridi, 2008, p. 198).

1. Importance of Ethical Computing

In our society we are constantly inundated with ethical dilemmas in the Information and Communication Technology sector. From issues about privacy and consent (Carter, Laurie and Dixon-Woods, 2015; de Bruin and Floridi, 2017) to copyright infringement (Chiou, Wan and Wan, 2012, p. 108). Most prominent are issues relating to privacy. Examples are the 2010 cyber-attack on Gmail and the NSA spying scandal of 2013 (de Bruin and Floridi, 2017, p. 22).

People have an innate sense of right and wrong. What is right or wrong can differ between nationalities, groups or people. These ideas need to be openly discussed and reasoned about. But there needs to be agreement on what is right and what is wrong. That is why we need ethical theory (Stahl, 2012, pp. 638–640).

As previously mentioned, according to Moor it is policy vacuums that create computer ethics problems (Moor, 1985, p. 266). Responsible Research and Innovation (RRI) can be used to develop policies for how researchers are to respond to the consequences of their ICT research and innovation (Eden, Jirotka and Stahl, 2013, p. 1). This approach has become prominent in Europe where it will underpin Horizon 2020, the European research framework (Stahl, 2013, p. 1).

Incorporating values in the design from the outset can have a bearing on the successfulness of the project. The Google Glass project was tested in 2014 and did not seem to consider the ethical problems associated with the technology and how society would react to it. Many people were concerned about how much this new technology would infringe upon their privacy. This led to the project being stopped in 2015 (Van Den Hoven, 2017, p. 71).

The design of technological devices incorporates in them certain ethical assumptions. Value-sensitive design (VSD) as a field of study tries to make values a key part of technological design process. This field of study started at Stanford in the 1970s (Van Den Hoven, 2017, p. 69). Some believe that VSD can support RRI and that RRI can benefit from the knowledge gained in the VSD field (Simon, 2016, p. 220).

Mittelstadt et al. (2016) (a study on the current state of ethics in algorithms), has the following argument. When an ICT system breaks or does something society sees as immoral, the developers of that system are usually blamed (Kraemer, van Overveld and Peterson, 2011, p. 251). This is justified when the developers have control over the actions of the ICT system (Matthias 2004) and becomes a problem in systems based on learning, for example machine learning algorithms like neural networks . Here the developer does not understand everything about how the system reaches certain conclusions. Is the developer now responsible for an outcome they could not have foreseen or at least was very difficult to foresee? The field of computer ethics have not found an consensus to this dilemma. But many agree that more research is needed.

Privacy

Piracy

Equal access

Check (Carter, Laurie and Dixon-Woods, 2015; Floridi and Taddeo, 2016)

Also see (Mittelstadt and Floridi, 2016)

Moor describes that a policy vacuum creates issues in computer ethics.

Policy vacuum is to be filled with the help of RRI(Eden, Jirotka and Stahl, 2013)

RRI (Von Schomberg, 2013)

1. Some guidelines on being ethical within the computing environment

One study felt that researchers and developers in the Information and communications technology (ICT) industry needs to understand that moral assumptions are made during the development of new technology and products. The researcher or developer brings in their own “views and values” into the product. The product is thus not “morally neutral”. Ethical issues need to be brought up early in the development process. The earlier in the development lifecycle these considerations are addressed, the easier it is to make the necessary changes. Additionally these ethical requirements should be put on par with the other non-ethics related requirements and not regarded as secondary or less important requirements (Van Den Hoven, 2017, pp. 66–70).

Governance of RRI needs to be “reflective”. The persons in charge of overseeing the RRI process, should ensure that the process “… reflect(s) upon its own assumptions, presuppositions and required consequences”. This needs to be applied to different views there currently is on privacy and to what extend privacy is wanted or needed (Stahl, 2013, p. 713; Stahl, Eden and Jirotka, 2013, pp. 212–214).

When it comes to privacy and data protection, the principal of informed consent should be followed.

1. Conclusion
2. References

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