Tilburg University

Techno-elicitation

van den Berg, B.

Published in:
Technologies on the stand

Publication date:
2011

Document Version
Publisher's PDF, also known as Version of record

Link to publication in Tilburg University Research Portal

Citation for published version (APA):
van den Berg, B. (2011). Techno-elicitation: Regulating behaviour through the design of robots. In B. van den Berg, & L. Klaming (Eds.), *Technologies on the stand: Legal and ethical questions in neuroscience and robotics* (pp. 403-422). Wolf Legal Publishers (WLP).

Chapter 19
Techno-elicitation: Regulating behaviour through the design of robots

Bibi van den Berg
Tilburg University
Tilburg Institute for Law, Technology and Society (TILT)
✉ bibi.vandenberg@tilburguniversity.edu

Abstract In the field of Law & Technology, scholars investigate the legal and regulatory consequences of the advent of new technologies, for example with respect to ICTs, biotechnologies, nanotechnologies, or neurotechnologies. It is important to investigate whether technological developments in these fields require adjustments in existing legal frameworks, and whether technological developments themselves need to be regulated. Moreover, in Law & Technology scholars also investigate the ways in which technological artefacts can be used *to regulate*. This is called 'techno-regulation'.

This paper has two goals. First, I will analyse the concept of techno-regulation and propose that it needs to be broadened. Techno-regulation focuses on the *intentional* influencing of human behaviour through the implementation of values, norms and rules into technological artefacts. However, extensive research in various disciplines has revealed that the design (shape, form, functionality) of technological artefacts greatly affects users' tacit and implicit responses to these artefacts. Since this has direct relevance to the theme of regulation, I propose to widen the reach of techno-regulation by speaking of 'techno-elicitation' instead.

In the second part of this paper, I focus my discussion of techno-regulation and techno-elicitation on the design of robots, which is relatively uncharted territory in the field of Law & Technology.

Keywords robots, techno-regulation, techno-elicitation, social responses, philosophy of design

Introduction

In the previous decades Law & Technology has become an established domain of legal scholarship. This field builds on the realisation that the advent and proliferation of new technologies has an impact on existing legal systems, and affects central (regulatory) values in societies. Hence, technological developments require a response from regulators and legal scholars. In order to find out precisely what response is needed – which of course varies from one technology to the next, and from one institutional, legal and economic system to the next – Law & Technology asks questions such as: What is the impact of technological developments on existing forms of regulation and (bodies of) law? Should the development of new technologies, for example information and communication technologies (ICTs),

biotechnologies, or nanotechnologies, be regulated, and if so, in which ways, or through which means?

The field of Law & Technology has two main areas of focus: the regulation *of* technologies, and regulation *through* technologies. I will discuss these in turn.

Regulation *of* technologies

The majority of research in Law & Technology focuses on the question of whether new technologies require changes to existing legal frameworks, and/or whether the development and proliferation of these new technologies raises new legal problems. Each new technology raises new sets of behaviours, new risks, and new practices of use, and hence legal scholars and governing bodies must investigate whether the use or application of such technologies has consequences that may fall outside existing legal frameworks. The scope of this area of research is vast. To give a few examples, it ranges from studying the effects of the use of information and communication technologies (ICTs) on citizens' privacy, to studying the validity and reach of intellectual property law and patent law in light of the advent of biotechnologies, to investigating the legal consequences of applying neurotechnologies and technologies for human enhancement in various social domains. In all cases researchers focusing on the regulation of technologies ask the following questions:

1. What are the effects, risks, opportunities and dangers resulting from the advent of new technologies, both in direct and in more indirect (or implicit) senses?
2. In which ways, and to which degrees, do existing legal frameworks provide sufficient protection against the possible problems, risks and dangers that may arise in the slipstream of these developments?
3. If legal frameworks are found to provide insufficient protection in one or more areas, then how can these frameworks be adjusted, so as to solve the problem?
4. And finally, especially in the case of technological developments that are considered inherently dangerous or risky, should the development of specific technologies as such be regulated, or the institutional or organisational environment into which they will enter, so as to ensure as safe an application as possible?

Asking and answering these questions, it is important to note, is always, and principally, a *contextual* enterprise. As Bert-Jaap Koops writes:

> Questions of technology regulation always have to take into account the location both of the technology and regulatory attempts, so that relevant socio-cultural, legal, economic, and institutional factors associated with that place can be factored in. (Koops, 2008, p. 314)

Regulation *through* technologies

As said, the majority of scholars in the field of Law & Technology study questions surrounding the regulation *of* technologies. Increasingly, however, a second domain of focus is gaining prominence: that of regulation *through* technologies. Lawrence Lessig has famously argued that technologies can also be used *to regulate*, i.e. to steer and guide the behaviour of individuals (Lessig, 2006). This has come to be known as 'design-based regulation' (Brownsword & Yeung, 2008) or 'techno-regulation' (Brownsword, 2008; Leenes, 2010). Techno-regulation studies the ways in which technologies can be used as regulatory tools (Brownsword & Yeung, 2008), i.e. as a means to influence the behaviours of individuals by implementing regulatory values, norms and standards into technological devices (Koops, 2008). Note that for scholars in Law & Technology 'regulation' relates to the *intentional* influencing of human behaviour. This means that techno-regulation, to them, revolves around the ways in which regulators – be they governments or industry or any other party – may attempt to evoke behaviours in regulatees through the intentional implementation of norms and standards into technological artefacts. Below I will question this exclusive focus on intentional influencing. For now, however, let's look at some examples of techno-regulation to shed light on its meaning and role in various social contexts.

One of the most oft-cited examples of techno-regulation is that of the use of speed bumps in traffic (Brownsword, 2008; Latour, 1992; Leenes, 2010; Yeung, 2008). Speed bumps are only one means of ensuring that drivers will adhere to a designated maximum speed in a certain area. Regulators can also choose to use traffic signs to the same end. However, the use of a speed bump regulates the driver's speed in a much more direct, and binding, way: a speed bump leaves much less room for being 'disobedient' than using traffic signs. After all, driving over a speed bump at high speed is physically uncomfortable and may damage the driver's car. Driving past a traffic sign at high speed does not affect the driver directly in this way. Hence, when using a speed bump chances are that drivers will be much more inclined to adhere to the traffic rules than when using a traffic sign. *By* design and *through* design speed bumps encourage drivers to stay within the speed limits set by a regulator.

Another example of techno-regulation is that of the use of DVD region codes. DVDs, Leenes writes "*generally contain various mechanisms of Digital Rights Management, which*

define what a user can and cannot do with the DVD"[183] (Leenes, 2010, p. 11). Media industries have divided the globe into nine different regions, so that DVDs can be marketed with different content, for different prices, and with different release dates in each region (Leenes, 2010). DVDs that work in one region, say Europe (region 2), will not play on DVD players in another, say the US (region 1), and vice versa. This is a clear example of regulation *through* technology – the software in the machine, and the code on the disc, jointly ensure that viewers can only watch those DVDs they are 'allowed' to watch, according to the industry's regulatory plans. Leenes writes: "*The technology enforces adherence to the rules by means of the software that is implemented into the machine. The enforcement is (almost) perfect.*" (Leenes, 2010, p. 11)

These two examples show that techno-regulation focuses on implementing rules, values, norms and standards *into the architecture*, or *code* in the case of software, of the artefact itself, thus ensuring that obeiance to laws and regulations is obtained. Morgan and Yeung write: "*code-based (or architecture-based) techniques* [seek] *to eliminate undesirable behaviour by designing out the possibility for its occurrence*" (Morgan & Yeung, 2007, p. 102). Or in the words of Brownsword:

> …techno-regulation […] functions in such a way that regulatees have no choice at all but to act in accordance with the desired regulatory pattern – it is the difference, for example, between systems that make it physically impossible to exit the Underground (or Metro) without a valid ticket and low level barriers that make it more difficult (but not impossible) to do so… (Roger Brownsword, cited in Morgan & Yeung, 2007, p. 103)

Note that not just the specific form of regulation implemented into a technological artefact, but also the level of *regulability as such* is a design choice: "*Different code makes differently regulable* [technologies]. *Regulability is thus a function of design.*" (Lessig, 2006, p. 34)

Techno-elicitation: Widening the reach of Law & Technology

In the previous section I argued that scholars in the field of techno-regulation focus primarily on the *intentional* influencing of human behaviour through the design of technologies. This applies, first and foremost, to those investigating the ways in which

---

[183] Translated by the author.

technologies can/ought to be regulated, but also to those focusing on techno-regulation.[184] In itself this is not surprising. After all, lawyers and regulators seek to find ways to explicitly channel behaviour, to keep it within the boundaries of the law. Therefore, 'regulation', to legal scholars, means "*the intentional influencing of someone's or something's behaviour*" (Koops, 2008). What this entails, however, is that *un*intentional forms of influencing, which may arise for example as a side-effect in the design of technologies, or forms of influencing that may steer individuals in more implicit ways, largely fall outside the scope of (techno-)regulation research.

To my mind, this omission is unfortunate, and in this paper I will explain why this is so. I argue that it would be good to increase the scope of research on techno-regulation beyond intentional influencing alone, because human behaviour is often strongly shaped, steered and affected in more subtle, implicit, and even unconscious ways by technological artefacts as well. Over the past decades a significant corpus of research in different disciplines, including engineering, computer science, human-computer interaction (HCI), human-robot interaction (HRI), science and technology studies (SST), and philosophy of technology, has consistently shown just how ubiquitous and important the *unintended*, *implicit* and *automatic* elicitation of human behaviours is in relation to technological artefacts. Technologies have been shown to have 'persuasive powers' (Fogg, 2003), which sometimes may be designed into them explicitly, but sometimes also operate in more subtle ways. Moreover, technologies contain 'scripts' (Akrich, 1992; Gjøen & Hård, 2002; MacKenzie & Wajcman, 1999; Oudshoorn & Pinch, 2003; Oudshoorn, Rommes, & Stienstra, 2004; Van den Berg, 2008, 2010), which delineate their use space, and invite certain types of behaviour, while constraining others (Hildebrandt, 2008a, 2008b; Latour, 1992; Winner, 1980). Or in different terms, technologies 'afford' certain actions, and restrict other behaviours, and hence implictly shape the behaviours of users (Gaver, 1991, 1996; Gibson, 1986; McGrenere & Ho, 2000).

What's more, research has also shown that human beings have strong tendencies to 'anthropomorphise' technologies (Bartneck, Kulic, Croft, & Zoghbi, 2009; Duffy, 2003; Nass, Steuer, Tauber, & Reeder, 1993; Turkle, 1984), to ascribe intentions and agency to these inanimate objects. This applies even to quite 'simple' artefacts, which do not display complex

---

[184] While legal scholars writing on techno-regulation often acknowledge explicitly that technological artefacts may also *unintentionally*, *subtly*, and *implicitly* regulate human behaviour as well (see for example Brownsword, 2008; Leenes, 2010; Yeung, 2008), their work focuses on the *intentional* influencing of human behaviour through design.

or very varied patterns of behaviour. One of the most famous examples to show how easy it is to invoke a tendency to anthropomorphise in humans is Joseph Weizenbaum's computer program ELIZA, which mimicked the behaviours of a Rogerian psychoanalyst (Weizenbaum, 1966). ELIZA consisted of a simple textual interface, through which individuals could 'converse' with this virtual therapist. The program used a limited set of conversion rules to turn users' phrases into questions, thus invoking the idea that the 'therapist' followed up on whatever they shared with a next question. Weizenbaum was shocked to find out how convincing his program turned out to be, i.e. how strongly users anthropomorphised this simple software program. He said:

> I was startled to see how quickly and very deeply people conversing with [ELIZA] became emotionally involved with the computer and how unequivocally they anthropomorphized it. Once my secretary, who had watched me work on the program for many months and therefore surely knew it to be merely a computer program, started conversing with it. After only a few interchanges with it she asked me to leave the room. Another time, I suggested I might rig the system so that I could examine all the conversations anyone had had with it, say, overnight. I was promptly bombarded with accusations that what I proposed amounted to spying on people's most intimate thoughts; clear evidence that people were conversing with the computer as if it were a person who could be appropriately and usefully addressed in intimate terms. (Joseph Weizenbaum, quoted in Kerr, 2004, p. 305)

Note that it is not just computer technologies that easily evoke anthropomorphisation. Philosopher of technology Don Ihde reminds us that at times we also tend to 'animate' cars, almost approaching them as if they are a kind of 'spirited horse', and that we 'compete' with virtual characters in video games as if they were real others (Ihde, 1990; also see Verbeek, 2005).

Yet another branch of research has shown that, at times, we even respond to technological artefacts in *social* and *emotional* ways (Breazeal, 2002; Dautenhahn, 2007; Dautenhahn, Bond, Canamero, & Edmonds, 2002; Picard, 1997; Turkle, 2007). This has led to a number of research initiatives investigating what exactly triggers such social or emotional responses to machines in humans – not only to, for example robots, but also to computers and televisions. Quite contrary to what one might expect Reeves and Nass' extensive research in this domain consistently reveals that humans, in fact, need only very minimal cues to invoke them. Even machines that do not even remotely look human (e.g., ordinary desktop computers), or display complicated behaviours (e.g., relatively simple software programs) evoke basic social mechanisms, such as a sense of politeness or of teamwork in users (Reeves & Nass, 1996).

Over the years, many explanations have been given for all of these implicit human responses to technological artefacts. Most often, these tendencies are explained by referring to our species' evolutionary 'social hardwiring': because we are social, emotional beings

through and through, we automatically use our repertoire of social and emotional responses in our interactions with technological artefacts (Nass & Moon, 2000; Nass, Steuer, & Tauber, 1994; Picard, 1997; Reeves & Nass, 1996).

What this vast body of research from various disciplines consistently shows, then, is that through their design technological artefacts may influence the behaviours of human beings in a variety of subtle, and implicit ways. This is relevant to those interested in techno-regulation as well. While users may sometimes be aware of technologies' powers of influence [read: regulatory powers], and may consciously accept or reject such regulation, apparently humans' behaviours can also be influenced [read: regulated] in more implicit and tacit ways. Perhaps, then, the scope of research on techno-regulation so far has been too narrow and ought to be widened, to include both intentional influencing and more tacit forms thereof. I propose to do just that, by replacing the notion of 'techno-regulation' with what I call 'techno-elicitation'. Techno-elicitation relates to *all forms of evoking human behaviour through technological design*. It is a scale of responses in users, running from explicit and conscious ones to implicit, and tacit evocations.

Users and designers

So far, in this article we've focused on the role technologies may play in either intentionally or implicitly influencing users. Techno-elicitation covers the entire range of behaviours users may display in response to (influences of) technological artefacts. However, studies have also shown that it is not just *users*' responses to the affording and constraining powers of technologies that are often implicit and tacit. Research in Science & Technology Studies (Akrich, 1995; Oudshoorn & Pinch, 2003), Actor Network Theory (Latour, 1992, 2005; Latour & Venn, 2002), value-sensitive design (Friedman, 1997; Friedman & Kahn Jr., 2006; Friedman, Kahn Jr., & Borning, 2002), and philosophy of design (Kroes, Light, Vermaas, & Moore, 2009; Verbeek, 2005) consistently reveals that *designers*, too, are often unaware of values, norms and stereotypes they embed into the artefacts they create. In many cases designers use implicit user models in the design process. Van Oost illustrated this in research on the values embedded into male and female shavers, which tacitly reflect ideas on gender differences: male shavers are grey and black, contain dials and screws, can be opened up and taken apart. Female shavers, in contrast, come in pastel colours, have smooth and curvy shapes, lack dials and switches, and cannot be taken apart (Van Oost, 2003). These differences are based on tacit assumptions on the part of he designers, Van Oost says, and they reflect stereotypical ideas on gender and technology use: men like technologies, and therefore want a shaver that looks as 'technological' as possible, whereas women are afraid of technology, and hence prefer shavers that look more like a cosmetics product than a technological artefact. Van Oost concludes:

...the gender script of the [female shaver] inhibits [...] the ability of women to see

409

themselves as interested in technology and as technologically competent, whereas the gender script of the [males shavers] invites men to see themselves that way. In other words: Philips [, the manufacturer,] not only produces shavers but also gender. (Van Oost, 2003p. 207)

One of the key findings in Van Oost's research was that the designers themselves were not aware of the fact that they had embedded stereotypical values into their design. One explanation why such value-embedding may easily be tacit and implicit in designers is what Oudshoorn has called 'I-methodology' (Oudshoorn & Pinch, 2003), i.e. designers' tendency to take themselves, their own needs, attitudes, preferences and capacities, as the main point of reference in design (Van den Berg, 2010).

What this reveals is that the concept of techno-elicitation, as we've defined it so far – focusing only on the user side – is still too narrow. Techno-elicitation, we must conclude, is a spectrum running from *intentional* and *explicit* evocation on one end (techno-regulation), to *implicit*, *accidental* and *unintentional* elicitation on the other (scripts, animism etc.), and it holds for both the *users* and the *designers* of technological artefacts. To complicate things further, different technologies all have their own medium-specific characteristics, which means that different technologies lead to different forms of techno-elicitation. In order to shed light on the workings of techno-elictation we need to investigate its occurrences and effects in different technological domains, then. In the second part of this article I will attempt to do so by focusing on regulation and robotics.

Regulating robotics

As we saw at the beginning of this article, technological developments require scrutiny on the part of legal scholars, to investigate whether laws and regulations need adjustment, to determine whether their design and/or proliferation needs to be regulated, and to come to an understanding of the regulatory powers of these technologies. Against this background, legal scholars have also turned to regulatory questions surrounding the advent of (increasingly) autonomous technologies, robotics and artificially intelligent machines. In fact, they were surprisingly early to realise that the creation of such intelligent, autonomously operating artefacts needed to be evaluated critically from a legal point of view as well. The earliest articles written in this field date from the beginning of the 1980s – a time when the realisation of artificially intelligent machines was a distinctly more remote possibility than it is today. Since that time, a serious body of literature has been created on the legal issues that may arise in a world inhabited by robots (as well as people).

In this body of literature, legal scholars have largely focused on three key themes: liability, the legal status of robots, and rights for robots. First of all, the advent of robotic and autonomous technologies raises questions regarding *liability* when things go wrong: who is responsible for a robot's behaviours? Do robots fall under product liability, and hence can we

hold manufacturers responsible for the damage they may cause? Or should robots be considered a special type of products, for whose behaviours producers cannot be held responsible, because, for example, their machinery is so complex that their behaviours will be inherently unpredictable? Or because neural networks enable them to learn new things that nobody has programmed into them? Or because so many companies, individuals and groups contribute to the creation of these machines that it becomes impossible to hold one company, individual or group responsible for their behaviours (Wallach & Allen, 2009)?[185] One solution that legal scholars propose to keep responsibility in the hands of humans while acknowledging some sense of 'agency' in robots, is to use legal constructions such as those pertaining to parents and children, owners and their wild animals, principles and agents in commerce, or employers and employees, and apply these to liability issues surrounding robots. In this way, the owners of robots would be held responsible for any damage these machines may do (Lehman-Wilzig, 1981). What complicates the study of liability and robotics is that issues of liability vary greatly across domains of application: robotic cars may have different legal provisions (i.e. in traffic law) than robots for the household (i.e. consumer law), and those used in the warfare (i.e. international law). Moreover, laws on liability vary from country to country, which further complicates the study of liability issues in the domain of robotics.[186]

A second domain of study in law and robotics relates to the question of the *legal status* of robots and other intelligent and/or autonomous machines. The central question here is: should robots be given a legal status, other than being a mere object, and hence become 'legal persons', and if so, what are the requirements they should meet in order to be granted such a status? Granting robots (or any other nonhumans) with legal status, and calling them a legal person, may seem counter-intuitive to non-lawyers at first, but in fact, several authors point out that legal personhood certainly isn't reserved for humans only (Calverley, 2008; Koops, Hildebrandt, & Jaquet-Chiffelle, 2009; Solum, 1992). Koops, Hildebrandt and Jacquet-Chiffelle write: "*In most modern legal systems, legal personhood is attributed to associations, funds or even ships*" (Koops et al., 2009, p. 9), and companies, trusts and other collectives are also recognised as legal persons by most legal systems. All of these (nonhuman) entities are treated as separate, autonomous entities by the law, rather than as an aggregate of the people that make up these entities, or as a collection of people behind them (Calverley, 2008;

---

[185] Also see Wendell Wallach's article in this volume.

[186] Chiara Boscarato's article in this volume discusses liability and robotics under Italian law.

Solum, 1992). Moreover, who or what counts as a legal person turns out to be a rather changeable, fluid category when viewed from a historical perspective. For centuries all sorts of nonhumans have played a role in Western law, from which we have recently eliminated them. For instance, there is a long series of animal species that have been tried in court throughout history, ranging from donkeys and beetles to rats, grasshoppers, dolphins and eels (Teubner, 2006). In a famous case the rats were exonerated on the grounds that it was impossible to set a date for their appearance before the judge (Teubner, 2006). Certain buildings, such as Roman temples and Medieval churches also used to have legal rights in various cultures of the past (Solum, 1992). And it is not just animals and structures that have figured in legal cases throughout history – so have all sorts of ghosts and gods, and a wide variety of other visible and invisible 'influences' (allegedly) affecting everyday life. More importantly, we also need to consider the fact that a significant portion of *human beings* today have rights that up until very recent times did not. Think for instance of women (Magnani, 2007), slaves (Lehman-Wilzig, 1981), children, foreigners and refugees, or people with disabilities or mental illnesses. These examples show that the category of legal personhood is not set in stone. At different times, different entities have been considered as legal persons or not. According to legal scholars, this means that we ought to at least consider the question of applying the term 'legal person' to robots, and to autonomously operating or artificially intelligent machines as well.

A third theme in research on robotics and regulation revolves around the question of *legal rights for robots* (Teubner, 2006). The debate in this area mainly focuses on comparisons between humans, as full bearers of rights, animals, as bearers of some rights in certain jurisdictions, and machines, which up until this point in time do not have rights. Deciding whether or not to grant such rights, Solum argues, would depend on both the rights themselves (e.g., the right to freedom of expression or the right to emancipation) and on the justification used for granting that right (Solum, 1992).

One line of reasoning for *withholding* all constitutional rights from autonomous, smart technologies without further justification is to claim that such rights can be given only to humans, full stop. Solum calls this the 'anthropocentric argument', which comes down to saying "*We are humans. Even if* [artificially intelligent machines] *have all the qualities that make us moral persons, we shouldn't allow them the rights of constitutional personhood because it isn't in our interest to do so*" (Solum, 1992, p. 1260). Although this may sound intuitive and express deeply held feelings by many, Solum rightly points out that this is a very shady moral argument, "*akin to American slave owners saying that slaves could not have constitutional rights simply because they were not white or simply because it was not in the interests of whites to give them rights*" (Solum, 1992, p. 1261). An even more dubious version of this argument is the 'paranoid anthropocentric argument', which claims that we should not give these nonhumans rights because they might become so powerful they would take over the world. This is an argument we should not take seriously at all, says Solum, because

…the danger seems remote, but if the danger were real it would not be an argument against granting [artificially intelligent machines] legal personhood. If [these machines] really will pose a danger to humans, the solution is not to create them in the first place. (Solum, 1992, p. 1261)

It appears, then, that at least in theory we cannot rule out that robots and other artificially intelligent machines may one day acquire legal status and be given legal rights in some form or other, that is, if they meet the requirements placed on humans and some nonhumans to qualify for these matters.

Techno-regulation and robots: Uncharted territory

The reader may have noticed that all three of the research themes discussed above fall within the domain of 'regulation *of* technologies' that I discussed at the beginning of this article. They all focus on the question of how advances in robotics fit within existing regulatory frameworks and bodies of law, and whether changes are required in those frameworks and bodies of law to meet the new social and legal demands created by the advent of such technologies. Alternatively, they focus on questions regarding the need (or lack thereof) or regulating the development and deployment of robotics technologies.

Why would it be relevant to study questions of techno-regulation and techno-elicitation in relation to robotics in the first place? I will answer this question by discussing two domains of application in robotics: healthcare and the military.

Robots in healthcare

A recent OECD report on healthcare spending stated that "*in all OECD countries total spending on healthcare is rising faster than economic growth*." (OECD, 2010). The World Health Organization (WHO) warns that while life expectancy is increasing, simultaneously birth rates are decreasing in most countries (WHO, 2010). This challenges existing healthcare systems: more people need healthcare services, yet fewer humans are available to provide those services.

One area of research and business rapidly developing to face this challenge is that of *healthcare robotics*. Healthcare robots, or 'carebots', could conduct various care tasks, such as delivering medication and food, monitoring, lifting or transporting patients, and providing companionship. Healthcare robots can also be used for therapeutic ends. Interaction with

robotic pets, such as Sony's AIBO[187] or the robot seal Paro[188], has been empirically shown to have a positive effect on the activity and social interaction levels in elderly people, to improve patients' moods, and to reduce stress levels and loneliness (Banks, Willoughby, & Banks, 2008; Broekens, Heerink, & Rosendal, 2009; Stiehl et al., 2005; Wada & Shibata, 2008; Wada, Shibata, Mushi, & Kimura, 2008).

Applying robots in care practices for the elderly and the sick also has a wide range of ethical consequences. In recent years a number of studies have been conducted on the ethical aspects of the application of robots in healthcare situations (Borenstein & Pearson, 2010; Coeckelbergh, 2009; Tiwari, Warren, & Day, 2010)[189]. These focus on, for instance, qualitative differences between care provided by humans and by robots, on the way the central values of our healthcare system, and our ideas on care, are affected by the application of healthcare robots, and on the requirements – both social, practical, emotional and ethical – that robots must meet if we are to allow them to care for our elderly and sick.

Yet studying the ethical aspects of applying robots to healthcare situations alone is not enough. Precisely because socially and emotionally complex contexts in which healthcare robots must operate, caring for patients in vulnerable situations, we must also elucidate the ways in which the design of healthcare robots, in terms of their physical form and functionalities, has a bearing on the behavioural responses they may elicit. As we have seen in this article, such behavioural responses may be evoked explicitly and intentionally, but also more implicitly and perhaps at times even unintentionally on the part of the designer. Moreover, users may be explicitly aware of the fact that certain behaviours are invoked by (the design of) healthcare and other robots, yet they may also be so subtle that they escape users' awareness.

Investigating the consequences of explicit (regulatory) design choices with respect to these machines is important for two reasons. First, it increases our ability to develop robots that uphold central values in healthcare practices, such as respecting patients' autonomy, privacy and integrity. Second, it contributes to defining the role, meaning and ethical 'bearing' of healthcare robots. Since technologies "*are by definition value-laden systems and designing such systems is, by definition, a value-laden activity*" (Kroes et al., 2009, p. 13), explicating (regulatory) design choices can contribute to designing legally, socially and ethically sound

---

[187] See http://support.sony-europe.com/aibo/index.asp

[188] See http://www.parorobots.com/.

[189] Also see Aimee Van Wynsberghe's article in this volume.

healthcare robots.

Robots in warfare

Research and development of robots for military purposes – both surveillance and warfare – has sped up and expanded more than any other area of in robotics in recent times. A significant number of robots is currently participating in the war in Afghanistan, in a variety of roles, ranging from finding explosives to patrolling the skies. While human beings are still always 'in the loop' when it comes to making final decisions in combat and in surveillance today, several researchers suggest that we are rapidly moving towards an era in which robot soldiers will engage in combat autonomously (Arkin, 2009; Krishnan, 2009; Singer, 2009). The fact that there is a wide range of thorny ethical and legal issues to be addressed has not gone unnoticed to these authors and others.[190] Debates run high regarding the question of a need for, and possibility of, implementing morality into robots[191] that participate in warfare, to turn them into 'ethical warriors', and of course, questions of liability, of international law (*jus in bello*), and of 'just wars' are on the agenda as well.

Many authors discuss the design and functionality that robot soldiers ought to have. What they implicitly say is that the design of these machines, the code we implement into them, has far-reaching consequences for the output, the behaviours they will generate in the real world. And now is the time to think about these matters: as developments in the creation of such machines are picking up speed. Or in the words of Lessig:

> Choices among values, choices about regulation, [and] about control […] – all this is the stuff of politics. Code codifies politics, and yet, oddly, most people speak of code as if it were just a question of engineering. Or as if code is best left to the market. Or best left unaddressed by government. […] How the code regulates, who the code writers are, and who controls the code writers – these are questions on which any practice of justice must focus… (Lessig, 2006, p. 78-79)

As with healthcare robots, here, too, the central aim is to generate discussion on the values we embed into machines, and the effects this may have in the settings in which they will be deployed. And here, too, studying the ethical aspects of applying robots to war is not

---

[190] Also see Andreas Matthias' article in this volume.

[191] For more on the foundations of building morality into machines, see the articles of Samir Chopra, Steve Torrance, and David Jablonka in this volume.

enough. Since military robots operate alongside human beings, the same types of implicit behavioural responses that have been discussed throughout this article also appear in soldiers in response to their interactions with such robots. Singer describes a clear case in point: during the war in Iraq, soldiers who had operated alongside a PackBot to find and dismantle explosives, became strongly emotionally attached to this machines, and were deeply saddened when one bad day it was blown up by a roadside bomb. They had named the robot Scooby-Doo, and had gone through so many difficult missions with it, in which it saved their lives a number of times. The soldiers were "*very upset*" when they learnt that it could not be repaired (Singer, 2009, p. 338). Singer writes:

> …while new technologies are breaking down the traditional soldierly bonds, entirely new bonds are being created in unmanned wars. People, including the most hardened soldiers, are projecting all sorts of thoughts, feelings, and emotions onto their new machines, creating a whole new side to the experience of war. […] Soldiers […] are truly bonding with these machines. (Singer, 2009, p. 338)

This example shows that in the case of military robots, too, it is important to get a better understanding of the ways in which the design of such robots may influence the behaviours of the individuals that have to work with it in the field. Both the functionality and physical shape of these machines must be taken into account to get a clearer grasp on the forms of techno-elicitation they invoke.

The same two reasons why it is important to investigate techno-elicitation in healthcare robots also apply to military robots, then. First, a better understanding of the workings of techno-elicitation in soldiers and other military personnel increases our ability to design and develop machines that meet their (all-to-human) social and emotional needs, and respect values such as comradery and teamwork in the army. Second, making implicit behavioural responses explicit, and designing these machines to meet actual needs and preferences, will lead to more socially and ethically attuned military robots.

Conclusion

In this article I set out to investigate some boundaries of the concept of 'techno-regulation', which is one of the key focal areas in Law & Technology. Techno-regulation focuses on the ways in which technologies can be used as regulatory tools, as instruments to intentionally steer and influence the behaviours of individuals. While I firmly believe in the enterprise of techno-regulation research as such, I have argued there is a need to widen the reach of this field of study, by also including implicit, tacit forms of influencing people's behaviours through technologies, and, moreover, to not only focus on the regulatory responses invoked in users, but also on the ways in which designers (sometimes intentionally, but often also tacitly) implement values, stereotypes and norms into

technologies. I have shown that developing a clearer conceptual understanding of the full range of techno-elicitation leads to a better grasp of techno-regulation as one of its manifestations, and this, in the process, consolidates the academic enterprise of Law & Technology.

In the second part of this chapter I have discussed regulation and robotics. After a discussion of the current legal debates in this field, I have used the design of robots in two different domains – healthcare and the military – as an empirical lens to contribute to a deeper understanding of the concept of 'techno-regulation' and other forms of behaviour elicitation. I conclude that a deeper understanding of the explicit and implicit regulatory powers of robots in these domains may contribute to more ethically, socially and legally sounds design of these machines.

References

Akrich, M. (1992). The de-scription of technical objects. In W.E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 205-224). Cambridge (MA): MIT Press.

Akrich, M. (1995). User representations: Practices, methods and sociology. In A. Rip, T.J. Misa, & J. Schot (Eds.), *Managing technology in society: The approach of constructive technology assessment* (pp. 167-184). London; New York (NY): Pinter Publishers.

Arkin, R.C. (2009). *Governing lethal behavior in autonomous robots*. Boca Raton: CRC Press.

Banks, M.R., Willoughby, L.M., & Banks, W.A. (2008). Animal-assisted therapy and loneliness in nursing homes: Use of robotic versus living dogs. *Journal of the American Medical Directors Association, 9*(3), 173-178.

Bartneck, C., Kulic, D., Croft, E., & Zoghbi, S. (2009). Measurement instruments for the anthropomorphism, animacy, likeability, perceived intelligence, and perceived safety of robots. *International Journal of Social Robotics, 1*(1), 71-81.

Borenstein, J., & Pearson, Y. (2010). Robot caregivers: Harbingers of freedom for all? *Ethics and Information Technology, 12*(3), 277-288.

Breazeal, C.L. (2002). *Designing sociable robots*. Cambridge, Mass.: MIT Press.

Broekens, J., Heerink, M., & Rosendal, H. (2009). The effectiveness of assistive social robots in elderly care: A review. *Gerontechnology Journal, 8*(2), 94-103.

Brownsword, R. (2008). So what does the world need now? Reflections on regulating technologies. In R. Brownsword & K. Yeung (Eds.), *Regulating Technologies: Legal*

futures, regulatory frames and technological fixes (pp. 23-49). Oxford: Hart.

Brownsword, R., & Yeung, K. (2008). Regulating technologies: Tools, targets and thematics. In R. Brownsword & K. Yeung (Eds.), *Regulating Technologies: Legal futures, regulatory frames and technological fixes* (pp. 3-23). Oxford: Hart.

Calverley, D.J. (2008). Imagining a non-biological machine as a legal person. *Artificial Intelligence & Society, 22*, 523-537.

Coeckelbergh, M. (2009). Health care, capabilities, and AI assistive technologies. *Ethical Theory and Moral Practice, 13*, 181-190.

Dautenhahn, K. (2007). Socially intelligent robots: Dimensions of human–robot interaction. *Philosophical Transactions of the Royal Society B, 362*(1480), 679-704.

Dautenhahn, K., Bond, A.H., Canamero, L., & Edmonds, B. (Eds.). (2002). *Socially intelligent agents: Creating relationships with computers and robots*. Boston, Mass.: Kluwer Academic Publishers.

Duffy, B.R. (2003). Anthropomorphism and the social robot. *Robotics and Autonomous Systems, 42*, 177-190.

Fogg, B.J. (2003). *Persuasive technology: Using computers to change what we think and do*. Amsterdam; Boston: Morgan Kaufmann Publishers.

Friedman, B. (1997). *Human values and the design of computer technology*. Stanford, Calif.; Cambridge; New York: CSLI Publications; Cambridge University Press.

Friedman, B., & Kahn Jr., P.H. (2006). Value sensitive design and information systems. In M.E. Sharpe (Ed.), *Human-Computer Interaction and Management Information Systems: Foundations* (pp. 348-372).

Friedman, B., Kahn Jr., P.H., & Borning, A. (2002). *Value sensitive design: Theory and methods*: University of Washington, Dept. of Computer Science & Engineering.

Gaver, W.W. (1991). *Technology Affordances*. Paper presented at the SIGCHI Conference on human factors in computing systems: Reaching through technology, New Orleans (LA).

Gaver, W.W. (1996). Affordances for interaction: The social is material for design. *Ecological Psychology, 8*(2), 111-129.

Gibson, J.J. (1986). *The ecological approach to visual perception*. Hillsdale (NJ): L. Erlbaum Associates.

Gjøen, H., & Hård, M. (2002). Cultural politics in actions: Developing user scripts in relation to the electric vehicle. *Science, Technology & Human Values, 27*(2), 262-281.

Hildebrandt, M. (2008a). A vision of ambient law. In R. Brownsword & K. Yeung (Eds.), *Regulating Technologies* (pp. 175-191). Oxford: Hart.

Hildebrandt, M. (2008b). Legal and technological normativity: More (and less) than twin sisters. *Technè, 12*(3), 169-183.

Ihde, D. (1990). *Technology and the lifeworld: From garden to earth*. Bloomington (IN): Indiana University Press.

Kerr, I.R. (2004). Bots, babes and the Californication of commerce. *University of Ottawa Law & Technology Journal*, 287-324.

Koops, B.-J. (2008). Criteria for normative technology: The acceptability of 'Code as law' in light of democratic and constitutional values. In R. Brownsword & K. Yeung (Eds.), *Regulating Technologies: Legal futures, regulatory frames and technological fixes* (pp. 157-175). Oxford: Hart.

Koops, B.-J., Hildebrandt, M., & Jaquet-Chiffelle, D.-O. (2009). *Bridging the accountability gap: Rights for new entities in the information society? [Deliverable 17.3]*: FIDIS - Future of Identity in the Information Society.

Krishnan, A. (2009). *Killer robots: Legality and ethicality of autonomous weapons*. Farnham, UK/Burlington, VT: Ashgate.

Kroes, P., Light, A., Vermaas, P.E., & Moore, S.A. (2009). *Philosophy and design: From engineering to architecture*. Dordrecht: Springer Science + Business Media B.V.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W.E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 225-259). Cambridge (MA): MIT Press.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford (UK); New York (NY): Oxford University Press.

Latour, B., & Venn, C. (2002). Morality and technology: The end of the means. *Theory, Culture & Society, 19*(5/6), 247-260.

Leenes, R. (2010). *Harde lessen: Apologie van technologie als reguleringsinstrument*. Tilburg: Universiteit van Tilburg.

Lehman-Wilzig, S.N. (1981). Frankenstein unbound: Towards a legal definition of Artificial Intelligence. *Futures, 13*(6), 442-457.

Lessig, L. (2006). *Code: Version 2.0* ([2nd ed.). New York: Basic Books.

MacKenzie, D.A., & Wajcman, J. (Eds.). (1999). *The social shaping of technology* (2nd ed.). Buckingham (UK); Philadelphia (PA): Open University Press.

Magnani, L. (2007). *Distributed morality and technological artifacts.* Paper presented at the Human Being in Contemporary Philosophy, Volgograd (Russia). Retrieved from http://www.volgograd2007.goldenideashome.com/2%20Papers/Magnani%20Lorenzo%20p.pdf.

McGrenere, J., & Ho, W. (2000). *Affordances: Clarifying and evolving a concept.* Paper presented at the Graphics Interface Conference, Montreal, Quebec (Canada). Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.153.8239&rep=rep1&type=pdf.

Morgan, B., & Yeung, K. (2007). *An introduction to law and regulation: Text and materials.* Cambridge, UK/New York: Cambridge University Press.

Nass, C.I., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues, 56*(1), 81-103.

Nass, C.I., Steuer, J., & Tauber, E.R. (1994). *Computers are social actors.* Paper presented at the Computer-Human Interaction (CHI) Conference: Celebrating Interdependence 1994, Boston (MA).

Nass, C.I., Steuer, J., Tauber, E.R., & Reeder, H. (1993). *Anthropomorphism, agency, and ethopoeia: Computers as social actors.* Paper presented at the Computer-Human Interaction (CHI) Conference 1993, Amsterdam (The Netherlands).

OECD. (2010). OECD Health Data 2010.

Oudshoorn, N., & Pinch, T.J. (2003). *How users matter: The co-construction of users and technologies.* Cambridge (MA): MIT Press.

Oudshoorn, N., Rommes, E., & Stienstra, M. (2004). Configuring the user as everybody: Gender and design cultures in information and communication technologies. *Science, Technology & Human Values, 29*(1), 30-63.

Picard, R.W. (1997). *Affective computing.* Cambridge (MA): MIT Press.

Reeves, B., & Nass, C.I. (1996). *The media equation: How people treat computers, television, and new media like real people and places*. Stanford (CA); New York (NY): CSLI Publications/Cambridge University Press.

Singer, P.W. (2009). *Wired for war: The robotics revolution and conflict in the twenty-first century*. New York: Penguin Press.

Solum, L.B. (1992). Legal personhood for Artificial Intelligences. *North Carolina Law Review, 70*, 1231-1288.

Stiehl, W.D., Lieberman, J., Breazeal, C., Basel, L., Lalla, L., & Wolf, M. (2005). Design of a therapeutic robotic companion for relational, affective touch, *2005 IEEE International Workshop on Robots and Human Interactive Communication* (pp. 408-415): IEEE.

Teubner, G. (2006). Rights of non-humans? Electronic agents and animals as new actors in politics and law. *Journal of Law and Society, 33*(4), 497-521.

Tiwari, P., Warren, J., & Day, K.J. (2010). Some non-technology implications for wider application of robots assisting older people. *Health Care and Informatics Review Online, 14*(1), 2-11.

Turkle, S. (1984). *The second self: Computers and the human spirit*. New York (NY): Simon and Schuster.

Turkle, S. (2007). *Evocative objects: Things we think with*. Cambridge (MA): MIT Press.

Van den Berg, B. (2008). Self, script, and situation: Identity in a world of ICTs. In S. Fischer-Hübner, P. Duquenoy, A. Zuccato & L. Martucci (Eds.), *The future of identity in the information society: Proceedings of the third IFIP WG 9.2, 9.6/11.6, 11.7/FIDIS International Summer School on the Future of Identity in the Information Society* (pp. 63-77). New York, NY, USA: Springer.

Van den Berg, B. (2010). *The situated self: Identity in a world of Ambient Intelligence*. Nijmegen: Wolf Legal Publishers.

Van Oost, E. (2003). Materialized gender: How shavers configure the users' femininity and masculinity. In N. Oudshoorn & T.J. Pinch (Eds.), *How users matter: The co-construction of users and technologies* (pp. 193-209). Cambridge (MA): MIT Press.

Verbeek, P.-P. (2005). *What things do: Philosophical reflections on technology, agency, and design*. University Park (PA): Pennsylvania State University Press.

Wada, K., & Shibata, T. (2008). Social and psychological influences of living with seal robots

in an elderly care house for two months, *6th International Conference of the International Society for Gerontology (ISG'08)*. Pisa (Italy).

Wada, K., Shibata, T., Mushi, T., & Kimura, S. (2008). Robot therapy for elders affected by dementia: Using personal robots for pleasure and relaxation. *IEEE Engineering in Medicine and Biology Magazine*, 53-60.

Wallach, W., & Allen, C. (2009). *Moral machines: Teaching robots right from wrong*. Oxford; New York: Oxford University Press.

Weizenbaum, J. (1966). ELIZA: A computer program for the study of natural language communication between man and machine. *Communications of the ACM, 9*(1), 36-45.

WHO. (2010). *Health topics: Ageing*, from http://www.who.int/topics/ageing/en/

Winner, L. (1980). Do artifacts have politics? *Daedalus, 109*, 121-136.

Yeung, K. (2008). Towards an understanding of design-based instruments. In R. Brownsword & K. Yeung (Eds.), *Regulating Technologies: Legal futures, regulatory frames and technological fixes* (pp. 79-109). Oxford: Hart.