Chapter 1
A Hitman's Approach to Ethics: Temptations and Challenges and Book Overview

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1 A Hitman's Approach to Ethics

Editing a contributed book is often not an easy process, and chapters are often delayed. One of the authors sent me a couple of emails with the subject heading 'almost hitman time' and told me that if he did not make the promised deadline, I had his permission to hire an assassin. I replied that unfortunately institutional budget cuts meant that there were no longer funds available for hiring assassins and that this might also be counter to institutional ethics policies.

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We then had a slightly flippant discussion about the ethics of hitmen (it is probably not an equal opportunities profession) and the ethics of using them to threaten or inflict retribution on authors who do not deliver chapters. This started me thinking about the ethics of hired killers.

I will admit to having no first-hand knowledge of hitmen. While I rarely talk about subjects of which I have little or no knowledge, the purpose of this discussion will be made clear later. I presume successful hitmen, like other successful 'professionals', must have a code of professional ethics. It might cover issues such as charging a fair price, confidentiality, refusing bribes, meeting deadlines, rejecting commissions which cannot be fulfilled and behaving discretely and professionally. Looking at this list, it would seem equally appropriate for an engineer (in private practice).

However, there is still the issue of whether it is in any sense meaningful for a hitman to behave in accordance with professional ethics. For instance, not accepting bribes may mean killing (murdering) a person or group of people according to contract rather than accepting money not to do so. Meeting deadlines means killing one or more people to an agreed deadline rather than at some later unspecified time. Rejecting commissions which cannot be fulfilled means not taking money to kill one or more people and then not killing them (and disappearing with the money). The problem is that killing people in return for an agreed sum is not ethical. Not overcharging, not accepting bribes and meeting deadlines do not make it so.

So what relevance does this discussion have for engineers? There has been a tendency for discussion of engineering ethics to focus on the ethics of professional practice. This is clearly very important. However, it is not sufficient. As the discussion of the professional ethics of contract killers illustrates, it is also essential for engineers to consider the ethics of what they are doing. For instance, are they involved in activities that benefit humanity and the environment, or are they the engineering equivalent of hitmen?

It should also be noted that hired killers who use state-of-the-art weapons to carry out their professional activities (murdering people for pay) are using technology designed by engineers. Engineers who are involved in weapons' design and development cannot be sure that these weapons will not end up being used by contract killers. Highly professional and highly paid hitmen will want the best modern technology in order to carry out their profession as effectively and professionally as possible. Naturally, the best modern weapons technology is designed and developed by engineers.

At the first international academic conference I attended there was what was supposed to be a light humorous talk in the afternoon. All I remember of it was the presenter talking about producing sub-standard cement and selling it to majority world (developing) countries. The buildings built with this substandard cement fell down after a short period, providing more opportunities to sell cement. I made a protest against this, dressed up in slightly technical terms, as it was an academic conference. Now I would probably be blunter, but I was a research student attending my first conference. Unfortunately no-one else said anything.

Producing substandard cement is not quite the same as being a professional killer. However, if buildings collapse as a result, this could lead to death and injury, possibly even on a much wider level than caused by the hitman. This approach also shows a total lack of respect for other human beings, particularly those in the majority world countries. In addition, the hitman at least has his professional ethics and possibly respect for himself as a highly trained professional (killer).

2 The Ethical Engineer

This raises the issue of the essential nature and characteristics of an ethical engineer. There is no unique answer. This book explores some of the issues and hopefully will put readers in a better position to behave ethically in both their professional and personal lives.

Being an engineer is both an enormous privilege and a very great responsibility. This gives rise to the question of an engineer's responsibilities. At the simplest level, this should require using their skills to make a positive difference to people, animals and/or the environment, as well as drawing attention to abuses, preferably with colleagues to avoid victimisation (Hersh 2002).

Unlike being a hitman, engineering should be an equal opportunities profession, but currently tends not to be (Hackett et al. 1992; Hersh 2000; Wynarczyk and Renner 2006). In addition to issues of justice, there is also the case of benefitting from the different perspectives of a wider section of the population. People may also design better for those who are similar to themselves. Therefore, involving a wider section of the community as engineers and designers may lead to products which more closely approach the ideal of design for all (Connell et al. 1997). In addition, it is only people in a particular community who fully understand the requirements and preferences of that community, giving rise to the need for end-user involvement in project design and the incorporation of material in engineering courses on working with diverse groups of end users.

Both the professional hitman and the substandard cement producer illustrate the temptations faced by engineers which must be resisted in order to remain ethical and to be true to themselves. One important temptation is to be interested purely in solving problems and involvement with an interesting state-of-the-art technology while not paying attention to the nature of the application and its ethical and other implications, as well as potential misuses. Another important temptation is to cut corners in order to make a quick profit. I like symbols, though I recognise that not everyone does, and therefore, I find the symbols of the hitman and the substandard cement producer useful in reminding me of what sort of engineer not to be. The hitman and substandard cement producer are complementary or probably, better said, an unholy duo. One lacks professional ethics and the other pays no attention to unethical outcomes.

It may be a truism to state that engineering and technology are at the basis of modern society. To give an example, many technological developments have dramatically increased the impact of modern war, including its geographical extent, environmental damage and large-scale casualties amongst civilians. Modern information and communications technologies could be considered to have had an almost revolutionary impact, which has produced great changes on most aspects of life. On the one hand, information and communication technology (ICT) has made it possible to communicate with friends and family all over the world, presented opportunities for overcoming some of the barriers experienced by disabled people and enabled the detection of global climate change at an earlier stage than would have been possible otherwise. On the other, ICT has changed the nature of work for many people and often speeded it up, has made possible very intrusive surveillance including in the workplace, had an important role in the development of military technologies and had played a significant role in increasing consumption.

This means that engineers have the potential to both have a significant positive influence on society and cause very serious and possibly lasting damage. Thus, being an engineer could be considered to be both a great privilege and a real responsibility. However, few engineering undergraduate, postgraduate, higher national diploma (HND) or vocational programmes have a significant component on engineering ethics, and even fewer, if any, try to integrate engineering ethics into all aspects of the curriculum.

3 Overview of the Book

Ethical engineering is a very wide subject. Therefore, I have chosen to focus on ethical engineering in the context of two very important global problems: sustainable development and international stability. Even with this restriction, it would be difficult within a reasonable length to cover everything, and the focus has been more on physical engineering than, for instance, biotechnologies. However, most of the ethical issues covered and solutions proposed are relevant across all of engineering.

In addition to the introduction and conclusion parts, the book is divided into three main parts, which examine the following important topics:

- Ethical impacts of advanced applications of technology.
- Engineering ethics and sustainable development.
- Engineering ethics and international stability.

Particular features of the book include the following:

- The application of ethical engineering to the two vitally important issues of environmental and international stability.
- The international perspective and authors, their expertise and experience and very different backgrounds.

- The origin of the book in the International Federation of Automatic Control (IFAC) Supplemental Ways of Improving International Stability (SWIIS) Technical Committee, now Technology, Culture and International Stability (TECIS 9.5), which has facilitated the discussion of the issues and refinement of the arguments presented in the book over a number of years.
- The parallel discussions taking place in Science for Global Responsibility (SGR), with most of the authors actively involved in either SGR or TECIS 9.5 and some, like Marion and Alan, involved in both.
- The detailed reference list at the end of each chapter and the bibliography of additional reading at the end of the book.

The main benefits of reading the book are the following:

- An increased understanding of what is meant by ethical engineering and its practical implications.
- The consequences of ethical and unethical behaviour for sustainable development and international stability.
- Increased understanding of some of the wider implications of the decisions made by engineers in their working lives and the types of ethics-related questions to ask before making these decisions.

4 Part I: Introduction

This part contains two chapters. Chapter 1 is this overview chapter, and Chap. 2 is 'Ethical Engineering: Definitions, Theories and Techniques' by Marion Hersh, Scotland. This chapter on engineering ethics provides the background and supporting framework to the book through presenting a number of definitions, theories of ethics and techniques and approaches for applying them in practice. After the introduction, the chapter is divided into three main sections. Section 2 considers different theories of ethics, including rule-based approaches such as the professional codes of engineering societies. These theories are organised according to a classification based on the two categories: (1) monist/pluralist and (2) process based, outcome based and process and outcome based. This section also includes a table of a number of theories of ethics, their properties and some references.

Section 3 presents a number of methods, approaches and techniques for applying ethical principles in practice. These include the ethical grid (Seedhouse 1988), which was originally developed to support ethical reasoning and decision making by health workers, an approach called perspectives, principles and paradigms (Anon undated) and the formation of a complete picture through the consideration of different ethical theories (Hersh 2003). Approaches to understanding individual values based on the Johari window (Brockbank and McGill 1999) and to achieving a change of ethos in organisations using multi-loop action learning (Hersh 2006; Nielson 1996) are also presented.

Section 4 considers ethical issues associated with processes and outcomes and uses the example of assistive technology to present some of these issues. It also

considers research ethics with regard to both the outcomes, including those related to research aims, and the process or the ethical conduct of research, including working with human participants. Ethical issues relating to safety, good design, gatekeeping and suppressing dissenting opinions and minority group researchers and whistleblowing are also discussed.

5 Part II: Ethical Impacts of Advanced Applications of Technology

Part II consists of two chapters on roboethics and ethical uses of outer space. Chapter 3 on 'Roboethics' by Peter Kopacek, Austria, and Marion Hersh, Scotland, considers the opportunities, threats and ethical issues in the fast-developing field of robotics. The chapter starts with definitions and statistics and a brief overview of some of the main technological developments and current and probable future applications of robots. This includes industrial and service robots, mobile robots, cloud and ubiquitous robots and bioinspired robots. The ethical issues raised by some of these types of robots are also discussed briefly.

The concept of roboethics is then introduced, and the limitations of early approaches focused on Asimov's (undated) laws of robotics are noted. However, the more general definition (Veruggio and Operto 2008) is able to cover the wider social implications of the introduction of robots and could be extended to cover the impact on the environment and other species. The ethical issues of current and future applications of robots are illustrated by a number of examples covering a wide range of applications, including health care, military robots and toy and companion robots. Some of the ethical theories presented in Chap. 2 are then applied to the evaluation of some of the applications of robots, and the reduction of their environmental impacts is also considered.

Chapter 4 on 'The Ethical Use of Outer Space' by Dave Webb, England, notes the rapid increase in the commercial and military uses of the space environment and that, whether we realise it or not, our lives are becoming increasingly influenced by and dependent on the use of space technology. The thousand or more operational satellites that currently orbit the Earth collect and broadcast enormous amounts of information worldwide, making important contributions to mapping and communications, environmental monitoring, agriculture, weather forecasting and an ever-growing range of human activities.

However, competition for valuable geostationary orbits and the positioning of military spy and other satellites has led to a situation where, rather than being viewed as a global resource, space is subject to commercial exploitation by whoever gets there first and open to military exploitation by whoever can develop the appropriate technology to dominate it. We have learned an astonishing amount about the Universe through international scientific collaboration, and it is now essential that we learn to cooperate further and develop global agreements on the way we make use of the space environment. This chapter explores the reasons why this is becoming increasingly necessary and important, why it is difficult to achieve and the progress that has been and is being made.

Section 2 discusses what we mean by outer space by tackling the question – where does outer space begin? This is followed by a description of the various forms of human activity in the region (exploration, commercial and military) along with estimates of their cost in Sect. 3. The various problems arising from the military use of space and the current projects that threaten space security are outlined. Section 4 emphasises the need to be aware of and care for the space environment, and this leads into a discussion of the problems of an unregulated use of space in terms of a tragedy of the commons in Sect. 5. Section 6 then looks at the ethical situation regarding a just and beneficial use of the space environment, and the existing international treaties and agreements are outlined along with the adopted procedural mechanisms. Finally, Sect. 7 concludes with some suggestions for future progress.

6 Part III: Ethical Engineering and Sustainable Development

Part III comprises three chapters on green jobs and energy, climate change and environmentally friendly bathing. Chapter 5 on 'Green Jobs and the Ethics of Energy' by David Elliott, England, affirms the irrefutable environmental case for switching to nonfossil energy, buttressed by the clearly unsustainable nature of our existing energy system, with climate change being the most obvious and pressing issue. This chapter looks at the social case for the transition and, in particular, at the claim that this switch could lead to more and better employment – good jobs in a green society. To set the scene, it first examines the record of the existing range of energy technologies in terms of their social and environmental impacts and their limited available resources, and then at the emergence of new renewable energy technological options that avoid or limit these impacts and constraints. The employment implications of these new options are then explored, as are trade union responses to the opportunities they offer and the challenges of a switch over to sustainable energy.

There will be jobs lost by the move away from reliance on the existing energy sources and a need for retraining. While there may be a net increase in employment, it is argued that what is perhaps more relevant is the type and duration of the new jobs. The chapter explores the emerging trade union view that what is needed is a 'just transition' to properly paid, sustainable employment with good conditions. It is argued that, although there is a need to change the way energy is produced and used and this change will create new jobs, we do not want jobs at any cost.

Chapter 6 on 'Disparagement of Climate Change Research: A Double Wrong' by Wiebina Heesterman, England, stresses the critical role of the engineering profession in the fight against climate change. This goes much further than risk management and the repair of structures damaged by extreme weather events such as persistent flooding. A crucial task is the development of a robust infrastructure capable of withstanding further weather onslaughts. New ways of working will be necessary to create resilient structures and services aimed at a low-carbon economy and the adaptation and mitigation of climate change. This also needs to be reflected in the professional education of future engineers. An understanding of the activities of the forces committed to dismissal and misrepresentation of the scientific evidence of climate change is essential.

The chapter focuses first of all on the scientific evidence for the reality of climate change. It then describes the ways in which vested interests have been able to harness the fears and feelings of those too scared to admit the possibility of it being true. This is followed by a discussion of the techniques and methods employed by individuals and organised groups intent on refuting and rejecting scientific arguments. Often, this process involves maligning the scientists and their integrity in order to create doubt regarding the science itself. Financial rewards from the fossil fuel industries which stand to sustain heavy losses from disinvestment certainly play an important role, although it is nearly impossible to discover which particular companies and/or individuals are involved. This is illustrated by specific examples, including a case study of an incident widely regarded as having transformed public consciousness to the extent that at least for a period the issue of climate change largely dropped out of sight. This is followed by the textual analysis of two books by authors not generally regarded as climate sceptics. However, much of their reputation has by and large been gained by making light of the issue and/or suggesting that climate change activists may well employ questionable techniques to reinforce their message.

Chapter 7 on 'Environmental and Social Aspects of Domestic Bathing', by Alan Cottey, sets domestic bathing in the broad context of the large and increasing overload of the planet's ecology by human activity. The domestic bathing practices of prosperous, westernised people are extravagant and involve the use of large amounts of water and energy. The section 'Technical Aspects of Bathing' contains a quantitative discussion of water and energy use and of greenhouse gas emissions, under various conditions, including different means of heating the water. These general conditions are followed by a comparison of different methods of bathing, principally shower, bath and basin.

Ways in which bathing can remain pleasurable and hygienic, yet use an order of magnitude less water and energy, are discussed. Such a reduction cannot be achieved through technical efficiency alone, because capitalism *requires* net economic growth of the historic kind. Hitherto, growth (roughly a few percent per annum) has exceeded efficiency gains (roughly one percent per annum). Thus, the fundamental questions are political. In particular, humanity must change from an ethos of domination and exploitation to an ethos of sharing our earthly home. The chapter shows that, with a radical change of economic ideas (household management that is simultaneously grand and modest) and with some simple (appropriate technology) developments of equipment, effective and pleasurable bathing is possible using resources at a level far below the current norm for prosperous people.

The discussion of bathing provides an example and draws out ideas which can be applied to other cases of human profligacy. The role of engineers, both as ordinary members of society and individuals with special talents and trained skills which can be applied to the invention and development of useful arts, is apparent throughout the chapter. In this Anthropocene epoch (This overload is indeed so marked that the term Anthropocene is widely used for a new geological epoch in which human influence is a major factor), the *creativity* of engineers, amongst others, is called for to work *with* the rest of nature towards a sustainable and beautiful twenty-first century.

7 Part IV: Ethical Engineering and International Security

This part consists of four chapters. The first three chapters examine ethical issues related to development in three different contexts: the automation and information and communications technology (ICT) industries in Poland, a telemedicine centre in Kosovo and technology development for Deaf people in South Africa. The fourth chapter considers ethical issues associated with military work.

Chapter 8 on 'Engineering Ethics Problems in a Developing Country' by Józef B. Lewoc, Poland, and colleagues draws on case studies of the experiences of successful leading designers in the areas of hardware, software, applications and research to discuss ethical issues related to working in the ICT and automation industry in Poland. The situation both pre and post the political and economic changes in 1989 is considered, with developments in the subsequent period based almost exclusively on technology transfer. A number of ethical theories are applied to analyse the actions of leading designers, large corporations post-1989 and the authorities in the state-owned firm Elwro pre-1989. Similarities and differences in the experiences of leading designers in the two periods are noted, and various suggestions for surviving while behaving ethically are made.

Chapter 9 on 'Rebuilding Hope in Post-conflict Regions: Telemedicine in Kosovo' by Anita Kealy and Larry Stapleton, Ireland, defines post-conflict regions as territories where there has been a severe, recent violent conflict which has fundamentally destabilised a society. Because of this, post-conflict regions frequently have a particular set of features which differentiate them from other developing or more stable regions. Studies from both developed and developing regions show that developing and implementing medical informatics or e-health are becoming a crucial part of effective health care. Developing and implementing large-scale, technologically enabled infrastructures such as health services are notoriously difficult, even in stable regions.

Post-conflict regions are extreme situations with many additional complicating features for large-scale technology projects. This chapter aims to set out the factors leading to a successful implementation of a telemedicine ICT system in Kosovo. Ciborra (2002) argues that ICT is more than a combination of hardware and software. ICT creates a backdrop for human actors that work with it and can both reflect and impact on the organisation it has become part of. Ciborra (2002) puts forward five features of the 'host', who is receiving the technology as a 'guest'. These features are evident in the findings from the successful implementation of the telemedicine centre. This research found that the impact on the organisation of hosting the technology emerges as one of the main factors which influenced the success of the centre. These findings suggest that when investigating the outcomes of large-scale technology projects in post-conflict developing regions, this aspect of the technology warrants further exploration.

Chapter 10 on 'Beyond Traditional Ethics when Developing Assistive Technology for and with Deaf People in Developing Regions' by Bill Tucker, South Africa,

highlights the limitations of traditional ethical approaches and procedures when engaged in assistive technology (AT) research for Deaf people in a developing region. Nontraditional issues arise as a consequence of employing action research, including how informed consent is construed and obtained, empowerment of participants to become involved in co-design, awareness of the unfamiliar cultural issues of participants (as opposed to subjects) and accommodating community-centred, as opposed to person-centred, nuances. Action research is a useful paradigm for ICT for development and requires that researchers intervene in a community to transform social practices based on mutually defined research goals. The author's approach to action research is called community-based co-design where technological innovation emerges together with a technology-empowered community.

This chapter describes work with the Deaf Community of Cape Town (DCCT), a disabled people's organisation that works on behalf of a marginalised community of undereducated, underemployed and semi-literate Deaf people across metropolitan Cape Town. Here, the capital 'D' calls attention to a cultural identity due to either the physical deafness or a preference for using signed language to communicate, in this case South African Sign Language (SASL).

This chapter shows how community-based co-design can direct academic research to bridging communication gaps while simultaneously providing ICT solutions to empower marginalised Deaf people towards independent communication. There is a conflict/tension between these two goals, with ethical issues nuanced by sensitivity to Deaf culture and their preference for SASL communication, power relations and technical and socio-economic disparity. There is also tension between the requirements of the Deaf community, and the evolving and changing roles and expectations of the research and traditional ethics processes, including those of university institutional review boards. The chapter discusses related work to identify the central shortcomings of traditional computer science and engineering approaches to ethics and illustrates the associated challenges with examples from work with the Deaf Community of Cape Town. The author reflects on how these ethical issues affect AT design, based on long-term engagement, and how this has affected the research team's practices and offers suggestions to others working on AT in developing regions.

Chapter 11 on 'Ethics, Scientists, Engineers and the Military' by Marion Hersh, Scotland, discusses the ethical issues arising from military work by scientists and engineers. The chapter is introduced by an overview of global military expenditure and its consequences. A number of statistics are presented on the trends in military expenditure and its consequences, as well as the resulting deaths and social costs in terms of inadequate development, poverty and lack of education. A three-part model of the causes of conflict is presented and discussed and used to highlight the importance of resolving the underlying issues that lead to conflict and changing the context that may encourage war rather than peaceful resolution. This leads into the discussion of military technology as part of this unfortunate context. An overview of different types of military technology is presented from nuclear weapons to small arms, and the various arms control agreements are discussed. This is followed by a discussion of the arms trade. Despite cuts in military expenditure due to austerity measures, this still remains very significant and includes sales to countries with

severe human rights violations. Corruption in the arms trade is considered, and features of the arms trade which encourage corruption are noted.

A case study of military research in the UK is presented and makes depressing reading. It is noted that most of the research relates to offensive rather than defensive weapons and that UK weapons are often exported to countries with very poor human rights records, which reduces rather than increases security. The penultimate section considers the impacts of military expenditure on the economy and discusses the research which shows that other types of expenditure generally lead to creation of more jobs than military expenditure. The final section summarises the chapter and presents further discussion. It notes that developments in military technology have transformed the nature of conflict and heightened insecurity. It is pointed out that the data shows that for many countries military spending relates to power, prestige and status rather than 'defence' and that engineers and scientists have had a major role in developing military technologies which have made conflict more lethal and to take place over a much wider area, involving more civilians. The importance of security policies based on peace building and resolving problems rather than fear and high-tech weapons is again highlighted.

8 Part V: Looking to the Future

This short part rounds off the book and contains one chapter, Chap. 12 on 'Conclusions and Looking to the Future' as well as resource materials, a list of additional reading, and contact for organisations of engineers and scientists working for change.

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