Law, Regulation, and Technology: The Field, Frame, and Focal Questions

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The Oxford Handbook of Law, Regulation and Technology
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Print Publication Date: Jul 2017 Subject: Law, IT and Communications Law, Law and Society
Online Publication Date: Dec 2016 DOI: 10.1093/oxfordhb/9780199680832.013.1

Abstract and Keywords

This chapter introduces law, regulation, and technology as a rapidly developing field of research. It offers a frame for an ambitious set of scholarly inquiries by suggesting three connected themes for research, each evoking ideas of 'disruption': (1) technology's disruption of legal doctrine and its normative foundations; (2) its disruption of regulatory frameworks more generally, often provoking concerns about regulatory legitimacy; and (3) challenges in constructing regulatory environments that are 'fit for purpose' in light of rapid technological development and disruption. The chapter then outlines the Handbook's structure, reflecting on the core values that underpin the law and regulation of technology; the doctrinal questions posed by new technologies; and how regulatory governance processes and institutions have been shaped by technological innovation. The final section examines these issues across six key policy spheres for technological development. We conclude by reflecting on the future of research and education in the field.

Keywords: technology, law, regulation, governance, regulatory environment, disruption

LIKE any Oxford Handbook, the *Oxford Handbook of Law, Regulation and Technology* seeks to showcase the leading scholarship in a particular field of academic inquiry. Some fields are well-established, with settled boundaries and clearly defined lines of inquiry; others are more of emerging 'works-in-progress'. While the field of 'law and information technology' (sometimes presented as 'law and technology') might have some claim to be placed in the former category, the field of 'law, regulation, and technology'—at any rate, in the way that we characterize it—is clearly in the latter category. This field is one of extraordinarily dynamic activity in the 'world-to-be-regulated'—evidenced by the almost daily announcement of a new technology or application—but also of technological innovation that puts pressure on traditional legal concepts (of 'property', 'patentability', 'consent', and so on) and transforms the instruments and institutions of the regulatory enterprise itself.

The breathless pace and penetration of today's technological innovation bears emphasizing. We know that, for example, so long as 'Moore's Law'—according to which the number of transistors in a dense integrated circuit doubles approximately every two years—continues to obtain, computing power will grow like compound interest, and that this will have transformative effects, such as the tumbling costs of sequencing each human's genome while the data deluge turns into an (p. 4) ever-expanding data ocean. Yet, much of what contemporary societies now take for granted—particularly of modern information and communication technologies—is of very recent origin. It was only just over twenty years ago that:

> Amazon.com began …, letting people order through its digital shopfront from what was effectively a warehouse system. In the same year, eBay was born, hosting 250,000 auctions in 1996 and 2m in 1997. Google was incorporated in 1998. The first iPod was sold in 2001, and the iTunes Store opened its online doors in 2003. Facebook went live in 2004. YouTube did not exist until 2005
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> (Harkaway 2012: 22).

As Will Hutton (2015: 17) asserts, we surely stand at 'a dramatic moment in world history', when our children can expect 'to live in smart cities, achieve mobility in smart transport, be powered by smart energy, communicate with smart phones, organise [their] financial affairs with smart banks and socialise in ever smarter networks.' If Hutton is correct, then we must assume that law and regulation will not be immune from this pervasive technological smartness. Those who are associated with the legal and regulatory enterprise will be caught up in the drama, experiencing new opportunities as well as their share of disruptive shocks and disturbances.

In this context of rapid technological change, the contours of legal and regulatory action are not obvious, nor are the frames for analysis. This Introduction starts by constructing the field for inquiry—law, regulation and technology—reflecting on key terms and exploring the ways in which we might frame our inquiries and focal issues for analysis. We suggest that the Handbook's chapters raise fundamental questions around three general themes coalescing around the idea of 'disruption': (1) technology's disruption of legal orders; (2) the wider disruption to regulatory frameworks more generally, often provoking concerns about regulatory legitimacy; and (3) the challenges associated with attempts to construct and preserve regulatory environments that are 'fit for purpose' in a context of rapid technological development and disruption. We then explain the structure and the organization of the Handbook, and introduce the concepts and contributions in each Part. Finally, we offer some concluding thoughts about this burgeoning field of legal research, including how it might inform the work of lawmakers, regulators, and policy-makers, and about its potential spread into the law school curriculum.

1. The Field and its Terminological Terrain

In the early days of 'law and technology' studies, 'technology' often signalled an interest in computers or digital information and communication technologies. (p. 5) However, the most striking thing about the field of technology, as constructed in this Handbook, is its breadth. This is not a Handbook on law and regulation that is directed at a particular stream or type of technology—it is not, for example, a handbook on *Law and the Internet* (Edwards and Waelde 1997) or *Information Technology Law* (Murray 2010) or *Computer Law* (Reed 1990) or *Cloud Computing Law* (Millard 2013) or *The Regulation of Cyberspace* (Murray 2007); nor is it a handbook on *Law and Human Genetics* (Brownsword, Cornish, and Llewelyn 1998) or on *Innovation and Liability in Biotechnology* (Smyth and others 2010), nor even on *Law and Neuroscience* (Freeman 2011) or a handbook on the regulation of nanotechnologies (Hodge, Bowman, and Maynard 2010). Rather, this work covers a broad range of modern technologies, including information and communication technologies, biotechnologies, neurotechnologies, nanotechnologies, robotics, and so on, each of which announces itself from time to time, often with a high-level report, as a technology that warrants regulatory attention.

However, it is not just the technology wing of the Handbook that presupposes a broad field of interest. The law and regulation wing is equally widely spanned. The field of inquiry is not restricted to interest in specific pieces of legislation (such as the UK's Computer Misuse Act 1990, the US Digital Millenium Copyright Act 1998, the EU General Data Protection Regulation 2016, or the Council of Europe's Oviedo Convention[1], and so on). Nor is this Handbook limited to assessing the interface between a particular kind of technology and some area or areas of law—for example, the relationship between world trade law and genetic engineering (Wüger and Cottier 2008); or the relationship between remote sensing technologies and the criminal law, tort law, contract law, and so on (Purdy 2014). It is also about the ways in which a variety of norms that lack 'hard' legal force, arising nationally, internationally, and transnationally (and the social and political institutions that support them), can be understood as intentionally seeking to guide and direct the conduct of actors and institutions that are concerned with the research, development, and use of new technologies. Indeed, regulatory governance scholars are inclined to claim that, without attending to this wider set of norms, and the institutional dynamics that affect how those norms are understood and applied, we may fail to obtain a realistic account of the way in which the law operates in any given domain. So, on both wings—that of law and regulation, as well as that of technology—our field of inquiry is broadly drawn.

The breadth of the field covered in this volume raises questions about what we mean by 'law', and 'regulation', and 'technology', and the title of the Handbook may imply that these are discrete concepts. However, these are all contested and potentially intersecting concepts, and the project of the Handbook would lose conceptual focus if we were to adopt conceptions of the three titular concepts that reduce the distance between them. For example, if 'law' is understood broadly, it may swallow up much of what is typically understood as 'regulation'; and, because both law and regulation display strong instru-

mental characteristics (they can be construed as means to particular ends), they might themselves be examples of a 'technology'. (p. 6) Not only that, turning the last point on its head, it might be claimed that when the technology of 'code' is used, its regulative effect itself represents a particular kind of 'law' (Lessig 1999).

One possible response to these conceptual puzzles is simply to dismiss them and to focus on more practical questions. This is not to dismiss conceptual thinking as unimportant; it is merely to observe that it hardly qualifies as one of the leading global policy challenges. If humans in the developing world are denied access to decent health care, food, clean water, and so on, we must ask whether laws, regulations, and technologies help or hinder this state of affairs. In rising to these global challenges, it makes no real practical difference whether we conceive of law in a restricted Westphalian way or in a broad pluralistic way that encompasses much of regulatory governance (see, for example, Tamanaha 2001); and it makes no practical difference whether we treat 'law' as excluded from or included within the concept of 'technology'.

However, for the purpose of mapping this volume's field of inquiry, we invited contributors to adopt the following definitions as starting points in reflecting on significant facets of the intersection between law, regulation, and technology. For 'law', we suggested a fairly conventional, state-centric understanding, that is, law as authoritative rules backed by coercive force, exercised at the national level by a legitimately constituted (democratic) nation-state, and constituted in the supranational context by binding commitments voluntarily entered into between sovereign states (typified by public international law). In the case of 'regulation', we invited contributors to begin with the definition offered by Philip Selznick (1985), and subsequently refined by Julia Black as 'the intentional use of authority to affect behaviour of a different party according to set standards, involving instruments of information-gathering and behaviour modification' (2001). On this understanding of regulation, law is but one institution for purposively attempting to shape behaviour and social outcomes, but there may be many other means, including the market, social norms, and technology itself (Lessig 1999). Finally, our working definition of 'technology' covers those entities and processes, both material and immaterial, which are created by the application of mental and/or physical effort in order to achieve some value or evolution in the state of relevant behaviour or practice. Hence, technology is taken to include tools, machines, products, or processes that may be used to solve real-world problems or to improve the status quo (see Bennett Moses, this volume).

These working definitions are intended merely to lay down markers for examining a broad and intersecting field of research. Debates over these terms, and about the conceptualization of the field or some parts of it, can significantly contribute to our understanding. In this volume, for example, Elizabeth Fisher examines how understandings of law and technology are being co-produced in the field of environmental law, while Han Somsen argues that the current era of technology-driven environmental change—the Anthropocene—presses us to reconceive our understandings of environmental law. Conceptual inquiries of this kind are important. (p. 7) Accordingly, although the contents of this Handbook require a preliminary frame of reference, it was not our intention either to pre-

scribe closely circumscribed definitions of law, regulation, or technology, or to discourage contributors from developing and operating with their own conceptual schemes.

2. The Frame and the Focus

Given the breadth of the field, one might wonder whether there is a unifying coherence to the various inquiries within it (Bennett Moses 2013). The short answer is, probably not. Any attempt to identify an overarching purpose or common identity in the multiple lines of inquiry in this field may well fail to recognize the richness and variety of the individual contributions and the depth of their insights. That said, we suggest that the idea of 'disruption' acts as an overarching theme that frames scholarly inquiries about the legal and regulatory enterprise in the face of technological change. This section examines three dimensions of this overarching theme—legal disruption, regulatory disruption, and the challenge of constructing regulatory environments that are fit for purpose in light of technological disruption. The 'disruptive' potential of technological innovation is arguably most familiar in literature concerned with understanding its microeconomic effects on established market orders (Leiser and Murray, this volume). Within this literature, Clayton Christensen famously posited a key distinction between 'sustaining innovations', which improve the performance of established products along the dimensions that mainstream customers in major markets have historically valued, and 'disruptive technologies', which are quite different: although they typically perform poorly when first introduced, these new technologies bring a very different value proposition and eventually become more mainstream as customers are attracted to their benefits. The eventual result is that established firms fail and new market entrants take over (Christensen 1997: 11). As the contributions to this volume vividly demonstrate, it is not merely market orders that are disrupted by technological innovation: new technologies also provoke the disruption of legal and regulatory orders, arguably because they can disturb the 'deep values' upon which the legitimacy of existing social orders rests and on which accepted legal and regulatory frameworks draw. It is, therefore, hardly surprising that technological innovation, particularly that of a 'disruptive' kind, raises complex challenges associated with intentional attempts to cultivate a 'regulatory environment' for technology that is fit for purpose. These different dimensions of disruption generated by technological change—legal disruption, regulatory disruption, and the challenges of creating an adequate regulatory environment for disruptive technologies—overlap, and they are reflected (p. 8) in different ways in the chapters of this volume. Separately and together, they give rise to important questions that confront law and regulatory governance scholars in the face of technological change and its challenges.

In the first dimension, we see many ways in which technological innovation is legally disruptive. If technological change is as dramatic and transformative as Hutton suggests, leaving no area of social life untouched, this includes its impact on law (Hutton 2015). Established legal frameworks, doctrines, and institutions are being, and will be, challenged by new technological developments. This is not a new insight, when we consider how other major social changes perturb the legal fabric of society, such as the Industrial Revolu-

tion historically, or our recognition of climate change and its impacts in the present day. These social upheavals challenge and disrupt the legal orders that we otherwise rely on to provide stability and certainty (Fisher, Scotford, and Barritt in press). The degree of legal disruption can vary and can occur in different ways. Most obviously, long-standing doctrinal rules may require re-evaluation, as in the case of contract law and its application to e-commerce (Waddams, this volume). Legal and regulatory gaps may emerge, as we see in public international law and EU law in the face of new technological risks (see Rayfuse and Macrory, this volume). Equally, technological change can provoke legal change, evident in the transformation of the law of civil procedure through 'techno-legal assemblages' as a result of digital information communication technologies (Contini and Cordella, this volume). Technological change can also challenge the normative underpinnings of bodies of law, questioning their fundamental aims or raising issues about how their goals can be accommodated in a context of innovation (see, for example, Herring, Novitz, and Morgan on family, labour, and tort law respectively, this volume). These different kinds of legal disruptions provoke a wide range of academic inquiries, from doctrinal concerns to analysing the aims and values that underlie legal doctrine.

Second, the disruption provoked by technological innovation extends beyond the formal legal order to the wider regulatory order, often triggering concerns about the adequacy of existing regulatory regimes, the institutions upon which they rely (including the normative standards that are intended to guide and constrain the activities of the regulated community), and the relationship and interactions between regulatory organizations with other institutions of governance. Because technological innovation frequently disrupts existing regulatory forms, frameworks, and capacities, it often prompts claims that regulatory legitimacy has been undermined as a result, usually accompanied by calls for some kind of regulatory reform, but sometimes generating innovation in the regulatory enterprise itself. For example, Maria Lee examines the law's role in fostering decision-making institutions that enable democratic participation by stakeholders affected by technological developments and the broader public, in order to help identify common ground so that regulatory interventions might be regarded as 'acceptable' or 'legitimate' (whether the issue is about safety or conflicting interests or values) (Lee, this (p. 9) volume; see also Macrory, this volume). In a different vein, Leiser and Murray demonstrate how technological innovation that has cross-boundary impacts, of which the development of the Internet is a prime example, has spawned a range of regulatory institutions that rely heavily on attempts by non-state actors to devise effective regulatory interventions that are not confined to the boundaries of the state.

In addition to institutional aspects of regulatory governance, technological innovation may also disrupt the ideas and justifications offered in support of regulatory intervention. While much academic reflection concerning regulatory intervention from the late 1970s onwards was animated by the need to respond to market failure, more recent academic reflection frames the overarching purpose of the regulatory enterprise in terms of 'managing risk' (Black 2014; Yeung, this volume). This shift in focus has tracked the increasing popularity of the term 'regulatory governance' rather than 'regulation', and highlights the increasingly 'decentred' nature of intentional attempts to manage risk that are undertak-

en not only (and sometimes not even) by state institutions, but also by non-governmental institutions, including commercial firms and civil society organizations. This turn also reflects the need to account for the multiplicity of societal interests and values in the regulatory enterprise beyond market failure in narrow economic terms. Aligning regulation with the idea of 'risk governance' provides a more direct conceptual linkage between concerns about the 'risks' arising from technological innovation and concerns about the need to tame their trajectories (Renn 2008). It also draws attention to three significant dimensions of risk: first, that the label 'risk' is typically used to denote the possibility that an undesirable state of reality (adverse effects) may occur; second, that such a possibility is contingent and uncertain—referring to an unwanted event that may or may not happen at some time in the future; and third, that individuals often have widely different responses to the way in which they perceive and respond to risks, and which risks they consider most troubling or salient. Reflecting on this incomplete knowledge that technological innovation generates, Andrew Stirling demonstrates how the 'precautionary principle' can broaden our attention to diverse options, practices, and perspectives in policy debates over technology, encouraging more robust methods in appraisal, making value judgments more explicit, and enhancing qualities of deliberation (Stirling, this volume). Stirling's analysis highlights that a fundamental challenge for law and regulation in responding to technological developments concerns the quest for social credibility and acceptability, providing a framework in which technological advances may lay claim to legitimacy, while ensuring that the legitimacy of the law and regulatory institutions are themselves maintained.

Of course, the idea of regulatory legitimacy is protean, reflecting a range of political, legal, and regulatory viewpoints and interests. In relation to regulatory institutions, Julia Black characterizes 'regulatory legitimacy' primarily as an empirical phenomenon, focusing on perceptions of a regulatory organization as having a 'right to govern' among those it seeks to govern, and those on behalf of whom it (p. 10) purports to govern (Black 2008: 144). Yet she also notes that these perceptions are typically rooted in normative criteria that are considered relevant and important (Black 2008: 145). These normative assessments are frequently contested, differently expressed by different writers, and they vary with constitutional traditions. Nonetheless, Black suggests (drawing on social scientific studies of organization legitimacy) that these assessments can be broadly classified into four main groups or 'claims' that are commonly made, each contestable and contested, not only between different groups, but within them, and each with their own logics:

(1) *constitutional claims*: these emphasise conformance with written norms (thus embracing law and so-called 'soft law' or non-legal, generalized written norms) and conformity with legal values of procedural justice and other broadly based constitutional values such as consistency, proportionality, and so on;
(2) *justice claims*: these emphasise the values or ends which the organization is pursuing, including the conception of justice (republican, Rawlsian, utilitarian, for example, or various religious conceptions of 'truth' or 'right');
(3) *functional or performance-based legitimacy claims*: these focus on the outcomes and consequences of the organization (e.g. efficiency, expertise, and effectiveness)

and the extent to which it operates in conformance with professional or scientific norms, for example; and

(4) *democratic claims*: these are concerned with the extent to which the organization or regime is congruent with a particular model of democratic governance, e.g. representative, participatory, or deliberative (Black 2008: 145–146).

While Black's normative claims to legitimacy are framed in an empirical context, much literature in this field is concerned with the legitimacy of technology or its regulation in a normative sense, albeit with a varied range of anchoring points or perspectives, such as the rule or nature of law, constitutional principles, or some other conception of the right or the good, including those reflecting the 'deep values' underlying fundamental rights (Brownsword and Goodwin 2012: ch 7; Yeung 2004). Thus, for example, Giovanni Sartor argues that human rights law can provide a 'unifying purposive perspective' over diverse technologies, analysing how the deployment of technologies conforms, or does not conform, with fundamental rights such as dignity, privacy, equality, and freedom (Sartor, this volume). In these legitimacy inquiries, we can see some generic challenges that lawyers, regulators, and policy-makers must inevitably confront in making collective decisions concerning technological risks (Brownsword 2008; Brownsword and Goodwin 2012; Brownsword and Yeung 2008; Stirling 2008).

These challenges can also be seen in the third theme of disruption that runs through many of the individual contributions in this volume. Reflecting the fundamentally *purposive* orientation of the regulatory enterprise, this theme interrogates the 'adequacy' of the regulatory environment in an age of rapid technological change (p. 11) and innovation. When we ask whether the regulatory environment is adequate, or whether it is 'fit for purpose', we are proposing an audit of the regulatory environment that invites a review of: (i) the adequacy of the 'fit' or 'connection' between the regulatory provisions and the target technologies; (ii) the effectiveness of the regulatory regime in achieving its purposes; (iii) the 'acceptability' and 'legitimacy' of the means, institutional forms, and practices used to achieve those purposes; (iv) the 'acceptability' and 'legitimacy' of the purposes themselves; (v) the 'acceptability' and 'legitimacy' of the processes used to arrive at those purposes; and (vi) the 'legitimacy' or 'acceptability' of the way in which those purposes and other purposes which a society considers valuable and worth pursuing are prioritized and traded-off against each other.

Accepting this invitation, some scholars will be concerned with the development of regulatory institutions and instruments that are capable of maintaining an adequate connection with a constant stream of technological innovation (Brownsword 2008: ch 6). Here, 'connection' means both maintaining a fit between the content of the regulatory standards and the evolving form and function of a technology, and the appropriate adaptation of existing doctrines or institutions, particularly where technologies might be deployed in ways that enhance existing legal or regulatory capacities (Edmond 2000). In the latter case, technological advances might improve the application of existing doctrine, as in the evaluation of memory-based evidence through the insights of neuroscience in criminal law (Claydon, this volume), or they can improve the enforcement of existing bodies of law,

as in the case of online processes for tax collection (Cockfield, this volume). Other scholars might focus on questions of effectiveness, including the ways in which new technological tools such as Big Data analytics and DNA profiling might contribute towards the more effective and efficient achievement of legal and regulatory objectives. Others will want to audit the means employed by regulators for their consistency with constitutional and liberal-democratic values; still others will want to raise questions of morality and justice—including more fine-grained questions of privacy or human dignity and the like.

That said, what precisely do we mean by the 'regulatory environment'? Commonly, following a crisis, catastrophe, or scandal—whether this is of global financial proportions or on the scale of a major environmental incident; whether this is a Volkswagen, Enron, or Deepwater Horizon; or whether, more locally, there are concerns about the safety of patients in hospitals or the oversight of charitable organizations—it is often claimed that the regulatory environment is no longer fit for purpose and needs to be 'fixed'. Sometimes, this simply means that the law needs revising. But we should not naively expect that simple 'quick fixes' are available. Nor should we expect in diverse, liberal, democratic communities that society can, or will, speak with one voice concerning what constitutes an acceptable purpose, thus raising questions about whether one can meaningfully ask whether a regulatory environment is 'fit for purpose' unless we first clarify *what* purpose we mean, and (p. 12) *whose* purpose we are concerned with. Nevertheless, when we say that the 'regulatory environment' requires adjustment, this might help us understand the ways in which many of the law, regulation, and technology-oriented lines of inquiry have a common focus. These various inquiries assume an environment that includes a complex range of signals, running from high-level formal legislation to low-level informal norms, and the way in which those norms interact. As Simon Roberts pointed out in his Chorley lecture (2004: 12):

> We can probably all now go along with some general tenets of the legal pluralists. First, their insistence on the heterogeneity of the normative domain seems entirely uncontroversial. Practically any social field can be fairly represented as consisting of plural, interpenetrating normative orders/systems/discourses. Nor would many today wish to endorse fully the enormous claims to systemic qualities that state law has made for itself and that both lawyers and social scientists have in the past too often uncritically accepted.

So, if post-crisis, post-catastrophe, or post-scandal, we want to fix the problem, it will rarely suffice to focus only on the high-level 'legal' signals; rather, the full gamut of normative signals, their interaction, and their reception by the regulated community will need to be taken into account. As Robert Francis emphasized in his report into the Mid-Staffordshire NHS Foundation Trust (centring on the appalling and persistent failure to provide adequate care to patients at Stafford Hospital, England), the regulatory environment for patient care needs to be unequivocal; there should be no mixed messages. To fix the problem, there need to be 'common values, shared by all, putting patients and their safety first; we need a commitment by all to serve and protect patients and to support each other in that endeavour, and to make sure that the many committed and caring pro-

fessionals in the NHS are empowered to root out any poor practice around them.'[2] Already, though, this hints at deeper problems. For example, where regulators are under-resourced or in some other way lack adequate capacities to act, or when regulatees are over-stretched, then even if there is a common commitment to the regulatory goals, simply rewriting the rules will not make much practical difference. To render the regulatory environment fit for purpose, to tackle corruption, and to correct cultures of non-compliance, some deeper excavation, understanding, and intervention (including additional resources) might be required—rewriting the rules will only scratch the surface of the problem, or even exacerbate it.

Although the regulatory environment covers a wide, varied, and complex range of regulatory signals, institutions, and organizational practices, this does not yet fully convey the sense in which the development of new technologies can disrupt the regulatory landscape. To be sure, no one supposes that *the* 'regulatory environment' is simply out there, waiting like Niagara Falls to be snapped by each tourist's digital camera. In the flux of social interactions, there are many regulatory environments waiting to be constructed, each one from the standpoint of particular individuals or groups. Even in the relatively stable regulatory environment of a national legal (p. 13) system, there are already immanent tensions, whether in the form of 'dangerous supplements' to the rules, prosecutorial and enforcement agency discretion, jury equity, cop culture, and cultures of regulatee avoidance and non-compliance. From a global or transnational standpoint, where 'law is diffused in myriad ways, and the construction of legal communities is always contested, uncertain and open to debate' (Schiff Berman 2004–5: 556), these tensions and dynamics are accentuated. And when cross-border technologies emerge to disrupt and defy national regulatory control, the construction of the regulatory environment—let alone a regulatory environment that is fit for purpose—is even more challenging (seminally, see Johnson and Post 1996).

Yet, we have still not quite got to the nub of the matter. The essential problem is that the regulatory governance challenges would be more graspable if only the world would stand still: we want to identify a regulatory environment with relatively stable features and boundaries; we want to think about how an emerging technology fits with existing regulatory provisions (do we have a gap? do we need to revise some part of the rules? or is everything fine?); we want to be able to consult widely to ensure that our regulatory purposes command public support; we want to be able to model and then pilot our proposed regulatory interventions (including interventions that make use of new technological tools); and, then, we should be in a position to take stock and roll out our new regulatory environment, fully tested and fit for purpose. If only the world was a laboratory in which testing and experimentation could be undertaken with the rigour of a double-blind, randomized, controlled trial. And even if that were possible, all this takes far too much time. While we are consulting and considering in this idealized way, the world has moved on: our target technology has matured, new technologies have emerged, and our regulatory environment has been further disrupted and destabilized. This is especially true in the provision of digital services, with the likes of Google, Uber, and Facebook adopting business models that are premised on rolling out new digital services before they are fully

tested in order to create new business opportunities and to colonize new spaces in ways that their technological innovations make possible, dealing with any adverse public, legal, or regulatory blowback after the event (Vaidhyanathan 2011; Zuboff 2015). In the twenty-first century, we must regulate 'on the hoof'; our various quests for regulatory acceptability, for regulatory legitimacy, for regulatory environments that are adequate and fit for purpose, are not just gently stirred; they are constantly shaken by the pace of technological change, by the global spread of technologies, and by the depth of technological disturbance.

This prompts the thought that the broader, the deeper, and the more dynamic our concept of the regulatory environment, the more that this facilitates our appreciation of the multifaceted relationship between law, regulation, and technology. At the same time, we must recognize that, because the landscape is constantly (p. 14) changing—and in significant ways—our audit of the regulatory enterprise must be agile and ongoing. The more adequate our framing of the issues, the more complex the regulatory challenges appear to be.

For better or worse, we can expect an acceleration in technological development to be a feature of the present century; and those who have an interest in law and regulation cannot afford to distance themselves from the rapidly changing context in which the legal and regulatory enterprises find themselves. The hope underlying this Handbook is that an enhanced understanding of the many interfaces between law, regulation, and technology will aid our appreciation of our existing regulatory structures, improve the chances of putting in place a regulatory environment that stimulates technologies that contribute to human flourishing and, at the same time, minimize applications that are, for one reason or another, unacceptable.

3. Structure and Organization

The Handbook is organized around the following four principal sets of questions.

First, Part II considers core values that underpin the law and regulation of technology. In particular, it examines what values and ideals set the relevant limits and standards for judgments of legitimate regulatory intervention and technological application, and in what ways those values are implicated by technological innovation.

Second, Part III examines the challenges presented by developments in technology in relation to legal doctrine and existing legal institutions. It explores the ways in which technological developments put pressure on, inform, or possibly facilitate the development of existing legal concepts and procedures, as well as when and how they provoke doctrinal change.

Third, Part IV explores the ways (if any) in which technological developments have prompted innovations in the forms, institutions, and processes of regulatory governance and seeks to understand how they might be framed and analysed.

Fourth, Part V considers how law, regulation, and technological development affect key fields of global policy and practice (namely, medicine and health; population, reproduction, and the family; trade and commerce; public security; communications, media, and culture; and food, water, energy, and the environment). It looks at which interventions are conducive to human flourishing, which are negative, which are counter-productive, and so on. It also explores how law, regulation, and technological developments might help to meet these basic human needs.

These four sets of questions are introduced and elaborated in the following sections.

(p. 15) 4. Legitimacy as Adherence to Core Normative Values

In cases where a new technology is likely to have catastrophic or extremely destructive effects—such as the prospect of genetically engineering deadly pathogens that could spread rapidly through human populations—we can assume that no reasonable person will see such development as anything other than a negative. In many cases, however, the way that disruptive effects of a particular technological development are regarded as positive or negative is likely to depend on how it impacts upon what one personally stands to lose or gain. For example, in reflecting upon the impact of ICTs on the professions, including the legal profession, Richard and Daniel Susskind (Susskind and Susskind 2015) argue that, although they may threaten the monopoly of expertise which the professions currently possess, from the standpoint of 'recipients and alternative providers', they may be 'socially constructive' (at 110), while enabling the democratization of legal knowledge and expertise that can then be more fairly and justly distributed (at 303–308). In other words, apart from the 'safety' of a technology in terms of its risks to human health, property, or the environment, there is a quite different class of concerns relating to the preservation of certain values, ideals, and the social institutions with which those values and ideals are conventionally associated.

In Part II of the Handbook, the focus is precisely on this class of normative values—values such as justice, human rights, and human dignity—that underpin and infuse debates about the legitimacy of particular legal and regulatory positions taken in relation to technology. Among the reference values that recur in deliberations about regulating new technologies, our contributors speak to the following: liberty; equality; democracy; identity; responsibility (and our underlying conception of agency); the common good; human rights; and human dignity.[3] Perhaps the much-debated value of human dignity best exemplifies anxieties about the destabilizing effect of new technologies on 'deep values'. In his contribution to this Handbook, Marcus Düwell suggests that human dignity should be put at the centre of the normative evaluation of technologies, thereby requiring us 'to think about structures in which technologies are no longer the driving force of societal developments, but which give human beings the possibility to give form to their lives; the possibility of being in charge and of leading fulfilled lives' (see Düwell, this volume). In this vein, Düwell points out that if we orient ourselves to the principle of respect for human

dignity, we will reverse the process of developing technologies and then asking what kinds of legal, ethical, and social problems they create; rather, we will direct the development of technologies by reflecting on the requirements of respect for human dignity (compare Tranter 2011, for criticism of the somewhat unimaginative way in which legal scholars have tended to respond to technological developments). (p. 16) But Düwell's reconstruction and reading of human dignity is likely to collide with that of those conservative dignitarians who have been particularly critical of developments in human biotechnology, contending that the use of human embryos for research, the patenting of stem cell lines, germ-line modifications, the recognition of property in human bodies and body parts, the commercialization and commodification of human life, and so on, involve the compromising of human dignity (Caulfield and Brownsword 2006).

As adherence to, and compatibility with, various normative values is a necessary condition of regulatory legitimacy, arguments often focus on the legitimacy of particular features of a regulatory regime, whether relating to regulatory purposes, regulatory positions, or the regulatory instruments used, which draw attention to these different values. However, even with the benefit of a harder look at these reference values, resolving these arguments is anything but straightforward, for at least five reasons. First, the values are themselves contested (see, for example, Baldwin on 'identity', this volume; and Snelling and McMillan on 'equality', this volume). So, if it is suggested that modern technologies impact negatively on, say, liberty, or equality, or justice, an appropriate response is that this depends not only on which technologies one has in mind, but, crucially, what one means by liberty, equality, or justice (see Brownsword on 'liberty', this volume). Similarly, when we engage with the well-known 'non-identity' (of persons never-to-be born) puzzle that features in debates about the regulation of reproductive technologies, it is hard to escape the shadow of profound philosophical difficulty (see Gavaghan, this volume); or, when today's surveillance societies are likened to the old GDR, we might need to differentiate between the 'domination' that Stasi-style surveillance instantiated and the shadowy intelligence activities of Western states that fail to meet 'democratic' ideals (see Sorell and Guelke, this volume). Even where philosophers can satisfactorily map the conceptual landscape, they might have difficulty in specifying a particular conception as 'best', or in finding compelling reasons for debating competing conceptions when no one conception can be demonstrated to be 'correct' (compare Waldron 2002).

Second, even if we agreed on our conception of the reference value, questions remain. For example, some claims about the legitimacy of a particular technology might hinge on disputed questions of fact and causation. This might be so, for example, if it is claimed that the overall impact of the Internet is positive/negative in relation to democracy or the development of a public sphere in which the common good can be debated (on the notion of the common good, see Dickenson, this volume); or if it is claimed that the use of technological management or genetic manipulation will crowd out the sense of individual responsibility.

Third, values can challenge the legitimacy of technological interventions systemically, or they may raise novel discrete issues for evaluation. These different types of normative challenges are exemplified in relation to the value of justice. Sometimes, new scientific insights, many of which are enabled by new technologies, prompt (p. 17) us to consider whether there is a *systemic* irrationality in core ethical, legal, and social constructs through which we make sense of the world, such as the concept of responsibility through which our legal and social institutions hold humans to account for their actions, and pass moral and legal judgment upon them (see, for example, Greene and Cohen 2004). It is not that advances in scientific understanding challenge the validity of some particular law or regulation, but that the law, or regulation, or morals, or any other such normative code or system is *pervasively* at odds with scientific understanding. In other words, it is not a case of one innocent person being unjustly convicted. Rather, the scientists' criticism is that current legal processes of criminal conviction and punishment are unjust because technological developments show that we are not always sufficiently in control of our actions to be fairly held to account for them (Churchland 2005; Claydon, this volume), despite our deeply held conviction and experience to the contrary. Such a claim could scarcely be more destabilizing: we should cease punishing and stigmatizing those who break the rules; we should recognize that it is irrational to hold humans to account. In response, others argue that, even if we accept this claim, it is not axiomatic that we should or would subsequently give up a practice that strongly coheres with our experience (see Morse, in this volume).

Scientific advances can affect our sense of what is fair or just in other ways that need not strike at the core moral and legal concepts and constructs through which we make sense of the world. Sometimes, scientific advances and the technological applications they enable may shed light on ways in which humans might be biologically identified as different. Yet, in determining whether differences of this kind should be taken into account in the distribution of social benefits and burdens, we are invariably guided by some fairly primitive notions of justice. In the law, it is axiomatic that 'like cases should be treated alike, and unlike cases unlike'. When the human genome was first sequenced, it was thought that the variations discovered in each person's genetic profile would have radically disruptive implications for our willingness to treat A and B as like cases. There were concerns that insurers and employers, in particular, would derive information from the genetic profiles of, respectively, applicants for insurance and prospective employees that would determine how A and B, who otherwise seemed to be like cases, would be treated (O'Neill 1998). Given that neither A nor B would have any control over their genetic profiles, there was a widely held view that it would be unfair to discriminate between A and B on such grounds. Moreover, if we were to test the justice of the basic rules of a society by asking whether they would be acceptable to a risk-averse agent operating behind a Rawlsian 'veil of ignorance', it is pretty clear that a rule permitting discrimination on genetic grounds would fail to pass muster (Rawls 1971). In that light, the US Genetic Information Non-Discrimination Act 2008 (the GINA law), which is designed to protect citizens against genetic discrimination in relation to health insurance and employment, would seem to be one of the constitutional cornerstones of a just society.

(p. 18) Justice is not exhausted, however, by treating like cases alike. Employers might treat all their employees *equally*, but equally *badly*. In this non-comparative sense, by which criterion (or criteria) is treatment to be adjudged as just or unjust? Should humans be treated in accordance with their 'need', or their 'desert', or their 'rights' (Miller 1976)? When a new medical technology becomes available, is it just to give priority to those who are most in need, or to those who are deserving, or to those who are both needy and deserving, or to those who have an accrued right of some kind? If access to the technology—suppose that it is an 'enhancing' technology that will extend human life or human capabilities in some way—is very expensive, should only those who can afford to pay have access to it? If the rich have lawfully acquired their wealth, would it be unjust to deny them access to such an enhancing technology or to require them to contribute to the costs of treating the poor (Nozick 1974)? If each new technology exacerbates existing inequalities by generating its own version of the digital divide, is this compatible with justice? Yet, in an already unequal society where technologies of enhancement are not affordable by all, would it be an improvement in justice if the rich were to be prohibited from accessing the benefits of these technologies—or would this simply be an empty gesture (Harris 2007)? If, once again, we draw on the impartial point of view enshrined in standard Rawlsian thinking about justice, what would be the view of those placed behind a veil of ignorance if such inequalities were to be proposed as a feature of their societies? Would they insist, in the spirit of the Rawlsian difference principle, that any such inequalities will be unjust, unless they serve to incentivize productivity and innovation such that the position of the worst off is better than under more equal conditions?

Fourth, and following on from this, deep values relating to the legitimacy of technological change will often raise conflicting normative positions. As Rawls recognized in his later work (Rawls 1993), the problem of value conflicts can be deep and fundamental, traceable to 'first principle' pluralism, or internal to a shared perspective. Protagonists in a plurality might start from many different positions. Formally, however, value perspectives tend to start from one of three positions often referred to in the philosophical literature as rights-based, duty-based (deontological), or goal- or outcome-based. According to the first, the protection and promotion of rights (especially human rights) is to be valued; according to the second, the performance of one's duties (both duties to others and to oneself) is to be valued; and, according to the third, it is some state of affairs—such as the maximization of utility or welfare, or the more equal distribution of resources, or the advancement of the interests of women, or the minimization of distress, and so on—that is the goal or outcome to be valued. In debates about the legitimacy of modern technologies, the potential benefits are often talked up by utilitarians; individual autonomy and choice is trumpeted by rights ethicists; and, reservations about human dignity are expressed by duty ethicists. Often, this will set the dignitarians in opposition to the utilitarian and rights advocates. Where value plurality (p. 19) takes this form, compromise and accommodation are difficult (Brownsword 2003, 2005, and 2010). There can also be tensions and 'turf wars' where different ethics, such as human rights and bioethics, claim to control a particular sector (see Murphy, this volume). In other cases, though, the difficulty might not run so deep. Where protagonists at least start in the same place, but then

disagree about some matter of interpretation or application, there is the possibility of provisional settlement. For example, in a community that is committed to respect for human rights, there might well be different views about: (i) the existence of certain rights, such as 'the right not to know' (Chadwick, Levitt, and Shickle 2014) and 'the right to be forgotten' (as recognized by the European Court of Justice (CJEU) in the *Google Spain* case, Case C-131/12); (ii) the scope of particular rights that are recognized, such as rights concerning privacy (see Bygrave, this volume), property (see Goodwin, this volume), and reproductive autonomy (see McLean, this volume); and (iii) the relative importance of competing rights (such as privacy and freedom of expression). However, regulators and adjudicators can give themselves some leeway to accommodate these differences (using notions of proportionality and the 'margin of appreciation'); and regulated actors who are not content with the outcome can continue to argue their case.

Finally, in thinking about the values that underpin technological development, we also need to reckon with the unpredictable speed and trajectory of that development and the different rates at which such technologies insinuate themselves into our daily lives. At the time that Francis Fukuyama published *Our Posthuman Future* (2002), Fukuyama was most agitated by the prospect of modern biotechnologies raising fundamental concerns about human dignity, while he was altogether more sanguine about information and communication technologies. He saw the latter as largely beneficial, subject to some reservations about the infringement of privacy and the creation of a digital divide. But revisiting these technologies today, Fukuyama would no doubt continue to be concerned about the impact of modern biotechnologies on human dignity, given that new gene-editing technologies raise the real possibility of irreversibly manipulating the human genome, but he would surely be less sanguine about the imminent arrival of the Internet of Things (where the line that separates human agents from smart agent-like devices might become much less clear); or about machine learning that processes data to generate predictions about which humans will do what, but without really understanding why they do what they do, and often with serious consequential effects (see Hildebrandt 2015, 2016); or about the extent to which individuals increasingly and often unthinkingly relinquish their privacy in return for data-driven digital conveniences (Yeung 2017) in which many of their transactions and interactions within some on-line environments are extremely vulnerable and, perhaps more worryingly, allow for highly granular surveillance of individual behaviours, movements, and preferences that were not possible in a pre-digital era (Michael and Clarke 2013).

(p. 20) The above discussion highlights that the interweaving of emerging technologies with fundamental value concepts is complex. As a report from the Rathenau Institute points out in relation to human rights and human dignity, while technologies might strengthen those values, they might also 'give rise to risks and ethical issues and therefore threaten human rights and human dignity' (van Est and others 2014: 10). In other words, sometimes technologies impact positively on particular values; sometimes they impact negatively; and, on many occasions, at a number of levels, it is unclear and moot or

to be determined whether the impact is positive or negative (see Brownsword, this volume).

5. Technological Change: Challenges for Law

In Part III, contributors reflect on the impact of technological developments on their particular areas of legal expertise. As indicated above, this can include a wide range of inquiries, from whether there are any deficiencies or gaps in how particular areas of law apply to issues and problems involving new technologies, to how technology is shaping or constructing doctrinal areas or challenging existing doctrine. Gregory Mandel suggests that some general insights about the interaction of existing areas of law and new technologies can be drawn from historical experience, including that unforeseeable types of legal disputes will arise and pre-existing legal categories may be inapplicable or poorly suited to resolve them. At the same time, legal decision-makers should also be 'mindful to avoid letting the marvels of a new technology distort their legal analysis' (Mandel, this volume). In other words, Mandel counsels us to recognize that technological change occurs against a rich doctrinal and constitutional backdrop of legal principle (on the significance of constitutional structures in informing the regulation of technologies, see Snead and Maloney, this volume). The importance of attending to legal analysis also reflects the fact that bodies of established law are not mere bodies of rules but normative frameworks with carefully developed histories, and fundamental questions can thus arise about how areas of law should develop and be interpreted in the face of innovation. Victor Flatt highlights how technology was introduced as a tool or means of regulation in US environmental law, but has become a goal of regulation in itself, unhelpfully side-lining fundamental purposes of environmental protection (Flatt, this volume). Jonathan Herring highlights how the use of technology in parenting raises questions about the nature of relationships between parents and children, and how these are understood and constructed by family law (Herring, this volume). (p. 21) Similarly, Tonia Novitz argues that the regulatory agenda in relation to technology in the workplace should be extended to allow enabling of workers' rights as well as their surveillance and control by employers (Novitz, this volume). These underlying normative issues reflect the extent to which different legal areas can be disrupted and challenged by technological innovation.

The more obvious legal and doctrinal challenges posed by technology concern what law, if any, can and should regulate new technologies. Famously, David Collingridge (1980) identified a dilemma for regulators as new technologies emerge. Stated simply, regulators tend to find themselves in a position such that either they do not know enough about the (immature) technology to make an appropriate intervention, or they know what regulatory intervention is appropriate, but they are no longer able to turn back the (now mature) technology. Even when regulators feel sufficiently confident about the benefit and risk profile of a technology, or about the value concerns to which its development and application might give rise, a bespoke legislative framework comes with no guarantee of sustainability. These challenges for the law are compounded where there is a disconnect be-

tween the law and the technology as the courts are encouraged to keep the law connected by, in effect, rewriting existing legislation (Brownsword 2008: ch 6).

In response to these challenges, some will favour a precautionary approach, containing and constraining the technology until more is understood about it, while others will urge that the development and application of the technology should be unrestricted unless and until some clear harm is caused. In the latter situation, the capacity of existing law to respond to harms caused, or disputes generated, by technology becomes particularly important. Jonathan Morgan (this volume) highlights how tort law may be the 'only sort of regulation on offer' for truly novel technology, at least initially. Another approach is for legislators to get ahead of the curve, designing a new regulatory regime in anticipation of a major technological innovation that they see coming. Richard Macrory explains how the EU legislature has designed a pre-emptive carbon capture and storage regime that may be overly rigid in predicting how to regulate carbon capture and storage (CCS) technology (Macrory, this volume). Others again will point to the often powerful political, economic, and social forces that determine the path of technological innovation in ways that are often wrongly perceived as inevitable or unchallengeable. Some reconciliation might be possible, along the lines that Mandel has previously suggested, arguing that what is needed is more sophisticated upstream governance in order to (i) improve data gathering and sharing; (ii) fill any regulatory gaps; (iii) incentivize corporate responsibility; (iv) enhance the expertise of, and coordination between, regulatory agencies; (v) provide for regulatory adaptability and flexibility; and (vi) promote stakeholder engagement (Mandel 2009). In this way, much of the early regulatory weight is borne by informal codes, soft law, and the like; but, in due course, as the technology begins to mature, it will be necessary to consider how it engages with various areas of settled law.

(p. 22) This engagement is already happening in many areas of law, as Part III demonstrates. One area of law that is a particularly rich arena for interaction with technological development is intellectual property (IP) law (Aplin 2005). There are famous examples of how the traditional concepts of patent law have struggled with technological innovations, particularly in the field of biotechnology. The patentability of biotechnology has been a fraught issue because there is quite a difference between taking a working model of a machine into a patent office and disclosing the workings of biotechnologies (Pottage and Sherman 2010). In *Diamond v Chakrabarty* 447 US 303 (1980), the majority of the US Supreme Court, taking a liberal view, held that, in principle, there was no reason why genetically modified organisms should not be patentable; and, in line with this ruling, the US Patent Office subsequently accepted that, in principle, the well-known Harvard Oncomouse (a genetically modified test animal for cancer research) was patentable. In Europe, by contrast, the patentability of the Oncomouse did not turn only on the usual technical requirements of inventiveness, and the like; for, according to Article 53(a) of the European Patent Convention, a European patent should not be granted where publication or commercial exploitation of the invention would be contrary to *ordre public* or morality. Whilst initially the exclusion on moral grounds was pushed to the margins of the European patent regime, only to be invoked in the most exceptional cases where the grant of a patent was inconceivable, more recently, Europe's reservations about patenting inven-

tions that are judged to compromise human dignity (as expressed in Article 6 of Directive 98/44/EC) were reasserted in Case C-34/10 *Oliver Brüstle v Greenpeace eV*, where the Grand Chamber of the CJEU held that the products of *Brüstle's* innovative stem cell research were excluded from patentability because his 'base materials' were derived from human embryos that had been terminated. This tension in applying well-established IP concepts to technological innovations reflects the fact that technological development has led to the creation of things and processes that were never in the contemplation of legislators and courts as they have developed IP rights. This doctrinal disconnection is further exemplified in the chapter by Dinusha Mendis, Jane Nielsen, Dianne Nicol, and Phoebe Li (this volume), in which they examine how both Australian and UK law, in different ways, struggle to apply copyright and patent protections to the world of 3D printing.

Other areas of law may apply to a changing technological landscape in a more straightforward manner. In relation to e-commerce, for example, contract lawyers debated whether a bespoke legal regime was required for e-commerce, or whether traditional contract law would suffice. In the event, subject to making it clear that e-transactions should be treated as functionally equivalent to off-line transactions and confirming that the former should be similarly enforceable, the overarching framework formally remains that of off-line contract law. At the same time, Stephen Waddams explains how this off-line law is challenged by computer technology, particular through the use of e-signatures, standard form contracts on websites, and online methods of giving assent (Waddams, this volume). Furthermore, in practice, (p. 23) the bulk of disputes arising in consumer e-commerce do not go to court and do not draw on traditional contract law—famously, each year, millions of disputes arising from transactions on eBay are handled by Online Dispute Resolution (ODR). There are also at least three disruptive elements ahead for contract law and e-commerce. The first arises not so much from the underlying transaction, but instead from the way that consumers leave their digital footprints as they shop online. The collection and processing of this data is now one of the key strands in debates about the re-regulation of privacy and data protection online (see Bygrave, this volume). The second arises from the way in which on-line suppliers are now able to structure their sites so that the shopping experience for each consumer is 'personalized' (see Draper and Turow, this volume). In off-line stores, the goods are not rearranged as each customer enters the store and, even if the parties deal regularly, it would be truly exceptional for an off-line supplier, unlike an e-supplier, to know more about the customer than the customer knows about him or herself (Mik 2016). The third challenge for contract law arises from the automation of trading and consumption. Quite simply, how does contract law engage with the automated trading of commodities (transactions being completed in a fraction of a second) and with a future world of routine consumption where human operatives are taken out of the equation (both as suppliers and as buyers) and replaced by smart devices?

In these areas of law, as in others, we can expect both engagement and friction between traditional doctrine and some new technology. Sometimes attempts will be made to accommodate the technology within the terms of existing doctrine—and, presumably, the more flexible that doctrine, the easier it will be to make such an accommodation. In other cases, doctrinal adjustment and change may be needed—in the way, for example, that the

'dangerous' technologies of the late nineteenth century encouraged the adoption of strict liability in a new body of both regulatory criminal law and, in effect, regulatory tort law (Sayre 1933; Martin-Casals 2010); and, in the twenty-first century, in the way that attempts have been made to immunize internet service providers against unreasonable liability for breach of copyright, defamation, and so on (Karapapa and Borghi 2015; Leiser and Murray, this volume). In other cases, there will be neither accommodation nor adjustment and the law will find itself being undermined or rendered redundant, or it will be resistant in seeking to protect long-standing norms. Uta Kohl (this volume) thus shows how private international law is tested to its limits in its attempts to assert national laws against the globalizing technology of the Internet. Each area of law will have its own encounter with emerging technologies; each will have its own story to tell; and these stories pervade Part III of the Handbook.

The different 'subject-focused' lines of inquiry in Part III should not be seen to suggest that discrete legal areas work autonomously in adapting, responding to, or regulating technology (as Part IV shows, laws work within a broader regulatory context that shapes their formulation and implementation). Moreover, we need to be aware of various institutional challenges, the multi-jurisdictional reach of some (p. 24) technological developments, the interactions with other areas of law, and novel forms of law that existing doctrine does not easily accommodate. At the same time, existing legal areas shape the study and understanding of law and its institutions, and thus present important perspectives and methodological approaches in understanding how law and technology meet.

6. Technological Change: Challenges for Regulation and Governance

Part IV of the Handbook aims to provide a critical exploration of the implications for regulatory governance of technological development. Unlike much scholarly reflection on regulation and technological development, which focuses on the need of the latter over the former, the aim of this part is to explore the ways in which technological development influences and informs the regulatory enterprise itself, including institutional forms, systems and methodologies for decision-making concerning technological risk. By emphasising the ways in which technological development has provoked innovations in the forms, institutions, and processes of regulatory governance, the contributions in Part IV demonstrate how an exploration of the interface between regulation and technology can deepen our understanding of regulatory governance as an important social, political, and legal phenomenon. The contributions are organized in two sub-sections. The first comprises essays concerned with understanding the ways in which the regulation of new technologies has contributed to the development of distinctive institutional forms and processes, generating challenges for regulatory policy-makers that have not arisen in the regulation of other sectors. The second sub-section collects together contributions that explore the implications of employing technology as an *instrument* of regulation, and the risks and challenges thus generated for both law and regulatory governance.

The focus in Part IV shifts away from doctrinal development by judicial institutions to a broader set of institutional arenas through which intentional attempts are made to shape, constrain, and promote particular forms of technological innovation. Again, as seen in relation to the different areas of legal doctrine examined in Part III, technological disruption can have profound and unsettling effects that strike at the heart of concepts that we have long relied upon to organize, classify, and make sense of ourselves and our environment, and which have been traditionally presupposed by core legal and ethical distinctions. For example, several contributions observe how particular technological innovations are destabilizing fundamental ontological categories and legal processes: the rise of robots and other artificially (p. 25) intelligent machines blurs the boundary between agents and things (see Leta-Jones and Millar, this volume); digital and forensic technologies are being combined to create new forms of 'automated justice', thereby blurring the boundary between the process of criminal investigation and the process of adjudication and trial through which criminal guilt is publicly determined (see Bowling, Marks & Keenan, this volume); and the growth of contemporary forms of surveillance have become democratized, no longer confined to the monitoring of citizens by the state, which enable and empower individuals and organizations to utilize on-line networked environments to engage in acts of surveillance in a variety of ways, thus blurring the public-private divide upon which many legal and regulatory boundaries have hitherto rested (see Timan, Galič, and Koops, this volume). Interrogating the institutional forms, dynamics, and tensions which occur at the interface between new technologies and regulatory governance also provides an opportunity to examine how many of the core values upon which assessments of legitimacy rest—explored in conceptual terms in Part II—are translated into contemporary practice, as stakeholders in the regulatory endeavour give practical expression to these normative concerns, seeking to reconcile competing claims to legitimacy while attempting to design new regulatory regimes (or re-design existing regimes) and to formulate, interpret, and apply appropriate regulatory standards within a context of rapid technological innovation.

By bringing a more varied set of regulatory governance institutions into view, contributions in Part IV draw attention to the broader geopolitical drivers of technological change, and how larger socio-economic forces propel institutional dynamics, including intentional attempts to manage technological risk and to shape the direction of technological development, often in ways that are understood as self-serving. Moreover, the forces of global capitalism may severely limit sovereign state capacity to influence particular innovation dynamics, due to the influence of powerful non-state actors operating in global markets that extend beyond national borders. In some cases, this has given rise to new and sometimes unexpected opportunities for non-traditional forms of control, including the role of market and civil society actors in the formulation of regulatory standards and in exerting some kind of regulatory oversight and enforcement (see Leiser and Murray, this volume; Timan, Galič, and Koops, this volume). Yet the role of the state continues to loom large, albeit with a reconfigured role within a broader network of actors and institutions vying for regulatory influence. Thus, while traditional state and state-sponsored institutions retain a significant role, their attempts to exert both regulatory influence and obtain a synoptic

view of the regulatory domain are now considerably complicated by a more complex, global, fluid, and rapidly evolving dynamic in which the possession and play of (economic) power is of considerable importance (and indeed, one which nation states seek to harness by enrolling the regulatory capacities of market actors as critical gatekeepers).

(p. 26) The second half of Part IV shifts attention to the variety of ways in which regulators may adopt technologies as regulatory governance instruments. This examination is a vivid reminder that, although technology is often portrayed as instrumental and mechanistic, it is far from value-free. The value laden dimension of technological means and choices, and the importance of attending to the problem of value conflict and the legitimacy of the processes through which such conflicts are resolved, is perhaps most clearly illustrated in debates about (re-)designing the human biological structure and functioning in the service of collective social goals rather than for therapeutic purposes (see Yeung, this volume). Yet the domain of values also arises in much more mundane technological forms (Latour 1994). As is now widely acknowledged, 'artefacts have politics', as Langdon Winner's famous essay reminds us (Winner 1980). Yet, when technology is enlisted intentionally as a means to exert control over regulated populations, their inescapable social and political dimensions are often hidden rather than easily recognizable. Hence, while it is frequently claimed that sophisticated data mining techniques that sift and sort massive data sets offer tremendous efficiency gains in comparison with manual evaluation systems, Fleur Johns demonstrates how a task as apparently mundane as 'sorting' (drawing an analogy between people sorting, and sock sorting) is in fact rich with highly value laden and thus contestable choices, yet these are typically hidden behind a technocratic, operational façade (see Johns, this volume). When used as a critical mechanism for determining the plight of refugees and asylum seekers, the consequences of such technologies could not be more profound, at least from the perspective of those individuals whose fates are increasingly subject to algorithmic assessment. Yet, the sophistication of contemporary technological innovations, including genomics, may expand the possibilities of lay and legal misunderstanding of both the scientific insight and its social implications, as Kar and Lindo demonstrate in highlighting how genomic developments may reinforce unjustified racial bias based on a misguided belief that these insights lend scientific weight to folk biological understandings of race (see Kar and Lindo, this volume). Taken together, the contributions in the second half of Part IV might be interpreted as a caution against naïve faith in the claimed efficacy of our ever-expanding technological capacities, reminding us that not only do our tools reflect our individual and collective values, but they also emphasize the importance of attending to the social meaning that such interventions might implicate. In other words, the technologies that we use to achieve our ends import particular social understandings about human value and what makes our life meaningful and worthwhile (see Yeung, this volume; Agar, this volume). Particular care is needed in contemplating the use of sophisticated technological interventions to shape the behaviour of others, for such interventions inevitably implicate how we understand our authority over, and obligations towards, our fellow human beings. In liberal democratic societies, we must attend carefully to the fundamental obligation to treat others with dignity and respect: as people, rather than as technologically malleable

objects. The ways in which our (p. 27) advancing technological prowess may tempt us to harness people in pursuit of non-therapeutic ends may signify a disturbing shift towards treating others as things rather than as individuals, potentially denigrating our humanity. The lessons of Part IV could not be more stark.

7. Key Global Policy Challenges

In the final part of the Handbook, the interface between law, regulation, and technological development is explored in relation to six globally significant policy sectors: medicine and health; population, reproduction, and the family; trade and commerce; public security; communications, media, and culture; and, food, water, energy, and the environment. Arguably, some of these sectors, relating to the integrity of the essential infrastructure for human life and agency, are more important than others—for example, without food and water, there is no prospect of human life or agency. Arguably, too, there could be a level of human flourishing without trade and commerce or media; but, in the twenty-first century, it would be implausible to deny that, in general, these sectors relate to important human needs. However, these needs are provided for unevenly across the globe, giving rise to the essential practical question: where existing, emerging, or new technologies might be applied in ways that would improve the chances of these needs being met, should the regulatory environment be modified so that such an improvement is realized? Or, to put this directly, is the regulatory environment sometimes a hindrance to establishing conditions that meet basic human needs in all parts of the world? If so, how might this be turned around so that law and regulation nurture the development of these conditions?

Needless to say, we should not assume that ‘better’ regulatory environments or ‘better’ technologies will translate in any straightforward way into a heightened sense of subjective well-being for humans (Agar 2015). In thinking about how law and regulation can help to foster the pursuit of particular societal values and aspirations, many inquiries will focus on what kind of regulatory environment we should create in order to accommodate and control technological developments. But legal and regulatory control does not always operate *ex post facto*: it may have an important *ex ante* role, incentivizing particular kinds of technological change, acting as a driver (or deterrent) that can encourage (or discourage) investment or innovation in different ways. This can be seen through taxation law creating incentives to research certain technologies (see Cockfield, this volume), or through legal liability encouraging the development of pollution control technology (see Pontin, this volume). As Pontin demonstrates, however, the conditions by which legal (p. 28) frameworks cause technological innovation are contingent on industry-specific and other contextual and historical factors. The more common example of how legal environments incentivize technological development is through intellectual property law, and patent law in particular, as previously mentioned. A common complaint is that the intellectual property regime (now in conjunction with the regime of world trade law) conspires to deprive millions of people in the developing world of access to essential medicines. Or, to put the matter bluntly, patents and property are being prioritized over people

(Sterckx 2005). While the details of this claim are contested—for example, a common response is that many of the essential drugs (including basic painkillers) are out of patent protection and that the real problem is the lack of a decent infrastructure for health care—it is unclear how the regulatory environment might be adjusted to improve the situation. If the patent incentive is weakened, how are pharmaceutical companies to fund the research and development of new drugs? If the costs of research and development, particularly the costs associated with clinical trials, are to be reduced, the regulatory environment will be less protective of the health and safety of all patients, both those in the developing world and the developed world. Current regulatory arrangements are also criticized on the basis that they have led to appalling disparities of access to medicines, well-known pricing abuses in both high- and low-income countries, massive waste in terms of excessive marketing of products and investments in medically unimportant products (such as so-called 'me-toos'), and under-investment in products that have the greatest medical benefits (Love and Hubbard 2007: 1551). But we might take some comfort from signs of regulatory flexibility in the construction of new pathways for the approval of promising new drugs—as Bärbel Dorbeck-Jung is encouraged by the development in Europe of so-called 'adaptive drug licensing' (see Dorbeck-Jung, this volume).

It is not only the adequacy of the regulatory environment in incentivizing technological development in order to provide access to essential drugs that might generate concerns. Others might be discouraged by the resistance to taking forward promising new gene-editing techniques (see Harris and Lawrence, this volume). Yet there are difficult and, often, invidious judgments to be made by regulators. If promising drugs are given early approval, but then prove to have unanticipated adverse effects on patients, regulators will be criticized for being insufficiently precautionary; equally, if regulators refuse to license germ-line gene therapies because they are worried about, perhaps irreversible, downstream effects, they will be criticized for being overly precautionary. (In this context, we might note the questions raised by Dickenson (this volume) about the licensing of mitochondrial replacement techniques and the idea of the common good).

In relation to the deployment and (*ex post*) regulation of new, and often rapidly developing technologies, the legal and regulatory challenge is no easier. Sometimes, the difficulty is that the problem needs a coordinated and committed international response; it can take only a few reluctant nations (offering a regulatory haven—for (p. 29) example, a haven from which to initiate cybercrimes) to diminish the effectiveness of the response. At other times, the challenge is not just one of effectiveness, but of striking acceptable balances between competing policy objectives. In this respect, the frequently expressed idea that a heightened threat to 'security' needs to be met by a more intensive use of surveillance technologies—that the price of more security is less liberty or less privacy—is an obvious example. No doubt, the balancing metaphor, evoking a hydraulic relationship between security and privacy (as one goes up, the other goes down), invites criticism (see for example, Waldron 2003), and there are many potentially unjust and counter-productive effects of such licences for security. Nevertheless, unless anticipatory and precautionary measures are to be eschewed, the reasonableness and proportionality of using of surveillance technologies in response to perceived threats to security should be a con-

stant matter for regulatory and community debate. Debate about competing values in regulating new technologies is indeed important and can be stifled, or even shut down, if the decision-making structures for developing that regulation do not allow room for competing values to be considered. This is a particularly contested aspect of the regulation of genetically modified organisms and novel foods, as exemplified in the EU, where scientific decision-making is cast as a robust framework for scrutinizing new technologies, often to the exclusion of other value concerns (see Lee, this volume).

Consider again the case of trade and commerce, conducted against a backcloth of diverse and fragmented international, regional, and national laws as well as transnational governance (see Cottier, this volume). In practice, commercial imperatives can be given an irrational and unreasonable priority over more important environmental and human rights considerations. While such 'collateralization' of environmental and human rights concerns urgently requires regulatory attention (Leader 2004), in globally competitive markets, it is understandable why enterprises turn to the automation of their processes and to new technological products. The well-known story of the demise of the Eastman Kodak Corporation, once one of the largest corporations in the world, offers a salutary lesson. Evidently, 'between 2003 and 2012—the age of multibillion-dollar Web 2.0 start-ups like Facebook, Tumblr, and Instagram—Kodak closed thirteen factories and 130 photo labs and cut 47,000 jobs in a failed attempt to turn the company round' (Keen 2015: 87–88). As firms strive for ever greater efficiency, the outsourcing of labour and the automation of processes is expected to provoke serious disruption in patterns of employment (and unemployment) (Steiner 2012). With the development of smart robots (currently one of the hottest technological topics), the sustainability of work—and, concomitantly, the sustainability of consumer demand—presents regulators with another major challenge. Facilitating e-commerce in order to open new markets, especially for smaller businesses, might have been one of the easier challenges for regulators. By contrast, if smart machines displace not only repetitive manual or clerical work, but also skilled professional work (such as that undertaken by pharmacists, doctors, (p. 30) and lawyers: see Susskind and Susskind 2015), we might wonder where the 'rise of the robots' will lead (Ford 2015; Colvin 2015). In both off-line and online environments, markets will suffer from a lack of demand for human labour (see Dau-Schmidt, this volume).

But the turn to automation arising from the increasing 'smartness' of our machines combined with global digital networks may threaten our collective human identity even further. Although the rise of robots can improve human welfare in myriad ways, engaging in tasks previously undertaken by individuals that are typically understood as 'dirty dangerous drudgery', they nurture other social anxieties. Some of these are familiar and readily recognizable, particularly those associated with the development of autonomous weapons, with ongoing debate about whether autonomous weapon systems should be prohibited on the basis that they are inherently incapable of conforming with contemporary laws of armed conflict (see Anderson and Waxman, this volume). Here contestation arises concerning whether only humans ought to make deliberate kill decisions, and whether automated machine decision-making undermines accountability for unlawful acts of violence. It is not only the technological sophistication of machines that generates con-

cerns about the dangers associated with ‘technology run amok’. Similar anxieties arise in relation to our capacity to engineer the biological building blocks upon which life is constructed. Although advances in genomic science are frequently associated with considerable promise in the medical domain, these developments have also generated fears about the potentially catastrophic, if not apocalyptic, consequences of biohazards and bioterrorism, and the need to develop regulatory governance mechanisms that will effectively prevent and forestall their development (see Lentzos, this volume). Yet, in both these domains of domestic and international security, the technological advances have been so rapid that both our regulatory and collective decision-making institutions of governance have struggled to keep pace, with no clear ethical and societal consensus emerging, while scientific research in these domains continues its onward march. As we remarked earlier, if only the world would stand still … if only.

In some ways, these complexities can be attributable to the ‘dual use’ character of many technologies that are currently emerging as general purpose technologies, that is, technologies that can be applied for clearly beneficial purposes, and also for purposes that are clearly not. Yet many technological advances defy binary characterization, reflecting greater variation and ambivalence in the way in which these innovations and their applications are understood. Consider networked digital technologies. On the one hand, they have had many positive consequences, radically transforming the way in which individuals from all over the world can communicate and access vast troves of information with lightning speed (assuming, of course, that networked communications infrastructure is in place). On the other hand, they have generated new forms of crime and radically extended the ease with which online crimes can be committed against those who are geographically distant from their perpetrators. But digital technologies have subtler, yet equally pervasive, effects. This is vividly illustrated in Draper and Turrow’s critical exploration of the ways in which networked digital technologies are being utilized by the (p. 31) media industry to generate targeted advertising in ways that it claims are beneficial to consumers by offering a more ‘meaningful’, highly personalized informational environment (see Draper & Turrow, this volume). Draper and Turrow warn that these strategies may serve to discriminate, segregate, and marginalize social groups, yet in ways that are highly opaque and for which few if any avenues for redress are currently available. In other words, just as digital surveillance technologies enable cybercriminals to target and ‘groom’ individual victims, so also they open up new opportunities through which commercial actors can target and groom individual consumers. It is not only the opacity of these techniques that is of concern, but the ways in which digital networked technologies create the potential for asymmetric relationships in which one actor can ‘victimize’ multiple others, all at the same time (see Wall, this volume).

While all the policy issues addressed in Part V of the Handbook are recognized as being ‘global’, there is more than one way of explaining what it is that makes a problem a ‘global’ one. No matter where we are located, no matter how technologically sophisticated our community happens to be, there are some policy challenges that are of common concern —most obviously, unless we collectively protect and preserve the natural environment that supports human life, the species will not be sustainable. Not only can technological

developments sometimes obscure this goal of environmental protection regulation (see Flatt, this volume), but technological interventions can also mediate connections between different aspects of the environment, such as between water resources and different means of energy production, leading to intersecting spheres of regulation and policy trade-offs (see Kundis Craig, this volume). Other challenges arise by virtue of our responsibilities to one another as fellow humans. It will not do, for example, to maintain first-class conditions for health care in the first world and to neglect the conditions for health and well-being elsewhere. Yet further challenges arise because of our practical connectedness. We might ignore our moral responsibilities to others but, in many cases, this will be imprudent. No country can altogether immunize itself against external threats to the freedom and well-being of its citizens. New technologies can exacerbate such threats, but can also present new opportunities to discharge our responsibilities to others. If we are to rise to these challenges in a coordinated and consensual way, the regulatory environment—nationally, regionally, and globally—represents a major focal point for our efforts, and sets the tone for our response to the key policy choices that we face.

8. Concluding Thoughts

In conclusion, our hope is that this Handbook and the enriched understanding of the many interfaces between law, regulation, and technology that it offers might improve (p. 32) the chances of cultivating a regulatory environment that stimulates the kind of technological innovation that contributes to human flourishing, while discouraging technological applications that do not. However, as the contributions in this volume vividly demonstrate, technological disruption has many, often complex and sometimes unexpected, dimensions, so that attempts to characterize technological change in binary terms—as acceptable or unacceptable, desirable or undesirable—will often prove elusive, if not over simplistic. In many ways, technological change displays the double-edged quality that we readily associate with change of any kind: even change that is clearly positive inevitably entails some kind of loss. So, although the overwhelming majority of people welcome the ease, simplicity, low cost, and speed of digital communication in our globally networked environment, we may be rapidly losing the art of letter writing and with it, the loss of receiving old-fashioned paper Christmas cards delivered by a postman through the letterbox (Burleigh 2012). While losses of this kind may evoke nostalgia for the past, sometimes the losses associated with technological advance may be more than merely sentimental. In reflecting on the implications of computerization in healthcare, Robert Wachter cautions that it may result in a loss of clinical skill and expertise within the medical profession, and points to the experience of the aviation industry in which the role of pilots in the modern digital airplane has been relegated primarily to monitoring in-flight computers. He refers to tragic airline crashes, such as the 2009 crashes of Air France 447 off the coast of Brazil and Colgan Air 3407 near Buffalo, in which, after the machines failed, it became clear that the pilots did not know how to fly the planes (Wachter 2015: 275). Yet measuring these kinds of subtle changes, which may lack material, visible form, and which are often difficult to discern, is not easy and we often fail to appreciate what we have lost until after it has gone (Carr 2014). But in this respect, there may be nothing

particularly novel about technological change, and in many ways, the study of technological change can be understood as a prism for reflecting on the implications of social change of any kind, and the capacity, challenges, successes, and failures of law and regulatory governance regimes to adapt in the face of such change.

Furthermore, technological disruption—and the hopes and anxieties that accompany such change—is nothing new. Several of the best known literary works of the 19th and 20th centuries evoke hopes and fears surrounding technological advances, including *Brave New World*, which brilliantly demonstrates the attractions and horrors of pursuing a Utopian future by engineering the human mind and body (Huxley 1932); *Nineteen Eighty Four*, with its stark depiction of the dystopian consequences of pervasive, ubiquitous surveillance (Orwell 1949); and before that, *Frankenstein*, which evokes deep-seated anxieties at the prospect of the rogue scientist and the consequences of technology run amok (Shelley 1818). These socio-technical imaginaries, and the narratives of hope and horror associated with technological creativity and human hubris, have an even longer lineage, often with direct contemporary analogues in ongoing contestation faced by contemporary societies pertaining to particular technological developments (Jasanoff 2009). For example, in contemplating (p. 33) the possibility of geoengineering to combat climate change, we are reminded of young Phaethon's fate in ancient Greek mythology; the boy convinced his father, the sun god Helios, to grant the wish to drive the god's 'chariot'—the sun—from east to west across the sky and through the heavens, as the sun god himself did each day. Despite Helios' caution to Phaethon that no other being, not even the almighty Zeus himself, could maintain control of the sun, Phaethon took charge of the fiery chariot and scorched much of the earth as he lost control of the chariot sun. Phaethon was himself destroyed by Zeus, in order to save the planet from destruction and the sun returned to Helios's control (Abelkop and Carlson 2012–13). If we consider the power of the digital networked global environment and its potential to generate new insight and myriad services ranging from enhancing productivity, pleasure, or health, we may also be reminded of Daedalus's Labyrinth: a maze developed with such ingenuity that it safely contained the beast within. But in containing the Minatour, it also prevented the escape of the young men who were ritually led in to satisfy the monster's craving for human flesh. In a similar way, the digital conveniences which the sophistication of Big Data and machine learning technologies offer which 'beckon with seductive allure' (Cohen 2012) are often only able to do so by sucking up our personal data in ways that leave very little of our daily lives and lived experience untouched in ways that threaten to erode the privacy commons that is essential for individual self-development and a flourishing public realm.

As Sheila Jasanoff reminds us, these abiding narratives not only demonstrate the long history associated with technological development, but also bear witness to the inescapable political dimensions with which they are associated, and the accompanying lively politics (Jasanoff 2009). Accordingly, any serious attempt to attempt to answer the question, 'how should we, as a society, respond?', requires reflection from multiple disciplinary lenses in which legal scholarship, on the one hand, and regulatory governance studies, on the other, represent only one small subset of lenses that can aid our understanding. But recognizing the importance of interdisciplinary and multidisciplinary scholarship in under-

standing the varied and complex interfaces between technological innovation and society is not to downplay the significance of legal and regulatory perspectives, particularly given that in contemporary constitutional democracies, the law continues to wield an exclusive monopoly on the legitimate exercise of coercive state power. It is to our legal institutions that we turn to safeguard our most deeply cherished values, and which provide the constitutional fabric of democratic pluralistic societies. Having said that, as several of the contributions to this volume demonstrate, markets and technological innovation are often indifferent to national boundaries and, as the twenty-first century marches on, the practical capacity of the nation state to tame their trajectories is continually eroded.

The significance of legal and regulatory scholarship in relation to new technologies is not purely academic. Bodies such as the European Group on Ethics in Science and New Technologies, the UK's Nuffield Council on Bioethics, and the US (p. 34) National Academy of Sciences, not only monitor and report on the ethical, legal, and social implications of emerging technologies, but they also frequently operate with academic lawyers and regulatory theorists as either chairs or members of their working parties. Indeed, at the time of writing these concluding editorial thoughts, we are also working with groups that are reviewing the ethical, legal, and social implications of the latest gene editing technologies (Nuffield Council on Bioethics 2016; World Economic Forum, Global Futures Council on Biotechnology 2016), machine learning (including driverless cars and its use by government) (The Royal Society 2016), utilizing Big Data across a range of social domains by both commercial and governmental institutions (The Royal Society and British Academy 2016), and the UK National Screening Committee's proposal to roll-out NIPT (non-invasive pre-natal testing) as part of the screening pathway for Downs syndrome and the other trisomies (UK National Screening Committee 2016). Given that lawyers already play a leading part in policy work of this kind, and given that their role in this capacity is far more than to ensure that other members of relevant working groups understand 'the legal position', there is a wonderful opportunity for lawyers to collaborate with scientists, engineers, statisticians, software developers, medical experts, sociologists, ethicists, and technologists in developing an informed discourse about the regulation of emerging technologies and the employment of such technologies within the regulatory array. It also represents an important opportunity for the scholarship associated with work of this kind to be fed back into legal education and the law curriculum. However, the prospects for a rapid take-up of programmes in 'law, regulation, and technology' are much less certain.

On the face of it, legal education would seem just as vulnerable to the disruption of new technologies as other fields. However, the prospects for a radically different law school curriculum, for a new 'law, technology, and regulation' paradigm, will depend on at least six inter-related elements, namely: the extent to which, from the institutional perspective, it is thought that there is 'a business case' to be made for developing programmes around the new paradigm; how technological approaches to legal study can be accommodated by the traditional academic legal community (whose members may tend to regard disputes, cases, and courts as central to legal scholarship); the willingness of non-lawyers to invest time in bringing students who are primarily interested in law and regulation up to speed with the relevant technologies; the view of the legal profession; the demand from (and

market for) prospective students; and the further transformative impact of information technologies on legal education.

It is impossible to be confident about how these factors will play out. Some pundits predict that technology will increasingly take more of the regulatory burden, consigning many of the rules of the core areas of legal study to the history books. What sense will it then make to spend time pondering the relative merits of the postal rule of acceptance or the receipt rule when, actually, contractors no longer use the postal service to accept offers, or to retract offers or acceptances, but instead (p. 35) contract online or rely on processes that are entirely automated? If the community of academic lawyers can think more in terms of today and tomorrow, rather than of yesterday, there might be a surprisingly rapid dismantling of the legal curriculum. That said, the resilience of the law-school curriculum should not be underrated. To return to Mandel's advice, the importance of legal analysis should not be underestimated in the brave new world of technology, and the skills of that analysis have a long and rich history.

Summing up, the significance of the technological developments that are underway is not simply that they present novel and difficult targets for regulators, but that they also offer themselves as regulatory tools or instruments. Given that technologies progressively intrude on almost all aspects of our lives (mediating the way that we communicate, how we transact, how we get from one place to another, even how we reproduce), it should be no surprise that technologies will also intrude on law-making, law-application, and so on. There is no reason to assume that our technological future is dystopian; but, equally, there is no guarantee that it is not. The future is what we make it and lawyers need to initiate, and be at the centre of, the conversations that we have about the trajectory of our societies. It is our hope that the essays in the Handbook will aid in our understanding of the technological disruptions that we experience and, at the same time, inform and inspire the conversations that need to take place as we live through these transformative times.

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Notes:

(1.) The Convention for the protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine, Council of Europe, 04/04/1997.

(2.) Chairman’s statement, p. 4. Available at: http://www.midstaffspublicinquiry.com/sites/default/files/report/Chairman%27s%20statement.pdf.

(3.) Readers will note that ‘justice’ does not appear in this list. As will be clear from what we have already said about this value, this is not because we regard it as unimportant. To the contrary, a chapter on justice was commissioned but, due to unforeseen circumstances, it was not possible to deliver it in time for publication.

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