

The International Library of Ethics, Law and Technology 15

Federica Lucivero

# Ethical Assessments of Emerging Technologies

Appraising the moral plausibility of  
technological visions

 Springer

# **The International Library of Ethics, Law and Technology**

Volume 15

## **Series Editors**

Anthony Mark Cutter, Lancashire, UK

Bert Gordijn, Ethics Institute, Dublin City University, Ireland

Gary E. Marchant, Center for the Study of Law, Science, and Technology,  
Arizona State University, USA

Colleen Murphy, University of Illinois at Urbana-Champaign, Urbana, IL, USA

Alain Pompidou, European Patent Office, Munich, Germany

Sabine Roeser, Dept. Philosophy, Delft University of Technology, Delft,  
The Netherlands

## **Editorial Board**

Dieter Birnbacher, Institute of Philosophy, Heinrich-Heine-Universität, Germany

Roger Brownsword, King's College London, UK

Ruth Chadwick, ESRC Centre for Economic & Social Aspects  
of Genomics, Cardiff, UK

Paul Stephen Dempsey, Institute of Air & Space Law, Université  
de Montréal, Canada

Michael Froomkin, University of Miami Law School, FL, USA

Serge Gutwirth, Vrije Universiteit, Brussels, Belgium

Henk ten Have, Duquesne University, Pittsburgh, USA

Søren Holm, University of Manchester, UK

George Khushf, Center for Bioethics, University of South Carolina, USA

Justice Michael Kirby, High Court of Australia, Canberra, Australia

Bartha Maria Knoppers, Université de Montréal, Canada

David Krieger, The Waging Peace Foundation, CA, USA

Graeme Laurie, AHRC Centre for Intellectual Property and Technology Law, UK

René Oosterlinck, European Space Agency, Paris

Edmund Pellegrino, Kennedy Institute of Ethics, Georgetown University, USA

John Weckert, School of Information Studies, Charles Sturt University, Australia

More information about this series at <http://www.springer.com/series/7761>

Federica Lucivero

# Ethical Assessments of Emerging Technologies

Appraising the moral plausibility  
of technological visions



Springer

Federica Lucivero  
Department of Social Science, Health and Medicine,  
Faculty of Social Science and Public Policy  
King's College London  
London, UK

ISSN 1875-0044                      ISSN 1875-0036 (electronic)  
The International Library of Ethics, Law and Technology  
ISBN 978-3-319-23281-2              ISBN 978-3-319-23282-9 (eBook)  
DOI 10.1007/978-3-319-23282-9

Library of Congress Control Number: 2015949923

Springer Cham Heidelberg New York Dordrecht London  
© Springer International Publishing Switzerland 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media  
([www.springer.com](http://www.springer.com))

It is not enough to change the world. That happens anyway and generally beyond our control. What matters is to interpret this change, specifically in order to lead it. So that this world does not change further outside of ourselves, ultimately becoming a world-without-us.

(G. Anders. Die Antiquiertheit des Menschen, vol 2)



# Preface

New File. The blank page is scary. Open recent > Notes for Chapter 1. Ctrl + A, Ctrl + C. Better to start with this. Now, Ctrl + V on the blank page. This paragraph is a good start for my book. Ctrl + X, Ctrl + V, select paragraph, move up. Uhm, no... Ctrl + Z. A tag pops up in the bottom right corner of my screen: "This is your rest break. Make sure you stand up and walk away from your computer on a regular basis. Just walk around for a few minutes, stretch and relax." I can check my Facebook page in my break. Or perhaps I shouldn't. I should install the software that limits my access to Facebook during working hours. This is killing my productivity! A walk might be better. Oh, wait: Ctrl + S.

These lines portray a typical moment in the experience of my daily life as I wrote this book. Yet 33 years ago, to the average academic, they might have seemed as though they were emerging from the pages of a science fiction story. It was in 1982, the year I was born, that WordPerfect Corporation introduced WordPerfect 1.0, destined to "become one of the computer markets most popular word processing programs".<sup>1</sup> With new technologies, such as this, come new innovations: novel tools become available, different skills are required, old abilities become superfluous, new problems emerge, whilst previous problems are redefined and addressed with original technical solutions from which novel moral obligations arise, together with needs and desires. This is just one example among the many possibilities showing how the introduction of technologies deeply affects our daily practices by altering our knowledge, habits, perceptions, capabilities, and values.

Would it have been worthwhile to reflect on the impacts of computing and word processing on writing practices 30 years ago? Would such a reflection have affected the development of new hardware and software to avoid the occurrence of Repetitive Strain Injury syndrome? Would it have impacted policy makers and managers to grasp the sudden changes of writing and working practices? Would such a reflection on potential impacts have helped parents to better understand their children? Finally, would such a prospective thinking on a future practice even be possible at all? As the Italians say: "history cannot be done with 'if' and 'but'". That is, retrospective speculations on how things could have been different 30 years ago are not purposeful.

---

<sup>1</sup> See <http://www.computerhope.com/history/1982.htm>.



Rather, what can be done is a prospective investigation of the relevance of such reflection on current emerging technologies.

The importance of a reflection on the desirability of emerging technologies has been addressed in the policy tradition of Technology Assessment (hereafter TA). In the early days, TA offices would produce reports that would guide policy makers' decisions concerning new science and technologies. Experts in science, technology and economics were considered the best candidates for the task of producing such reports on technologies' impacts. Later, the argument was made that, if technology plays such a big role in citizens' lives, everyone in society should participate in decision making about new technologies. Thus, not only the experts, but also the citizens should have a say in deliberating on the desirability of emerging technologies. If emerging technologies should be democratically evaluated, then the values and understanding of desirability should be clarified and openly discussed.

Etymologically, the word "assess" comes from the Latin *ad-sedēre*, meaning to sit, referring to the sitting position of judges comparing and estimating the "value of (property or income) for the purpose of apportioning its share of taxation".<sup>2</sup> An assessment is an act of determining an amount (for example properties or income) and estimating (or comparing) its value with respect to a quality standard (for example spending or purchasing power). In this sense, assessing emerging technologies is an evaluative activity: it does not simply describe what impact a technology might have, it also suggests whether this impact is good or bad according to some "value". Although Technology Assessment activities are always evaluative of the desirability of technologies, the meaning of "desirability" has been interpreted in a variety of ways. A technology may have desirable consequences when it enhances the economy of a country, when it improves people's health, or the environment or when it eases people's everyday lives. Different economic, scientific, social or moral values can be mobilized to assess the desirable impacts of a new technology. We can define this evaluation as normative when a technology is assessed with respect to explicit norms or authoritative standards. Such standards may be legal or moral norms. The adjective "normative" is often used to qualify a judgment in opposition to a "descriptive" account. While the latter aims at describing a state of affairs, in a presumably objective and value-neutral manner, the former is a judgment, an evaluation based on some previously established values. As it will be discussed throughout this book, this distinction has been criticized by a broad scholarship in the humanities and social sciences, which has argued that facts are always value-laden and descriptions are never neutral accounts of facts, but always framed in a way that promotes some aspects and marginalize and exclude others. Despite such agreement on the normative character of any account, there has been a long tradition of TA exercises that has not directly engaged in discussions concerning the implied, sometimes hidden, values that guided such assessments. Discussions and debates on the goodness and rightness of new science and technologies on the basis of moral norms and principles have, instead, been relegated to the realm of ethics that traditionally deals with

---

<sup>2</sup>"assess, v.". OED Online. September 2011. Oxford University Press. <http://www.oed.com/view/Entry/11849?redirectedFrom=assess> (accessed October 06, 2011).

controversies concerning moral values. As Chap. 1 will show, this has been acknowledged as a weakness of current TA approaches and accordingly, some attempts have been made to overcome such limitations and include spaces for the discussion of moral values in assessments of emerging technologies. These attempts have aimed at shedding light on the normative character of decisions concerning these technologies and, in some cases, critically discuss their appropriateness. Falling into this tradition, this book aims at investigating ways to do “ethical” assessments of emerging technologies, that is assessments that disclose the normative nature of visions and decisions about emerging technologies, by exploring their moral purport.

In moving towards this goal, this book focuses on one specific aspect: the fact that in these assessments we focus on science and technology that is still emerging. Prospective evaluation is not easy. In our daily lives, we have a hard time anticipating the consequences of our own actions. The task becomes even harder when the consequences depend on a large network of interacting players. The greatest challenge comes when we want to evaluate the desirability of these future consequences. Should we then give up with the attempt of meaningful discussions about the potential role that future technologies may play in our lives? Some policy analysts, sociologists and philosophers have argued that this is not ideal given that the expectations of the ways in which emerging technologies will change our lives, the promises of their benefits as well as the threats of potential losses determine our present decisions. Visions of technologies guide our decision-making processes; they justify our choices and exclude alternatives. This happens on multiple levels: when politicians deliberate on investing public money for the research and development of new technologies; when healthcare managers decide how to re-organize the system for efficiency; when researchers select the focus of their research; when entrepreneurs consider what to invest in; when adolescents decide on a course of study; when patients exclude certain treatments but accept others; when doctors empower their patients in the decision-making process. Reflecting on the meaning of emerging technologies enables our society to understand current technological developments and their role in our practices in the very near-future. This understanding allows us to interpret them and hopefully to make more cognizant decisions in the present.

This book contributes to the debate of “how” the desirability of emerging technologies can be assessed. In particular, it addresses the question of how to deal with “expectations” on emerging technologies when assessing their desirability. Emerging technologies are, by definition, “not there yet” and we can only assess their desirability by looking at the current expectations of their future development. Yet, these expectations do not provide stable grounds for philosophers and ethicists to ask moral questions about the desirability of emerging technologies. Why? The grammar of expectations clarifies this point. If I say that I expect to finish writing my book in a few months, my expectation communicates that I believe and I hope that I will finish my book in a few months. In the act of expecting, there is an element of belief that something can happen, for example that I have enough chapters written. There is also an element of interest that something should happen, for example that I want to finish my book. Furthermore, I can utter this expectation in order to convince my editor to be ready to receive my book. Since my expectation

depends on my beliefs and interests, and can have a specific function, it cannot be taken as a starting point from which the value of my book can be assessed. The same line of reasoning applies to expectations that emerging technologies will produce some societal benefit.

Philosophers of technology and applied ethicists cannot take expectations surrounding emerging technologies as descriptions of states of affairs. In the case of technologies that are still emerging, the normative assessment of the desirability of emerging technologies has to start by appraising the quality of expectations surrounding those emerging technologies. How can the epistemological robustness of such expectations be assessed in view of a normative reflection on their desirability? This methodological question is the central focus of this study. The goal of this book is to articulate, implement and justify the approach to assessing the plausibility of expectations surrounding new and emerging science and technologies. This book argues that ethical assessments of emerging technologies are always plural and context specific. Although the two technologies taken as case studies are both examples of emerging screening innovation, the proposed methodology can be used for different types of technologies.

This book is organized in three parts: Part I presents the problems, research questions and the approach that is taken in order to address them; Part II describes and justifies the three steps of the proposed approach, through an exploration of the case of an emerging technology for cancer screening, the “Nanopil”; Part III, addresses the possibilities for applying and implementing the three-step approach described in Part II. In Chap. 1, introduce the general debate on the assessment of emerging technologies. I focus on a gap between two traditions used to assess technologies, namely Technology Assessment and institutional ethics. The former tradition fails to deal with questions about the desirability of emerging technologies, while the latter lacks a sociological sense of the context. Different approaches have addressed this gap, but the aspect of epistemological uncertainty that characterizes emerging technologies seems to remain understudied. Chapter 2 expands on the topic of “expectations” and the need to assess their quality. In this chapter, I present a body of literature that justifies the need to develop a methodology for assessing the quality of expectations. I first turn to the literature on the sociology of expectations to investigate their social construction. According to the literature, expectations should not be taken at face value, because they have a strategic and performative role. The literature on “visions” emphasizes that it is indeed important to assess the desirability of the values and norms implied in visions of future technologies. Since this normative content is not always explicit, it should be disclosed before it can be assessed. These analyses of expectations are enlightened by the literature on empirical philosophy of technology that points out that technologies often do much more, and very different things, than they were originally intended to. Consequently, I argue that, before asking whether these implicit norms and values are desirable, one should check how plausible it is that they will indeed be realized. To address this question, I develop an analytic and methodological approach which I refer to as “plausibility assessment”. This approach is based on a three-step process that

requires the articulation of three elements of these expectations: the expected artifact, its potential use and the anticipated valuable impacts.

Such an analytical framework is further described in the second part of this book where the expectations of a specific emerging technology are used as an exemplary case: the “Nanopil”, an ingestible device for in vivo screening of intestinal cancer. Chapter 3 illustrates how to address analyzing expectations about a future artifact. After introducing public expectations surrounding the Nanopil, I explain why further analysis is needed and how it can be done. Then, I present my research design and the analysis of expectations of the Nanopil, explaining how this analysis helps to address the question of the plausibility of expectations. Chapter 4 addresses the question of how to analyze expectations of the potential use of an emerging technology. Using the example of the Nanopil, I explain why they need to be assessed and what conceptual and methodological tools help with this. These preparatory analyses set the stage for addressing the main question pertaining to the plausibility of visions in Chap. 5. In this chapter, I return to the question of how plausible it is that certain values and desirable worlds will indeed be realized by a new technology. The plausibility of the expectations of the Nanopil is assessed on three levels: how likely is it that the artifact will promote the expected values? To what extent are these values desirable? And how likely is it that a technology will instrumentally bring about a desirable consequence?

The third part of this book discusses how the three-step approach developed in Chaps. 4, 5 and 6 can be applied to other cases and used to develop tools for integrating ethical inquiry in TA exercises. In Chap. 6, I apply this analytical and methodological framework to another technology: the Immunosignatures. At the end of this chapter, I discuss those parts of my approach that have been adjusted in order to analyze this specific technology, and those parts of the analysis that remain the same. Chapter 7 shows how a plausibility assessment can improve the debate on the desirability of emerging technologies. Using the pragmatist normative framework, this chapter explains how democratic deliberations can be improved by triggering stakeholders’ moral imagination through scenarios and vignettes. The analysis of two pilot workshops, organized with the scientists and engineers developing the Nanopil and the Immunosignatures, highlights the opportunities and limits associated with these tools. Chapter 8 returns to the discussion outlined in Chap. 1. It discusses the contribution of the proposed approach to assessing the expectations of plausibility to the fields of applied ethics and Technology Assessment. This final chapter aims at explaining how this study contributes to the goal of ethically assessing emerging technologies by improving the conditions for democratic deliberation on the desirability of emerging technologies.



# Acknowledgements

Although I will never manage to thank adequately all those who have, directly or indirectly, played an important role in the realization of this book, I will nevertheless make an attempt. I would like to thank Marianne Boenink and Tsjalling Swierstra for their continuous and caring intellectual and emotional support in the drafting phase. I am grateful to Philip Brey, Frans Brom, Erik Fisher, Alfred Nordmann, Arie Rip, and Peter Paul Verbeek, and two anonymous reviewers for their constructive and critical comments. Many friends and colleagues have read and commented on these chapters – Aimee, Anna Laura, Eleni, Lieke, Lise, Pierre, Ronald – thanks for your constructive critiques and encouragements. A special thanks goes to Clare and Lucie for their thorough comments on the last revised chapters.

My research would be all ‘head’ and no ‘body’ without the availability and generosity of the people I interviewed in conducting my case studies. In particular, I wish to thank the BIOS group at Twente University and the Centre for Innovation in Medicine at Arizona State University. These groups are working on the two emerging technologies that I used as case studies for this research project. I wish to thank all the members of these groups, especially those who have spent long hours discussing their research with me. The expertise, patience and enthusiasm that they showed in our conversations and through their participation in the activities that I organized have been crucial for this whole study.

I have been part of great academic communities that have inspired the content of this book and encouraged me to publish it: my colleagues at the Department of Philosophy at the University of Twente, the Tilburg Institute for Law Technology and Society, and the Social Science Health and Medicine, especially Barbara Prainsack, for her support in the very last phases prior to publication. Also, I would like to thank Sally Eales for carefully editing several chapters of this book. Of course, I take full responsibility for every mistake or imperfection still present in the text. Finally, I am grateful to those who helped with the material realization of this book: Chris Wilby, my editor, who supported me with great patience and encouragement and the 3TU Centre for Ethics and Technology and the Socio-Technical Integration Research (STIR) who have financially supported this project.

Much gratitude and love goes to my family, especially to my dad for his affectionate availability and prompt support when I was lost with layouts and formats. And Alessio, who supported me with patient love and encouragement while I was working on this publication, and who both inspires and grounds me every day.