Digital Modernity

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ABSTRACT

"Modernity" is a social, cultural or historical descriptor for a certain type of society or set of social arrangements. This monograph reviews narratives of digital modernity, without endorsing them; as narratives, they selectively discuss aspects of our sociotechnical context, descriptively, teleologically or normatively. Digital modernity narratives focus on the possibilities of the data gathered by an ambient data infrastructure, enabled by ubiquitous devices such as the smartphone, and activities such as social networking and e-commerce. Some emphasise continuities with 20th century modernity narratives, while others emphasise discontinuity, such as theories of the singularity. Digital modernity is characterised by: a subjunctive outlook where people's choices can be anticipated and improved upon; the valorisation of disruptive innovation on demand; and control provided by data analysis within a virtual realm (cyberspace or the metaverse) which can be extended and applied to the physical world (in such applications as the quantified self and the smart city). The synergies and tensions between these three aspects are explored, as are the opportunities for and dilemmas posed by misinformation. Five principles emerge from the study of relevant texts and business models: (1) the quantity of data being produced in the world has enabled, and been enabled by, technological, social, economic and

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cultural change, and as such is a marker of a qualitative change in modernity; (2) digital modernity is a subjunctive world in which reflexivity and choice are outsourced to the ambient data infrastructure; (3) since personalisation replaces choice in digital modernity, and since effective personalisation demands knowledge about the individual on the part of the personalised service provider, privacy is now an obstacle to the delivery of digital modernity; (4) to exist is to be backward; (5) the best that hapless reality can achieve is to get closer to the perfection of the algorithm and the data. To conclude, digital modernity is contrasted with other theories of the 21st century information society, including postmodernism, the network society and ANT.

Keywords: digital modernity; data; smart technology; ubiquitous technology; sociotechnology; Web Science

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1

Introduction

"Modernity" is a social, cultural or historical descriptor for a certain type of society or set of social arrangements. It may be associated with a particular historical period, delineated by a range of dates (e.g., 1500–1989), or with particular properties that a society may exhibit (e.g., individualism, or rational-scientific problem-solving). Although, in ordinary language, a "modern" society usually means current society, or a particular rational ideal of it, this social scientific use of the term "modernity" leaves open the possibility that it describes the past. Those who believe modernity has ended or passed have often suggested that current societies are *postmodern*.

For reasons that will become clear, modernity is a contentious and disputed term, often understood implicitly. It is a way of describing and classifying highly complex, dynamic and emergent aggregate social phenomena, and so dramatically simplifies such contexts. However, the language of modernity remains attractive to commentators, academics and policymakers. In this monograph, I will review the literature that characterises what I will call *digital modernity*. It is important to realise that this monograph is a review; I do not endorse the descriptions and narratives of digital modernity and am not proselytising. I do, however,

contend that they are influential and important for understanding 21st century sociotechnological development. This monograph *reports* a class of narrative description; it does not defend it.

The terminology can get confusing, partly because it is fought over by historians, sociologists, political scientists and philosophers, critics and others in the humanities, and non-academic journalists and commentators. Those who wish to be interdisciplinary, or who wish to reach wider or more general audiences (as in this monograph), end up blending these terms to render them even more baffling. Hence, to orient ourselves initially:

- *Modernity* itself is a cultural condition, which could be rendered as an aggregate of social phenomena, a narrative or a logic. It refers to and defines a *modern* society.

- *Modern* is an ambiguous adjective, either describing a society that meets the conditions of modernity, or referring to a period of time in which such societies flourished.

- *Postmodernity* is a cultural condition of a society that has passed through modernity, no longer displaying modern characteristics; instead, that society is *postmodern*. If a society is postmodern, then the period of time in which it was modern has a start and an end (e.g., 1500–1980).

- *Modernisation* is the (set of) process(es) by which a society becomes modern, enacts its modernity, or follows the logic of modernity.

- *Modernism* is something else, an almost-defunct movement in art that celebrated modernity, of no relevance to this monograph; a *modernist* is an exponent or adherent of modernism. I will therefore avoid these terms (although I will occasionally refer to adherents of digital modernity as "modernists" or "digital modernists" for ease of exposition).

- *Postmodernism* (and *post-modernist*) are ambiguous, and can refer to the superseding of modernism (the original literary/critical

usage of the term), or the superseding of modernity (a derivative usage brought in by Lyotard, 1984); in this monograph, I shall use the term "postmodernism" exclusively in the second sense.

This is an enormous topic, and I can't hope to cover it comprehensively in the space available. My aim is to set out key aspects of and problems with the narrative, and illustrate them with sufficient references to enable the student or researcher to drill down more deeply. I have not used many of the lenses through which much academic research in this area is performed, such as inequalities, power, neoliberalism, gender, post-colonial attitudes, disability and sexuality; neither have I discussed many important issues, such as privacy, the evolution of law, Internet governance, cybercrime and cybersecurity, and geopolitics in any detail. Their omission is a deliberate decision of scope, not lack of awareness, and I leave such discussion to the better-qualified (e.g., Alper *et al.*, 2016; Castells, 2000b; Dobransky and Hargittai, 2006; Haffner, 2018; Halford and Savage, 2010; Haraway, 1991; Hargittai and Hsieh, 2013; Helsper, 2012; Lupton, 2015, 117–140; Moyo, 2018; Nakamura, 2014; Nakamura and Chow-White, 2011; Norris, 2001; Robinson *et al.*, 2015; Watling, 2011; Wodajo, 2022; Zimmerman, 2017). This is intended to be a preliminary sketch of a narrative that, for better or worse, underlies many assumptions about the development of technology. Cyberspace is a constructed world, and so may well be re-engineered, but to do that involves both understanding the technology, and *the narratives or myths that justify it internally*. Without that understanding, and the ability to develop alternatives, the researcher stands on one side, a spectator. It is all very well to interpret the world, as a 19th century sage put it, but if the point is to change it, then one has to engage in terms that will have traction.

What does "digital modernity" buy us as a term? A number of things: first, it names and clusters a group of those internally-justifying narratives, the better to understand them; second, it highlights that there will be important continuities and discontinuities with 20th century modernity; third, by emphasising the digital it highlights the particularly relevant technological aspects of 21st century modernity; fourth, it provides some distance from contrasting or related ideas such as

postmodernism or the network society (see Section 9). The analysis will attempt to explain what apparently divergent narratives – particularly optimistic and pessimistic ones – share, as well as what they do and don't share with previous narratives. Both history and the present (and, ultimately, the future) are made up of gazillions of events, ranging from the infinitesimal in time and space to continental and global movements, that collectively look like chaos; any sensemaking narrative will select from these a tiny subset that it claims are characteristic in some way. Stuff happens – but *these* are what we need to understand the age. It follows that gazillions to the power of gazillions of narratives could be generated, but only some are useful. Narratives of digital modernity are useful because – for reasons to be given in Section 2.2 below – they help explain the development of technology. Digital modernity matters because many influential people accept, and often generate, the digital modernity narrative.

Given digital modernity's strong association with the Web, it is a central topic for Web Science, the interdisciplinary study of the World Wide Web from the technological, social and individual points of view (O'Hara *et al.*, 2013). It will be seen from this survey how research from anthropology, biotechnology, business and management, computer science, criminology, economics, geography, law, media studies, network science, philosophy, politics, psychology, sociology and more are relevant. The literatures invoked are not – cannot be – complete, but should give the student sufficient leads to follow up matters of interest.[1]

The structure of the monograph is as follows. Section 2 will outline the general conception of modernity, and Section 3 the emergence of the particular variant digital modernity at the beginning of the 21st century, and its continuities and discontinuities with preceding narratives. Modernity in general is associated with individuality, the compression of time, and the compression of space, and these three aspects of digital modernity will be discussed in Sections 4–6 respectively. In these earlier sections, five perhaps startling principles which together

[1] I have also taken some quotes and insights from representative literary and cultural figures. In general, I have not referenced these, as most works by these authors have been republished in countless editions. They are there less as a research resource, than as illustrations of a point of view.

help characterise digital modernity will emerge. Having gathered these principles together, Section 7 will discuss the relation between them and the different dimensions of time and space, for the narrative of digital modernity contains potential difficulties and even contradictions. Section 8 takes some of these themes further, looking at epistemology and misinformation, while Section 9 will place digital modernity in the context of alternative theories of modernity, including postmodernity, which has its own take on truth. Section 10 briefly summarises and concludes, while an Envoi returns to the early modern period to explore a remarkable parallel.

For future reference, the five principles are as follows.

(1) The quantity of data being produced in the world has enabled, and been enabled by, technological, social, economic and cultural change, and as such is a marker of a qualitative change in modernity (Section 3.4).

(2) Digital modernity is a subjunctive world in which reflexivity and choice are outsourced to the ambient data infrastructure (Section 4.1).

(3) Since personalisation replaces choice in digital modernity, and since effective personalisation demands knowledge about the individual on the part of the personalised service provider, privacy is now an obstacle to the delivery of digital modernity (Section 4.2).

(4) To exist is to be backward (Section 5.2).

(5) In digital modernity, the best that hapless reality can achieve is to get closer to the perfection of the algorithm and the data (Section 6.1).

They will be explained and derived in the sections shown.

2

Narratives of Modernity

However modernity is characterised, it is associated with *modernisation*. A society achieves modernity by undergoing modernisation, which may be the result of a social consensus, or may be imposed on a community from the top down. Rationalism, individualism or minority rights (or other properties) may be determined by a sociopolitical elite in the face of resistance from traditionalists or communitarians. Alternatively, a population may modernise in the teeth of the opposition of a more conservative elite, by adopting technology, developing popular arts or even simply dressing in non-traditional ways. Mechanisms for, and symptoms of, modernisation have included democracy, free markets, global influences on the arts, and women's emancipation.

2.1 Modernity, Linearity and Resistance

Modern societies are characterised in relative terms, compared to non-modern (or *pre-modern*) societies. The contrast is often made out using terms such as "advanced" and "backward". A modern society is advanced compared to a backward one, implying a linear scale connecting the two. Two coeval societies may be compared using this scale – one more advanced (less backward) than the other. Or different historical

periods of the same society may be compared – "between 1500 and 1800, the society became more advanced". It also follows that, perhaps due to a natural catastrophe (Erikson, 1976) or the spread of a "backward" ideology (Berger, 1996–1997), an advanced society might slip into relative backwardness.

Modernisation is the process of moving away from the backward end of the scale toward the advanced, and as such provides a simplifying narrative of progress. Modernity is the end product of such narratives; the extent of a society's modernity will be described by a narrative of modernisation. It should be said that social phenomena are so complex and open to diverse interpretations and valuations that any narrative of modernity might be challenged by alternatives and counter-narratives. Narratives simultaneously conceal and emphasise: "myths are important both for what they reveal (including a genuine desire for community and democracy) and for what they conceal (including the growing concentration of communication power in a handful of transnational media businesses)" (Mosco, 2004, 19).

Three assumptions stand out about the relationship between modernity and modernisation. First, progress is commensurable on a linear scale, so that it is possible to make judgments such as "that society is more advanced than that", or "this culture is becoming more backward." Second, it is possible to specify the meaning of terms like "advanced" and "backward" independently of processes such as modernisation, avoiding circularity. Third, progress happens broadly across a range of fronts, so that, for instance, it would be unlikely that a nation would become more advanced in one respect (say, technologically), while becoming more backward in another (say, with respect to human rights) (O'Hara, 2020a, 198–199).

Modernity affects the conditions for its own expression. The conception of linear temporality itself has been claimed to be characteristic of modernity (Fritzsche, 2004), compared to a cyclic pre-modern notion of time in which progress is not expected, and current events are seen as symbolic of both past and future (Eliade, 1971). As an example with some significance in the history of European thought, consider the fourfold significance of the resurrection of Christ in pre-modern Christian theology, an event that (i) was prefigured symbolically by

several narratives from the ancient Old Testament past, for example the Exodus of the Jews from Egypt, (ii) actually happened at a point in the past, as relayed by the Gospels, (iii) occurs perpetually in the present, allegorically, in the hearts of penitent sinners, and (iv) prefigures the future Day of Judgment when Christ will arise once more. The event wasn't in any sense a one-off, but infused the whole history of humankind, its immanence connecting the deep past with the far future for that particular community of belief (and was an irrelevance to alternative religious communities). This is not unique to Christianity; in Shia Islam, similar considerations apply to the Battle of Karbala, in which the Imam Husayn met his death in the year 61AH (AD680).

> For Sunnis, Karbala is history, albeit a dark chapter. For Shias, it is the beginning, the motif around which faith has been shaped. Karbala defines Shiism's ideals: dedication to the imams as an article of faith and commitment to pursuing justice in the face of tyranny. . . . For Shias, Husayn's martyrdom is . . . a metahistorical manifestation of the truth. Even before there was Islam or Husayn . . . the spiritual essence of Husayn's great deed existed as a timeless expression of divine grace.
>
> (Nasr, 2006, 49–50)

On the modern view, however, such non-linear phenomena have no place in a narrative; either Jesus did not exist, or if He did He was born in such-and-such a year and died in such-and-such a year, and is thus absorbed into the flow of history. Virgil could not have known of him, Tacitus did. Resurrection would be a miracle, and many in the modern period have preferred to explain the Gospel stories as allegorical. Others have developed naturalistic hypotheses, such as that Christ's body was lost (Edelman in 1746), He was mistakenly pronounced dead (Bahrdt in 1780), the risen Christ was a vision or hallucination (Strauss in 1835), as well as the explanation referred to and rejected in the Gospel of Matthew, that the body was stolen.

From the modern point of view, linearity also means that there is no reason why the "facts of the matter" can't be accepted by all religious and non-religious communities; (some) communication and even

toleration occurs when all sides can agree (in principle) on the events in history, even if they disagree about their significance (whether Jesus was indeed the son of God, or merely a human preacher). In Europe, it may have been the fearsome religious wars of the 17th century, which were apocalyptic without being decisive or "herald[ing] final judgment . . . [which] disclosed a new and unorthodox future" (Koselleck, 1985, 22; O'Hara, 2010, 66–68; see also Kaplan, 2007 for an alternative view), that undermined the assumption that history had meaning. Other non-religious factors also contributed to this draining of meaning from history, such as "the deep rupture in remembered experience that came with the French Revolution" (Fritzsche, 2004, 16). Our distance from the past is compounded with a revolution in space, as travel and migration also put distance between people and their historical roots (Anderson, 1991).

Modernity may seem to liberate the individual from the stifling effects of tradition and superstition, or alternatively may seem alienating in contrast to the meaningful community of pre-modernity; it is a matter of taste (Bruckner, 2013, 172–177). On the one hand, according to one prominent commentator, "the desire to live in a modern – that is, technologically advanced and prosperous – society" is "universal" (Fukuyama, 2006). On the other, the replacement of small-scale cottage entrepreneurs and craftspeople by polluting factories, the division of labour and a wage economy (Durkheim, 2014) is a step toward unfeeling barbarism. During the First World War, Paul Elmer More wrote that "As we contemplate the world converted into a huge machine and managed by engineers, we gradually grow aware of its lack of meaning, of the emptiness of human value; the soul is stifled in this glorification of mechanical efficiency" (1921, 249), an oft-expressed protest that has certainly been renewed in the digital world. George Grant, a resister of modernity, was concerned that technology is creating a universal society, with an argument derived ultimately from Hegel's *Phenomenology of Spirit*, suggesting modernisation is the synthesis of the negations of smaller communities (Grant, 1969, 76–78). And today, the replacement of the disconnections and inconveniences of the 20th century with the efficiencies of always-on connectivity is commonly regarded with nostalgic regret (Gordon, 2022; Harris, 2014; Jansson and Adams 2021; Keen,

2012; Lanier, 2011; Paul, 2021; Turkle, 2011), or what Bratton called "perplexed melancholy" (Bratton, 2015, 39). Establishing a narrative of modernity is a task of persuasion, and even if the narrative is widely accepted, it will always be vulnerable to alternative interpretation.

Conversely, a critical or pessimistic narrative may be undermined by the widespread bottom-up adoption of the very practices or technologies of which the narrative is critical. As an example, Wendy Brown was scathing about what she considered the "so ubiquitous as to be comic" over-use of the mobile phone in Italy at the turn of the 21st century (Brown, 2004), but the Italians had the last laugh as, by 2021, over 80% of the world's population used smartphones.[1] The decline of the Internet has been predicted (Modis, 2005), although less often now. Even more recently, while social media are deplored (Lanier, 2018), their user base continues to grow.[2] In 2021, global social media penetration was 53.6%.[3]

2.2 Styles of Narrative

Such narratives might be *descriptive*, *teleological* or *normative*. A descriptive narrative simply enumerates markers of modernity that can be verified as actually happening. Industrialisation is one such; others identified by Max Weber include (i) rationalised private enterprises seeking monetary profit in markets, (ii) greater uptake of technology, including by those enterprises, (iii) labour mobility allowing rational allocation of labour, (iv) citizens' rights provided and defended by the state, (v) bureaucratic administration, (vi) stability of law and predictable legal consequences of actions, (vii) representative political institutions with widespread suffrage, (viii) secularisation, (ix) achievements receiving roughly commensurate rewards (Shils, 1997c, 228). Other common markers remarked upon by more recent theorists include (x) internal migrations from rural to urban centres, (xi) greater equality between

[1] https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/, https://www.bankmycell.com/blog/how-many-phones-are-in-the-world.

[2] https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/.

[3] https://www.statista.com/statistics/269615/social-network-penetration-by-region/.

the genders, (xii) relatively greater importance of weak ties between people (Granovetter, 1973) as compared to the strong ties of kinship or common group membership, (xiii) transactional interactions (pragmatic reciprocal exchanges focused on mutually beneficial outcomes) displacing ritual, obeisance and respect for status, (xiv) the displacement of *ad hoc* responses to events with abstract, theorised management, and (xv) shifts from local standards to more global aspects of culture. In such a narrative, the narrator aims to show that a society is verifiably changing in certain ways. A teleological narrative describes the modernisation process as determined, as an unstoppable process (sociologist Anthony Giddens described modernisation as a "juggernaut" for example – Giddens, 1990, 139). Such a narrative says that, like it or not, this is where we will end up so we have better learn to either like it or live with it. A normative narrative describes what *ought* to happen, so modernisation becomes an ideal that needs to be pursued, facilitated, supported or funded.

These three modes often combine within a single account – a not unusual phenomenon in social thought (cf. Karl Marx, for instance). As an example, Bratton's *The Stack*

> names the organization of a planetary-scale computing infrastructure [descriptive], [while] my purpose is to leverage it toward a broader program for platform design [normative]. . . . As a model, The Stack is simultaneously a portrait of the system we have but perhaps do not recognize [descriptive], and an antecedent of a future territory [teleological].
>
> (Bratton, 2015, 5)

Some have pushed back – for instance Georg Simmel, sociologist and early chronicler of modernity, warned in 1907 about the confusion of means and ends, and the use of loaded vocabulary to give illusory impressions: "the degree to which [a technology] approximates to its own immanent ideals, is all too easily interpreted as a value and dignity

in itself, and in its relationship to other elements of life" (Simmel, 2004, 481).[4]

Nevertheless, these narratives matter when they are taken seriously by opinion-formers, such as academics, technologists (such as Elon Musk, founder of X.com, SpaceX and Neuralink and CEO of Tesla – Kulshreshth *et al.*, 2019; Musk, 2014, 2019), entrepreneurs (such as Mukesh Ambani, founder of Reliance Jio – Mukherjee, 2019) and policymakers (such Dominic Cummings, chief advisor to British Prime Minister Boris Johnson in 2019–2020 – Blunkett and Flinders, 2021). When such influential people, and early adopters of innovative technologies and practices, actively work to ensure that such narratives are instantiated, then the narratives become "imaginaries", or discourses through which sociotechnical reality is shaped and modelled (Jasonoff, 2015). These are the creative ways in which people picture their societies functioning, the ways people interact:

> . . . the ways people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper normative notions and images that underlie these expectations.
>
> (Taylor, 2004, 23)

Imaginaries shape the ways that people as a matter of fact do interact with their fellows. They create and conform to their own expectations of how society should be. Hence the truth, falsity, plausibility and defensibility of such narratives are of less moment than the fact that people and organisations subscribe to them, and defer to them, so that "Values which do not 'yet' exist, except as probabilistic estimations, or risk structures, acquire a power of command over economic (and

[4] En passant, he also added the sage advice that "People's ecstasy concerning the triumphs of the telegraph and telephone often makes them overlook the fact that what really matters is the value of what one has to say, and that, compared with this, the speed or slowness of the means of communication is often a concern that could attain its present status only by usurpation" (Simmel, 2004, 482). As we shall see, this latter thought is being seriously challenged, as algorithms try to turn the *quantity* of expressions captured into something more valuable than high-*quality* expression.

therefore social) processes, necessarily devalorizing the actual" (Land, 2019, 515–516). As the Thomas Theorem has it, "if men define situations as real, they are real in their consequences" (Thomas and Thomas, 1928, 571–572). "In these frames work will be transformed, education upturned, corporate structures revitalised, democracy itself reassessed" (Webster, 2006, 5).

2.3 Cultural Variation

Modernity may express itself differently across cultures, so that, for instance, it may have different characteristics in East Asia from modern European societies (Appadurai, 1990; Wagner, 2012), although some argue that its main roots are in capitalism and the nation state, and that therefore it is a predominantly Western or European phenomenon at least in form, if not in subsequent development (Gamble, 2009; Giddens, 1990, 174–176). Modernity in Europe has often been taken to have been nascent in the Renaissance (Grady, 2000), and drastically accelerated by the Enlightenment (O'Hara, 2010), a period roughly running from the late 17th century to the early 19th, which provided the classic narrative of modernisation, particularly in its displacement of tradition by reason, via its critique of traditional sources of authority. Even so, the Enlightenment developed differently in, say, Britain and Germany (Lash, 1994, 121–127), and differently again in the Netherlands (Koenis, 2014). And, of course, in all places, modernity is spread unequally, its benefits as well as its costs (Castells, 2000b; Lash, 1994, 120; Lupton, 2015, 117–140; Norris, 2001; O'Hara and Stevens, 2006).

American accounts tend to focus on industrialisation and individualism. For instance, in her influential discussion of surveillance capitalism, Shoshana Zuboff argues that modernity has moved through three stages. Her characterisation is relatively narrow in both time and space, based on the power and position of the individual, and derived almost exclusively from the American experience. The first modernity involved the growth of the individual, separated or disembedded from traditional norms and rules. This early individual (Zuboff places this social movement at the beginning of the mass migrations of the 20th century and the development of mass production) wielded his or her identity

within a nexus of other traditional identities based on family, geography, religion and tradition, giving a choice or a range of opportunities. In the second modernity, this nexus of identities melted away as individual life choices supported by education, democracy and capitalism proved overwhelmingly superior from the modern individual's perspective (Lash, 1994, 115; Zuboff, 2019, 31–37). Her "third modernity" correlates with what I am calling digital modernity.

Individualism is less prominent in Asia than in Europe or the United States, leading to many imaginaries about the ability of technology to stress conformity (such as the idea of social credit in China, which serves both as a potential if not yet practicable means of population control for Chinese national and local government, and as a scare story for democrats in the West – Mac Síthigh, 2021; Zhang, 2020a).

Religion is another variable; the US has retained a strong religiosity during its modernisation, in contrast to the weakening hold of religion in Europe, where it is often taken as a marker of pre-modernity, associated with mysticism, irrationalism and traditionalism. For example, Simmel took "believing in God's direct control over our earthly life" as the paradigm naivety about causation and natural causes (Simmel, 2004, 483). Because religion gives meaning to life, pre-modern societies are often said to be intrinsically meaningful to their populations, unlike the more transactional and exploitative relationship we have with our modern social environment. In modernising societies, highly traditional and institutionalised religions such as Catholicism have declined, being supplanted by alternatives such as Pentecostalism that have adapted while retaining a non-rationalist outlook. Islamic fundamentalism also seems to have prospered in modernising societies (both in Islam's traditional homelands and amongst the diaspora) compared to more nuanced traditions rooted in their societies (Roy, 2004). On a more secular note, the economic power that modernity brought to Europe enabled colonialism and the exploitation of non-European peoples, which at a minimum complicates the experience of modernity in the global South (e.g., Chatterjee, 2010).

We should bear in mind that the weight of sociology on this topic originates from Europe and the United States, and is doubtless biased toward the characteristics of those societies. This will also be true

of this review, which will focus largely on narratives generated in technologically-sophisticated societies; the reader should bear this bias in mind. Cultural variation in digital modernity will be revisited in Section 9.3.

2.4 Themes of Modernity

It should also be noted that narratives of modernity have evolved alongside the societies they describe. What appeared "modern" to a person in 1850 would look very different to someone in 1950, or indeed 2020. Furthermore, as the narratives themselves are rarely explicitly stated as such, different observers may discern or emphasise different claims or phenomena. However, some themes are more prominent and constant than others, especially connections with technology, science, rationalism and increases in wealth (especially for the poorest).

Giddens argued that modernisation has three major consequences (Giddens, 1990). First, abstract measures of time and space supersede local variations. Universal clocks and measurements replace particular traditions, and outside influences through communications, new media, transport and migration become relatively more important (Castells, 2000a; Simmel, 2004, 443–446). Memory is focused less on habit, narrative and living memory, and more on representation and recall from media technologies (Hutton, 1993, 16). Albert Camus wrote in 1947 about the view from an aeroplane as

> one of the elements of modern negation and abstraction. There is no more nature; the deep gorge, true relief, the impassable mountain stream, everything disappears. There remains a *diagram* – a map. Man, in short, looks through the eyes of God. And he perceives then that God can have but an abstract view.
>
> (Quoted, with Camus' emphasis, in Zaretsky, 2013, 135)

This view strikingly foreshadows James C. Scott's description of the geometrically-planned city with a formal spatial order, hard to understand at street level by citizens, but legible to authorities from above (Scott, 1998, 55–58).

Second, social action and interaction become "disembedded" from local contexts, so they can increasingly be described without reference to local preferences or customs. Disembedding both flows from and supports specialisation and the division of labour, what 20th century author Rebecca West called

> the peculiar bargain this age had driven with . . . his fellow men: teaching them to perform one enormously complicated operation, such as flying a plane, but in exchange taking away their knowledge of certain very simple things, such as the pull of the moon on the sea, and the unlikelihood that a man can kill another man without being found out, or even the nature of murder.
>
> (West, 1977, 277)

Simmel traced one mechanism to the money economy, as fluctuating exchange values create ceaseless change and motion: "money is involved in the general development which in every domain of life and in every sense strives to dissolve substance into free-floating processes" (Simmel, 2004, 168). Other technologies have added so much to this that Zygmunt Bauman introduced the idea of *liquid modernity*, where social conditions are fluid, unstructured and underdetermined, characterised by constant change (Bauman, 2000).

This all requires access to abstract means of disembedded description, and especially quantification, against which non-quantified methods for describing and justifying human purposes appear redundant (Grant, 1969, 109). As W.H. Mallock complained in the late 19th century, progress is "such improvement as can be verified by statistics, just as education is such knowledge as can be tested by examinations" (quoted in Kirk, 1986, 399).

Third, the dissolution of local reference points and the ready availability of representations of the past mean that people become more self-critical and adaptive, so that the new communications create tight and fast feedback loops, a phenomenon dubbed *reflexivity* (Beck, 1994a; Giddens, 1994), whose social emergence was dated to the 19th century (Sennett, 2002, 151). Reflexivity makes decision-making, policymaking

and prediction far more complex, as social causes and effects have circular or reciprocal connections, in the liquid conditions of late modernity. Agents recognise the social forces acting upon them, perhaps imperfectly, and act to emphasise or counter them, resulting in a measure of freedom from subjugation by classical modernity and Fordist industry (Giddens, 1984, 1991; Lash, 1994, 113). Politics becomes decentralised, and the major collective forces such as social class become too monolithic to express the complexities of one's interests, leading to what Giddens calls *life politics* and Ulrich Beck *sub-politics*, a politics relative to the self-maintenance of the individual. Beck also makes the distinction between (conscious) reflection, and (possibly unconscious) reflexivity which may be the side-effect or unintended product of the actions of ourselves and others, including organisations. In this way, reflexive modernity might undermine its own foundations, "by-passing the dominant categories and theories of industrial society" (Beck, 1994b, 177), for example if ecological crisis made certain forms of industrial organisation impossible, or if globalisation provoked too strong a nationalistic backlash. The key factor for Beck is the emergent feedback loop, not the conscious organising principle of the agents it supervenes upon.

Reflexivity can be seen, for instance, in the close monitoring of the way one's imagined biographical future fits with one's preferences and expectations. We see this in new practices in planning for careers, in which expectations are increasingly de-standardised (so expected career stages and achievements are decoupled from expected stages in one's lifetime) and dynamic (so change is expected and prioritised over work routine within a single organisation) (Vinken, 2007). Furthermore, employees are more concerned with the conduct of the company they work for (or the retailers from whom they buy), because these impact on their own biographies (Bimber, 2003). While certain aspects of our biographies are tailored or given structure for us, for example by welfare states or tax authorities which impose certain structures, even within these constraints "individuals must produce, stage and cobble together their biographies themselves" (Beck, 1994a, 13; Lash, 1994, 115).

On a wider scale, reflexive governance may involve the transformation of the very systems in which it operates (Hendriks and Grin, 2007). Processes become more prominent than things; transformation,

recontextualization, relocation, new understandings and potentialities congruent with one's preferences are valued in more modern societies over given or imposed objects, relationships and places (Arendt, 1998, 299). "As the gods are demystified, man mystifies his own condition; his own life is fraught with meaning, yet it remains to be played out. Meaning is immanent in it, yet the person is unlike a stone or a fossil which is fixed and so can be studied as a form" (Sennett, 2002, 151).

3

From Analogue Modernity to Digital Modernity

Giddens was writing before the exponential take-off of the Internet, smartphones, World Wide Web, Web 2.0 and social media. This review will argue that since his and others' classic accounts, modernity has advanced still further because of this technology, which has stimulated a new set of narratives that describe what I will call *digital modernity* (O'Hara, 2020a; O'Hara and Hall, 2021, 20–23). In this section, I will discuss the properties of the digital modernity narrative itself, many of which grow out of the general properties of modernity, making digital modernity a new phase of modernity, a continuation along the linear scale of advancement, with a clear definition in terms of the types of technological connection envisaged. The changes do not have to be seen as inevitable or predetermined, and progress might have taken other forms, but the technology is seen as changing all aspects of human society comprehensively "leading to unprecedented paradigm shifts in the economy, business, society, and individually. It is not only changing the 'what' and the 'how' of doing things but also 'who' we are" (Schwab, 2016, 3).

In this section, I will sketch the continuities and discontinuities between digital modernity and other modernity narratives. Section 3.1

describes the relevant technological changes that created digital modernity, which happened round about the turn of the century. Section 3.2 describes the foundational resource *data*, creator and creation of these changes, and the related ideas of information and knowledge. Section 3.3 discusses the effects of extracting data from the world. Section 3.4 describes the sudden acceleration in the production of data, and Section 3.5 follows this into the world of big data, while Section 3.6 rounds off with some speculative accounts of where digital modernity may be headed.

3.1 Digital Modernity in Relation to Other Narratives of Modernity

To emphasise the contrast with previous manifestations of modernity, I will refer to these as *analogue modernity*, by which I only mean non-digital modernity. *High modernity* is a term often used to refer to the advanced modernity of the 20th century, particularly post-WWII, and the turn of the century is a reasonable cut-off point for analogue modernity as well. In Western democracies, the Web became a notable phenomenon in the mid-1990s, social media began to appear around 2002–2003 alongside the interactive Web 2.0, and smartphones took off a year or two later. Bratton argues that "sometime from 1995 to 1997 or so, especially in academic design programs, software seemed to displace theory as a tool for thought" (Bratton, 2015, xvii). Google was founded in 1998, with its influential integrated philosophy summarised by a critic as:

> . . . combining a theory of knowledge (nicknamed 'Big Data'), a technological vision (centralized cloud computing), a cult of the commons (rooted in 'open source' software), a concept of money and value (based on free goods and automated advertising), a theory of morality as 'gifts' rather than profits, and a view of progress as evolutionary inevitability and an ever diminishing 'carbon footprint.'
>
> (Gilder, 2018, 25)

We will revisit these components later.

By 2010, the suite of technologies characteristic of digital modernity was more or less in place. Hence analogue modernity includes all types of

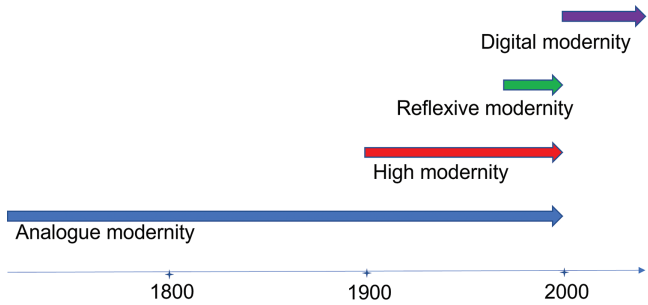

Figure 3.1: Sketchy timeline of different species of modernity.

modernity up to the widespread adoption of digitally networked technology by individuals. High modernity is that type of analogue modernity usually described in terms of technologically-based problem-solving, and reflexive modernity is a late development of high modernity, complicated in the ways that Giddens and Beck described (and sometimes referred to as *late modernity* for that reason).

This (rough) timeline is depicted in Figure 3.1, but is meant as an orienting exercise as much as anything, not a firm definition or socio-historical characterisation. Indeed, outside the wealthy democracies, different timelines can certainly be drawn, although digital modernity has been somewhat more global than analogue modernity: smartphones and social media use have spread dramatically everywhere producing more homogeneous technological experiences. China and India between them had about 1.5bn smartphone users in 2021.

By the use of these terms I do not wish to suggest that digital modernity is "better" or more advanced than analogue modernity, only to draw attention to the key role that digitally networked technologies play in early-to-mid-21st century modernity. Whereas digital technologies were increasingly important in analogue modernity, they were certainly not key (mobile phones only appeared in the 1980s). The systems that delivered analogue modernity had usually been crafted in a pre-digital age, with digital technology added on to speed up some aspects or reduce costs. In contrast, the 2020s see construction of new systems around digital networks, disruption of pre-digital systems and the reconstruction of non-digital items in digital terms as "smart" upgrades.

Frank Webster's sceptical critique argued that the literature was confused with the promiscuous use of technological, economic, occupational, spatial and cultural criteria by theorists (Webster, 2006, 8–21). This monograph will not focus on the economic or occupational (which is not to say they are not important), but will be chiefly concerned with technology and culture. Webster himself suggested that theoretical knowledge is an important but neglected factor, but in Section 3.3 I shall argue that the advances of data-driven ML have tended to reduce its significance in digital modernity.

Technological criteria will be the most prominent in this review. Modernity has always had a strong association with technology, and the World Wide Web is a particularly modernising technology, facilitating globalisation and expert systems, while disintermediating and undermining traditional practices and hierarchies. "Computation is a logic of culture, and so also a logic of design", producing an "emerging big picture" (Bratton, 2015, xvii). It has even been asserted that neural plasticity results in changes to human cognition as a result of technologies mediating between minds and worlds; minds trained to remember long narratives acquire skills different from those trained for knowledge-based problem-solving, and different again from those brought up on Internet search (Carr, 2010). These cognitive changes may be seen as predictable and benign (Shadbolt and Hampson, 2018) or dehumanising (Hari, 2022). The language of modernisation has driven many entrepreneurs' imaginaries across Silicon Valley and the technology industry, and science fiction has also played its role (Lasbury, 2017). Even though faith in progress is declining thanks to the wars and environmental degradation of the 20th century, digital technology is spared the most trenchant criticism. Alan Turing, for example, is regarded with an admiration that we don't find with, say, Oppenheimer.

Yet opinions differ as to whether technology can provide a locus of meaning for modern citizens. For Beck, technology exists for its own sake, with its own autonomous logic in reflexive modernity, removed "from its contexts of military and economy utility" (Beck, 1994a, 28), while Pascal Bruckner counters that "the objects that surround us have souls, whether we like it or not. Cars, mobile phones, screens, and clothes are in every respect not gadgets but rather enlargements

of ourselves" (Bruckner, 2013, 173). This illustrates how narratives of modernity can converge on certain ideas (such as technology), without reaching consensus. Although 20 years separate these two accounts, and Bruckner wrote during the digital period, his positive attitude to consumerism is still countered by opposition similar to Beck's.

Does this emphasis mean that narratives of digital modernity embrace *technological determinism*, the idea that technology is an autonomous, exogenous force that can shape society in predictable ways, one of the big no-nos of contemporary social science (Dafoe, 2015 for an interestingly balanced review)? Undoubtedly, many do. Arguments about the singularity, for instance, which I will introduce in Section 3.6, certainly have that character, and many digital modernists are comfortable with the autonomy and centrality of the technology. Furthermore, many narratives of modernity of all kinds have a teleological character. However, it is also the case that many of its constructs are largely based on sociotechnical change that *has already occurred* – the amount of data created has already increased by orders of magnitude from the days of reflexive modernity, the number of people possessing smartphones has already reached a critical mass, and so on. Therefore an account might be able to avoid the dangers of determinism simply by describing relations that are in place and reasonably mature, rather than attempting to predict future developments, or to suggest that there was only one path from previous stages of modernity. The account might sketch a progressive development or evolution, without suggesting that it was inevitable, permanent or irreversible.

As a species of modernity, digital modernity inherits many of the characteristics of the genus, including its focus on individualism, technology, innovation, transactional relationships and the disintermediation of hierarchies. While many accounts of modernity stressed the increasing centrality of computing technology, especially "equipment highest in the information content, such as the camcorder, the remote-control switch of the television and operation of the time-shift on the video recorder . . . the Sega and Nintendo consoles, the home computers and electric guitars" (Lash, 1994, 133–134), what marks digital modernity out from the various species of analogue modernity is the specific importance of technologies designed to exploit abundant data, deployed

over a network connected by computing devices designed to facilitate and magnify the supply of data.

Zuboff writes that companies like Apple, Facebook and Google grew up to service and empower individuals newly liberated from traditional norms and rules, leading to their gaining access to information about their users' actions and preferences, which led to what she calls the third (i.e., digital) modernity poised between a positive vision of democratised access to information supporting individualised transactions, and a negative vision of the monopoly of that information by the tech giants and platforms for the profit that comes from social control and/or prediction (Zuboff, 2019, 46–55), in terms of privacy (Véliz, 2020), autonomy and power (Schneier, 2015).

This enabled a shift from technological manipulation of our *environment* to manipulation of our *society* and our *selves* in order to solve the problems created by modernity itself. This was not unanticipated, as one critic put it in 1976:

> [W]e are faced with calamities concerning population, resources, and pollution if we pursue those policies (here designated as industrial growth) which have increasingly dominated societies over the last centuries. The attempt to deal with these interlocking emergencies will require a vast array of skills and knowledge. . . . This mastery will now have to concentrate around the conquest of human nature rather than around the sciences concerned with non-human nature, as was the case in the past.
>
> (Grant, 1998, 419)

The spread of infrastructure to carry data – particularly but not exclusively the Web – has led to the rapid development and deployment of a number of enabling technologies that initially impacted on administration, representation and calculation, but which now push the envelope of many more activities, some that seem irretrievably physical. The technologies include: cloud computing; data science and big data analytics; the Internet of Things (IoT), including smart homes and cities; 5G wireless; cybersecurity; artificial intelligence (AI), including machine learning (ML) and deep learning; text, image, video and voice

processing; autonomous vehicles, drones and non-humanoid robotics; edge computing; augmented and virtual reality; distributed ledgers, including blockchain and cryptocurrencies; 3D printing; biotechnology, biopharmaceuticals and telemedicine; and quantum computing. These are of course at varying stages of maturity, and many of the narratives of digital modernity I will consider are based on the *potential* of widespread deployment of such technologies (even hype), rather than considered analyses of actuality.

3.2 Data, Information and Knowledge

The basic ingredient for digital modernity is data, but what is data?[1] There are various, often conflicting, definitions, while some write about the information society, or the knowledge economy. It is important to have a scheme in place to avoid internal inconsistency, although so entangled are the definitions through the literature that it will be impossible to rationalise them all.

In particular, the digital world is constructed around two terms which are remarkably over-defined and underspecified: *data* and *information*. They have been defined in many different and conflicting ways, varying across disciplines, as well as often being used interchangeably (personal *data* in EU data protection law is more or less equivalent to personally identifying *information* (PII) in the US). Claude Shannon described information as being a choice between a set of options, that can be reconstructed by the receiver of the message (Shannon and Weaver, 1949). Data might be collections of facts (e.g., the data about which a scientist reasons), or information that can be stored, analysed and processed (as in personal data), or a collection of 1s and 0s in a binary notation (Kitchin, 2014, 2–4). Information may be taken as reality, such as patterns or fingerprints, instructional, such as algorithms or recipes, or semantic, such as maps or timetables (Floridi, 2010, 74). One account stresses five issues that definitions of information need to finesse: (i) Does information reduce uncertainty? (ii) Does it have to take physical

[1] In this monograph, "data" will be used as a singular mass noun, rather than as a plural. This usage, widely but erroneously thought to be incorrect, is defended in https://webscience.org/data-are-or-data-is-a-pedant-writes/.

form? (iii) Does it need a particular structure or order? (iv) Is it related to human intention to communicate? (v) Must it be true (Case 2002)? Few accounts address all these issues.

For digital modernity, whatever account of data and information we have must sit consistently with the use of digital technology, especially as connected by the Internet and its signature protocols TCP/IP. Our devices have no semantic capabilities at all; they are designed to send messages around a network coded in binary as 1s and 0s (bits). Even the idea that they are 1s and 0s is an interpretation imposed upon electronics designed to respond to different voltages, indifferent even to the fact that they are bits. Computers are designed to respond to such voltages according to their programming, and the Internet designed so that patterns of bits can be transferred quickly and efficiently between senders and receivers (O'Hara and Hall, 2021, 27–35). Whatever computers manipulate must have physical form (the voltage), and needs a structure.

It is usual, and arguably essential, in computer science to call *data* whatever computers manipulate, sensors output, or the pipes of the Internet convey (O'Hara and Hall, 2021, 12–18).[2] The important point is that it is uninterpreted, and so we should think of data as *a structure of uninterpreted symbols*. It follows that something physical must first be identified *as* a symbol, so the physical form must be recognised – as when a computer receives a low (<0.4v) voltage and then treats it as a symbol (a 0). Symbol recognition must therefore be *mechanically* possible, and symbols are recognisable and discriminable by such properties as shape and sequence.

If we see data in this way, we must understand it to be intrinsically meaningless, though by virtue of its structure capable of carrying (and usually designed to carry) a message. The message it carries will depend on the system which receives and interprets it. Given this definition of data, it makes sense to call *information* the *interpretation that a system gives the data it receives*. Hence, unlike data, information is meaningful,

[2]For other disciplines, such as, say, archaeology, this distinction is far less meaningful. Hence from those perspectives, the term "data" often refers to what I will call information, but perhaps information in a particularly basic or unanalysed form.

is about things. Information requires hermeneutics (cf. Couldry, 2014; Gilder, 2018, 103).

As an example, consider the string "00100100", made up of a specific sequence of bits, which could be stored in a computer or sent round the Internet. As data, it is meaningless in and of itself, and will gain meaning only when it is taken up by a human or social system and becomes information. As information it may have indefinitely many meanings. Some examples of common meanings are (a) an integer expressed in binary format, so in this case 36 when the string is re-expressed as a decimal, (b) the ASCII 8-bit encoding of text characters, which in this case is the code for the dollar sign "$", (c) a sequence of survey answers, such as "no, no, yes, no, no, yes, no, no", or (d) the colour of a pixel on an 8-bit colour scheme. But it could have its own meaning, given by a particular system, unlimited except by the linguistic capabilities of that system (8 bits can distinguish between 256 pieces of information). Data without an interpretation is effectively gibberish, an arrangement of physical phenomena that could carry a signal but as a matter of fact doesn't.

Hence all information (at least in the digital world) is expressed by a substrate of data interpreted by a human system. It need not express a truth – it could be something false, or a command, or simply specify an object such as a number. As Theodore Roszak complained, "it does not matter whether we are transmitting a fact, a judgement, a shallow cliché, a deep teaching, a sublime truth, or a nasty obscenity" (Roszak, 1986, 14). Information has semantics, so it won't be gibberish, but it needn't be useful or valuable. Note that if we want to introduce quantification into a narrative of digital modernity (which we will), then uninterpreted data will be by far the easiest thing to count – the number of bits is determinable. Information is far harder to quantify, because interpretations are less clear-cut (cf. Webster, 2006, 26).

Many theorists have complained that we also need a term for valuable information (Webster, 2006, 25–28). As utility or value is functional to people or systems (unlike, say, fake news or trolling), we can think of useful information as the information (that could be) brought to bear in problem-solving, which we might term *knowledge* (O'Hara, 2002). When conceptualised like that, knowledge could be declarative or tacit,

centralised or distributed, abstract or situated, retrieved from storage or inferred on the fly, depending on what is useful. While usefulness to a system often requires truth, it doesn't always – know-how is not the kind of thing that can be true, and reasonable approximations or undetermined predictions can be just as useful ("all models are wrong", as the statistician George Box joked, "but some are useful"). The 'knowledge' in the knowledge economy is no longer the justified true belief of traditional epistemology (O'Hara, 2002), and to the devices used within the system, it is simply data.

On these definitions, personal data is misnamed, and is "really" information – if it is about an identifiable person, it must be *interpreted* as being so. The US equivalent "PII" is therefore more accurate. Similarly, Shannon's "information" is "really" data on this reading, because he was interested only in how signals could be discriminated and copied, not what they conveyed. Certain phrases such as "location data" have wide currency, even though, as it specifies a location, such "data" is really information on these terms. We should really understand location data as referring to data from GPS-enabled devices, which is turned into information about the location of the device (and by extension, its owner) by a system. It would be confusing if I were to push against such common usages. We will also see, particularly in quotes from other commentators, that the words "data" and "information" are often used interchangeably, and we have to bear this in mind in our reading. The situation is summed up in Figure 3.2.

This distinction may seem like an exercise in labelling, and to some extent it is. However, the definition of this monograph does have ramifications: Google's defence in the famous legal case that established a "right to be forgotten" in European law in 2014 (O'Hara, 2015b) rested precisely on the distinction. Google argued that its data processing was merely a matter of moving symbols around, not inferences about individuals (O'Hara and Hall, 2021, 86–87). That argument was rejected by the courts, in my view correctly but for the wrong reason. The court (in my terms) confused data and information. My own view is that Google was correct to suggest its data processing was merely symbolic, not semantic, but that the output of the processing *became information* about the object of the search by its presentation in a human system,

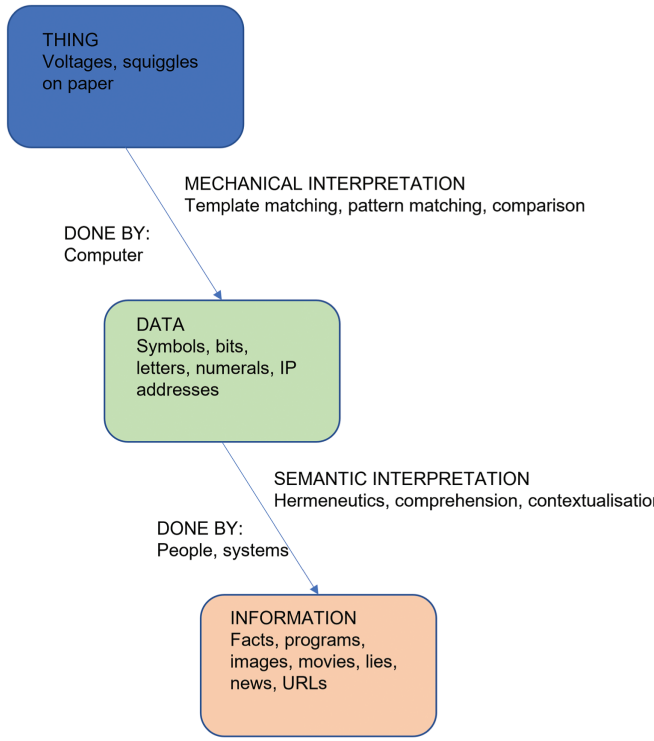

Figure 3.2: From data to information.

Source: O'Hara and Hall (2021, 14, Figure 1.2).

a ranked Google search page. Hence it *was* about whatever is named by the search term (which was created by a human user, designed to refer to a specific object). The user/search engine system created an interpretation for the results, making them *semantic* information, not *syntactic* data.

3.3 Datafication, Disintermediation and Machine Learning

In 1932, Bertrand Russell noted that "Work is of two kinds: first, altering the position of matter at or near the earth's surface relatively to other such matter; second, telling other people to do so" (2004, 3). Digital modernity has changed that – now, increasingly large portions of

what is often called the "knowledge economy" (Boutang, 2011; Burton-Jones, 1999; Foss, 2002; Neef, 1998; Neef *et al.*, 1998; O'Hara, 2002; Zuboff, 2019) involve moving intangible or barely tangible bits around (Negroponte, 1995).

Modernisation – and its associated sub-processes, such as secularisation, industrialisation, systematisation, quantification – is always ongoing, as noted for example by Max Weber (Kalberg, 2005; Weber, 2019). It has been noted that high modernity "opts for the precise, regular, constant, and reliable over the wild, spectacular, idiosyncratic, and surprising" (Bennett, 2009, 129), by systematising knowledge and eschewing magical effects. Its typical attitude to those areas of life that resisted modernisation was to label them as resistant to scientific or social scientific treatment, either in the expectation that science would eventually advance sufficiently to theorise them, or to ring-fence them as private, aesthetic or mystical areas (Bennett, 2009, 130; Sennett, 2002). Quantification became a routine of everyday life through many aspects of modernity, from democracy to science, but perhaps especially the money economy.

> The money economy enforces the necessity of continuous mathematical operations in our daily transactions. The lives of many people are absorbed by such evaluating, weighing, calculating and reducing of qualitative values to quantitative ones. Gauging values in terms of money has taught us to determine and specify values down to the last farthing and has thus enforced a much greater precision in the comparison of various contents of life.
>
> (Simmel, 2004, 444)

But the specific advance of digital modernity was the comprehensive digitisation (or datafication) of a much wider range of aspects of experience, combined with an epistemological shift from science-as-causal-explanation to data-science-as-discovery-of-correlation (Mayer-Schönberger and Cukier, 2013). "The continuing emergence of planetary-scale computation and metainfrastructure and of information as a historical agent of economic and geographic command together suggest that something fundamental has shifted off-center" (Bratton, 2015, 3),

to modernise, digitise, and even govern all sorts of areas, including what were previously private matters of taste, whether sexual or aesthetic. The Internet allows computing resources, including memory and programs, to be served to clients on demand ("as-a-service"), moving away from the model of companies investing in internal IT systems. Such interactions generate data, which can be mined by ML algorithms for more insights, to become the basis of more services (e.g., cybersecurity). This enables the production of small-percentage improvements in large-scale processes, thereby generating substantial aggregate gains. It also dampens, if not reverses, a trend emphasised by Webster in his classic discussion of the information society:

> It can be argued that theoretical knowledge has come to play a key role in contemporary society, in marked contrast to earlier epochs when practical and situated knowledge were predominant. ... Abraham Darby's development of the blast furnace, George Stephenson's railway locomotive, James Watt's steam engines, Matthew Boulton's engineering innovations, and any number of other inventions from around 1750 to 1850 were the products of feet-on-the-ground innovators and entrepreneurs, people who faced practical problems to which they reacted with practical solutions.
>
> (Webster, 2006, 29)

The distinction between theoretical and practical knowledge is no doubt permeable and there are no absolutes here, but the data scientists whose expertise underlies digital modernity have much more in common with Darby and Stephenson than the theoretical scientists who interested Webster. And this has spread to social science. For instance, economics, traditionally a discipline conducted through abstract theory expressed by mathematical models, is transforming into a more information-driven econometric pursuit, as evinced for instance by Nobel Memorial Prizes in Economics being awarded to number-crunching empiricists in 2019 (Abhijit Banerjee, Esther Duflo and Michael Kramer) and 2021 (David Card, Joshua Angrist and Guido M. Imbens). At the same time, many commentators have begun to think of digital modernity as another industrial revolution, although commentators disagree as to whether it

is the third (Brynjolfsson and McAfee, 2011, 76) or the fourth (Schwab, 2016). This may be happening, paradoxically, at a time when many argue that the rate of scientific progress is slowing, research is costlier and its results less dramatic, so that once more technology rather than science is powering the revolution (Bhaskar, 2021).

Disintermediation (Wigand, 2020) is the process of removing or reforming intermediary steps from a practice. Once a context has been rendered as data, and correlative patterns within it discovered, digital modernity licences the disintermediation of complex processes via quantification, by demystifying the intermediate steps (Curley and Salmelin, 2018). The apparently intuitive powers of middlemen and women to connect providers and consumers (for which they were able to charge a premium) can be simulated by AI at scale, reducing costs.

Disintermediation can come in two forms (or as a combination or cycle of the two). First, a complex set of steps can be collapsed into a single step, by computing and implementing the input/output function of the complex as a whole. If that can be done with sufficient accuracy, then the intermediate steps are not required, and the intermediaries (who were able to gain from rent-seeking by their crucial role in the original practice) are rendered redundant. For example, travel agencies used to mediate between holidaymakers and travel and hotel companies, finding offers and composing packages, and for this service were able to charge commission. The Internet disintermediated the travel industry, allowing customers to do their own searches for travel and accommodation (Tse, 2003).

The second kind of disintermediation is the replacement of an intermediary by a piece of technology, lowering global costs. Platforms displace linear business models with networks of buyers and sellers (Johnson, 2012; Mansell and Steinmuller, 2020; Parker *et al.*, 2016). In a sense, this can also be seen as a reintermediation, with the arrival of platforms to facilitate customers' searches, replacing the travel agencies, but with a different business model of charging subscriptions, or a percentage of transactions, or providing free services for advertising (Chircu and Kauffman, 1999, 2000; Rosenbloom, 2007). Associations to defend common interests are now less important for individuals,

who can pursue their own independently, and in competition, on the platform (Lash, 1994, 115).

Whereas on the linear model the intermediary acted as guarantor for the trustworthiness of the parties, on a network model the network itself is supposed to supply trust via feedback from participants, leveraging the local trust between directly-connected participants. The role of the platform is then to supersize this trust delivery, as the greater scale that the digital platform can support creates network effects, so that the value of the platform to participants increases exponentially as it grows.

In many ways, the platform is a purer form of two-sided market than is found under analogue modernity (Rysman, 2009; Spulber, 2019); it is a characteristic business model of digital modernity, and on the strength of that we might even say that one potential characterisation of the progress from analogue to digital modernity is datafication + disintermediation. It should be noted that some platform sceptics argue that the economic dominance of platforms is one of the self-fulfilling myths of digital modernity, and is better explained by lax regulation, effective management and aggressive acquisitions of competitors and disruptors, all of which feed a myth of invulnerability (Knee, 2021). Counter-strategies are available, both for incumbent businesses (Akbar and Tracogna, 2018) and regulators (Katz, 2019).

Whether or not platforms do live up to their billing, datafication undermines the occult claims to expertise of intermediaries. But from another point of view, datafication *reverses* the trend back to magic. As noted, systematised knowledge is less likely to be required, as data science eschews causes and explanations to focus on correlations, with the scale of the analysis ensuring statistical significance (Mayer-Schönberger and Cukier, 2013). One celebrated example is Deepmind's AlphaGo, which beat a recognised (human) Go champion using unknown techniques and creating undreamt-of strategies (Holcomb *et al.*, 2018), although admittedly also using orders of magnitude more power than a human brain (Gilder, 2018, 71).

Scientists were the masters and mistresses of analogue modernity through their institutions, societies and capture of policy debates (Arendt, 1998, 324), but under digital modernity they may have lost

that pole position as policymakers, business leaders, military leaders and educationalists find more value in data science's correlations than traditional scientists' explanations. The result is something of a mystery, and – certainly for some policymakers – restores some of the surprise and spectacle of magic, "a more effective means of realising an end it shares with alchemical magic, namely, to gain godlike powers of mastery over nature" (Horvath *et al.*, 2018, 3). See also Gilder (2018).

This is a worrying development for those used to the reliability of analogue/high modernity, and there is a lot of pushback away from the magic black box. Explaining AI output to dispel the sense of arbitrariness has always been a research issue, even in the days of rule-based expert systems (Berry, 1997; Southwick, 1991; Swartout, 1983), owing to concerns that explanations would be required in order for their recommendations to be trusted or taken seriously (McKinlay, 2020). Being rule-based, such AI was explainable in a basic sense simply by tracing the rules that fired in an inference; the rules used were often taken from an expert's practice, and so were understandable to an extent by outsiders. To bolster these explanations, the justifications for the rules (used by coders in writing the programs), the models upon which they were based and the principles governing expertise in the domain were also traced and mined to justify output (Schreiber *et al.*, 2000; Swartout, 1985). Explainable AI based on ML faces a different problem, which is that the systems, with their non-linear structures, do not map straightforwardly onto human-readable concepts at all, so the procedure of unpicking the program could not be explanatory of that technology (Hoffman *et al.*, 2018; O'Hara, 2020b). Indeed, it has been argued if we had such an explanation of ML reasoning, we wouldn't need the technology, since the explanation would be in terms of rules with which we could do the inference (Robbins, 2019). Hence there has been a dramatic growth of explainable AI as a research programme (Barredo Arrieta *et al.*, 2020; Došilović *et al.*, 2018; Gunning *et al.*, 2019; Samek and Müller, 2019), as well as concerns that, without the ability to understand why powerful AI programs have made their recommendations, we risk ceding control to them (Gibbs, 2021; McKinlay, 2020; Russell, 2019). Some have suggested that there is a lot of hype around ML and deep learning, and that simple, explicable algorithms perform

at least as well as complex black boxes (Katsikopoulos, 2021). More pragmatically, the EU's General Data Protection Regulation insists on a duty of explanation to those affected by AI decisions (Edwards and Veale, 2018; O'Hara, 2020b).

3.4 The Centrality of Data

Hype or reality, where does the magic black box come from? Computing power alone was seen as a game-changer early in the century, with many arguments for example that statistical analyses of datasets would inevitably outdo intuitive or common sense human reasoning (Ayres, 2007; Levitt and Dubner, 2005), so that it was the only game in town. The ML techniques upon which AI currently rests are not dramatically more powerful than techniques from the 20th century (Gilder, 2018, 65; Kelleher and Tierney, 2019, 97–150; Mitchell, 2019, 109–139), and are able to tell us relatively few things: ML can be used to cluster entities to maximise diversity between clusters and minimise it within them; it can be used for collaborative or content-based filtering (as in recommendations that "people who like X often like Y"); it can predict unknown properties (such as a probabilistic estimate of someone's voting intention from their reading habits, education and income); and it can do outlier recognition (such as spotting unusual activity on a credit card). Yet these fairly basic operations can become very powerful when combined and used over large datasets, and have been facilitated by the huge increase in available computing power thanks to Moore's law, which enables more extensive searches of data, the exploitation of powerful graphics processing chips, and more complex neural nets, i.e., deep learning (Kelleher, 2019; Mitchell, 2019, 109–115). But the key development leveraging this computing power was the abundance of data.

Some very large datasets were beginning to appear at the turn of the century, creating demand for computing power, such as from the Large Hadron Collider at CERN (Bencivenni *et al.*, 2008; Bird, 2011; Karaca, 2017), and these prompted the development of grid computing, the use of a distributed system of computers to solve a single task in coordinated parallelism (Magoules *et al.*, 2009), and more effectively

cloud computing, the provision of computing resources as an on-demand service by a provider (Hayes, 2008), as well as other related ideas for increasing computing resources and making them more efficient through integration (Foster *et al.*, 2008). Those wishing to gather information which went beyond data from formal interactions like shop purchases developed special-purpose devices that it was hoped would catch on, such as Google Glass, an optical display system disguised as a pair of spectacles (Rauschnabel *et al.*, 2015), Microsoft's SenseCam, a wearable sensor-augmented stills camera (Hodges *et al.*, 2006), or Sociometric Solutions' Sociometer, a corporate ID badge containing a location sensor, accelerometers, proximity sensors to detect who is nearby, and a microphone to detect (but not record) speech (Pentland, 2014, 220–222). However, computing power alone, while effective enough to grab attention, needed to be complemented by the spread of another device, the smartphone, and another institution, social media, which between them revolutionised not only the quantity of data created, but also its quality, in the sense of the number of situations and interactions it covered (Lupton, 2015).

One of the patterns – perhaps *the* key pattern – that marks the advent of digital modernity is a dramatic increase in the quantity of data being created, on the back of increased computing efficiency, which has resulted in dramatic decreases in the costs of acquisition and storage. Greater use of data at all levels has tended to produce vertical integration of functions, whether in "superapps" or in the computing infrastructure as a whole, going as far as the claim that computation is now done at a planetary scale (Bratton, 2015), hence both consuming and outputting data at similar magnitude. Most pre-2010 narratives of digital modernity, both positive (Ayres, 2007) and negative (Mosco, 2004), missed the significance of the tsunami of data that was soon to engulf us – and it is only fair to add that it was missed by the present author as well (O'Hara and Shadbolt, 2008; O'Hara and Stevens, 2006). Indeed, even the best-known literary account of social media, Dave Eggers' *The Circle*, focuses on the loss of privacy resulting from personal exposure of information, not the gathering of data from minute surveillance, thereby also missing the point by a country mile.

In, say, the 1980s, a large amount of information was recorded on paper, a technology that is useful but doesn't scale very easily (twice the amount of information requires twice the space). However, by the turn of the century, it was being recorded digitally and stored in computers, often for very small audiences, such as office paperwork and digital photographs, but even then the power remained nascent. A typical account from 2008 lamented the isolation of electronics devices from each other, that sensor outputs were not often online, that speech recordings needed to be tagged expensively by hand, and that biometric systems tended to be of a single modality. It looked forward to technology correcting these failings, but it was impossible to reach the potential of data technology without doing so (Yannopoulos *et al.*, 2008, 102–103).

In 2000 it was estimated, roughly, that the amount of data created annually was of the order of one exabyte, or a billion billion bits, of which printed documents comprised a mere 0.003% (Lyman and Varian, 2000; O'Hara, 2002, 24–27). This was a tipping point, and the quantity of data increased exponentially thereafter. It was still possible, as late as 2006, to assert that "the majority of the world's people will never get to use a phone in their lives" (Webster, 2006, 74), but just ten years later, the majority of the world's people owned a smartphone.[3] And that meant the production of information. Estimates can only be approximate, but in 2020 one calculation suggested annual production was 44 zettabytes, or 44,000 times the production in 2000, and projected that *daily* production of data would be 463 exabytes in 2025, or 200–400 times the *annual* production in 2000 (Desjardins, 2019). It is hard to write this off as a merely cosmetic or quantitative change. It is for these reasons that digital modernity is often described in narratives as qualitatively different, and that 2000 is marked out in this monograph as the most suitable transition point. This leads us to the first major principle of digital modernity, which will be expanded upon in the remainder of Section 3.

> (1) The quantity of data being produced in the world has enabled, and been enabled by, technological, social, economic

[3] https://www.statista.com/statistics/330695/number-of-smartphone-users-world wide/.

> and cultural change, and as such is a marker of a qualitative change in modernity.

Vincent Mosco describes a pattern in the history of technology:

> the real power of new technologies does not appear during their mythic period, when they are hailed for their ability to bring world peace, renew communities, or end scarcity, history, geography and politics; rather, their social impact is greatest when technologies become banal – when they literally (as in the case of electricity) withdraw into the woodwork.
>
> (Mosco, 2004, 19)

This observation didn't apply to digital modernity, partly because its mythic period was about to be extended by the data deluge, and partly because it was not a narrative about technology, but already a narrative about the interaction between technology and the world. The paradoxical dialectic between the myth-making that Mosco ably conjures, and the effect on individual lives is perhaps better expressed by Charles Jonscher as two complementary morals: "The first is to regard almost any prediction of the future power of the technology itself as understated. The second is to regard almost any prediction of what it will do to our everyday lives as overstated" (Jonscher, 1999, 248). This captures the combination of the difficulty of prediction with the often excessive excitement and hype. In the case of digital modernity, the potential of the technology was the focus of the pre-2010 narrative: sheer computing power and the almost limitless promise of Moore's Law would ultimately be able to tear down any problem by exploring every possible option. But it turned out that this understated the technology. What really supersized it was the instrumentation of the world to facilitate the creation of data in quantity.

Smartphones themselves may furnish access to GPS location data, WLAN data from local wireless networks in specific locations, accelerometer data, Bluetooth data about nearby devices, mobile phone tower IDs, call logs, text/SMS logs, browser histories for Web activity, contact lists, apps installed, used and running, screen state, battery status, social

media usage, credit card activity, banking and games. Alex Pentland wrote that

> the difficulties in collecting sufficient quantities of continuous, fine-grain data have meant that social science analyses were often confined to examining the preconditions of change or large, slow phenomena, such as demographic shifts or long-term health outcomes. ... With the coming of digital media and other big data, all this has changed. We can now watch human organizations evolve on a microsecond-by-microsecond basis and examine all of the interactions between millions of people.
>
> (Pentland, 2014, 120–121)

The smartphone, it was postulated, would provide "honest signals", or unconscious and incontrovertible evidence of our attitudes, across all sorts of behaviours (Pentland, 2008). Personal voice assistants such as SIRI and ALEXA are beginning to provide another vector for information gathering (Hoy, 2018; Maras and Wandt, 2019). Online payments became another source of detailed information, and even some of the darker areas of sexuality were illuminated by data from pornography sites (Keilty, 2018).

Similarly, public opinion could now be measured as an aggregate of sentiment on social media, or microblogging platforms. Twitter's self-image, for instance, as described by its founders and executives, is as a means of expressing public opinion over and above the opinions of individuals, almost as a Habermasian public sphere, "the free speech wing of the free speech party" (quoted in Frier, 2020, 157). While they resisted the creation of a Retweet button for some time, eventually they gave into demand and allowed people to express approval of a particular view easily (Shadbolt *et al.*, 2019, 47–50), thereby creating the machinery for "virality", so that messages could be endorsed at scale, quickly, leading to the virtue signalling, *faux* outrage and downright injustices of Twitterstorms. Virality also enabled manufactured content, tailored to the algorithm, to crowd out more considered private content, which led to the early demise of Twitter's short form video service Vine (Frier, 2020, 156–157).

The promise of digital modernity is the possibility of rapid, constant and comprehensive feedback. Not only do we know what has been purchased in aggregate, but we also know who purchased what, and when, and what characteristics they have. Via product reviews, likes, repurchases and other information, we even have a relatively strong grip on which purchases are enjoyed most, and by whom.

One important type of feedback analysis is *A/B testing*, comparing two values of a single variable over a large population, that can be used to work out something as simple as what shade of blue a website should be in order to retain more visitors, or as complex as how to increase the probability someone might vote (Bond *et al.*, 2012). Even a small discrepancy between the effects of the variable values can scale up to large absolute increases in revenue, customer satisfaction or other outcomes, allowing for persistently incremental improvements in service quality within a highly experimental ethos, never satisfied with a particular level of performance. Social networks typically run hundreds of such experiments a day, and are often imbued with a strong experimental culture (Xu *et al.*, 2015), even if not every company is up to the standards of the tech giants (Fabijan *et al.*, 2018). Yet despite the relatively straightforward idea, A/B testing can pose and address complex problems – for instance, the A/B effect may be influenced not only by the treatment received by individuals, but their place in the network and the influence brought by their social connections (Gui *et al.*, 2015). Hence, while ML and data science are fairly straightforward in principle, in practice they can be very powerful when used effectively.

3.5 Big Data, the Ambient Data Infrastructure and the Public-Private Relation

In order to achieve the potential of ML, much is made of the importance of amalgamating data from heterogeneous sources to create large datasets and ultimately "big data" in terms of the so-called 3 Vs, the *volume* of data, the *variety* of sources, and the *velocity* of its production (Fan *et al.*, 2014; Kelleher and Tierney, 2019; Mayer-Schönberger and Cukier, 2013), which were quickly expanded to 6 Vs by including its veracity (which is discussed in more detail in Section 8.2 below),

its value and its variability. As the dictionary is not exhausted, and as people are still trying to make a mark with big data PowerPoint slides, we might expect more Vs to emerge, and lo and behold a recent paper managed, without obvious irony, to get the number up to 17 Vs (Panimalar *et al.*, 2017). Actually, the later Vs are either redundant or misleading, so personally I prefer to stick to the original 3 Vs. These originals are attributes such that, if they are all large for a dataset, we can reasonably say we are talking about big data. The other 14 Vs do not have this – veracity and value, for instance, can apply to any dataset, and a dataset with large veracity (i.e., accuracy) or large value could thereby be just as easily a small dataset as a big one. They and the other Vs might well be useful parameters for evaluating (any) data, but they are not markers of big data. Stick to the 3 Vs, is my advice.

The big data hypothesis is that the value of the sum will exceed the sum of the value of the datasets processed individually, enabling the discovery of subtle patterns barely detectable amongst the noise with a high degree of statistical significance. While the "myth of big data" (Couldry, 2014) implausibly attributes near-omniscience to it, the results can be pretty impressive. Indeed, the data doesn't have to be perfect, only better – many fintech apps succeed not by predicting credit risk accurately, but by using a range of big data sources and averaging across a range of risks, meaning they outperform banks in terms of accuracy and costs, as the latter restrict themselves (or are restricted) to more formal sources of information. In the integrated Google philosophy spelled out in Section 3.1, big data was the epistemological foundation.

However, the management of large quantities of data, the demands of real-time processing, the avoidance of bottlenecks in storage and retrieval, its high dimensionality, the accumulation of noise as well as value, the risk of spurious correlations and the variation across datasets of representation formalisms all demand a high level of competence and care in its curation and analysis. Thus we have seen the development of techniques such as multimodal analysis (O'Halloran *et al.*, 2021), big data platforms such as Hadoop (White, 2015) and representation languages such as RDF to support linkage (Manola and Miller, 2004) combined with the always-on connectivity of our devices to create what we might call an *ambient data infrastructure*, permanently ready to

gather and process the data created by our digitally-enabled activities. This infrastructure has evolved, was not planned, and yet coheres; in combination with big data it became the technological underpinning of the Google vision set out in Section 3.1. It can be described narrowly, but the more ambitious narratives tend to be expansive, drawing no distinction between it and wider social and institutional developments:

> ... energy and mineral sourcing and grids; subterranean cloud infrastructure; urban software and public service privatization; massive universal addressing systems; interfaces drawn by the augmentation of the hand, of the eye, or dissolved into objects; users both over-outlined by self-quantification and also exploded by the arrival of legions of sensors, algorithms, and robots. Instead of seeing these as a hodgepodge of different species of computing, spinning out on their own at different scales and tempos, we should see them as forming a coherent and interdependent whole.
>
> (Bratton, 2015, 4–5)

This account focuses on the infrastructure itself, but the coherence is perhaps better seen as provided by the commodity it produces – data.

Digital modernity seems to select for two complementary centripetal forces in its infrastructure. First, for datasets to be amalgamated, they need to be brought together, and while it is perfectly possible to form short-lived data coalitions on the fly to exploit opportunities, it is easier to imagine such amalgamation in the presence of a central body with the reach to discover the data and the power to compel its delivery. Second, the management of big data being so complex a task, it seems to demand extensive and coordinated resources. Early writers and philosophers who raised such issues, ranging from Alexis de Tocqueville (*Democracy in America*), Aldous Huxley (*Brave New World*) and more recently José Saramago (*All the Names*), tended to assume that such centralisation required government agency. Dan Hind's polemic against "occult Enlightenment", the use of science in pursuit of power without any commitment to open inquiry, also pointed the finger at governments and the deep state controlling the information infrastructure (Hind, 2008), while sociologist James C. Scott's pioneering analysis of how

citizens are rendered legible to authorities was pointedly entitled *Seeing Like a State* (Scott, 1998).

Certainly the state will inevitably be drawn to use new sources of information about its citizens (Bratton, 2015, 8). However, it has turned out that governments are relatively bad at this (and democratic governments are relatively scrupulous as well in protecting citizens' privacy and autonomy), while the private sector has both the skills and incentives to achieve it (and possibly fewer scruples). Hence the data analysis infrastructure, rather than being centralised, is ambient, distributed and generally privately-owned. We might say that rather than the state rendering its citizens legible to it by datafying them, private organisations render consumers or users legible to them by the same means. Even the authoritarian Chinese government outsources much of its data gathering to private companies such as Alibaba and Tencent, regulating the Chinese information space to ensure it can get access to data if required. Different infrastructure providers compete with each other, while endeavouring to centralise locally around their own infrastructure. We can see this, for instance, in the giant knowledge graphs that sit behind Google, Meta and other companies, written in proprietary languages and with no external documentation, and whose ontologies and labels often define the world as we see it through our smartphones (Fensel *et al.*, 2020; Kejriwal, 2019). The key is often vertical integration, the creation of a "walled garden" that is sufficiently attractive for users to wish to dwell in it, and sufficiently comprehensive that users don't need to leave, whether they are communicating with friends, consuming entertainment, accessing news, playing games, banking, buying or selling. Such integration goes against the grain of the generative nature of digital networks (Zittrain, 2008), while the model brings with it security issues because centralisation entails a data silo as a single point of attack (Gilder, 2018, 168), but commercial pressures often outweigh the purists' view of the technology (O'Hara and Hall, 2021, 105–114).

3.6 Machine Intelligence, the Singularity and Discontinuity with Analogue Modernity

Digital modernity narratives may be positive or negative (Norris, 2001, 3–92, Smith and Browne, 2019), and "the dystopians join the utopians in imagining a supremely competent and visionary Silicon Valley" (Gilder, 2018, 7). Many rest on the supposition that computers will soon outperform human brains, and indeed combinations of brains (Kurzweil, 2005, 2014). This is an important shift, as human intelligence is often understood as the paradigm of intelligence, whether purely conceptual as in Alan Turing's famous test, or as an embodied property (Harnad, 1989; Schweizer, 1998, 2012). Hence it is tantamount to accepting that machines (in some combination) will be more intelligent than (some combinations of) people. This may happen because humans are enhanced in various ways (for instance bringing digital technology into direct combination with physiology via genetics, nanotechnology and robotics – Goertzel, 2013; Haraway, 1991; Kurzweil, 2005; Pearce, 2012).

The Turing Test is an anthropocentric definition of intelligence, but both the logic and the history of artificial intelligence suggest that the Turing Test is simply inappropriate for making such judgments (Bray, 2012; French, 2000a; Yampolskiy and Fox, 2012), even if

> the Turing Test will remain important, not only as a landmark in the history of the development of intelligent machines, but also with real relevance to future generations of people living in a world in which the cognitive capacities of machines will be vastly greater than they are now.
>
> (French, 2000b)

This last is an important point, as machines will be developed where they add most value or productivity, and so will develop in parallel to human intelligence. The claim of digital modernity would then amount to smart machines being tools that humans can use which will change many things, and which pose serious questions of control, about which one may be positive (Shadbolt and Hampson, 2018) or negative (Russell, 2019).

Nevertheless, the achievements of ML and AI will be measured alongside those of human intelligence, in the same way as mechanical achievements are often compared with human strength when their potential becomes evident and they become in their turn the object of myth (Mosco, 2004, 117–140). The comparison inspires awe, in the sense of Edmund Burke's discussion in *The Sublime and the Beautiful* (1756), so that it is difficult to apprehend other causes of social change. The technology appears to be so powerful that any other factor, including laws and especially politics, seems comparatively negligible (Mosco, 2004). Conceiving of technology as a sublime force in this sense is mythmaking, but myths can be potent; the narrative of digital modernity is not only persuasive in general, it persuades persuasive people. It makes it possible to represent the networked digital realm as a wholly new phenomenon, emerging from a discontinuity in history (Mosco, 2004, 55–84).

One especially potent version of digital modernity is *the singularity*, the idea that technology is approaching a moment or tipping point where technological advance becomes uncontrollable by human agency, and technological generations will improve on each other autonomously in increasingly rapid cycles (Barrat, 2015; Eden *et al.*, 2012; Hanson, 2008; Kurzweil, 2005; Land, 2019; Loosemore and Goertzel, 2012; Tegmark, 2017). Given that intelligent machines are generally designed for task-based reasons, and therefore require some kind of human input at a minimum in setting the design goals and allocating capital (Miller, 2012), the singularity demands the evolution of general-purpose AI from special-purpose algorithms, as well as automated and non-overridable investment decisions (smart contracts, perhaps?). It has been argued that the development of general AI using reinforcement learning and deep learning is likely to lead to an adversarial relationship between machines and people (Arel, 2012), while more widely some claim that anything of that intelligence will develop its own survival drives causing it to compete with humans for scarce resources (Barrat, 2015), though such speculation clearly relies on anthropocentrism about intelligence. The removal of human agency (or what Nick Land scathingly refers to as "residual anthropolitical signature" – Land, 2019, 519) will open up

the possibility of a powerful feedback loop, as the singularity "identifies the basic diagram of modernity as explosive" (Land, 2019, 511).

Whether such narratives are seen as benign or threatening, they create a demand for institutions and technologies for asserting control over the process, at the worst because it will be an existential threat (Muehlhauser and Helm, 2012; Muehlhauser and Salamon, 2012; Omohundro, 2012; Russell, 2019; Smith and Browne, 2019), especially if at the same time as enhancing machine intelligence, reliance on machines is undermining human intelligence and creating an "attentional pathogenic culture" (Hari, 2022). This has been called "the primacy of the secondary", "the inertial telos which, by default, sets actual existence as the end organizing all subordinate means" (Land, 2019, 512). However, these extreme positive and negative versions of the digital modernity narrative are not essential, and it is not hard to find commentators who reject the idea as based upon enthusiastic but unjustified extrapolation from rapid developments in digital technology at a specific point in history (Mitchell, 2019; Modis, 2012).

A somewhat calmer view is that the advancing technology will increase productivity to such an extent that it will disrupt the world of work, so that production in advanced economies will gradually be performed by capital rather than labour (Brynjolfsson and McAfee, 2011, 2014). AI in particular, as well as sectors enhanced using the measure-and-test business models of Silicon Valley such as biotechnologies (ranging from gene editing to 3D printing of artificial meat) and renewable energy (such as electric vehicles and next generation batteries) provide grounds for optimism. New technologies are being adopted more quickly, especially since the COVID-19 pandemic; large numbers of people have begun to use not only smartphones, but also personal voice assistants, e-commerce, telemedicine, videoconferencing and digital payments and currencies. Efficient businesses and markets will be able to adapt or even replace jobs that require intelligence rather than creativity or flexible labour with AI systems trained to make the right kind of distinctions. This is sometimes seen as liberating, if those displaced workers can be compensated and retrained, or concerning, if the economy grows while leaving whole classes behind.

Networks are more scalable than hierarchies. In the struggle to control a domain which is growing more complex, a hierarchy that was adequate at one stage will start to show its inadequacy, if only because it is more difficult to gather the requisite distributed information in a centralised policymaking hub (Ferguson, 2017). This has long been realised. Hannah Arendt contrasted the fixed strength of a person or small group with the potential of a wider group to produce a variable and flexible amount of power when it works together which disappears when it disperses (Arendt, 1998, 200). However, beyond the distributed exchange structure of the free market (von Hayek, 1937), it was not until recently that technology was developed to exploit the insight. The ability to muster networks effectively using technology now makes this potential always-on (Johnson, 2012).

Optimists argue that this will help expand democracy, by allowing consultation of citizens, discussion, debate and even decision-making (Coleman and Blumler, 2009; McGinnis, 2013; Mossberger *et al.*, 2008). The way the Internet is designed will allow or inhibit certain types of engagement (Lessig, 1999), and some have argued that there are engineering principles that themselves will improve public discourse. For instance, proponents of net neutrality (the idea that each packet of data carried on the Internet is treated the same as all others, with no special "fast lane" for corporations who pay for faster connections, or for applications, like streaming video or interactive games, that are time critical) often argue not only that it is the most efficient engineering principle, but also that it is the most democratic, protecting free speech and restricting censorship (Nunziato, 2009). In other words, the engineering design of the Internet and the way uninterpreted data is treated by it will affect the flow of information not only practically, but also in terms of justice, democracy and free speech. Digital modernity, on such accounts, contains within it the possibility of creating a democratic sphere beyond the reach of analogue modernity.

Such moderate views are continuous with theories of the singularity through the suggestion that technological evolution is happening at exponential, rather than linear, rates (Azhar, 2021; Schwab, 2016, 3), across all human systems, and will actively reshape the lives of people

and the futures of nations and businesses, both for good and ill (Schmidt and Cohen, 2013; Smith and Browne, 2019).

4

The Subjunctive World

The importance of reflexivity as a factor in late analogue modernity was noted in Section 2.4. The evolution into digital modernity is marked by the partial outsourcing of reflexivity to the ambient data analysis infrastructure (deepening a process some had identified whereby important structural constraints on individuals had already shifted from social structures and institutions to ICT under reflexive modernity – Lash, 1994, 120–121). Supplementing, and sometimes replacing, individuals' attempts to understand and steer the social forces acting upon them is the panoply of recommendations made based on profiles developed from past behaviour and choices, and the choices of those of similar background (Bayamlioğlu *et al.*, 2018; Binns, 2022; Hildebrandt and Gutwirth, 2008).

It was a commonplace of analogue modernity that individuals were expected to make choices "without being able, owing to the complexity of modern society, to make the necessary decisions on a well-founded and responsible basis, that is to say, considering the possible consequences" (Beck, 1994a, 8). Recommendation algorithms are by some measures superior in their reliability for deciding what choices individuals should make, for example increasing the novelty and diversity

of choices (Castells *et al.*, 2015), and recommender systems play an increasingly prominent role in many areas of life (Aggarwal, 2016), ranging from e-commerce (Amazon – Smith and Linden, 2017), friendship or following (Facebook and other social networks – Kywe *et al.*, 2012), work (LinkedIn – Diaby and Viennet, 2014; Kenthapadi *et al.*, 2017), dating based either on location for speedy hook-ups (Tinder, Grindr – Fitzpatrick *et al.*, 2015) or on character for longer-term relationships (Xia *et al.*, 2016), entertainment (Netflix, Spotify, Last.fm, YouTube – Celma, 2010; Davidson *et al.*, 2010), news topics (Raza and Ding, 2021), and even fashion (Dokoohaki, 2020). A Microsoft executive was quoted as saying that its voice assistant Cortana knows your preferences better than you do (Zuboff, 2019, 164).

This has caused disquiet, about the effects of filter bubbles (Pariser, 2011), echo chambers (Sunstein, 2007), radicalisation (Stevens and O'Hara, 2015) and disinformation (Howard, 2020) caused by recommenders working on skewed information, as well as other sorts of bias that can result in recommendations of dubious quality (Kirdemir *et al.*, 2021). Some look to the use of AI to correct these biases in AI (Färber and Bartscherer, 2021), but others have found that users seem to prefer biased outputs to more balanced or diverse offerings in at least some contexts, as the introduction of a wider range of outputs has in some experiments resulted in less relevance and less user satisfaction (Han *et al.*, 2021). Others have argued that recommendation apps largely reproduce types of offline behaviour and bias (Conner, 2019). Nevertheless, the detection, mitigation and elimination of bias from data analysis in general and recommender systems in particular remains a massive growth area of research aiming to bring ideals of social justice to digital modernity.

While there is resistance to the idea that "the logistics of . . . consumption has been transformed into data science and data engineering problems" (quote from Passoth, 2020, also Aunspach, 2020; Lanier, 2011), this does not seem to have a great deal of traction amongst consumers themselves (Renninger, 2019). Indeed, though a negative view, this narrative still accepts descriptive and arguably teleological narratives of digital modernity, even while normatively advocating resistance. The net result of outsourcing reflexivity to the ambient data

analysis infrastructure is that individuals' self-awareness is deployed to question the surface features of the recommendations (e.g., looking further down the ranked list to look for choice options), rather than the recommendation system itself or the profile of the individual upon which it is based.

4.1 Outsourcing Reflexivity

At the apex of analogue modernity, Giddens listed a number of choices we have to make in order to know how to act and "colonize the future in relation to the past" to work out who we are:

> who do you spend most of your time with; what your favourite foods are; your posture; how much or how little you smile; how late you stay up all night; whether you smoke; whether you gossip; who you admire most; how calm you are; how you spend your holidays etc.
>
> (Giddens, 1994, 74)

What is particularly interesting about Giddens' list is that under digital modernity most if not all of these choices, that used to be made routinely without help, are now influenced by, and can be ceded completely to, the ambient data infrastructure.

Analogue modernity produced "a culture of built-up knowledge and self-confidence: more and higher education, as well as better jobs and opportunities to earn money, in which people no longer just obey" (Beck, 1994a, 20), leading to their withdrawal from many traditional areas of social life whose utility had diminished, and their adoption of new activities and identities. Under digital modernity, this "emigration", to use Beck's term, is mediated by the ambient data infrastructure, which can highlight certain choices, increase their probability of being chosen by connecting them with rewards, or even to "grey out" alternatives by manipulating the architecture to close them out. This mediation is based on previous behaviour, and the behaviour of similar individuals. Indeed, Bauman always argued that disembedding never went as far as Giddens and Beck claimed, and that even in the heyday of choice one was often corralled into "zombie categories", nudged or coerced

into being a consumer, or a welfare cheat, leading to what he called the 'miseries of happiness' (Bauman, 2008; Dawson, 2010). However that may be, the ambient infrastructure has dialled down the prominence of authentic choice still further.

How are people clustered in this way? Whereas individuals were responsible for their biographies under analogue modernity (Beck, 1994a, 13–16), under digital modernity they are *profiled* (Bayamlioğlu *et al.*, 2018; Binns, 2022; Hildebrandt and Gutwirth, 2008). Individuals are denied a view of their profile(s), and so find them hard to criticise (although Dave Murray-Rust reminds me that under analogue modernity it wasn't easy to get hold of one's personal data either, or to understand it, even though one had data protection rights). It has been argued that profilers should be as transparent to individuals as individuals are to them (Hildebrandt, 2015, 222–224), but it is hard to see how this could work in practice, (a) because the profile is an important piece of intellectual property that profilers will lobby strongly to defend, and (b) because there is a marked lack of skills and appetite to monitor such things among individuals themselves.

Beck highlighted four aspects of reflexivity under reflexive modernity (Beck, 1994b, 174–175), which remain relevant under digital modernity. The *subjects* of outsourced reflexivity are social agents which the feedback from information processing could influence – individuals, but also social groups, institutions, expert systems and other structures. The *medium* of outsourced reflexivity is data, collected and inferred by the ambient infrastructure (the technological underpinning of the Google philosophy set out in Section 3.1). The *consequences* are many and varied, and often continuous with those of reflexive modernity (e.g., social atomisation); particular phenomena that seem to have become important include the loss of privacy (Section 4.2 below), highly disruptive innovation (Section 5.1), and problems with echo chambers and misinformation (Section 8). The *motors* of outsourced reflexivity are those phenomena that support the ambient infrastructure, including the Internet, social media and surveillance capitalism. Perhaps even the COVID-19 pandemic, by forcing so much behaviour online, has been a motor. It has been argued that design needs to accommodate the more-than-human, non-human intelligences that work within the

infrastructure at speeds or scales that simply by-pass any "humans in the loop". This demands "a design practice that discerns and integrates different capabilities, uniquely human and uniquely artificial, into appropriate co-performances and makes explicit and contestable the decisions that are delegated from everyday practice to development practice" (Giaccardi and Redström, 2020, 44). The ambient infrastructure depends less on human decision-making at any level, and on this view the design ideally comes to accommodate itself.

It is worth noting the caveat that when feedback shapes future performance, the system's functionality or ethos will be subject to change depending on what data is gathered and how it is fed back, especially when it happens at scale or is automated.[1] For instance, Twitter's ambition to be a Habermasian public sphere of barrier-free discussion and debate, and Instagram's to allow the illustration of people's lives with high-quality images taken by non-experts with low-level equipment, were affected by feedback provided at scale via likes and follower numbers. When content can go viral via innovations such as the retweet button (motors of outsourced reflexivity), social networks are inevitably shaped by what they measure and feed back (consequences). Reflexivity is moulded by the urge to maximise positive feedback by sharing content that is more likely to be liked (Frier, 2020, 234).

We can express the progression from pre-modernity to analogue modernity to digital modernity using a grammatical metaphor (O'Hara, 2021, 43–44).

- Pre-modernity is characterised by a cyclical understanding of history, a lack of appreciation of (or appetite for) change, and a strong sense of the interconnection of things, providing a rich nexus of purposes and justifications of behaviour. Past, present and future tenses collapse into each other, so the pre-modern world is an *eternal world*.

- Analogue modernity is characterised by the privileging of individuals. Social constraints and obligations are downplayed in favour

[1] See the quote from W.H. Mallock in Section 2.4, essentially making the same point about pre-digital evaluative methods.

of individuals' choices, and past and future are less important than preferences expressed at the moment of choice (as architect of modernity Henry Ford put it, "History is bunk"). The modern world is expressed in the *present tense*.

- Digital modernity similarly privileges individuals, but their actual choices are subordinated to those of the ambient data analysis infrastructure, which is sufficiently well-informed to make choices that will appeal more to their preferences than their actual choices would have. In other words, the infrastructure chooses the things that individuals *would have chosen, if only they had all the data that the infrastructure has to hand*. This is expressed in the subjunctive mood, the grammatical feature used when expressing a state of unreality or possibility that has not actually occurred. Digital modernity, then, is shaped by the *subjunctive mood*.

This leads us to the second of the five principles which help characterise digital modernity.

> (2) Digital modernity is a subjunctive world in which reflexivity and choice are outsourced to the ambient data infrastructure.

This change seems from a rational point of view to be a logical extension of the pursuit of the modern individual's interests, as expressed, for example, in the US Declaration of Independence (1776) as the inalienable right to the pursuit of happiness. On the assumption that the ambient infrastructure knows better than individuals what will actually produce their happiness, then there is an obvious argument for outsourcing the selection of actions, choices or purchases to the infrastructure. But many thinkers in the analogue world prized the ability to make one's own mistakes. For instance, André Gide, the French novelist, wrote in 1935:

> Know thyself. *A maxim that is as pernicious as it is ugly. To observe oneself is to arrest one's development. The caterpillar that tried 'to know itself' would never become a butterfly.*
> (Gide's emphasis)

Outsourcing reflexivity, then, creates the subjunctive world in which the ambient infrastructure is a better guide to what will satisfy our preferences. It is also less problematic, as the infrastructure not only does the reflection but is influential on the resulting decisions, removing some of the indeterminacies and local maxima caused by human reflexivity. Of course, it may be, as in Huxley's *Brave New World*, that preferences are being manipulated to make this easier to achieve. However, there are plenty of results that show the superiority of recommended items over personally chosen ones in a number of spheres, at least in terms of *post hoc* consumer satisfaction, although it may sometimes be that they work by ignoring the personal and recommending generally-popular items at the top of a global ranking order (Cremonesi *et al.*, 2010). The move to a "prediction society" has always been part of the narrative of modernity (Westin, 1967, 359), but the novelty of principle (2) is that we don't have to predict the choice, we can inform the individual what they *would* choose in a position of epistemological advantage, or indeed simply impose that ideal choice by manipulating the environment.

4.2 Personalisation and Privacy

An important development of high modernity was a concern for individuals' dignity and autonomy, often valued above the flourishing of the community in which they are embedded. In the 20th century, the expression of individuality was mediated through mechanisms of choice, such as democracy, free markets, freedom of expression, freedom of association and freedom of religion and ideology. The division of labour allowed a dramatic broadening of consumption of goods, services and media, but "such consumable material, in order to be acceptable and enjoyable to a very large number of individuals, cannot be designed for subjective differentiation of taste" (Simmel, 2004, 455). The loss of subjective differentiation was compensated for by the range of choice between goods.

This raised various issues, not least those of consistency of the choices for an individual through time (Engel and Kirchkamp, 2019; Jacobson and Petrie, 2009; Kurtz-David *et al.*, 2019) and across individuals (Arrow, 2012; Maskin and Sen, 2014), weakness of the will and other

disorders of choice (Heather, 2020; Kampa, 2020; O'Hara, in press; Silver, 2019), and the ways we learn preferences (Evans *et al.*, 2016; Luo *et al.*, 2017). If individuals are choosers, all these difficulties have to be explained in terms of preference structures, such as postulating a split between first and second order preferences (Jeffrey, 1974). The not-too-convincing postulation of *rational economic man*, the human as chooser, came to dominate economic, political, organisational/managerial and even social thought (Robbins, 1932).

Digital environments make authentic choices harder; many services are apparently designed to be addictive (Berthon *et al.*, 2019; Hendricks and Mehlsen, 2022, 107–135; Peper and Harvey, 2018; Pontes *et al.*, 2020; Sun and Zhang, 2021; Sutton, 2020; Švelch, 2019), so for example people find it very hard not to offend their friends and family by scrolling obsessively through their smartphone when they should be paying attention (Aargaard, 2020), while the business model of some games, of free play with paid-for in-game treats, also rewards providers of compelling services.

Furthermore, the abundant data about behaviour has resulted in a turn in economics from theories of rational choice to empirical and data-driven statements about behaviour, which turns out very often not to be rational (Corr and Plagnol, 2019; de Jonge, 2012; Kahneman, 2011). Finally, the use of information technology (and other production methods such as 3D printing) have broken the link that Simmel noted between the division of labour and impersonal production (Aheleroff *et al.*, 2021). From the point of view of digital modernity, questions about the difficulties of choice are, in theory, rendered unnecessary by the successes of recommender systems, using the data and the correlation techniques that the ambient data infrastructure makes possible. This is one of the major discontinuities between analogue and digital modernity.

The superiority of recommendations over choices has three dimensions (as well as the revenue generation that recommendation has made possible). First, the recommendation is likely to be superior in terms of the satisfaction expressed by the user/consumer. The user will be likely to rate a recommendation higher than a choice, and recommendation is increasingly important for discovering preferences (Smith and Linden, 2017; Stratigi *et al.*, 2019). Although user preferences can become

anchored by recommendations used as reference points (Adomavicius *et al.*, 2013), the point is no less salient for that; if user preference is fundamentally malleable, then recommendation is even likelier to deliver outcomes judged positive by users (though see Banker and Khetani, 2019 for an expression of the downsides of this).

Second, a recommender system can be tailored to the interests or values of the individual or of the community (Stray, 2020; Stray *et al.*, 2021; Wang *et al.*, 2019a), and so can side-step issues such as weakness of the will. Recommender systems need not be tempted by short-term considerations of pleasure (of course, they might also be designed deliberately in order to tempt users into disregarding their first order preferences – there is nothing intrinsically virtuous about recommendation).

Thirdly, the range of choices opened up by digital search and aggregation techniques is simply unmanageable, and the exercise of choice under the pressure of demands for authenticity and contentment is a potential cause of great anxiety. Because "in post-traditional contexts we have no choice but to choose" (Giddens, 1994, 75), choice, rather than the liberating expression of individuality of analogue modernity, looks to many more like a "tyranny" (Salecl, 2010). Expressing individuality by choice in this environment looks increasingly problematic.

The alternative thrown up by digital modernity is *personalisation*. Rather than the world presenting itself to individuals who select those parts they prefer, the world is moulded around them to create optimally preferential experiences for everyone. The choice function is preserved only to the extent that they are given an attenuated menu of choices, or a ranked list such that the probability of something being chosen from a low rank is small (Isaac and Schindler, 2014). There is much research into the visualisation of ranked lists (Mylavarapu *et al.*, 2019), but it is an academically-driven sideshow to the simplicity and elegance of linear ordering. Thus the subjunctive world achieves its promise of organising the world so that individuals get the choices they would have made, if only they had had the capacities of the ambient data infrastructure (O'Hara, 2021).

Note one important side-effect of this switch. Under analogue modernity, key to the expression of individuality is authentic, autonomous

choice. This requires a certain space or solitude for reflection, so that individuals can avoid or filter out exogenous influences and coercion, and achieve genuine autonomy. Indeed, to the extent that individuals are known not only by friends but also strangers, autonomy is the harder to exhibit; this was graphically shown in the classic novel *Don Quixote*, published in two parts in 1605 and 1615. Quixote's freedom of choice and ability to develop are severely constrained by the brilliant narrative twist that all the characters in Part II of the novel have read Part I, and so are well aware of his madness and obsession with outdated chivalric values.

In other words, the requirement for privacy is baked into the conditions for analogue modernity, and it is no surprise to find that, during its 20th century heyday we witnessed the development of law as a means for individuals to mark out and defend private territory in spatial, informational and decisional terms, ranging from Warren and Brandeis' classic paper on privacy law from 1890 (Warren and Brandeis, 1890), to the creation of rights to privacy in the Universal Declaration of Human Rights (1948) and the European Convention on Human Rights (1950, effective 1953), to the prominence of privacy as a political issue (Westin, 1967), to the EU's Data Protection Directive (1995).

However, under digital modernity, as authentic choice is no longer characteristic of the expression of individuality, privacy is not required; indeed, it is a hindrance that prevents full personalisation. This implies the third principle of digital modernity (Lupton, 2015, 33–38; O'Hara, 2020c, 2021).

> (3) Since personalisation replaces choice in digital modernity, and since effective personalisation demands knowledge about the individual on the part of the personalised service provider, privacy is now an obstacle to the delivery of digital modernity.

In other words, whereas it used to be thought that individuation was inimical to individuality, under digital modernity the former is *a means toward* the latter. This is an ambivalent situation, even as we receive improved goods. As we try to exercise control through choice, at what point do we become cyphers by using technology to make choice

manageable (Delacroix and Veale, 2020)? "We live in the knowledge that our lives have unique value, but we are treated as invisible" (Zuboff, 2019, 45). As commentators from Tocqueville to Orwell have argued, "when citizens removed themselves from public affairs to concentrate on their own private ends, power . . . was relinquished to administrative elites who begin to enjoy a dangerous type of license" (Dwan, 2018, 66). The personalisation that expresses individuality also produces a flow of information about the individual for future manipulation (Zuboff, 2019, 256). We might say that Facebook turns us all into Don Quixote.

4.3 The Shrinking of Space and Time

The subjunctive world of digital modernity, by replacing free choice with informed recommendation, claims a discontinuity in history and politics (Mosco, 2004). It also undoes temporal and spatial relations; data, particularly sensor data from smartphones and the IoT, can be read to allow the comprehension of any point in space, while globe-spanning networks allow action to be taken anywhere as well, so a Russian hacker can exercise more influence on an American election than an American news anchor. Furthermore, while personal relationships used to be restricted to physical localities, and it was hard to keep in touch across long distances, it is now often easier to contact one's Facebook friends than the people in one's neighbourhood. This happens instantly – messages are trivial to send, and even the choices we make are recommended in the blink of an eye.

The two dimensions of space and time can be plotted on a pair of axes, as in Figure 4.1. Progress consists in moving from a peripheral, backward pre-modern state at the bottom left, towards the upper right, through the advanced, central situation of analogue modernity, to the innovative cyberspace of digital modernity. Progress, in this sense, may be a straightforward advancement along a 45° line between the dimensions, in which case freedom and organisation complement each other (suggesting Giddens' notion of *structuration* that modernity simultaneously constrains and empowers individuals – Giddens, 1984). However, as we will see it is not as simple as that suggests.

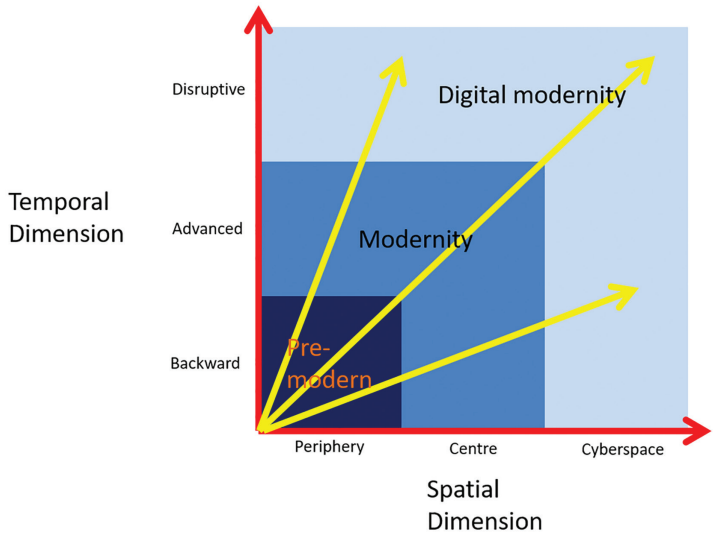

Figure 4.1: Trajectories through the dimensions of digital modernity.
Source: O'Hara (2020a, 201, Figure 1).

Let us therefore move on to consider the development of digital modernity, and its narrative of advancement, first across time, and then space.

5

Digital Modernity in Time

Progress from backwardness to advancement is perhaps most naturally seen as a temporal process, so that, for instance, one might talk of the pre-modern medieval civilisation of Europe, to the early modernity stretching roughly from the Renaissance to the Enlightenment, and then the modern world proper, founded on capitalism and rational Enlightenment principles. European nations became global traders and warriors in the early modern period, and so many other parts of the world were influenced (voluntarily or otherwise) by those interventions, but in general we should not assume that non-European areas modernised at the same pace, or in the same ways, as Europe. Modernity in most places is broadly characterised by the emergence of science, technology, rationalism, secularism, liberty and abstract expert systems, and the decline of tradition, religion and community and kinship ties, but everywhere has its own idiosyncrasies through time (for instance, the United States is hardly characterised by a lack of religiosity, while traditions can be reborn or reimagined for new generations in new contexts). Furthermore, as already noted, the temporal dimension is seen as linear, suggesting a general trend of linear progress, which could be halted or even reversed by natural or man-made disasters.

5.1 Disintermediation and Disruption

In pre-modernity, time is understood via practices such as traditions. Traditions have a repetitive character, which gives them a presence through time.

> Tradition . . . is an orientation to the past, such that the past has a heavy influence or, more accurately put, is made to have a heavy influence, over the present. Yet clearly . . . it is also about the future, since established practices are used as a way of organising future time.
>
> (Giddens, 1994, 62)

Time is compressed by modernity, through speed of communication, action and calculation (Castells, 2000a, 460–499; Harvey, 1990), as well as the loss of tradition's organising principle, spreading what has been called the "cybervirus of amnesia" (Huyssen, 2000). Automated responses mean that entire processes can be performed more quickly than ever. Disintermediation and automation speed things up even more, even with humans in the loop. A 19th century romance could fill hundreds of pages of a novel, whereas dating apps take us from discovery to consummation in the course of an evening (indeed, more than once, for those with stamina). The past can be preserved, but its declining living presence in the present leads to what Adorno called *musealisation*, a process of conversion into exhibits that "itself is sucked into that vortex of an ever faster circulation of images, spectacles, events, and thus is always in danger of losing its ability to guarantee cultural stability over time" (Huyssen, 2000). See also Heelas *et al.* (1996).

Disintermediation, via the digitisation of communications, processes and agents, entails disruption of existing processes, or, as Arendt poignantly put it, a loss of human experience (Arendt, 1998, 321–322), creating a space for innovation to improve performance (Christensen, 1997; Christensen *et al.*, 2015; Yang *et al.*, 2016). The improvement may not always counter the loss. Disintermediated travel agents were important elements in cementing face-to-face trust in the travel business (Giddens, 1990, 85), a function that cannot be performed by online

brokers such as Opodo.com.[1] Consider the results of disintermediating the gambling industry, disconnecting the input/output money function (the "essence" of gambling) from the object of the gamble. One can use a fixed odds betting terminal dozens of times in the period it would take one to place a single bet at the roulette table. People are no longer restricted to betting on the outcome of complex cricket, tennis or snooker matches, but on utterly irrelevant and meaningless questions such as whether a bowler will bowl a no-ball at a particular time – so-called proposition bets, which have led to the hard-to-detect crime of spot-fixing. Disintermediation has meant the decline of pastimes that have provoked great art and literature (horse racing from Trollope and Zola to Conan Doyle, roulette from Dostoyevsky and Stendhal to Ian Fleming), and a corresponding rise of gambling addiction (Chóliz, 2016) and match-fixing (Andreff, 2019, 1–18). The result is that all the mechanisms that made gambling a social pastime with support networks that helped provide a brake for (some of) those on the slippery slope to perdition are replaced by a quantified input-output function solely defined around the money that leaves and enters the gambler's wallet. And since that input-output function naturally favours the companies that define it, it is in their interests to maximise its use. The social damage they cause is externalised, and their costs are lowered as they have no need to supply an experience alongside the gamble; the sole question is the behavioural psychology of how to ensure the gambler remains at the machine.

The classic theoretical account of disintermediation and disruption is Schumpeter's creative destruction (Schumpeter, 1950), in which economic structures are transformed from within, and sources of existing wealth are destroyed to enable new sources of greater power to emerge. Even well-managed companies can be uprooted because sound management practice makes it harder to develop or anticipate disruptive technologies. A tenet of modernity in general has always been that solidity and permanence are illusory. "All that is solid melts into air", wrote Marx and Engels in 1848, because of capitalism's "uninterrupted

[1] Disclaimer: I am one of very many people who had a bad and costly experience with Opodo and would recommend travellers avoid it.

disturbance of all social conditions", while in our own time we have seen the spread of the fluid social conditions of liquid modernity (Bauman, 2000). It was often thought, not least by Schumpeter, that constant crisis and creative destruction would ultimately undermine capitalism and lead to socialist societies, but later theorists such as Clayton Christensen and Bauman argued that this was where capitalism got its energy from and renewed itself. Three of the components of Google's philosophy, as outlined in Section 3.1 above, are disruptive of capitalism: eschewing intellectual property and copyright, paid services and profit. Free services are "paid for" with data, leading to the innovation of surveillance capitalism (Zuboff, 2019).

While many innovative disruptors usually work faster, sometimes by orders of magnitude, than the institutions and practices they disrupt, this is not the import of the metaphor of the temporal dimension. Indeed, some disruptive innovations, such as bitcoin payments, take up more measured time than the disruptee, in this case traditional card payments (a point made to me by Reuben Binns). While measured time is certainly an important aspect of the temporal aspect of modernity, modernisation also includes a sense of progress, and a perception of being up-to-date, appropriate for the latest stage of modernity.

The point is that the post-disruption system, seen from the perspective of digital modernity, is *more* modern, *more* advanced, more nearly a part of the future than the system before it was disrupted, with its primitive processes, archaic intermediaries and unfashionable technologies. The post-disruption system has progressed beyond the pre-disruption one, not only in the sense that it occurred later, but in the symbolic sense that the post-disruption system is a separate, more advanced step on a timeline of significant stages in finance, work, healthcare, education or commerce. It is not that the disruption takes place through time, or that the technology is necessarily faster than what it has disrupted, but rather that *the disruption moves us to a new temporal phase or period*, through a temporal boundary so that the pre-disruption system can now be referred to as "the old days", with nostalgia if not regret for its passing (Harris, 2014; Paul, 2021).

To take the example of finance, fintech is repeatedly held up as a potential disruptor, in several areas including cryptocurrencies, stablecoins, central bank backed currencies, ledgers, digital payments, cross-border transfers, foreign exchange, peer-to-peer services including lending, settling invoices and escrow, crowdfunding, trading including retail investing in stocks and shares and swarm trading, and also including criminal activities such as money laundering and low-risk reception of ransom (Bussman, 2017; Cai, 2018; Gomber *et al.*, 2018). The main tool of disruption is disintermediation, creating an instant connection, which is technologically guaranteed. Much of the financial industry has been built on the needs for (i) intermediating between investors and entrepreneurs, or creditors and debtors, (ii) avoiding conflicts of interest, (iii) trusted maintenance of records of transfers of money and ownership of property, and (iv) pricing illiquid assets. In each case, fintech has advantages over traditional institutions – it can reduce trading costs to (close to) zero, removing intermediaries takes away conflicts of interest between them, distributed ledgers are argued to be more secure and trustworthy than centrally-maintained ones, and fintech can aggregate baskets of illiquid assets to make markets, while ML can price similar but not identical assets. Furthermore, ML can take advantage of the vast range of data that powers digital modernity to create extra services.

Disruption can be unexpected and emergent, as when a Reddit forum managed to mobilise sufficiently many low-volume day traders to materially affect the share prices of targeted firms (see Section 8.2). Even disruptors can be disrupted – the venture capital funds of Sand Hill Road which more or less created the financial conditions for the Silicon Valley ecosystem (Mallaby, 2022; Nicholas, 2019) supplied social networking and mentoring services for nerdy founders, but the major gains of the industry have resulted in more competition and an influx of innovative finance, disintermediating the VCs' "old boy networks".

Some of the impetus for fintech came from the financial crisis of 2008, and the consequent erosion of trust in the financial system, which enabled fintech startups to claim that as well as new or more efficient services, they provided new approaches to trust, whether peer-to-peer, transparency or so-called "trustless trust" (Menat, 2016). Many fintech firms focus on service and customer experience, without a corresponding

understanding of the complexities of security (Haupert *et al.*, 2017), so that the risks from disruption are high, and regulators are usually watchful (Alvarez, 2018; Omarova, 2020; Shanaev *et al.*, 2020) – especially in China, where there has been a push against potentially destabilising cryptocurrencies, with a ban on exchanging them for fiat money (Chen and Liu, 2021; Xie, 2019; Zhang and Gregoriou, 2020). Privacy would also seem to be an obvious loser wherever cash is displaced by online payments, with the corresponding loss of anonymity (Rennie and Steele, 2021).

5.2 Innovation on Demand

The ability of the advanced society to innovate is part of what distinguishes it from the backward one (which, with a cyclic and fatalistic view of history may not even pursue innovation very far anyway). Modernity in contrast challenges or decentres authority (Giddens, 1994, 107), either rejecting it outright, or alternatively demanding it prove itself frequently. The individual should be autonomous. In 1773, Goethe wrote "One thing is for certain: happy and great alone is the man who needs neither to command nor to obey to amount to something", while in Kant's great essay of 1784 "What is Enlightenment?" the reader is exhorted to "dare to know", i.e., not to take anyone's word for anything – find out for oneself (a rigorous demand that of course has been dropped in the subjunctive world). The Industrial Revolution showed the power of allowing the owners of capital to invest in innovative machines and processes. "Change, unstoppable and uncontrollable, something that appeared completely inconceivable, even blasphemous, to earlier periods, now comes to be taken for granted, a certainty that always deserves to be questioned" (Beck, 1994a, 26). In 19th century Paris, entrepreneurialism became a way of life; the person of calm and measured judgment had no role to play, was an irrelevance (Sennett, 2002, 154).

It was thought by many theorists of analogue modernity in its reflexive phase that the pace of innovation would eventually decelerate, because of environmental concerns, moral issues (particularly in biotechnology), and others, as well as a certain inertia that technology creates. Reflection on these problems would, it was thought, create a global

politics that would confront the logic of unfettered innovation (Giddens, 1990, 169–170). Yet this didn't happen; the reflexive nature of late analogue modernity might have caused such a politics to emerge, but as reflexivity was outsourced to the infrastructure, the logic remained in place.

Inheriting that mindset, digital modernity's propensity for innovation has little standing in its way – nothing is so powerful or important that it cannot be improved by a daring individual prepared to back his or her insight; the classic digital texts bulge with accounts of the potential of networked computing power and data to change politics, history, economics or social relations. The experimental outlook of constant testing and perpetual beta (i.e., the release of new versions of software or other technology early and often, at the beta development stage, to uncover its faults all the sooner, rather than perfecting the product before release – Švelch, 2019) produces a culture of constant innovation – innovation on demand. An obvious example of this is the production of the first COVID-19 vaccines, reducing a standard development time of up to ten years to a six-month process from the first publication of the SARS-CoV-2 genome to phase 1 studies, and some of the early efforts also included the wider innovation of the development of mRNA vaccines.

The super-advanced society can (ideally) innovate routinely, at will, which means that all processes will be open to disruption and disintermediation; "not only [has] subversion ... become a central feature of our existence but [also] we live inside or within institutionalised subversion" (Horvath *et al.*, 2018, 1). Any centralised authorities will be likely targets for disruption, decentralising and flattening hierarchies. Hence, in such a society, on this narrative, disruption to existing institutions, practices and processes will be routine, and entrepreneurs will constantly be on the lookout for new areas in which to innovate, while incumbents will be consistently fighting off pressure.

At the limit, this is a world in which disruption is constant and everything is liable to be disrupted. But disruption is the pre-requisite, or constant companion, of innovation, and innovation on demand is the mark of advancement. Everything that exists, therefore, is liable to be innovated over, open to a more advanced alternative, so we can

state a fourth principle that follows immediately from digital modernity (O'Hara, 2020a, 199):

(4) To exist is to be backward.

Any system when implemented is immediately under threat from innovation, and ripe for disruption (Colombo *et al.*, 2015). Advancement is constant, and so nothing in the stasis of existence can be advanced; it is already backward relative to potential disruptive innovation that, if not on tap, is at least conceivable around the next corner. Airbnb (Guttentag, 2015) and Uber (Cramer and Krueger, 2016; Urbinati *et al.*, 2018; Yang *et al.*, 2016) have not only each disrupted an industry (of tourist accommodation and taxis respectively), but also challenged regulatory systems across the globe, yet are already the targets of new disruptive technologies (Greene, 2017; Langner, 2016). Even the mighty are under pressure; TikTok threatens to disrupt Facebook by importing Chinese practices and the expertise that underlies them, leveraging the creator economy to benefit both the creators and itself (Abidin, 2021), mashing up social networking and e-commerce (so-called social commerce – Lin *et al.*, 2019). Facebook/Meta has always cultivated paranoia about disruptive competitors (Frenkel and Kang, 2021; Frier, 2020, 108, 124), and Zuckerberg has exhorted his workforce to "live in the future" (Zuckerberg, 2022). And disruption thrives on disruption; political disruption facilitated by technology can facilitate the introduction of new practices that existing institutions are unable to support (Dikeç, 2017), and the coalescing of new (mass) groups (Margetts *et al.*, 2016).

According to Christensen's disruptive innovation theory, sound management practice generally involves a good relation with customers, understanding their needs and investing in what they say they want. However, disruptive technologies tend to underperform established ones in the features that appeal to mainstream customers; where they disrupt is providing new attributes valued by early adopters. They typically take off in small markets, which are unlikely to provide interesting prospects of growth for bigger organisations. Thus sheltered, they can improve their product while creating new demand for the additional attributes, and eventually take over (Christensen, 1997).

Hence disruptive innovation can be a tragic process where companies are overrun because they are well-managed. An alternative response for canny incumbents is to acquire or take stakes in troublesome competitors, or undermine them by locking customers into a wider package (as Microsoft did to Netscape in boosting its own Web browser, a practice both illegal – Tomlin, 2004 – and unethical – Klein, 2001a; Spinello, 2003), although these tactics are now the target of anti-trust and competition regulators (Windrum, 2004). Another possibility is a management strategy such as Apple's of disruption from within. The caveat has to be added that it is easier said than done to disrupt an incumbent. Disruption (measured by the rate of disavowal of a service by users) and innovation (measured by the rate of uptake of a service) may not be as closely linked as the narrative maintains, and it may be possible for incumbent and newcomer to coexist, at least for a period, (Chandrasekaran *et al.*, 2022).

Regulation is as likely as not to be designed to protect incumbents (regulatory capture), and therefore to hinder the hyper-speed progress that motivates the temporal dimension (Land, 2019). Law traditionally follows technological development, and in an age of super-disruption, can only lag further behind. Experts are far from easy to find, either lawyers who understand new technology, or neutral technologists (when a technology is going through a disruptive phase, often the only experts are those who are in the vanguard). In Lawrence Lessig's analysis, some regulation can be absorbed into code itself, as a technology might make certain uses or actions impossible (Lessig, 1999); this is a complicating factor, but while there are many illustrations of Lessig's thesis, it cannot supply a manual for technology regulation (Kirby, 2009, 10), and it is a hard but important task to envisage the law as a part of a regulatory suite which will include imposed technological constraints (Brownsword, 2019).

However, doing nothing is not neutral either; while a comprehensive piece of legislation is being drafted, markets are made and unmade, companies driven out and bankrupted, and technologies made obsolete. Famously, Netscape was vindicated only after its business model had been effectively destroyed by Microsoft. The tension for regulators is that not only is doing nothing not neutral, but doing something might

suppress valuable innovation (Bittlingmayer and Hazlett, 2000; Kirby, 2009, 11–13).

5.3 Disrupting Disruptive Innovation

Disruptive innovation theory itself may have been disrupted by digital modernity. It is not clear that it correctly describes many of the disruptive practices characteristic of digital modernity. Take for instance the phenomenon of *blitzscaling*, where companies spend large amounts of investors' cash to build large networks that are expected to create value in the future, but which at present only generate large costs (Kuratko *et al.*, 2020), with a prime short-to-medium term focus on growing the network. Because such companies, unconcerned with profit, are as a side-effect able to undercut more traditional competitors on price or service, which have to rely on providing returns to investors, this enables them to disrupt their sector (Kenney and Zysman, 2019).

But, in contrast to the received picture of disruptive innovation, blitzscaling may not disrupt large organisations, but industries of small providers (taxicabs, in the case of Uber and Lyft – Daub, 2020). It may disrupt entire ways of life – at the time of writing in 2022, a lot of debate surrounds the future of cash in a world of cryptocurrencies, digital payments systems and central bank digital currencies (Antonopoulos, 2015; Frisby, 2014; McDonald, 2021; Prasad, 2021; Roberts, 2021; Steinmetz *et al.*, 2020). The world of work is similarly a hot topic, with certain types of job under threat and undesirable ones proliferating (Brynjolfsson and McAfee, 2011; Cowen, 2013; Ford, 2013; Frey, 2019; Smith and Browne, 2019, 231–247; Susskind and Susskind, 2015), although such concerns were also prominent under analogue modernity (Lash, 1994, 120, 134). News media at all scales, especially print, have been disrupted by Internet news, with arguably deleterious results. Silicon Valley types have disrupted the internal combustion engine and space travel, arguably more positively (although Elon Musk's satellite Internet has also filled the sky with junk, so the digital world has disrupted astronomical research – Massey *et al.*, 2020).

Secondly, for the immense growth required, the disruptor needs a global market, not a small one. And thirdly, the disruption may

simply happen because money is invested in growth, not efficiency (Kuratko *et al.*, 2020); a blitzscaling firm might drive profit-oriented incumbents out of business, funded by investors keen to have a stake in the growing network and uninterested in profit in the short term (Klein, 2001a). A blitzscaling startup creates uncertainty both for itself and its competitors, which in itself may cause a general dip in profitability across an industry, even as consumers benefit from low prices or free services. The classic disruptive innovation theory seems not to apply to Uber; neither does it apply to the smartphone, which certainly disrupted the mobile phone industry, but absolutely not by honing an inferior product in a small market.

The pro-disruption aspect of digital modernity is naturally a target of conservative critiques (O'Hara and Garnett, 2020). Edmund Burke wrote as early as 1790, that "A spirit of innovation is generally the result of a selfish temper and confined views", a view that observers of Elon Musk might endorse. Maybe it is disruption that has become the stable institution as Silicon Valley billionaires' deep pockets enable them to disrupt whatever they fancy (Daub, 2020).

Or, put another way, the tech giants might simply disrupt the disruptors. As Zuckerberg once stated,

> There are important counter-trends to [the centralisation of power by tech companies] – like encryption and cryptocurrency – that take power from centralized systems and put it back into people's hands. But they come with the risk of being harder to control. I'm interested to go deeper and study the positive and negative aspects of these technologies, and how best to use them in our services".[2]

With that in mind, Facebook bought WhatsApp, Instagram, Oculus and tbh, while Google has bought Waze and Nest, and so on. Many "disruptors" disrupt largely to draw attention to themselves, and be bought out by the giants (Buenstorf, 2016; Desyllas and Hughes, 2009).

Could digital modernity even disrupt itself? It has been claimed that the singularity, if it emerged, would create a posthuman world

[2] https://www.facebook.com/zuck/posts/10104380170714571?pnref=story.

characterised by lack of connection between individuals, thereby *de facto* dismantling digital modernity (Roden, 2012). Google's ambitions are to move beyond search to AI-based suggestions (Gilder, 2018, 234), for example multisearch (Zeng, 2022). Less radically, Beck's argument that reflexivity will undermine the industrial society and processes upon which reflexive modernity is founded (Beck, 1994b), may also be applied to digital modernity. For instance, the vast energy requirements of data centres to power the big data economy, as well as activities such as cryptocurrency mining, will add to, rather than subtract from, ecological crisis. The polarised abuse between rival groups, fostered in echo chambers of personalised media, may result in the breakdown of the social relations required for a functioning knowledge economy, making of the online world what has been called a "liminal void" (Boland, 2018). US politics in the first quarter of the 21st century seems to be utterly gridlocked, for example, so that the world's foremost superpower can neither take decisions nor settle upon consistent non-partisan policy on any of the problems faced by it and the wider world (Ringen, 2013, 204–218). The connectivity required by such phenomena as smart devices or working from home opens up a massive cyber-attack surface for enemy states, foreign nationalists and cybercriminals that can only be partially defended by the state; some have advocated the disruption and replacement of data-based surveillance capitalism with an architecture based on blockchain, which has been dubbed the cryptocosm (Gilder, 2018, 45–48). And ultimately, phenomena such as policing expression through Twitterstorms (Section 6.4.4 below) and overwhelming surveillance (Section 4.2) may negate many of the advantages of liberal democracy itself.

The temporal dimension is confused and chaotic, with disruption, innovation and modernity all contested, reminiscent of Walter Benjamins' Angel of History, in his ninth thesis on the philosophy of history (written in 1940).

> His face is turned towards the past. Where *we* see the appearance of a chain of events, *he* sees one single catastrophe, which unceasingly piles rubble on top of rubble and hurls it before his feet. He would like to pause for a moment so fair,

> to awaken the dead and to piece together what has been smashed. But a storm is blowing from Paradise, it has caught itself up in his wings and is so strong that the Angel can no longer close them. The storm drives him irresistibly into the future, to which his back is turned, while the rubble-heap before him grows sky-high. That which we call progress, is *this* storm.
>
> (Benjamin, 2019, 201, Benjamins' emphases)

6

Digital Modernity in Space

The second dimension through which digital modernity unfolds is space (O'Hara, 2020a, 198), where the contrast is between being at the *centre* of things, where value is created, and being *peripheral* (Shils, 1975). To the periphery the narrative relegates rural areas, so-called edgelands and liminal spaces, and the developing world, contrasting with major cities, hubs, centres of excellence, the clusters of creativity and industry where innovation happens (Formica, 2017). These latter are small spaces, even defined by absence: "cities are the absence of physical space between people and companies" (Glaeser, 2011, 6). Modernisation privileges the centre and marginalises the periphery (Harvey, 1990).

> The only indispensable material factor in the generation of power is the living together of people. Only where men live so close together that the potentialities of action are always present can power remain with them, and the foundation of cities, which as city-states have remained paradigmatic for all Western political organization, is therefore indeed the most important material prerequisite for power.
>
> (Arendt, 1998, 201)

Again, this is not inevitable or irreversible. The periphery can modernise with development, and may integrate with global networks to prosper (Castells, 2000a, 407–459), for example using space-shrinking technologies such as fast broadband and 5G. Similarly, the centre can lose its position through decline, or may have to struggle to retain relevance through regeneration. If the latter, then the nature of regeneration is likely to be contested, between top down schemes answering to national policy imperatives and modernisation initiatives, or bottom up, local schemes created by residents which may have a larger emotional or nostalgic content (Clark and Wright, 2018; Gao *et al.*, 2020); there is a lot at stake. "Tradition is always rooted in contexts of origin or central places" (Giddens, 1994, 80), and so is focused on place; post-traditional modernisation is transferrable and abstract, and so moves where it can most efficiently be applied.

Innovation is fostered in clusters, hubs and cities. Paradoxically, "proximity has become ever more valuable as the cost of connecting across long distances has fallen" (Glaeser, 2011, 6), so that, for instance, automated trading in financial centres demands clustering because the distance from the server to the market can determine how efficiently it can take advantage of minuscule and fleeting arbitrage opportunities (Lewis, 2014; Urstadt, 2009). Within a hub, acquaintance is not rationed by geography, and while global connections are possible, personal acquaintance is important for learning, trust and influence (Pentland, 2014). In contrast to peripheries with geographical constraints and sparse populations, interpersonal connections need no longer be the accidental or imposed connections of family or neighbours (though these remain and are obviously valuable). They can also include rationally chosen, transactional connections (Lash, 1994, 115), either temporary or one-off (such as employment of a consultant), or longer term (such as financial advisors, employers and employees, and collaborators). Silicon Valley is the most prominent example of such a hub, but we could also cite Bengaluru's "Unicorn Street", Beijing, London, Tel Aviv, Singapore, or São Paolo. Innovation hubs can specialise to focus still further, like Lagos (rapidly becoming a centre for the growing African fintech industry), Chengdu (IoT), Hefei (AI), or Wuhu (robotics).

This section is organised as follows. In Section 6.1, I discuss the metaverse, the latest understanding of a virtual space into which real space is collapsing. Section 6.2 describes the population of the metaverse, its avatars, and the possibilities they raise for improvement of real-world analogues. Section 6.3 describes smart cities, jointly environments for physical people and avatars. Finally Section 6.4 discusses the use of data in the metaverse as a means for evaluating and correcting physical space.

6.1 From Innovation Clusters to the Metaverse

How does the spatial transformation continue into digital modernity? When the potential of proximity is augmented by global networked communications, social networks can become very large, and an individual's network can become extremely rich. Social groups can form using networked technologies that may centre in hubs but also include large numbers remotely, able to contribute to problem-solving, the spreading of ideas or merely play (Shadbolt *et al.*, 2019).

The effective result is the reduction of space asymptotically to zero, where the functionality of connecting devices in effect allows any kind of relationship to be conducted, so space shrinks to within the device – in other words to the representations of the device. Human and non-human entities are connected by networks and affect each other, as noted by several theorists (Latour, 2005, 63–86; Lupton, 2015, 23–27). This was first described by novelist William Gibson, and termed *cyberspace*.

> Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts. ... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding ...
>
> (Gibson, 1984, 69, Gibson's ellipses)

Manuel Castells wrote of real virtuality:

> *. . . a system in which reality itself (that is, people's material/symbolic existence) is entirely captured, fully immersed in a virtual image setting, in the world of make believe, in which appearances are not just on the screen through which experience is communicated, but they become the experience.*
> (Castells, 2000a, 404, Castells' emphasis)

More recently, this idea has crystallised around a synthetic parallel world which is being called the *metaverse* (Ball, 2022), the idea of which grew out of science fiction (the term was coined in Neal Stephenson's 1992 novel *Snow Crash*, but the basic idea was used earlier by Stanley Weinbaum, Ray Bradbury, Philip K. Dick and Isaac Asimov, as well as Gibson – Ball, 2022) and early ambitions for the Web (Marc Andreessen founded Netscape, and Jim Clark invented Silicon Graphics' 3D Geometry Engine, both in anticipation of the metaverse – Gilder, 2018, 166). The vision was honed by online multiplayer games such as Second Life (Bainbridge, 2009; Barnett and Coulson, 2010; Castronova, 2005; Ducheneaut *et al.*, 2006), 3D virtual environments such as VR Chat (Gunkel *et al.*, 2018; McVeigh-Schultz *et al.*, 2018, 2019; Zhan *et al.*, 2020), and augmented reality environments such as Pokémon Go (Berryman, 2012; Carmigniani and Furht, 2011; Carmigniani *et al.*, 2011; Juan and Pérez, 2011; Zhan *et al.*, 2020) and, is, at the time of writing, a future development of immersive virtual or augmented reality, which may take the form of a series of persistent virtual spaces unified by a platform infrastructure to create an ambient/virtual data analysis infrastructure, and may emerge from unconnected virtual spaces shared at scale (Lee *et al.*, 2021).

As well as gaming, the metaverse is being adopted in the worlds of fashion, real-estate (designing and trading virtual properties in the metaverse as non-fungible tokens (NFTs – see Section 9.2.4), which already are changing hands for large sums (Dowling, 2022)), music concerts (legendary pop group ABBA relaunched themselves in 2022 with on-stage "Abbatars"), and other markets in NFTs. The infrastructure will also have to manage transitions between the physical and the virtual, and connect the two (Golding, 2019; Hugues *et al.*, 2011; Zhan

et al., 2020). Some look forward to a reality just as meaningful as the physical (Chalmers, 2022; Søraker, 2014).

Note that all of these terms – cyberspace, real virtuality and the metaverse – are no doubt under-theorised and subject to arbitrary morphing, while others have also been used (the "information superhighway" has died out as a term, but it nicely expresses principle (1)). They are all essentially contested pieces of jargon intended to label a goal, such that victory may be declared at some point in the future, even if current views of the goal diverge radically. While the future is being enacted, or enacting itself, optimists will highlight successes, while pessimists will claim vindication for their warnings. What connects the past discourses with the future ones are the use of malleable terms like "metaverse" and "cyberspace", alongside contingent and largely unforeseen sociotechnical developments. By applying the same word to changing technologies and practices, the illusion of consistency and prescience can be maintained. We may not agree on what the metaverse is, and it may just be a marketing term, but it will do as an anchor for the various pundits of digital modernity, optimistic and pessimistic, to debate and predict.

The metaverse will contain elements of physical reality, and online versions of physical-world institutions can be constructed (Duan *et al.*, 2021), but it will allow dynamic reconfiguring of those elements. Perhaps of most interest at the moment is the possibility of altering or customising identities, gender, ethnicity and so on (Wallis and Ross, 2021), as well as the development of specific ethical codes tailored to or influenced by the virtual environment (Sparrow *et al.*, 2021). Such reconfiguration pushes back at fixed ideas about what it means to be human. It will provide opportunities to (virtually) do things that are impossible, or too dangerous, or too expensive, to do in the physical world (Bailenson, 2018). More prosaically, where reconfiguring involves the unpaid labour of participants, as in the world of gaming, there may be issues about remuneration (Arrieta-Ibarra *et al.*, 2018; Duffy *et al.*, 2021; Ekbia and Nardi, 2017; Grimes, 2006; Laato *et al.*, 2019; Robinson and Smith, 2018).

Perhaps the most significant statement of intent was that of Mark Zuckerberg, who surprised commentators in 2014 by buying Oculus, a VR company that manufactured the Rift gaming headset, for billions

of dollars (Egliston and Carter, 2020; Harley, 2020), and later brought his social network Facebook under a holding company named Meta (Newton, 2021; Zuckerberg, 2021). As well as Meta, giants such as Nvidia, Epic Games and Tencent hope to be major players, while Decentraland, SuperWorld, the Sandbox and Somnium Space are all earning real money from selling virtual real-estate. Microsoft has developed a platform for both application development and collaboration within a metaverse, including Mesh, which hosts virtual spaces, and HoloLens, a mixed-reality headset. Nvidia's Omniverse platform allows users to bring their own constructions to a virtual space, where they can be combined with others in collaborative work. If online collaboration in virtual space is to become routine, standards akin to the Web's HTML will be needed.

A persistent online environment, whether the metaverse, or cyberspace, or attenuated versions of either, would be a mine for data to render its participants legible to the ambient infrastructure. The quality of cyberspace data may be challenged, with some complaining about a "fantasy of perfect data" (Carter and Egliston, 2021), but it could still be very expressive about our interactions. It therefore affords opportunities for order, calculation and rationality, presenting the possibility of implementing the Enlightenment dream of an ordered society in which human needs are accurately identified and supplied. The idea that "knowledge is power" was a central assumption of the Enlightenment (from Francis Bacon) which received several knocks as reflexivity and globalisation have complicated predictive calculations: "the more we try to colonize the future, the more it is likely to spring surprises on us" (Giddens, 1994, 58). Maybe the big data architecture, with its focus on correlations rather than causes, partially reasserts and restores the connection. This vision has been called "computational rationality", comprising the progressive development of representations and inferential procedures for probabilistic inference at scale, reflexivity, and managing tradeoffs in effort, precision and timeliness of inference, to maximise the expected utility of outputs (Gershman *et al.*, 2015). Using the data within the ambient infrastructure to manipulate both individuals, by giving them feedback on their performance, and the cyberspace environment that they perceive, could lead to more rational and pro-social behaviour in the interests of the individuals themselves.

Pentland argues that big-data-driven systems responsive to feedback form a "nervous system" to maintain stability of government, energy, health and transport systems, which could "reinvent societies' systems within a control framework: one that first senses the situation; then combines these observations with models of demand and dynamic reaction; and, finally, uses the resulting predictions to tune the systems to match the demands being made of them" (Pentland, 2014, 138). Perhaps the metaphor of the digital body politic can be taken further, with sensors and the IoT as the nervous system, AI as the brain, blockchain as memory, and social media as the limbic system for collective precognitive function (Cohen, 2020; Tay, 2019). Psychiatrist Iain McGilchrist suggests that

> the right [brain] hemisphere underwrites breadth and flexibility of attention, where the left hemisphere brings to bear focussed attention. ... [T]he right hemisphere sees things whole, where the left hemisphere sees things abstracted from context, and broken into parts, from which it reconstructs a 'whole': something very different.
>
> (McGilchrist, 2019, 27–28)

Given the way these functions map onto machine abilities, it may be that the digital body politic is rather biased toward the left hemisphere. All this is continuous with a long-held ideal of modernity, "that there is a fundamental common interest which is inherent in society and which, once disclosed, will supervene over all other interests of the respective parties; it assumes rigorously persuasive rationality and relevant empirical knowledge of a high degree of precision and reliability" (Shils, 1997a, 85).

While it is certainly true that our environment has both online and offline aspects, it is an exaggeration to say that there is no distinction at all, as we have noted. Rather, the spatial dimension of digital modernity is characterised by the bold choice to make the online aspect prior or more important in key senses, in order to access that empirical knowledge.

We can now state the underlying principle of the spatial dimension of digital modernity (O'Hara, 2020a, 200):

> (5) In digital modernity, the best that hapless reality can achieve is to get closer to the perfection of the algorithm and the data.

This principle, of course, underlies the subjunctive world. The ambient infrastructure knows individuals better than they do themselves, because it not only has far more information about the individual (derived from actual events, actions and judgments involving the individual, and so honest signals, unlike memory or survey responses – Pentland, 2008), it also has information about events, actions and judgments involving people with similar attributes. Then, given its epistemologically-justified statistical/ML techniques, it is in a fine position to make judgments about what individuals would choose and how they would behave if only they had the relevant data and/or the correct parameters with which to judge their own well-being.

Thus the Enlightenment ideal of mastery over a deterministic universe is jettisoned in favour of a more probabilistic model driven by experimentation, A/B testing, perpetual beta and so on.

> The clockwork universe of Laplace, so easily mastered given sufficient information, is long gone from the agenda of serious scientific understanding. . . . [W]hilst we cannot predict the precise result of our actions, we can determine probabilistically likely ranges of outcomes. What must be coupled to such complex systems analysis is a new form of action: improvisatory and capable of executing a design through a practice which works with the contingencies it discovers only in the course of its acting.
>
> (Williams and Srnicek, 2019, 360–361)

After the disappointments of the Enlightenment and analogue modernity, this opens up the hope for "humans to attain the powers typically associated with the divine" (Horvath *et al.*, 2018, 1).

This "abductive experimentation that seeks the best means to act in a complex world" (Williams and Srnicek, 2019, 361) is of a piece with the reflexivity outsourced to the ambient infrastructure. However, what sounds like the difficult task of experimenting and envisaging

new types of action and feedback is made a lot easier by a standard technocratic move. As in other areas of expert management, when something works in laboratory conditions, the technocratic temptation is simply to reproduce the laboratory conditions in the wider world (O'Hara, 2015a), just as in analogue modernity people worried that the reductionist psychology of behaviourism could become true simply because people started behaving, or were coerced into behaving, as the theory predicted (Arendt, 1998, 322; Lemov, 2005). The incentives to follow a crowd – once its opinion has been aggregated and publicised – means that the desire to be part of and acceptable to a group drives behaviour, as the pursuit of followers and influence governs everything. The infrastructure of the subjunctive world, as well as telling people what they would prefer, also tells them what others want and expect. Failure to provide it will mean unpopularity, and the old punishments of ostracism, banishment and excommunication are updated into the digital world.

In other words, the subjunctive world of the metaverse will terraform the physical world to make it maximally amenable to the output of its underlying infrastructure. The world becomes moulded in accordance with expectations, so that – a trivial instance – restaurants and other venues cease to be visually creative and aim for the kind of "insta-worthy" look that characterises photos of food and architecture on Instagram (Frier, 2020, 159–178). Apps such as Facetune and Adobe Lightroom can improve facial appearance in photos; this could simply be a harmless recreation of an image informed by the feelings of the sitter or photographer in what has been called "emotive validity" (Boeriis, 2021), but when shown to others at scale can create an aesthetic that influences others' self-image negatively (Fardouly and Vartanian, 2016; Fardouly *et al.*, 2015, 2018; Fatt *et al.*, 2019; Kleemans *et al.*, 2018), even influencing them to change their physical appearance with plastic surgery (Rajanala *et al.*, 2018), a development unsurprisingly welcomed by plastic surgeons (Basa and Spiegel, 2020; Youn, 2019). Such changes need not only be aesthetic; systems such as the Chinese social credit system are "generative of a distinctive personhood that concretizes China's ongoing social transformation" (McDonald and Dan, 2021, 87), through successive processes of depersonalisation (e.g., automating

credit allocation systems) and repersonalisation (as citizens infer a human-scale "logic" underlying such systems and conform to them) (McDonald and Dan, 2021). In these ways, the inevitable evolutionary progress postulated by Google's philosophy, summarised in Section 3.1, is brought to fruition.

6.2 The Avatar

Cyberspace is populated by whatever can be constructed from the data. In particular, this means the *avatar*, including digital twins or digitally-extended selves. Avatars may be agents under the control of individuals; digital twins are more properly thought of as *models* or *simulations* of real-world originals (Batty, 2018; Boschert and Rosen, 2016). A digital twin can be characterised as a comprehensive functional description of a person, component, mechanism or system, which includes the information which will be useful for understanding (and manipulating) it across its lifecycle.

In 1907, Simmel contrasted a chess game between two opposing generals, which is uninformative about their relative strategic position, and a war game between them in which their forces are representative of their real-world resources, which will be far more instructive about the future course of a battle – Simmel, 2004, 149). At the present time, battlefield simulation is a military imperative, so Simmel's suggestion has become a key part of command and control, as AI systems are applied to the data being created by armed conflict (for example following the Russian invasion of Ukraine) to forecast outcomes and prioritise strategies (Andres, 2020; Czarnecki, 2011; Gallagher *et al.*, 2018; Pournelle, 2022), although AI will always have to overcome the fact that in warfare, the enemy (and the enemy's AI) also has a say (Wallace, 2022). We are beginning to hear the *defence metaverse* being discussed increasingly often (Neumann, 2022).

The opportunities for creation and manipulation of digital twins will only get greater as AI, cognitive psychology and neuroscience converge (Gershman *et al.*, 2015), while the AI may make it possible for the twin to reason about its own performance (which some writers have even referred to as consciousness – Jennions and Angus, 2022). Indeed,

the avatar and the physical person may enhance each other, becoming greater than the sum of their parts, as in theories of the Web-extended mind (Smart, 2014), while simultaneously suggesting the possibilities of joining them together in a collective intelligence with the ambient data infrastructure as the platform (Halpin *et al.*, 2014).

6.2.1 Avatars and Digital Twins

While most literature focuses on human avatars, they may also be objects; a factory, a transport network, and a component of an artefact could have digital twins. Analysis of real-world information about the physical or physically-embedded object, combined with AI and ML applied to the digital twin, would allow managers to understand, for instance, when a component may need to be checked or changed, how to adjust a system to minimise carbon emissions, or how something will react to an arbitrary stress or impact. Even non-human avatars can interact directly with people. For instance, it has been hypothesised that fears of climate change may cause depression and anxiety in many young people (Majeed and Lee, 2017). These concerns are driven, not by actual changes in the climate, but by extrapolation from models (avatars) of the global climate (O'Hara, 2021, 49–50). The concerns are no less real, and most neutral observers demand significant policy responses to climate change based entirely on the projected behaviour of the models/avatars (Lloyd and Winsberg, 2018). Indeed, at a basic level, for search to work, there must be a database, real or virtual, that is a 'mirror world' of the real world (Gelernter, 1991).

Digital modernity thus sharpens the focus to aspects of the real-world object or person that can be datafied, and uses those to drive policy, in accordance with the Silicon Valley truisms that if it can't be measured it can't be managed, and that if it can't be managed, then it can't be significant, which ultimately takes us to the startling principle (5) of the subjunctive world. On the strongest narratives of digital modernity, the twin would contain *all* the relevant information, and the relation between the flesh and blood person and the information would go beyond that of original and copy. On these strong narratives, human individuals need not necessarily die with their bodies, but may

live on or be resurrected through information processing, and have a future as pure software avatars, "uploaded" to a virtual dimension. This "technological supernaturalism" may correspond to the Christian vision of an eternal life after the death of the mortal body (Proudfoot, 2012).

In another, only mildly weaker, expression of digital modernity, information about individuals is part of their identities, making people examples of "inforgs".

> We are all becoming *connected informational organisms (inforgs)*. This is happening not through some fanciful transformation in our body, but, more seriously and realistically, through the reontologization of our environment and of ourselves.
>
> By reontologizing the infosphere, digital ICTs have brought to light the intrinsically informational nature of human agents. This is not equivalent to saying that people have digital alter egos, some Messrs Hydes represented by their @s, blogs, and https. This trivial point only encourages us to mistake digital ICTs for merely *enhancing* technologies. The informational nature of agents should not be confused with a 'data shadow' either. The more radical change, brought about by the reontologization of the infosphere, will be the disclosure of human agents as interconnected, informational organisms among other informational organisms and agents.
>
> (Floridi, 2007)

This idea corresponds less to Christian theology than to the Ancient Egyptian idea that the soul comprises a number of essential components, including the body, the spirit, the name, the shadow and the soul. The informational avatar could be another element of the Egyptian ontology.

Most obviously, avatars refer to, represent, or, on the stronger claim, *are* intrinsic parts of individuals, creating layered structures from their own records, transactions and the ambient infrastructure's inferences and profiles, referencing and linking to information about others, to create a rich picture of each individual in his or her social context legible to the infrastructure (Belk, 2013; Parkinson *et al.*, 2018; Ruckenstein

and Pantzar, 2015). The self-presentation of the individual is included in the avatar (Bullingham and Vasconcelos, 2013), which may or may not correspond to actuality, may or may not have a physical component (cf. Haraway, 1991), and may be false or falsified for reasons of privacy, *amour propre* or fantasy (Lo *et al.*, 2013; Van Kleek *et al.*, 2016), as well as more sinister motives (Rege, 2009; Whitty, 2015). One estimate suggests that "the universal patterns of online personal strategies follow mostly conscious decisions, resulting in users maintaining 70% control of their digital footprints. However, the remaining 30% of online activities are unconscious floating with digital dynamics and resulting in a wide range of non-expected consequences from identity theft to kidnapping" (Feher, 2021). The ambient infrastructure is relatively good at detecting deception by both individuals and those who have stolen identities, and machine assistance certainly improves on human detection rates (Lai and Tan, 2019).

The effect on individuality of this datafication is complex and even contradictory. Many constraints that have previously been accepted, such as the need to coordinate choices with other family members, or traditional taboos, become redundant. Fragmentation into small groups orthogonal to inherited identities was already an issue in analogue modernity, for example in the entertainment world with the end of the mass audience and its replacement with interactive networks (Castells, 2000a, 355–406), as some people watched MTV, others Sky News, and so on. Those segmented audiences seemed revolutionary enough, but the ubiquity of the smartphone and personalisation of service delivery has taken what Castells called *real virtuality* further. Even within the same household or family, there may now be virtually no common media experience thanks to filter bubbles; short-form video, pornography, news of every possible slant, films of different kinds, sports, multiplayer games and virtual reality concerts may all be watched or participated in individually and independently by relatives. Across the generations, the result may be utter incomprehension.

However, this focus on the individual does not necessarily support individualism or solipsism. Much information about individuals is about their environment and networks, and many inferences that go to make up individuals' profiles are based on information about others. As Giddens

put it, analogue modernity "is decentred in terms of *authorities*, but recentred in terms of opportunities and dilemmas, because focused upon new forms of interdependence. To regard *narcissism*, or even *individualism*, as at the core of the post-traditional order is a mistake" (Giddens, 1994, 107, Giddens' emphasis). That this remains the case in digital modernity is argued, for example, by Barry Wellman, who suggests Internet use is reinforcing a pre-existing turn to societies organised around individuals' networks rather than group or local solidarities, a situation he calls *networked individualism* (Quan-Haase *et al.*, 2002; Rainie and Wellman, 2012; Wellman *et al.*, 2003). This is a gradual, ongoing development; younger individuals tend to use more types of digital media, have more diversified networks, and use digital media to develop new connections, whereas older ones tend to use digital technologies to navigate pre-existing networks, which may rest on more traditional forms of solidarity (Wellman *et al.*, 2020). Individuals are not only using technology to coordinate their group activities, but creating new types of group, with greater scale and focus, using the affordances of networked technology and data, whose sociotechnical character is marked by the terminology of *social machines* (Shadbolt and Hampson, 2018, 103–125; Shadbolt *et al.*, 2019). One important advantage of social machines is that, while the computers process data, people process information; the two types of inferential agent complement each other in the whole.

New networks continue to be created under digital modernity, especially for those types of activity which involve rich interaction. A science fiction show/film, for example, may produce a lively critical discussion, fan fiction, spinoff games and what has been called 'fan service', material designed to please diehard fans such as the return of recurring characters (Beaty, 2016). These are not built on top of older networks, but in many cases may thrive at their expense, not least because fans themselves may provide much of the material for free, a process that has been deemed exploitative (Ekbia and Nardi, 2017).

6.2.2 Improving the Avatar, Improving the Self

The process of amassing information about individuals has been long in the making. Documentary identity enables the state to count and tax individuals, allow them to vote and persuade them to join the army; it makes citizens legible to government (Scott, 1998). Psychological modelling is an important predictive tool, and information facilitates classifications and discriminations. Information was already a vital tool of analogue modernity between the wars (Koopman, 2019). The dramatist Jean Giraudoux wrote as early as 1933 that "Government defines the physical aspects of man by means of The Printed Form, so that for every man in the flesh there is an exactly corresponding man on paper", while science presents us with the world and the people in it mediated through instruments. Yet the information collected in the analogue age was relatively sparse, and Arendt quoted the physicist A.S. Eddington as suggesting (in the first half of the 20th century), that this was like knowing a person through his telephone number (Arendt, 1998, 261). The progress from the written to the digital, admirably portrayed in (Westin, 1967), also energised the private sector and dramatically increased the volume of data available. After the three great transformations of analogue modernity – human activity into productive labour, nature into land/property, and exchange into money (Polanyi, 2001) – it has been argued that a fourth has occurred, human experience into behavioural information (Zuboff, 2019, 99).

Such a view in effect turns people into written texts, which reminds us of Socrates' discussion of orality and literacy in Plato's dialogue *Phaedrus* (Plato, 1997a, 552). Socrates (who never wrote anything) was concerned that writing, in contrast to speech, can't adapt to or interact with interlocutors (answering questions, for instance), and cannot defend itself. Similarly, an avatar is a record of past behaviours combined with analysis, inference and modelling by outsiders, rather than an autonomous representative of the person. If there is to be an exact correspondence between person and avatar as Giraudoux suggested, then the person will have to adapt to the avatar rather than *vice versa*.

The profusion of data means that the individual is measurable, therefore manageable, and via feedback, perfectible. This is a response to principle (4), that to exist is to be backward – individuals respond by changing their nature. Such data has fuelled programmes to supercharge well-being. The premise of the *quantified self* philosophy (Lupton, 2016, 2017; Ruckenstein and Pantzar, 2015) is that algorithmically-driven analysis of the data – especially from wearable health-related technologies such as fitness trackers, smart watches, biosensors, mood trackers and monitors of specific functions such as ECGs or blood pressure, but also increasingly from devices embedded in the body – render individuals transparent not only to others but to *themselves* as quantified systems, allowing digital feedback to be used to self-optimise or *biohack* (Gangadharbatla, 2020; Yetisen, 2018). This might be done for example with special foods, "athleisure" clothes (Lipson *et al.*, 2020), drugs or fasting, often with the imprimatur of Silicon Valley methods and companies such as HVMN (Health Via Modern Nutrition) or sleeptech firm Oura Health. Implants can also facilitate new types of interaction with the physical world; in Sweden, implanted microchips to allow identification or payments have become something of a craze (Petersén, 2019), while in 2021, a man with a progressive neurodegenerative disease proved able to send Tweets just by thinking, thanks to a chip next to his motor cortex (Tangermann, 2021). Computational models of the body, meanwhile, are now good enough to be used for *in silico* clinical trials instead of the bodies of physical people (Sarrami-Foroushani *et al.*, 2021). In 2022, Altos Labs,[1] which aims to halt the aging process by cellular rejuvenation, began its work with $3bn in the bank provided by its initial investors (obviously not put off by the anticlimaxes of similarly ambitious firms, such as Google's Calico Life Sciences,[2] and Craig Venter's Human Longevity,[3] both about ten years older but at the time of writing without significant products).

Note that self-optimisation is really optimisation of the *data*; individuals optimise the data feedback as a proxy for their selves, and those aspects of the self that are prominent in the data are the ones that will

[1] https://altoslabs.com/.
[2] https://www.calicolabs.com/.
[3] https://humanlongevity.com/.

be optimised (Kristensen and Ruckenstein, 2018; Pantzar and Ruckenstein, 2017; Stark, 2020; Tolentino, 2019). There is (as Murray-Rust correctly pointed out to me), a difference as to whether the individual or an external policymaker is in charge of the optimisation process, but the mechanisms and logic are identical. This acceptance of the data and inclusion in our selves as inforgs extends the narrative of modernity in which information about an individual in the files becomes "part of his estimation of himself" (Westin, 1967, 360). Self-tracking medical sensors are interfaces for improving ourselves, sometimes called "the laboratory of the self", and in our data-driven lives our avatars are correspondingly more prominent (Berry *et al.*, 2021; Ruckenstein and Pantzar, 2017; Vigren and Bergroth, 2021). The "primary means and interests" of the ambient data infrastructure are not human discourse and human bodies but, rather, "the calculation of all the world's information and of the world itself *as* information" (Bratton, 2015, 8).

The assumption that such technologies lead us to make rational choices to improve ourselves looks increasingly realistic (Lomborg *et al.*, 2018; Lupton, 2021), downplaying the privacy and other risks of such technologies (Festic *et al.*, 2021), for example in the context of gamified engagement where avatars are in competition with others (Blaszka and Rascon, 2021). Gamification, competition, data-sharing and other kinds of social engagement push us to improve relative to a collective standard, and give us methods to do it. We are judged by others' standards, and learn from others' experiences. Zuboff called this "the machine template for the social relations of an instrumentarian society. The essence of these facts is that first, *machines are not individuals*, and second, *we should be more like machines*" (Zuboff, 2019, 414, her emphases), enabling "forceful new means of mastery over the most intimate aspects of the lives of masses of people" (Grant, 1998, 432).

Our defence, if one is needed, may be old-fashioned inertia. In practice, much use of quantified self technology is episodic, progress is rarely as linear as adverts suggest (Didžiokaitė *et al.*, 2018; Gorm and Shklovski, 2019), and the industry still has to win over many of its users to its data-driven ideology (Sharon and Zandbergen, 2017). People buy (or get given) the smart gadgets, which are worn for a couple of weeks

and then relegated to the back of a drawer. Nevertheless, the direction of travel is established.

6.3 Smartness in the Spatial Environment: Smart Cities

As well as individuals, geographical areas can also be rendered as information and subsumed into cyberspace. Smart cities are defined as "places where information technology is combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic, and environmental problems" (Townsend, 2014, 15), also Albino *et al.* (2015), Appio *et al.* (2019), Batty *et al.* (2012), Caragliu *et al.* (2011), Cocchia (2014), Joss *et al.* (2019), Mac Síthigh (2021), O'Hara and Hall (2021, 221–228), Schaffers *et al.* (2011), Shapiro (2006) and Zhuhadar *et al.* (2017). The requirement on the technology is that it delivers community well-being, not simply economic growth, tax revenues or profits for the companies (Narayan, 2020). Just as the modern city, while it often shares a site with a traditional city, "is ordered upon quite different principles" (Giddens, 1990, 6), the aim – certainly not achieved at the time of writing – is that smart urbanism will be similarly transformative.

Of course, digital reality cannot substitute for the physical. The two coexist. A smart city may be smart and virtual, but it is also tactile, aesthetic, audible, legible and meaningful. Acquaintance may no longer be rationed by presence, but presence is a strong influence over and predictor of online acquaintance. The city's physical demeanour may be influenced by Instagram, in the way that earlier cities were influenced by mapping and photography, but it still has a demeanour of its own, and the Instagrammable parts are akin to the wide boulevards of the Enlightenment, the grid systems of rational planning, the skyscrapers of the business district, and the crowded estates, ghettos and slums of the essential workforce. But the narrative of digital modernity privileges the digital, and at the extreme cherishes the myth that the digital twin is an effective stand-in for the otherwise real in policy discussion and debate (because existence itself is a signifier of backwardness).

6.3.1 Smart Cities as Policy Loci

The demand for a smart city is usually a response – often pitched teleologically as necessary and unavoidable – to the urban growth and amalgamation characteristic of earlier stages of modernity (Sassen, 2001) and the technical, material, social and organisational problems this has caused. Some have argued pessimistically that this is basically elites commissioning technology to cement their own position and sustaining the hierarchies that led to the problems in the first place (Nugent and Suhail, 2021). Networked technology is also a security/hacking risk for policing (Ismagilova *et al.*, 2020; Kitchin and Dodge, 2019). More positive themes are that smart cities improve quality of life, are globally competitive, are environmentally sustainable, are more equal (Caragliu and Del Bo, 2021) and are more democratic (I shall revisit this point in Section 6.4.2). Theorists of cities argue that cities, already innovative centres, could become more so by being smart, for instance by improving "idea flow" (Pentland, 2014, 155–173).

The smart city can be built anew on an empty site, such as Saudi Arabia's Neom (Hassan, 2020), or can spruce up existing "legacy" infrastructure. Whole nations, such as Singapore (Cavada *et al.*, 2019) or Estonia (Anthes, 2015; Goede, 2019; Lember *et al.*, 2018), compete to be the most modern and the most technologically enabled; sometimes the smartness is restricted to receptive neighbourhoods (Robinson and Coutts, 2019; Scassa, 2020), often for a temporary period while the local government is in receipt of a development grant (Han, 2020). China has 500 smart cities under development – branded there as "safe" cities, characterised by a large measure of centralisation and surveillance, oriented toward control of the citizen – and via its Belt and Road Initiative is assiduously exporting the technology to poorer countries in the global South (O'Hara and Hall, 2021, 141–144). Many of Egypt's infrastructure upgrades and new cities, begun under the rule of Abdel-Fattah al-Sisi, have been branded as "smart", particularly expressed through cameras and surveillance (Eldrandaly *et al.*, 2019). One can certainly imagine in a chaotic African megacity that the means of imposing order and suppressing crime would be attractive, although quality of governance may also be a concern. Either way, the smart city

is technologically-rooted, dependent on low power/miniaturised sensors, high speed/capacity wireless communications, and high-performance edge computing, with the technology interfacing with and feeding back into governance processes. Some cities use a 'dashboard' approach of indicators (Dameri, 2017, 67–84; Townsend, 2014, 306–307), top down metrics arranged for clarity suggesting the metaphor of driving and the idea of incremental adjustment.

The services they provide comprise citizen-aware intelligent environments and user-centric services, such as smart homes and smart buildings, smart energy, smart mobility, smart parking, and smart health and well-being, which between them are intended to improve efficiency, lower resource consumption and promote quality of life for citizens via, as ever, speedy or real-time performance feedback and experimental improvement. Smart cities promise rational and renewable energy use (Sakano, 2019; Seixas *et al.*, 2019), managed traffic (Rehena and Janssen, 2019; Townsend, 2014, 204–205), strategic healthcare targeted to entire populations equally, and taking into account prevention as well as cure (Miranda *et al.*, 2019), industrial competitiveness and economic growth (Chun *et al.*, 2019). Smart homes allow for individuals to control their own environments to their own satisfaction, whether in terms of comfort, or of behaving in a particularly ideological way, such as minimising a personal carbon footprint.

6.3.2 What is Smartness?

It will have been noted that the word "smart" turned up in that paragraph more than once – indeed more than a handful of times. As a term of art, the smartness of devices and systems is essential for understanding the spatial narrative of digital modernity, although there isn't much consensus about a precise meaning (Alter, 2020). It conjures up visions of "sensible" and "rational" use of resources, so that, for example, traffic flows smoothly without congestion, carbon emissions are reduced across the city thanks to sensible use of energy, design minimises crime and fear of crime, and so on.

More particularly, smartness is measured against a global vision for what a smart city or system should be, and smart devices should help

approach or achieve that vision. Sometimes the parameters are emergent from many individual behaviours, in which case the devices should help solve collective action problems and manage the transition from policy applied to individuals to the desired emergent output (O'Hara *et al.*, 2013). Smart systems can be local, even localised to a specific household or business, where a householder or owner configures technology in a single building or office to achieve certain goals of saving money, being productive, or simply showing off the latest technology by being an early adopter (Davidoff *et al.*, 2006; Guerreiro *et al.*, 2018; Stojkoska and Trivodaliev, 2017; Vorderer *et al.*, 2016). For an individual, such a project can be frustrating (He *et al.*, 2019), but the data resulting may still of be of wider interest to policymakers, academics or entrepreneurs.

Fundamentally, a smart device must be able to advise on how best (however "best" is ultimately determined) to manage, and operate within, an existing dynamic environment. Hence the smart city, smart system or any smart device, is adjustable upon receipt of feedback from other relevant systems, learning and adapting dynamically to new circumstances.

Smart behaviour by a device is almost always rooted in the gathering of data about its use to provide feedback, and hence it is characteristic of the subjunctive world. Smartness depends on a breach of the user's privacy. As Pentland argues,

> the most important generator of city data is . . . the ubiquitous mobile phone. These devices are . . . personal sensing devices that are becoming more powerful and more sophisticated with each model iteration. In addition to deriving information on user locations and call patterns, we can map social networks, and even gauge people's moods by analyzing the digital chatter that has become so pervasive. Consumers are also beginning to make purchases simply by scanning items with their phones, thereby adding financial and product choice information to the digital biographies sketched by mobile phone traffic.
>
> (Pentland, 2014, 138–139)

It is often possible to work with anonymised information, or to manage the data carefully to protect privacy (Elliot *et al.*, 2018). Analysis may be elaborately privacy-preserving (Al-Rubaie and Chang, 2019). But fundamentally, smartness puts privacy at risk, while reliable privacy obviates smartness.

The intuitive meaning of the term is the American colloquial word "smart" – the smart system does what a smart person would do (this strongly recalls the humancentric Turing Test-style definitions of intelligence criticised in Section 3.6, although smartness would certainly seem to include being able to behave in ways not envisaged directly by the designer). The list of devices that have been or can be made "smart" gets longer every month – smart cars, cameras, doorbells, ventilation systems, thermostats, electricity and gas meters, locks, sex toys, glass, bombs, dolls, surfaces, and so on. The intuitive meaning of "smart" may be behaviourally human-centric, but there is a further implication that devices will be connected to the Internet, given regular software upgrades, and will adjust their behaviour according to the data they produce and the feedback they receive. Furthermore, such devices may exist in a system, and so will often have to work in tandem – for instance, smart ventilators, thermostats, meters and heating systems will need to work together to produce a temperature in a particular range while minimising carbon emissions, minimising bills and other *desiderata*. They will need to sense the environment about them, communicate to the wider system, receive messages, interact with human controllers, actuate mechanisms, and coordinate responses with other elements of the system. They should not need direct control, or work under an explicit program. Smartness, it should be clear by now, is not a binary, but will be on a spectrum and furthermore will be context-dependent.

Steven Alter has proposed a multidimensional approach to describing smartness, measured on a qualitative scale (Alter, 2020). At the lowest level of smartness, we might see scripted execution of activity, following a program that might produce the illusion of intelligence in a systemic context. Above that, a device might show formulaic adaptation, based on predefined inputs, or creative adaptation which is unscripted or only partially scripted. At the highest level, devices will exhibit undesigned and unscripted behaviour on unanticipated inputs. There

may be, through clever organisation, a high level of smartness from a system made up of relatively unsmart devices (rather as a neural net has more impressive information processing abilities than the nodes that make it up). The smartness itself may be expressed over different categories of behaviour (Alter, 2020): information processing, internal regulation (i.e., self-monitoring, self-diagnosis, self-correction), action in the world (including sensing, actuation and communication) and knowledge acquisition (beyond sensing, including inference, classifying and testing). Edge computing (Khan *et al.*, 2019) is computing within a smart system that takes place in the system's devices themselves, as opposed to repatriating data to a central processor. Edge computing is more efficient and secure, but the centralised model allows simpler and therefore cheaper and less resource-heavy devices in the environment.

Smart devices are enabled in the environment by the IoT, a key innovation of digital modernity (Alaa *et al.*, 2017; Zanella *et al.*, 2014), which is the connection of objects to the Internet via TCP/IP (O'Hara and Hall, 2021, 218–220). The IoT enables the instrumentation of the whole environment, through static devices, and including mobile ones too (of which the smartphone is perhaps the most important example, as it provides diachronic data series about individuals). Once the environment is instrumented, smartness may be added, either at the edge in the devices themselves, or centrally.

Smart devices, small-scale systems and homes are fine in their way, but they don't tick all the boxes for digital modernity. The notion of systems in control requires the more ambitious scale of the city. An unconnected group of smart homes is likely to stumble into the same collective action problems as unconnected users of unconnected devices – the need to travel at the same time, to use power at particular times, to render streets depopulated and unsafe at night, and so on – and so exhibit the same non-smart aggregate behaviour. Furthermore, the unfamiliarity of the technology for all but the most technically-able can lead to conflict between users, especially when one person is responsible for setting up the system (Geeng and Roesner, 2019), or, more frequently, between users and the system (Miandashti *et al.*, 2020). To resolve these domestic issues, the home itself needs to be modelled as

a smart multi-agent system consisting of gadgets and humans (Mekuria *et al.*, 2019).

The digital modernity narrative requires that the city as a multi-agent system in its own right can solve these inter-household conflicts and collective action problems by coordinating the households effectively. The IoT technology carries out the first stage, by rendering those individuals legible to the ambient data infrastructure, and all sorts of devices may be smart at a local level, but the injection of smartness at scale is still necessary for the narrative. Cyberspace is ordered and global, not local and idiosyncratic.

6.3.3 Smartness, Policy and Democracy

Once the city and the individual achieve an online presence with a smart data infrastructure, the transformation of citizen into avatar is facilitated. Rational policy can be connected directly with the condition of citizens' information, not the citizens themselves. It responds to data-crunching, adjusted according to the feedback. To the extent that this programme is followed through, this tends to create four important conditions (O'Hara, 2020c, 18–19).

First, the understanding of behaviour, responses and outcomes uses vocabulary that is what philosophers call "thin" rather than "thick" (Williams, 2005), made up of purely evaluative terms rather than those with descriptive content which tend to introduce bias and/or worldly considerations into their correspondingly more complex semantics. For instance, about physical presence, thin concepts might include "tall" and "obese" (or may be have precise quantified definitions such as "height above 1.8m" or "BMI above 30 kg/m^2"), whereas thick analogues might include "imposing" and "beefy". The sensors of the IoT and other devices typically need straightforward evaluative mechanisms for engineering reasons – indeed, many areas where science intersects with the semantics of human description are described scientifically using thin concepts, because the complexities of thick concepts defeat the methodology (Abend, 2011). However, thin concepts, because abstract and not socially-embedded, are less meaningful on a human level, distancing policymaking from embedded human interests.

Second, reasoning is statistical, and so the ethos is consequentialist based on increasing the probability of good outcomes. It is also general, and so less sensitive to the specifics of a situation. General populations are assessed, and the output is a set of actions to try to optimise parameters. If a desirable parameter currently stood at 50%, an effective policy intervention might try to increase it to 60%. In other words, the positions of 100 people net out of 1000 would improve. But that might mean that the position of 150 people improved, while that of 50 deteriorated, so individual reversals may occur, in the midst of a population-wide improvement. Such a framework favours target-setting, a practice associated with its own biases (Bevan and Hood, 2006; Hood, 2012). For instance, it incentivises policy measures that improve the position of those just below a target boundary, and disincentivises those aimed at improving people who are a long way below.

Furthermore, because of the focus on thin rather than thick concepts, many targeted parameters are already proxies for those of real interest (for instance, to measure the exercise people are getting, we might actually use data from the accelerometer of their smartphones). In most cases, this is harmless, but proxies can develop lives of their own. For instance, in one famous experiment, researchers claimed that Facebook could, by varying the vocabulary of newsfeeds, adjust users' moods, making them happier or not depending how the stories they were reading were couched (Kramer *et al.*, 2014). But their happiness was measured by the vocabulary they were using, and so the whole effect might be explained by the users adjusting their own vocabulary to be consonant with that of their friends as part of a socialisation process (Schieffelin and Ochs, 1986). But – since proxies for levels of happiness might be used as important policy parameters (Helliwell, 2019) – then apparent policy successes might be achieved simply by engineering an adjustment of vocabulary in social media users, rather than any more significant change (O'Hara, 2015a).

Third, data-driven policy demands a flexible bureaucracy to carry it out, with low friction dataflow. Most bureaucracies inherited from analogue modernity are hierarchical, but agile network structures are more appropriate to avoid data being siloed to the detriment of policy-making. This seems to favour the private sector over the state as the

main provider of the ambient data infrastructure, and makes it harder for the state on its own to determine how policy is made. But the result may be less democratic oversight.

Fourth, many of our interests are group interests, and much ML works by clustering people into groups. However, groups that are meaningful for us – families, professions, interest groups – may not map onto the clusters derived by ML, based on coincidences of attributes that correlate with behaviours that are of interest to the system. Indeed, such correlation can only be with those behaviours about which either information has been directly collected, or which has been inferred from the behaviour of others in the cluster.

6.4 Discipline and Harm

The datafication of life under digital modernity and the use of regular feedback is a type of *discipline*, even a kind of power, which suggests the work of Michel Foucault (Foucault, 1977, 1982). Foucault's concept of *biopower* (Foucault, 1978, 140–144) is a modern type of power, based not upon threat of pain or violence, but rather on the continuous and knowledge-based management of life to optimise positive qualities, using measures of control that operate through a range of specialisations, including medicine, mental healthcare, urban planning, risk management and insurance, and so on. Law is augmented, if not superseded, by norms and management techniques. Governmentality, the coercion of human behaviour, goes beyond what governments achieve, and also includes the structures, institutions and technologies that are internalised or otherwise responded to by people who do what is expected of them, because it is extremely hard to do anything else (cf. Bratton, 2015, 7–8; Giddens, 1984; Lessig, 1999). The data provides a type of governmentality, traceable to the 4th principle that to exist is to be backward, that interprets backwardness and idiosyncrasy as a type of transgressive harm or self-harm, and removes them.

6.4.1 Nudging and Norms

Critics of modernity have always argued that official thought focuses on shallow positivist competence and mathematicising as the objective way to policy (Grant, 1969, 34), and digital modernity might be seen as an endpoint of that criticism. Yet from the perspective of the mid-20th century, technology perhaps appeared more centralised, monolithic and even grotesque, such as the ideologically-driven moonshot programmes (Grant, 1969, 89) than in the digital age. Under digital modernity, technology is being used, in however centralised and coercive a way, to help the sick and poorly off, as well as address liveability issues such as congestion and collective action problems such as climate change. The critique now focuses less on the worthier aims of smart policy, and more on how it is designed and delivered, from the top down or the bottom up. The poor and disadvantaged tend to see these problems differently from technocrats (Grant, 1969, 91).

In authoritarian places such as China, coercion and top down policymaking is taken as read. However, in liberal polities, coercion is problematic. Habermas wrote of "the Janus face of enlightenment and control; of information and advertising; of pedagogy and manipulation" (Habermas, 1989, 203) in the public sphere. Yet people are persuadable both by reason, and by manipulation based on their perceptions and nature.

> There is a constant oscillation between a political representation of the self, as rational, disembodied, autonomous and disconnected, on the one hand, and a scientific representation of the self, as heteronomous, and resulting from multifactorial contexts fully explainable by the range of scientific disciplines (social, natural and technological).
>
> (The Onlife Initiative, 2015, 11)

The ambient data infrastructure is at the centre of such oscillation. To avoid the appearance of coercion, the covert paternalist philosophy of *nudging* has emerged (Thaler and Sunstein, 2008). This involves manipulating the choice space so that those options most consistent with policy objectives are chosen, a strategy particularly effective in

digital modernity as data can be used to shape the choice space (for instance, by manipulating the order in which options are presented), to provide feedback to citizens, and to provide feedback to policymakers, all through technology that is ubiquitous, networked, and dynamically updated (Hildebrandt and O'Hara, 2020; Yeung, 2017), at the cost of the decisional privacy of citizens (Lanzing, 2019). Claims made for nudging range from the common sense point that where a choice has a default option, nudging is unavoidable and the choice should be the most benign (e.g., an occupational pension scheme should be opt-out, not opt-in), to stronger hopes for widespread behaviour change (Hansen and Jespersen, 2013; Leggett, 2014; Mols *et al.*, 2015). Children in particular may be adversely affected by nudging, as the curbing of their autonomy may affect their learning and development (Smith and Villiers-Botha, 2021). Modernising governments have striven to create behavioural insights units to look for nudging opportunities (Halpern, 2015), and the job description of "choice architect" has appeared (Johnson *et al.*, 2012). Freely available data even increases the options for personalised nudging, that is delivering nudges specifically designed for particular individuals (Mills, 2022), and self-nudging, delivering nudges to oneself (Reijula and Hertwig, 2022).

In the private sector, researchers have noted the apparent paradox under surveillance capitalism that algorithmically-manipulating choice spaces "brings about unprecedented levels of consumer empowerment and autonomy and total control over and manipulation of consumer decision-making" (Darmody and Zwick, 2020), and the same is true of public interventions with citizens also (Rebonato, 2014); The term "empowerment" is problematic, especially if it only means "empowered to do what others want". Nudging is coercive, and yet supposedly voluntary, thereby keeping it apparently consistent with liberal nostrums. Nudging has been promoted as so-called "means paternalism", which frames it as a remedy for the reasoning failures of citizens, who are supposedly unable to achieve their goals because they do the wrong thing, or alternatively fail to get their first order preferences because they are distracted by their second order preferences (Le Grand, 2022), and so, for example, might be nudged by a restaurant menu to choose food "responsibly" (Filimonau *et al.*, 2017).

6.4.2 Who Decides What Choices Are Bad?

While it can be plausibly argued that policymakers should ignore, or not commission, analyses that reveal citizens' decision-making shortcomings as a matter of respect (Fox, 2020), policymakers' imperatives tend to form a slippery slope from the setting of defaults in citizens' interests, to engineering optimal outcomes for individuals, to engineering optimal social outcomes (e.g., environmental goals), and even to engineering optimal political outcomes (e.g., gender equality, or eradicating racism). In fact, almost at each stage on that slippery slope, the policymaking nudge enthusiast can and does argue that good outcomes for the citizen are simultaneously good social outcomes, by which they really mean that they have defined good outcomes for the individual and society in such a way that they coincide.

Policy interventions available in smart cities have the same paradoxical nature (Mac Síthigh, 2021). In their motivating imaginaries, they are linked to policy aims such as reducing carbon emissions which stem from policymakers, academics and technologists. While there is a lot of rhetoric about involving citizens in design and decision making (Cardullo *et al.*, 2019; Ho, 2017; Howard, 2015; Le Dantec, 2016; Townsend, 2014, 282–320), there is little discussion about what happens when citizens decide against laudable policy, and prefer, say, cheaper to cleaner power, or reject social inclusion because of its perceived link to crime (and indeed in that case, it has been argued that smart policy such as predictive policing often reproduces inequality and becomes a self-fulfilling prophecy – Ugwudike, 2021). Supposed failures of democracies to solve collective action problems are generally rooted in the choices of individual citizens, rather than failures of politicians; we might criticise politicians for failures of leadership, but as Jean-Claude Juncker once said, "We all know what to do, we just don't know how to get re-elected after we've done it". Development of a smart city that, say, promotes cycling may have impressive results in terms of carbon emissions, congestion, pollution and public health, but if democratic legitimacy is a requirement of such development, it is not clear how to ensure that cyclists' interests will be privileged by the citizens' independent vote. It might be argued by designers that these goals are

Table 6.1: The recovery of instrumental rationality under digital modernity

Response to Instrumental Rationality Under Analogue Modernity to Create Consensus (from Beck, 1994a, 29–30)	**Response Under Digital Modernity**
Demonopolization of expertise: reject the notion that administrations and experts know what is better for people.	Outsource decisions to the choice architecture, or allow it to manipulate the choice space, because it is able to find weak signals from noisy datasets.
Open up decisions to wider circles according to social standards of relevance.	Open up the acquisition and analysis of behavioural information to wider circles according to relevance determined by ML algorithms.
Open up decision-making so that decisions are not already made when people are consulted.	Schedule decision-time to query time, so decisions are freshly-minted from all available information.
Public dialogue should replace behind-the-scenes discussion.	Behind-the-scenes discussion is replaced by black box algorithms, which ideally would generate their own explanations.
Norms for consultation processes must be agreed.	Privacy policies, waivers of liability and other means of managing the outputs and use of the ambient infrastructure must be agreed.

in everyone's interests, but if they are imposed we should not confuse this for a bottom up process – design will have been delivered by the policymaking and academic elite from the top down.

The top down/bottom up tension between computational rationality and democracy has always been present under modernity. Elites are concerned about the ambivalence of the population when "they are convinced that they have work out [their] plans 'rationally', to the best of their knowledge and abilities, in accordance with 'the public good' " (Beck, 1994a, 29). As expert systems become increasingly influential (Giddens, 1994, 82–91), a major issue is how to reconcile liberal ambitions for individual autonomy with rational administration, and the subjunctive world of digital modernity may ameliorate some of the conflicts. Beck argued that "the model of unambiguous instrumental rationality must be abolished" in analogue modernity (Beck, 1994a, 29), and gave five conditions for trusted and consensual decision-making (without suggesting how these be achieved). But under digital modernity, instrumental rationality is supplied as a service by the ambient infrastructure, altering those five conditions as in Table 6.1.

Under digital modernity, instrumental rationality fights back, now represented by the ML of the ambient data infrastructure. In the subjunctive world, experts may no longer "know exactly, or at least better, what is right and good for everyone" (Beck, 1994a, 29), but the data does indeed proclaim better than anyone's memory or convictions what they have in the past preferred, and what people like them have preferred. Nothing is imposed – the data infrastructure presents a choice, but one constrained by ranking, ordering, A/B testing and other techniques that support nudging to do the "right" thing.

Even given that there is power to influence policy in the ambient infrastructure, there are still arguments to be had about what instrumental rationality consists in – should a smart city be modern, rational and intelligent? Or progressive? Or open for business opportunities and economic growth (Hollands, 2008)? These don't always pull in the same direction, and each approach will silence some voices (Nugent and Suhail, 2021; Zook, 2017). Some have claimed that whatever direction the smart city goes, the real winners are the platforms, the infrastructure providers who are the *sine qua non* for data to flow under surveillance capitalism (Zuboff, 2019, 247).

The avatar's data promotes self-optimisation, and the smart home's data allows householders to control their own environments. Similarly, it is possible to democratise the smart city by making its data available for urban or smart city hackers ("smart citizens") to take control of their own environment, for instance, to fix transport timetables, improve walkability and cyclability, or map urban "food deserts" (Shelton and Lodato, 2019; Townsend, 2014, 226–230). Indeed, political information of wider scope can be available to citizens via *open source intelligence* (OSINT – Glassman and Kang, 2012), where information placed online from environmental sensor outputs, satellite imagery, CCTV footage or traffic camera footage can be used by those with the know-how to monitor their geographical area in terms of environmental problems, economic factors and even military matters (the Russian invasion of Ukraine in 2022 was clearly evidenced by satellite and social media footage). This opens the city to more bottom-up control, but since the relevant skills are concentrated within particularly geeky groups – often young, often male, often white or Asian, often highly educated

– the interests of women, the elderly or the poor may be neglected, however good-hearted and paternalistic the hackers (Shelton *et al.*, 2015). While cities are meant to be hubs for social capital, simply because an individual lives in a connected city doesn't mean that he or she inherits social capital directly (Calzada and Cobo, 2015).

Design for smart policy cannot afford to be utopian. Reality generally bites, in terms of recalcitrant populations, funding shortfalls, technology failures, and the failure to design for communities that don't have strong political voices (Shelton *et al.*, 2015). Other governmental requirements also loom large, security perhaps most clearly (Lee *et al.*, 2019). Given the tendency of some governments to interfere in or hack foreign information systems, cybersecurity has to be taken seriously as a feature of digital modernity (O'Hara and Hall, 2021, 154–168). The highly evolved cyber-nation Estonia came under serious cyberattack, very possibly from Russian non-state hackers, in 2007 (Donner, 2007; O'Hara and Hall, 2021, 158; Pomerantsev, 2019, 82–90; Soldatov and Borogan, 2015, 151–152), since when cyberattacks have become a routine continuo behind Russian aggression. A concerted one preceded its invasion of Ukraine in 2022 (O'Neill, 2022).

6.4.3 The Modification of Mill's Harm Principle

Datafying individuals has been represented as the latest stage of biopower (Lupton, 2015, 28–29), for example determining how people drive, how they manage their health, gambling (Welch, 2021), and lawbreaking (Ugwudike, 2021). As a tool of government, it builds on innovations of the welfare state of analogue modernity, as, for example, governments increasingly take on responsibility for the welfare and upbringing of children. Data enables micromanagement, and with that comes the temptation to delve ever deeper into the lives of individuals as a trade-off – the provision of help and support is dependent upon behaviour conforming to norms which the system aims to reproduce, while the norms themselves may be based on a set of expectations rooted in a very specific group of people and not applicable to other groups (Henrich, 2020; Ugwudike, 2021, 193–195). In other words, a population is expected to conform to a particular theory of behaviour and set

of incentives, and the welfare system provides welfare as a means to enforce such conformity. That is not to say that such techniques cannot be resisted: while AI, for instance, may be deployed to detect patterns of disruptive behaviour such as extremism, extremists themselves may fight back by changing behaviour and terminology, and rapidly moving accounts. Furthermore, the pragmatic obstacles to the application of data science in covert social contexts, such as the lack of validated datasets for training, the difficulties of multidisciplinary cooperation, and risk-aversion of government and law enforcement agencies in the implementation of AI systems, should not be underestimated (Fernandez and Alani, 2021).

This paternalistic use of discipline is intended to reduce harm. What, precisely, is harm in the subjunctive world? Under liberal regimes, interference in the lives of individuals is constrained by John Stuart Mill's *harm principle*, that "The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others" (for a useful reformulation in terms of consensual and non-consensual harm, Saunders, 2016). The principle, a cornerstone of liberalism, takes the self as both the locus of harm and the measure of its interests.

However, in the subjunctive world, the harm principle needs revision, because individuals are no longer considered best placed to formulate their interests; the data will tell us that far better. We have further seen how the physical world struggles to achieve the elegance and perfection of the algorithm. The state of the avatar is the important factor, not the physical person, and so we should expect a revision of Mill's principle as we switch focus. When we conceive of people as inforgs (Floridi, 2007), we take into account their need to flourish in an information-rich environment known as the infosphere. This is treated ontologically in information ethics, not epistemologically, and is itself is a moral patient, analogous to the natural environment (Floridi, 2013).

The process of datafication has led to an expansion of the infosphere, and the consequent increase of coverage of a person's information. So, for example, datafication of medicine is now a well-known and understood technique, leading to the entire discipline of medical informatics (Dutfield and Sideri, 2020; Haux, 2010; Prokosch and Ganslandt, 2009;

Ruckenstein and Schull, 2017; Venot *et al.*, 2014; Wyatt and Liu, 2002), and the management of risk via modelling, probability and health promotion. Personalised and precision medicine take into account the circumstances, genomes and background of patients, and include not only prescribing medicines but also behavioural change and nudging. Many governments have strategies to, for example, promote walking or reduce loneliness. It seems perverse and merely ideologically-driven to suggest, as many critics have, that those engaged in gathering data and quantifying themselves are "idealised neoliberal subject[s] . . . accepting, and encouraged to accept, the decline in social and health provision by internalising the responsibility for [their] own health, by measuring, regulating, and collecting biometric data and taking control of their own bodies on a detailed level" (Welch, 2021, 64–65), when governments supply far deeper and more detailed medical interventions than ever before. It is an extraordinary level of management in liberal societies, enabled by rich datasets about individuals. Models of health are probabilistic, aggregative and comparative, so the actions of, say, drinkers, smokers or those who do not take exercise will all tend to lower not only their personal life expectancy and other estimates of health and well-being, but also those of the populations in which they live.

This helps restore a balance that many have argued has been disrupted. As we moved from high modernity to reflexive modernity to digital modernity, our responsibilities to the state, major social groups and society have been progressively downplayed, to be replaced by a sense that our chief responsibilities are to ourselves, as sub-politics takes over from traditional politics (Bimber, 2003; Lash, 1994, 132–133). However, given the calculation of our health and wellbeing from aggregate information from our avatars, it turns out that these responsibilities now more nearly coincide. This has led to the claim that health has now become a required objective for the responsible citizen (Spratt, 2021; Welch, 2021, 63). Why should this be?

For example, the effects of loneliness on well-being, it is estimated, are about equivalent to smoking fifteen cigarettes a day – a non-trivial amount. A lonely person, on this account, therefore brings down the total life expectancy of their population by a small amount (as if they hadn't got enough to worry about). This means that, for instance, a small

child or even someone yet unborn has their own life expectancy (which depends on the population life expectancy) reduced correspondingly. Smokers, drinkers, the lonely, the idle and others with lifestyles that negatively affect models of their well-being all tend to drag down models of their community. Reducing someone's life expectancy is a type of harm, and so, in this data-driven world, the harm that avatars of the unhealthy cause the avatars of the healthy justifies government intervention on a version of Mill's harm principle revised for digital modernity. Smoking, drinking and being lonely would not, on Mill's original principle, so easily justify intervention, because the only person harmed would be the smoker, the drinker or the lonely person (with some exceptions for cases of passive smoking, violent drunks, and so on). If we base the calculation on health data, then the justificatory space opens up, because one's actions affect the infrastructure's perceptions of others (O'Hara, 2021, 45–49).

6.4.4 Privatised Discipline

However, not all harm is defined centrally by statisticians and target-setters. Imperfection of an avatar is already taken as a justification for outsourcing remedial action to the private sector, such as delivering "positive" messages or behavioural interventions via social media (Burke and Bloss, 2020; Chau *et al.*, 2018; Elaheebocus *et al.*, 2018; Pagoto *et al.*, 2016; Simeon *et al.*, 2020; Sosik and Cosley, 2014; Welch *et al.*, 2016). However, in cyberspace imperfection is also policed by the digital citizenry itself (Goldman, 2015; Kasra, 2017; Laidlaw, 2017; Ronson, 2015). Some celebrate this as a reproduction of older community-based methods of achieving shame and justice, such as the charivari:

> a complex political performance that is built out of mocking laughter, insults, masking and anonymity, and the mingling between active crowds and passive audiences. . . . The charivari, both on- and offline, from the July Monarchy to antispam vitriol and 4chan's lulz-driven crusades in the present day, draws much of its efficacy from renegotiating the boundaries between public and private life.
>
> (Brunton, 2013)

This "complex political performance" can take many forms, and not all crowdsourced discipline is as benign as this account suggests. First, vigilantism attempts to enforce what is perceived as justice, safety or social order, without due process (often through lack of trust or faith in legitimate authority), using the coercive power of opinion and networks (Favarel-Garrigues *et al.*, 2020; Loveluck, 2020). Examples include circulating photos of men spreading their legs on public transport, attempting to solve a mystery or find a missing person (Buozis, 2019), crowdsourcing identification of criminals or illegal immigrants via CCTV footage, naming and shaming those accused of sexual harassment, animal cruelty, hate speech or other offences whose punishment is deemed insufficient, or finding and publicising faked scientific reports. Benjamin Loveluck categorises vigilantism into four types, flagging breaches of social norms, investigating incidents to uncover perpetrators, discover missing persons or find and evaluate evidence, hounding supposed perpetrators as a punishment, and more organised leaking by a group such as WikiLeaks (Loveluck, 2020).

A second form is more political policing, denouncing those who, for example, have strong opinions about gender or race, or who use or have used language which is perceived as sexualised or racist, sometimes on public occasions but also in conversation intended to be private (Chiou, 2020; Cook *et al.*, 2021; Gomez-Mejia, 2020, 319–321; Mueller, 2021; Ronson, 2015; Sailofsky, 2021). Denunciation often takes the form of doing perpetrators reputational harm, denying them access to public forums, and sometimes depriving them of their jobs and livelihoods. Opinion here is split between those who consider this form of attack as a legitimate defence or assertion of minority rights, and those who detect illegitimate online mob-rule, which argument has moved to a metalevel, with an increasingly bad-tempered and toxic debate about whether the argument about "woke cancel culture" is itself merely "the dominant culture's ability to narrativize the process of being 'canceled' as a moral panic with the potential to upset the concept of a limited public sphere" (Clark, 2020) or the identification of a genuine threat to civility (Perry, 2020; Pilon, 2020; Norris, 2021). There is also concern that, online, encapsulating criticism in a memorable hashtag can misrepresent the nature of the harms of racism or discrimination, even while denouncing

them (Bouvier and Machin, 2021). The perception that those denounced tend toward the political right (itself contested – Cook *et al.*, 2021; Norris, 2021), while academics tend toward the political left, confuses the debate still further; academic communities have been accused (by both sides) of bad faith research and illegitimate suppression of free speech and academic freedom, and so the status of academic literature (and practice) is itself in question (Read and Leathwood, 2021; Rom and Mitchell, 2021; Suissa and Sullivan, 2021; Teixeira da Silva, 2021).

Third is shaming (Cheung, 2014; Norlock, 2017), which at worst borders hate speech. This is less controversial as generally negatively construed as discipline-transformed-into-harm (Billingham and Parr, 2020; Fritz, 2021; Frye, 2021), but nonetheless attempting to shame people into conforming with norms remains a prominent activity. Shaming may be aimed at immigrants (Rohlfing and Sonnenberg, 2016), white supremacists (Milbrandt, 2020), people with criminal convictions (Dunsby and Howes, 2019), fat people (Ravary *et al.*, 2019; Spratt, 2021), senders of "dick pics" (Paasonen and Sundén, 2021), sexually-active women (Jane, 2017; Van Royen *et al.*, 2018), women who eat on public transport (Alberti, 2021), those who over-use water during droughts (Milbrandt, 2017), entitled white women ("Karens") (Negra and Leyda, 2021), welfare recipients (Brooker *et al.*, 2015), those behind on school lunch money payments (Oravec, 2020), those who use their volunteering experiences to get dates (Laywine, 2021), and even doctors trying to deal with the COVID-19 pandemic (Dolezal *et al.*, 2021).

It has been suggested that shaming others is a means of helping define one's own identity in terms of opposites, adding a crusading, opinionated aspect to one's online presence (Shenton, 2020), especially as social media reduce users' moral sensitivities with the combination of lack of face-to-face encounter, relative anonymity and the comparative strength and intensity of the language used (Ge, 2020). This may nevertheless be overridden; a study of those accused of shaming people by publicising sexual images showed that while a majority rationalise and justify their actions, a large minority admit to losing control and causing unjustified harm (Harder and Hasinoff, 2021). Shaming others is apparently also a good way of increasing one's follower count (Basak *et al.*, 2019), and this reminds us that it is not an action without effects

beyond the shamer and shamee; a "shaming event" provides feedback to a neutral audience that a particular type of behaviour or attribute is perceived negatively; e.g., fat-shaming may help spread anti-fat attitudes (Ravary *et al.*, 2019).

In its fourth type, crowdsourced discipline is simply an attack on objects of hatred: unprovoked hate speech (Carlson, 2021; Chetty and Alathur, 2018; Megarry, 2014; Ullmann and Tomalin, 2020; Ziccardi, 2020), for which the digital environment affords ease of access, anonymity, a large audience and instantaneity (Brown, 2018). Indeed, because those indulging in the practice form a relatively tight and connected network, hate messages tend to reach larger audiences than non-hate content (Mathew *et al.*, 2019).

7

Relationships Between the Temporal and Spatial Dimensions

In one sense at least, the two dimensions of digital modernity complement each other. Seen from the temporal perspective, digital modernity disrupts the existing world. From the spatial perspective, it creates a superior version to fill the vacuum. These dimensions may find themselves in harmony or tension, but the connective tissue between them is the view of individuality of digital modernity, and the subjunctive world. The subjunctive world is the means of crafting the superior replacement. These ideas are contained in the five principles of digital modernity, which we can now repeat and see as a whole.

(1) The quantity of data being produced in the world has enabled, and been enabled by, technological, social, economic and cultural change, and as such is a marker of a qualitative change in modernity.

(2) Digital modernity is a subjunctive world in which reflexivity and choice are outsourced to the ambient data infrastructure.

(3) Since personalisation replaces choice in digital modernity, and since effective personalisation demands knowledge about the individual

on the part of the personalised service provider, privacy is now an obstacle to the delivery of digital modernity.

(4) To exist is to be backward.

(5) In digital modernity, the best that hapless reality can achieve is to get closer to the perfection of the algorithm and the data.

7.1 The Limits of Complementarity: Disrupting and Controlling the Physical World

The two dimensions of digital modernity focus on freedom (temporal) and order and organisation (spatial), and we have seen them plotted on a pair of axes in Figure 4.1. However, it will have been noted from the discussions of Sections 5 and 6 that progress in time and progress in space are not the same thing. A focus on disruption may or may not integrate easily with a focus on computational rationality.

Sometimes they complement each other well (as argued, for example, by Horvath *et al.*, 2018), or it may be that one dimension has priority over the other, for example that the metaverse is itself a disruptor, so in that case the demands of the spatial dimension are subordinate to the disruptive demands of the temporal (Barbazzeni, 2021; Bhadra, 2021). For instance, in e-healthcare, datafication disrupts and disintermediates inefficient incumbents, allowing new firms to bypass middlemen and women, contacting patients directly at home, allowing them to diagnose and test themselves and putting them in direct dialogue with specialists. This process, accelerated by the COVID-19 pandemic, helps build the patients' avatars with trackable information, so that medical decision-making and diagnostic procedure, typically "a kind of dance" of power and medical authority (Hobson-West and Jutel, 2020) can include inference and calculation. The tech giants are experimenting with devices and data; for instance, Google acquired fitness tracker Fitbit, Microsoft bought medical AI firm Nuance, and Oracle is at the time of writing attempting to acquire health IT service provider Cerner. Amazon has created the Halo Band to collect physiological information, both Apple and Samsung smartwatches contain health functions such as ECG monitors, and Amazon Web Services has a healthcare division.

Startups are also on the trend, e.g., Teva has developed a smart inhaler with sensors connected to a phone app, Truepill, Hims & Hers, and PharmEasy are online pharmacies, while Skin + Me, Thriva and Levels Health allow at-home diagnostics.

Yet complementarity only goes so far. While datafication and information processing are disruptive, devices need to work effectively, and information privacy needs to be protected in many fields, particularly healthcare. Healthcare is unsurprisingly highly regulated, often to the benefit of incumbents (who have lobbying power and the ability to influence regulation). Such regulation preserves continuity with the expert systems of analogue modernity, and provides means to resist the hype (and downright fraud) that can produce over-inflated expectations and *hubris*. The human body may not always respect Silicon Valley production methods, even if many processes are performed on avatars. There were warnings about the Theranos home diagnostic service (Diamandis, 2015), founded by a 19-year-old Stanford dropout, long before it collapsed under charges of fraud and technical failure (Fiala and Diamandis, 2018), furnishing, like Enron and Lehman Brothers before it, an essential moral tale.

Mental health apps motivate their own issues. They raise billions of dollars of equity investment every year, are often used by companies to monitor workforces, and they have thrived in the difficult conditions of the COVID-19 pandemic. Yet, despite their potential, their effectiveness is similarly unproven within the mental health community (Torous *et al.*, 2018). Furthermore, although they analyse sensitive and sometimes dark thoughts, they can have security weaknesses; for instance, Finnish startup Vastaamo, which connected patients with therapists, required therapists to keep notes but did not encrypt them, leading to serious blackmail threats when the databases were hacked (Lindroos-Hovinheimo, 2020).

Another commercially thriving, but not yet clinically proven, field is the sleeptech industry, where companies such as Oura Health, Kokoon and Eight Sleep sell Silicon Valley-influenced sleep monitors, smart mattresses, wearable vital sign monitors and so on (Lorenz and Williams, 2017). Sleeptech is a particularly interesting phenomenon from the point

of view of digital modernity, as it extends the coverage of the data-driven avatar into time periods where individuals might have believed themselves disconnected from the ambient infrastructure (Nansen *et al.*, 2021). It has also been accused, at least in a sporting context, of creating "new rest-related obligations and re-constitut[ing] collective understandings of sleep and sleep difficulties along racial, gender, and economic lines" (Barnes, 2022).

Failures with datafied real-world processes are not confined to healthcare. The office property company WeWork, which created and rented out real and virtual shared workspaces, was marketed aggressively (and absurdly), as a "physical social network" whose mission was to "elevate the world's consciousness"; it was valued at $47bn by private investors at one stage, but the prospectus for its Initial Public Offering revealed merely a property company with no obvious network effects to leverage (hence blitzscaling had had no positive effects). Billions of dollars were lost (Westbrook, 2021). Defence and military technology can deliver pilotless drones, augmented reality on the battlefield and all sorts of smart weapons, but even the smartest and best-equipped armies can be neutralised in the right circumstances by dedicated insurgents, improvised explosives, uncooperative civilians and complex terrain (Gordillo, 2018). Datafication may not always deliver digital modernity, and merely asserting an optimistic narrative about the power of the data won't reduce essential dependencies on physical reality.

7.2 Progress and Disruption

It may also be the case that in some circumstances the imperatives of the two dimensions, freedom/disruption and organisation/rationality pull in different directions. The disruption implicit in the temporal dimension may interfere with the rational delivery of optimal outcomes in the physical dimension, or vice versa (O'Hara, 2020a, 202–203). Data may regulate, rather than liberate, creative disruption, by allowing dynamic and pervasive quantification of risk (Hacking, 1990; Yeung, 2017), closing down dangerous options as often as the technology opens them up. Decisions about this often devolve to the major platforms, partly through their ability to buy out disruptors, and partly because their role as

platforms means that they ultimately provide visibility, legibility and legitimacy for the disruptors, creating a set of dependencies and conflicts of interest that are hard to navigate (Gillespie, 2017; Hardaker, 2021; Kenney *et al.*, 2021; Kenney and Zysman, 2016). Platforms become coordinators and controllers of the disruptive forces they unleash.

Ultimately, the desire to become the future encourages challenge, conflict and an agonistic approach to settled consensus. Even those within the consensus can emerge stronger from the challenge, if they can see it off. However, a well-ordered (cyber)space implies coordination if not centralisation. Seen through the disruption lens, digital modernity allows people to make and defend their own choices, however idiosyncratic, but through the order lens, it shepherds people toward outcomes in their interests by the most efficient and effective route. These two aims will often coincide, but not always.

For example, some theories of digital modernity seek to argue that the Internet provides a Habermasian public sphere (Habermas, 1989) – a plausible suggestion, at least structurally, as there are relatively few barriers to entry (access is discussed in Mossberger *et al.*, 2008; Norris, 2001), and no intrinsic status or hierarchy among netizens; it does seem to amplify the voices that were already loud in the offline media world (Hindman, 2009) but whether that could be measured now that the media are highly integrated between online and offline is a moot point. However, the rational discussion space envisaged by Habermas is in reality a rowdy and robust bear pit, often with coarse language, trolling, racism and sexism within echo chambers (Boland, 2018), largely owing to the cheap overproduction of feedback via likes and following which incentivises inflammatory content over self-expression. This compares with staid programmes for setting up independent spaces for deliberative discussion that optimists for e-democracy have proposed (Coleman and Blumler, 2009); one wonders who would be likely to go there, and what such deliberative debate would achieve. The cacophony of opinion that the Internet has unleashed may structurally have something in common with the public sphere, but behaviour within it is largely disruptive (Cohen, 2020). There appears to be little appetite for well-behaved disputation, given the feedback that social media provide. Benign initial aims of social networks are easily disrupted, because behaviour adapts

to the measurement and feedback provided; Twitter as a means of self-expression morphed, via the retweet button, into a means to get attention and engage in dispute.

Disruptors or hackers claim authority on the basis of the number of clicks they get, but this is mutable, always at risk and up for grabs. Meanwhile, the idea that optimal outcomes for individuals or society can be found through data analysis implies a more abstract authority based on scientific knowledge, expert systems, data science and the ability to craft effective ML algorithms. In real-world systems, these two sources of authority might easily contradict each other (Powell, 2016). Much "outlaw" innovation thrives in the shadowy, low-trust, high-risk precincts of the Dark Web, and industries such as pornography (Barss, 2010; Bartlett, 2014; Coopersmith, 2000; Keilty, 2018; Leukfeldt and Holt, 2020; Voss, 2015).

Finally, it was noted in Section 6.4.4 that cyberspace was self-policing, in that discipline has been privatised. Yet, as discussed there, such "discipline" becomes "calling out", "shaming", and often looks more like abuse: discipline ceases to be disciplined. The ideal of a self-policing space can notoriously be disrupted by trolling and other activities, intended to entertain an audience with rough humour at the expense of the trolled person (Dynel, 2016). Adolescents appear to be especially vulnerable to this, while still finding it hard to refuse access to their online selves (Weinstein and Selman, 2016). Women and non-white people are common targets of trolling and abuse, especially when asserting or defending their rights (Jakubowicz, 2017; Lewis *et al.*, 2017). Digital modernists would like to sort these problems technically, but while there has been progress in this direction solutions may need an embedded social component (Geiger, 2016), if not wholesale use of cheap human labour (Roberts, 2019).

Sometimes, the narrative of digital modernity is so embedded that it is not clear that the perpetrator fully "gets" the offline/online distinction. For instance, neo-Nazi groups bundle up fantasies of white supremacy, homophobia, misogyny and xenophobia in a jokey treatment of popular culture memes of violence as entertainment that still carries a potent threat for non-initiates (Askanius and Keller, 2021), while gang members use social media for Internet "banging", or posting threatening videos

as a routine form of generating and perpetuating conflict across gang divides (Patton *et al.*, 2019).

At worst, trolling breaks out of cyberspace and re-enters the physical world by posing a physical threat to the denounced person. This can take the form of doxing (or doxxing), the practice of exposing personal data that will allow the person to be found, for example their telephone number, place of work, or home address (Douglas, 2016; Snyder *et al.*, 2017, Trottier, 2020), thereby facilitating further harassment by other (less cowardly) people. Is this harassment (Calabro, 2018; Li, 2018; Wu, 2015)? Or activism (Douglas, 2020; Lee, 2020)? Or both? A related practice is swatting, making an emergency call to the authorities demanding an armed response (from the Special Weapons And Tactics squad – SWAT), as if from the victim's home (DaPonte, 2016). Whether the focused and decontextualised certainties of the activist justify such abuse of opponents is not a question usually addressed by those sympathetic to activism (Jane, 2014). A further physicalisation of abuse is the death (or rape) threat, an expression of the desire for an attack on the physical body (Casula *et al.*, 2021; Hardaker and McGlashan, 2016; Jane, 2016).

7.3 Glaucon's Dilemma

The metaphors of digital modernity are entrancingly ethereal – cyberspace, the cloud, virtual reality, the World Wide Web, frictionless information, metaverse, cryptocurrencies – or liminal – the edge, peer-to-peer, blockchain, the information superhighway. Yet we still have to access this unearthly realm with real physical devices, PCs, smartphones, sensors, data centres and futuristic implants in the brain. Designers need to come together with engineers, managers and marketers to develop networks of users with sufficient scale to provide the benefits of communication and sharing information.

These affordances are built on centuries of social regularity, regulation and practice – the rule of law, respect for contract, limited liability, accountancy, auditing, banking, international law, intellectual property – as well as science, mathematics, logic and engineering, and socially defensive institutions such as the police, armies and education systems

(O'Hara, 2020a). They are driven by, and have been adapted to, a range of ideologies and geopolitical realities (Ball, 2020; O'Hara and Hall, 2021). They also require materials, such as rare earths, compounds of lithium for batteries for portability, and copper wires to carry information and electricity (Bratton, 2015, 12, 92–96; Ensmenger, 2018). Indeed, Berners-Lee's invention could be the *World Wide* Web only because of the prior innovation of fibreoptic cabling able to transfer information quickly and efficiently enough across the major oceans (Blum, 2012, 191–226; Starosielski, 2015a, 2015b). The shortage of semiconductors in the post-COVID recovery demonstrated the importance of that industry to the global knowledge economy (Voas *et al.*, 2021), an industry which itself is a complex ecosystem of leading-edge design and fabrication, routine chip fabrication plants, chip design (and specialist design software), assembly, testing and packaging (ATP), lithography, and other specialist niches. The cloud is a network of data warehouses, which generates about the same amount of humanity's carbon emissions as the airline industry (Garg *et al.*, 2011; Holt and Vonderau, 2015; Xu and Buyya, 2020). It requires a physical infrastructure based on power and communications cables, electricity and wireless communications, without which it cannot survive. The requisite infrastructure, such as power grids and communications networks, demands strategic investment whose return won't be realised for years or decades. It also needs to be extended to areas that are poor, war-torn or badly governed (Parks, 2015), and wherever it is based, it needs to be dismantled or disposed of sustainably at the end of its life (Miller, 2015). Economic, political, environmental and physical security therefore need to be established over periods of time exceeding a single working career, if not a lifetime.

Yet many see digital modernity as a means for overthrowing precisely this nexus of cultural, legal and physical infrastructure accumulated over centuries. John Perry Barlow's iconic *Declaration of the Independence of Cyberspace* suggested that "Your legal concepts of property, expression, identity, movement, and context do not apply to us. They are all based on matter, and there is no matter here" (Barlow, 1996). Economist Paul Mason argued that capitalism "will be abolished by creating something more dynamic that exists, at first, almost unseen within the old system, but which will break through, reshaping the economy around new

values and behaviours" (Mason, 2013). Important institutions such as contract, money, and even social trust itself are to be disrupted by the blockchain (Christopher, 2017; D'Onfro, 2020; Ferreira, 2021; Frisby, 2014; Low and Mik, 2020; O'Hara, 2017; Prasad, 2021). The political programme of accelerationism aims to destroy capitalism by accelerating its disruptive and alienating tendencies, "channeling capital into mechanical automatization, self-replication, self-improvement, and escape into intelligence explosion" (Land, 2019, 517). Accelerationists on the political right argue that this is natural and inevitable (Land, 2019), while on the left, they are more likely to suggest capitalism needs a helping and guiding hand (Williams and Srnicek, 2019).

There is a fallacy in such thinking. While it is no doubt possible to argue that, for instance, "technological development is being suppressed by capitalism, as much as it has been unleashed" (Williams and Srnicek, 2019, 361), it does not follow that getting rid of the blocker (capitalism in this particular analysis) will do the unleashing. If the blocker to further progress is an essential precondition to that progress, then removing it will simply make the progress impossible. In Plato's *Republic*, Socrates describes the frugal way of life in a just state. But his interlocutor Glaucon replies "It seems that you make your people feast without any delicacies. . . . If they aren't to suffer hardship, they should recline on proper couches, dine at a table, and have the delicacies and desserts that people have nowadays" (Plato, 1997b, 1011). Socrates replies that:

> It isn't merely the origin of a city that we're considering, it seems, but the origin of a luxurious city. . . . The things I mentioned earlier and the way of life I described won't satisfy some people, it seems, but couches, tables and other furniture will have to be added, and of course, all sorts of delicacies, perfumed oils, incense, prostitutes, and pastries. We mustn't provide them only with the necessities we mentioned at first, such as horses, clothes, and shoes, but painting and embroidery must be begun, and gold, ivory, and the like acquired. Isn't that so?
>
> (Plato, 1997a, 1011–1012)

To get all these desirable things, the new state will need to defend its land and go to war, and so needs an army and arms. It will need agricultural surpluses, and decision-making methods that scale to a larger population. It will need doctors, women's dresses, animals to eat, musicians, actors, servants. And now the new city looks much like the old, and so is more likely to host the old infelicities as well as the new blessings.

This is Glaucon's dilemma. If we innovate by disrupting the system, we risk losing its current benefits. It applies to the Google philosophy summarised in Section 3.1, that postulates a diminishing carbon footprint. As data centres consume electricity, and as rare earths are mined for components, can that be guaranteed? Can Silicon Valley methods of A/B testing simply reduce carbon emissions without unintended consequences? Digital modernity cannot simply sweep away the remains of the pre-modern and modern worlds, because they contain not only much of value in themselves, but also the foundations of digital modernity itself.

8

Information, Truth and Two Realities

The spatial dimension of digital modernity, particularly as expressed by its governing principle (5), shows that the digital realm seeks to appropriate (the label of) reality, or to become the canonical arena for human and social activity. In all such discussions, we must ensure we don't get carried away. It is a common claim that the distinction between online and offline has been blurred, or effaced entirely (e.g., Bratton, 2015, 19–40 has a rather more sophisticated statement of this claim than usual, siting it within a discussion of Carl Schmitt's philosophy of binary oppositions). It is true that from the perspective of the people in a situation, different aspects may take place online or offline, or it may not matter, and it is often the case that people have little sense of the distinction. Marketing may also favour the removal of the distinction, as when the CEO of General Motors declared in 2022 that her firm had transformed "from automaker to platform innovator". But it can still be drawn: offline is what remains after a power cut, or a DDoS attack on one's systems, or the government enforces an Internet blackout.[1]

[1] https://pulse.internetsociety.org/shutdowns.

It may be more pertinent to note that the distinction between hardware and software, which does disappear in theory (Moor, 1978; Suber, 1988), has been worn down in the 21st century (Bratton, 2015; Vahid, 2003). The smartphone has become a mobile phone that could run apps, while in the 2020s there have been various schemes to implement a 5G mobile telephony network as software in the cloud (Pliatsios *et al.*, 2018); other examples include application-specific integrated circuits (ASICs), open-source hardware and software from the Arduino company, and field-programmable gate arrays (FPGAs). Indeed, the term "virtual reality" was coined in explicit analogy to the theoretical construct of "virtual machine". This convergence of software and hardware has been enabled by technological innovation; a similar convergence of telephony and computing was proposed in the 1980s, but proved impossible. Network operator AT&T and computer firm IBM attempted to compete on each other's territories via the acquisitions of NCR by the former and Rolm by the latter, but their products were not able to bridge the gap between them (Balakrishnan, 1988; Gambardella and Torrisi, 1998; Lys and Vincent, 1995). In general, the distinctions between the physical and the virtual, offline and online, atoms and bits, all remain in place, even though we are getting more adept at ignoring them. We increasingly organise the world to render them irrelevant, which makes narratives organised around concepts such as cyberspace and real virtuality compelling.

Digital reality is only indirectly constrained by physical reality and the limitations imposed by the laws of physics; in its ultimate destination, the metaverse, bodies can change, move through each other, and elegant buildings can loom miraculously on the horizon or even hover in the air. This recaptures the sense of wonder and boundlessness of the pre-modern age, when traditional authorities (including God) were the custodians of objective reality, thereby taking the responsibility for securing the truth away from ordinary people (Arendt, 1998, 277–278).

Science is one of the hallmarks of modernity, bringing its virtues of truthfulness, scepticism and method with it (Arendt, 1998, 324), and these have become generalised epistemological virtues across society, and ultimately became part of the reflexivity that complicated modernity. Beck wrote of two types of science: "laboratory science, which

penetrates and opens up the world mathematically and technically but devoid of experience and encapsulated in a myth of precision ... [and] a public discursivity of experience which brings objectives and means, consequences and threats, controversially into view" (Beck, 1994a, 30). These don't always coincide, and the second can't be "managed" by the first via schemes such as "public understanding of science" (Bauer, 2009). For instance, laboratory-science accounts of vaccination policy frame the issues for the public in terms of risk, but individuals don't make decisions by calculating (or miscalculating) risk, so the public information campaigns can fall flat and fail to convince sceptics (Hobson-West, 2003). Public discursivity is a kind of sub-politics of the acceptable social limits of a science, and this distinction tracks a dialectic within modernity between those modernists of a scientific or scientistic bent, such as Hobbes, Descartes, Locke, *les philosophes* of the French Enlightenment, Adam Smith, Comte, and Marx, through to Giddens and Beck, and those of a more Romantic tradition who often reacted against and critiqued the first group, including Rousseau, Robert Burns, Hegel, Baudelaire, Nietzsche, Walter Benjamin, and T.S. Eliot, through to Bauman and Lash.

One way of depicting the emergence of digital modernity out of reflexive/analogue modernity is in terms of the evolution of these two epistemological paradigms. Laboratory science evolves into data science; number crunching now methodologically dominates increasingly many scientific specialisms from archaeology to zoology. Meanwhile, the public discussion, which used to be curated in the mass media, has moved online, resulting in far more dialogue at faster speed, and the possibility of virality of ideas. Beck wrote of the public discussion being "media-dependent, manipulable, sometimes hysterical", and parasitic on the scientific discussion for its subject matter, about which "it can stir up repressed doubts, which are chronically excluded in standard science" (Beck, 1994a, 31), and this tense relationship survives the transformation.

The public discussion under digital modernity generates data trails which can be monitored and analysed for real time insight, bringing the second paradigm within the scope of the first as an object of study. The viral discussion can be shown to include *misinformation*, deliberate or

otherwise, delivered in alarming quantities at alarming speed (Howard, 2020). There has always been misinformation of course, but now it can be quantified and tracked, and from the perpetrator's point of view used as a deliberate, precise, targeted weapon. It has therefore become a public policy issue.

Hence what gets said in digital modernity matters for reality, raising questions about who has the power to get their voices heard and their realities established. This is not a new sociological discussion – it dates back at least as far as 1960s critiques of science (e.g., Feyerabend, 2010) and of rationalist/liberal philosophies. The monsters spawned by that debate are thriving now, as denialism about climate science, vaccination science and epidemiology, genetic modification and other disciplines. If the epistemological aspects of the creation of knowledge are rejected as irrelevant, and commentary focuses entirely on sociocultural processes to the exclusion of concepts such as "truth" and "method", as methodologies such as the strong programme in science and technology studies urged (Bloor, 1991), then science appears "only" to be one among many methods for getting people to believe things they otherwise wouldn't. That concession means that the academic community has few means for justifying science in the face of denialism.

While the social turn in the philosophy of science was certainly justified, since science is a social activity, it was, predictably, a disastrous own goal to abandon the defence of reason and method in science. The slippery slope towards that drastic step must be avoided if we are to have a principled means of attacking misinformation. If we abandon these means, then all that is left is the use of whatever power remains in the hands of mainstream elites, for example demanding that platforms moderate content, a process which will be particularly fraught at the boundary between content which is illegal, and that which is legal but offending against some standards (Hendricks and Mehlsen, 2022, 61–88). Platforms themselves will also have to use their own power to subject a workforce to potentially disturbing content at a cost-effective rate (Roberts, 2019). In this section, we will explore these issues further.

8.1 Misinformation

The more that digital modernity is insulated from physical reality, the harder it is to discover and remove statements about physical reality that are false or misleading. Innocent or not-so-innocent mistakes can easily be propagated when traditional epistemological gatekeepers are considered redundant, such as when half of the Scots version of Wikipedia was written by a young American boy with no understanding of the dialect (Brooks and Hern, 2020). The famous selfie by Ellen DeGeneres with lots of stars at the Oscars was meticulously planned by DeGeneres, Twitter, Samsung and others (Frier, 2020, 152). Instagram thrives on manufactured imagery, and its guidance about misleading photos childishly describes how sad people would be if they discovered a great photo was set up, and argues that photos should be meaningful and genuine – interestingly contested terms (Frier, 2020, 155). But the deliberate pollution of the information space is of greater moment, if only because it can be targeted at vulnerable points, which can be identified thanks to the data that the information space creates about itself.

Misinformation has become an issue of great concern (Fernandez and Alani, 2018; Hendricks and Mehlsen, 2022, 37–60; Wang *et al.*, 2019b; Zhang and Ghorbani, 2020), especially through the COVID-19 epidemic (Al-Rakhami and Al-Amri, 2020; Brennen *et al.*, 2020; Kouzy *et al.*, 2020), and this literature will only grow, as a matter of policy necessity. Surveys from the COVID-19 pandemic have shown, for instance, that misinformation tends to involve misrepresentation of existing and often true information, giving it a misleading spin or putting it in a misleading context, rather than a complete fabrication (Brennen *et al.*, 2020). It also attempts to discredit genuine information (Shahi *et al.*, 2021), is often expressed using less tentative language (Shahi *et al.*, 2021), and doesn't involve elaborately falsified visuals (Brennen *et al.*, 2021). More effective misinformation postulates conspiracy theories behind the medical information it claims is misleading (Enders *et al.*, 2020; Lobato *et al.*, 2020). Social media companies have invested in fact-checkers to label or take down misinformation, although with patchy coverage (Brennen *et al.*, 2020; Lim, 2018; Shahi *et al.*, 2021), while a debate has

arisen about whether fact-checkers' epistemology assumes too naïve a distinction between fact and opinion (Amazeen, 2015; Uscinski, 2015; Uscinski and Butler, 2013). It may even be that corrected misinformation still continues to shape attitudes with what have been called "belief echoes" (Thorson, 2016).

Misinformation can also be institutionalised, most notably in the practice of "fake news" (Gelfert, 2018; Quandt *et al.*, 2019). This term has evolved, or become less precise, over the years, is sometimes used interchangeably with "misinformation" (Zhang and Ghorbani, 2020), and is sometimes used by politicians and others to decry the output of the mainstream mass media. However, academics have sought greater precision and distinction from the wider term, and defined "fake news" as "news articles that are intentionally and verifiably false, and could mislead readers" (Allcott and Gentzkow, 2017, 213), imitating professional news media formats, but produced by different organizational processes designed to serve up false content (Lazer *et al.*, 2018). This can be placed on a sliding scale from satire to propaganda to intentional fabrication (Wardle, 2017). There are many attempts to use technology to try to uncover fake news, but the difficulty of this task is compounded by the nature of the information space: reliable auxiliary information is needed, while users' engagement with fake news, usually via social media, produces an unstructured and noisy data trail (Shu *et al.*, 2017). Furthermore, the mere presence of a fact-checker could be counter-productive – first of all, a user may trust the fake news outlet more than the operators of the fact-checker, and secondly the very existence of an infrastructure designed to discover fake news may undermine trust in the veracity of all news (Hameleers and van der Meer, 2020; O'Hara and Hall, 2021, 168–172). It may even be that the 'real' function of some fake news is to pollute the information space and reduce trust in news globally, rather than to mislead readers on its specific content.

Another type of misleading content that flourishes in the digital realm is the "deepfake", highly realistic and convincing content, usually an image or video, using AI to depict events or conversations that never happened (Gosse and Burkell, 2020; Kietzmann *et al.*, 2020; Kwok and Koh, 2021; Westerlund, 2019), which can be used in the service of fake

news (Whyte, 2020), pornography (Maddocks, 2020), faking evidence (Liv and Greenbaum, 2020; Murphy and Flynn, 2021) and marketing (Kietzmann *et al.*, 2021). A particular specialism that deepfakes open up is that of *face manipulation*. The face is a vital biometric for recognition, in social contexts and on media, and deepfake technology can be used to synthesise new ones, swap identities or manipulate the expressions which are so important for imputing motives or sincerity to people (Tolosana *et al.*, 2020).

These and other technologies have been industrialised, indeed weaponised, by many actors via institutions such as troll farms, botnets and junk news operations, acquiring the scale to be a genuine threat to democracy and civil society (Howard, 2020). Many states have indulged in this kind of pollution, but perhaps Russia is the most advanced, especially as its politics has the greatest ideological affinity to such processes; Russian ideology embraces misinformation not merely as a form of *Realpolitik*, but rather as a means of national validation against perceived threats from the West (O'Hara and Hall, 2021, 157–164; Pomerantsev, 2019; Soldatov and Borogan, 2015).

The ability or willingness of individuals to engage critically with information has an important effect on how digital modernity plays out. Misinformation supports the disruption principle (4) more clearly than principle (5) of the digital modernity narrative to specify an alternative, superior reality. This is hardly the better future promised by Eric Schmidt, never mind Kurzweil's singularity. A superior reality, the metaverse or cyberspace, is at best, on current technology, a hybrid reality which makes essential reference to the physical world. Deepfakes are fine in the metaverse, where individuals may deliberately create avatars, or impossible objects, in an understood space; memes may circulate that are self-consciously spurious, such as the satirical conspiracy theory that Birds Aren't Real.[2] But if digital modernity is to be a narrative that subsumes the physical world, misinformation is problematic. If it only bequeaths a reliable description of the physical world of value for policymakers and academics to support good-faith

[2] https://birdsarentreal.com/.

top-down provision of advice and population management, it is hardly going to be a liberating technology for everyone else.

The ambient data infrastructure allows data to be gathered on how misinformation is received and by whom. Only a minority of misinformation comes from celebrities, but their involvement boosts social media engagement with it (Brennen *et al.*, 2020; Shahi *et al.*, 2021); bottom-up misinformation is common (Kouzy *et al.*, 2020), and often spread thoughtlessly (Laato *et al.*, 2020; Pennycook *et al.*, 2020; Pennycook and Rand, 2021). It can be spread by media news websites, especially when hard information is scarce (Cuan-Baltazar *et al.*, 2020). There are correlations between susceptibility to misinformation, low trust of scientists, approval of social hierarchies, vaccine hesitancy and reluctance to follow rules (Enders *et al.*, 2020; Lobato *et al.*, 2020; Roozenbeek *et al.*, 2020), while women, older people, those with higher numeracy skills and/or higher education levels are less susceptible (Pickles *et al.*, 2021; Roozenbeek *et al.*, 2020). Misinformation often professes concern for the potential for others to be harmed (Shahi *et al.*, 2021). Given all this, bottom-up data-driven visions of digital modernity, such as the democratic smart city peopled by smart hackers, may be less plausible than the top-down idea that the data infrastructure will be used to reduce agency to manipulate and manage misinformation, even if in the best interests of the population as a whole.

Many means of combatting misinformation try not to undermine the autonomy of individuals, leaving it to their choice as to whether they take into account alternative sources of information such as fact-checkers (Brandtzaeg *et al.*, 2018; Hameleers and van der Meer, 2020; Howard, 2020; Margolin *et al.*, 2018; Walter *et al.*, 2020). It may also be addressed by effective use of social media by authorities (Hauer and Sood, 2020; Vraga and Bode, 2021), and with nudge strategies aimed at those spreading misinformation thoughtlessly (Pennycook *et al.*, 2020; Pennycook and Rand, 2021).

However, it may be that strategies for restoring the information space and removing misinformation must include the restoration of the authority of science, logic, rationality, reason and other epistemologically virtuous approaches to the production of knowledge. For instance, the online crowdsourced encyclopaedia Wikipedia was originally seen

as a democratic, open resource, but in the end became such a key provider of information that reputational issues came into play. At that point its bottom-up ethos was subordinated to a strict editing policy based on a hierarchy of trusted gatekeepers – the very model that Wikipedia was supposed to disrupt. During the COVID-19 pandemic, when misinformation became a serious public policy issue, those articles relevant to the virus were subject to especially stringent gatekeeping (O'Hara and Hall, 2021, 64–65).

8.2 The Prospects for Veracity in Digital Modernity

The disruptive effect of misinformation on cyberspace is hard-wired into digital modernity. In this subsection, I will briefly consider four phenomena that jointly or separately will tend to undermine the ability of digital modernity to present a virtual world that thoroughly appropriates the functions of reality. Although principle (5) tells us that the physical world can at best only approach the perfection of the algorithms, it turns out that the algorithms are likely to fall short of absorbing the offline world completely.

The first point concerns the nature of computing systems. One way of describing misinformation systems is that "they deliberately misrepresent symbols" (Howard, 2020, 137). This suggestion is incomplete, but is valuable in bringing to the fore the linguistic nature of what is going on. Recall the discussion of data and information from Section 3.2; misinformation is a particularly difficult problem to solve using technical means only, because misinformation is *about* something, and therefore requires interpretation. The infrastructure, on the other hand, is there to move data about and perform operations on it, but not to determine what it is about. There is, therefore, no material difference between information and misinformation from the perspective of the infrastructure (or between sensitive and neutral information, or between confidential and public information).

Second, it was noted earlier that one way of thinking of digital modernity was as outsourcing reflexivity to the ambient data infrastructure. The more completely this is done, the closer that the subjunctive world gets to total realisation. However, people do retain the ability

to reflect on their positions, and on the attenuated choices that the ambient infrastructure presents them with. Reflexivity can never be fully outsourced.

This means that the correlations discovered by the infrastructure can turn out to be spurious, and its predictions rendered null, because they are taken into account by those represented in them (O'Hara, 2020c, 19). Data is gathered up to time t_1, at which point it is analysed. Analysis suggests a policy intervention at time t_2, predicting a specific result at t_3. But our actions between t_2 and t_3 are not "naïve", but informed by the expectation of the policy's outcome at t_3, and we adjust our strategies accordingly, a potentially important change that might undo the correlations in the data up to t_1 (compare a voting intention expressed for an opinion poll, with the intention of the same voter once he or she is aware which parties are leading in the polls and which are in a hopeless position). Prediction, rather than narrowing down the space of options as it is supposed to, may ultimately end up creating fresh opportunities (a different argument to a similar conclusion can be found in Arendt, 1998, 178).

Indeed, the extent of the knowledge that the infrastructure has about us is quite likely to be exaggerated, partly because it makes for a more dramatic narrative of digital modernity, whether it boosts the potential of big data (Agrawal *et al.*, 2018; Ayres, 2007; Carter and Egliston, 2021; Mayer-Schönberger and Cukier, 2013), or supports theories such as the singularity (Kurzweil, 2005). More importantly, though, the myth of digital omniscience is very handy from the point of view of boosting the share prices of major tech platforms, and the valuations of startups. For instance, Facebook's share price fell immediately after the scandal about emotional contagion experiments broke (Kramer *et al.*, 2014, and see Section 6.3.3), but within a month was higher than its pre-scandal rating, spurred by the suggestion that Facebook had control of its users' emotions (O'Hara, 2015a). As another example, online advertising has disrupted the offline business because of the idea that one can trace, via the data trail, which adverts have led to which sales. However, there are still inefficiencies in the market, such as the presence of ad blockers, as well as outright fraud, that mean that measuring the effect of adverts is not as straightforward as the myth suggests (Gordon *et al.*, 2021).

A third issue concerns the over-production of data. As increasingly many activities shift online, and the physical world is instrumented by the IoT, the data trails become thicker. The raw material for reflexivity outsourced to the ambient data infrastructure is correspondingly increased. This might lead us to consider a societal version of an individual pathology called *hyperreflexivity* (Sass, 2017). Reflexivity is underpinned by an instinctive, non-reflective ability to grasp the intersubjective worlds of context, background and meaning of the objects, events, situations and others that make up our lifeworld, an ability that has been described, for example, as tacit knowledge (Polanyi, 1967), habitus (Bourdieu, 1990), a harmonic sense of belonging to oneself (Dalle Luche, 2003), skilful coping (Dreyfus and Dreyfus, 1986), background capacities (Searle, 1992), and *sensus communis* (Arendt, 1992; Degryse, 2011) – or less academically, common sense. In the psychotic condition of hyperreflexivity, patients over-analyse, worrying about questions whose answers are assumed in normal situations, such as why that person said "hello", or whether I am safe from attack sitting on the commuter train. In other words, it focuses intensively in depth on detail, and misses the basic *Gestalt* which intersubjectively connects others: "what is taken for granted suddenly becomes unfamiliar or strange; what was implicit becomes explicit and enters the focus of attention" (Fuchs, 2010, 239). It is, for example, a symptom of schizophrenia.

As reflexivity complicates the notions of social cause and effect by creating tight feedback loops between them, hyperreflexivity complicates things still further, as the sufferer tries to reason him- or herself out of the cognitive dissonance by focusing even more closely on what is puzzling them. It has been claimed that hyperreflexivity itself is a pathology of modernity, that as a psychological symptom it appeared alongside the Renaissance distinction between the virtues of prudence, including moderating one's psychological exposure to others, and sincerity, including harmony between feelings and public utterances (Pérez-Álvarez, 2008).

Be that as it may, given "the fundamentally social nature of human experience, . . . constituted by a range of sensory, intercorporeal and cognitive capacities that are acquired in social interactions" (Thoma and Fuchs, 2018), retaining the *sensus communis* means that our experience

of reality inherits a great deal of tacit understanding. But conceding reflexivity to the data infrastructure may reduce the tacit knowledge brought to bear in the evaluation of a situation. For instance, there is value in the stability and durability created by tradition (Giddens, 1994, 61–66; Heelas *et al.*, 1996; Shils, 1981), but this will be hard to instil into the infrastructure. To the infrastructure, as to the hyperreflexive psychotic, there is no common sense, and any understanding is as good as the next. At a minimum, different and parallel perspectives are needed to retain plurality, and so it is important not to allow the infrastructure's aggregative statistical analyses to define the common interest (Arendt, 1998, 57–58).

Finally, the ambient data infrastructure requires design, standards and cooperative behaviour, all of which are targets of the *hacker ethic*, which celebrates the expertise of gifted programmers to create innovative code with unexpected output using elegant means. It challenges the traditional work ethic, replacing the latter's ideals of duty and service with joy, creativity, competitiveness, passion, freedom and autonomy (see also Figure 9.1 in Section 9.2.6). This subversion, enabled by global communications networks (Castells, 2000b, 169–211), has an aesthetic of its own, undermining the basic functions of a system by using them to demonstrate its inconsistencies (Boutang, 2011, 87–91; Himanen, 2001; Mosco, 2004, 48; Tirri, 2014), disrupting supposedly powerful corporate networks and "sticking it to the man" (Arora, 2019, 50–68; Halpin, 2012). This aesthetic has exacerbated a dispersed and *ad hoc* challenge to the Internet which manifested as cybercrime and hacking, and groups such as Anonymous and WikiLeaks, but which in more recent years has attracted more influential backers at the level of the nation state (O'Hara and Hall, 2021, 154–156; Perlroth, 2021).

The hacking need not be technical, but can also harness the power of large numbers to disrupt a functioning process. For instance, in 2021, the value of shares of nearly-defunct games company GameStock was boosted by a factor of 30 by users of the Internet forum r/wallstreetbets, thereby causing many hedge funds which had been short-selling the low-priced stocks to lose money, resulting ultimately in the suspension of the commission-free broker Robinhood and others. In all, this adventure wiped 5% off the value of the S&P 500 stockmarket index (Jakab, 2022;

Umar *et al.*, 2021). The ability of hackers to create these ludic effects threatens to destabilise cyberspace, and, given its constructed nature, it is hard to see how they can be made to go away.

Indeed, the power of large groups to cohere online is part of the story of how central nostrums of good government and evidence-driven policy, and teleological theories such as globalisation, are challenged under digital modernity. "Peasants with pitchforks" are able to group together and organise, as for example in the 2016 British Brexit referendum, the US Presidential elections of 2016 and 2020, and the campaigns of the *gilets jaunes* in France and the 5 Star Movement in Italy. This is a challenge for Castells' theory that "generic labour", i.e., excessively rigid and conservative non-information workers, would be sidelined in the network/information society, for which they lacked the skills, and they would occupy a "fourth world" (Castells, 2000b, 128–152). Technology is a key enabler of many of these developments, which has been used very effectively by populist movements to mobilise such people (even if this has been a somewhat top-down process). Castells did predict that social movements would flourish in the network society (Bartlett *et al.*, 2011; Castells, 2004), but oddly those bottom up movements that have self-consciously wished to mobilise online, such as the Occupy movement, have been comparatively unsuccessful, despite utopian hopes that digital technology would help them (Garrett, 2006; Halpin, 2012; Hampson, 2012; Jagodzinski, 2013; Klein, 2001b; Mason, 2013; McGinnis, 2013).

The success of populist movements under digital modernity has no doubt been helped by the use of the Internet to organise. However, there are certain aspects of the digital modernity narrative that have also inspired these movements, and in particular the metaphor of the blue and red pills. In the final subsection, I will briefly trace the development of myths underlying the nature of the world and perception, taking us from Plato to *The Matrix*.

8.3 The Cave and the Demon

The status of the virtual world has been foreshadowed in previous thinking. One example is the metaphor of the cave from Plato's *Republic*, in which was envisaged a group of prisoners only able to see shadows

cast by a flickering fire behind them. Their perceptions were contrasted with someone who had escaped from the cave and seen the outside world (Plato, 1997a, 1132–1135). This reversed an earlier Homeric picture, in that Plato suggests that our knowledge of the everyday, physical world is imperfect, whereas precision and perfect knowledge are only possible of the abstract, logical, mathematical, conceptual world of ideas (Arendt, 1998, 292). This is a precursor of principles (4), that to exist is to be backward, and (5), that reality can't beat the data.

The tragedy of the cave is that it is a permanent prison for a pre-modern person. While a craftsman or woman can try to create objects guided by the ideas in their heads, the model they attempt to reproduce "possesses a degree of permanence and excellence which is not actualized but on the contrary spoiled in its materialization through the work of human hands. Work makes perishable and spoils the excellence of what remained eternal so long as it was the object of mere contemplation" (Arendt, 1998, 303). It does, nevertheless, suggest an analogous contrast between the uncertainties of the physical world and the abstract, logical, precise world of data and ML. However, in the updated digital cave, there would be no need for recourse to the outside to calibrate the prisoners – ML could record and refine the flickering shadows in order to recover accurate signals of whatever caused them. From the noisy and imprecise data, the informative signal could be extracted and communicated direct to the prisoners without releasing them. On the revised cave metaphor, digital modernity does not postulate a separate realm, so much as promise an epistemologically transparent rendering of the existing physical world.

Nowhere does Plato suggest the distinctively modern thought experiment that the external, physical world does not exist. A more important source of the idea of building a cyber/virtual spatial world from data can be found in the *cogito ergo sum* argument of René Descartes' *Discourse* (1637), one of the intellectual foundations of modernity (Albano, 2000; Cahoone, 1987). Descartes' refusal to submit to appearances, instead relying on the subjective rationality of the individual's cognition, it has been argued, was also mirrored in contemporary or even earlier philosophical shifts in some non-European cultures (Lu, 2019).

The idea of the subjective world being constructed, a demonic miracle in Descartes' thought experiment, received a scientistic shift from Hilary Putnam, who suggested the possibility that, for all they know, people may be brains in a vat, with a powerful computer simulating reality by sending electrical signals to the brains' neurons (Putnam, 1981). Though both Descartes and Putnam raised these possibilities only to debunk them, the idea has often been thought compelling (Chalmers, 2022). Technologically, it is the imaginary that underlies virtual reality, and would clearly require the use of AI to achieve realism in the simulated world. We see this, for example, in the importance of AI in the games industry, where the movements and actions of in-game characters need to be not only realistic, but intelligent and strategic, and yet hard for the player to predict (Millington, 2019).

These ideas reached their popular fictional apogee in the 1999 film *The Matrix*, one of the cultural touchstones of digital modernity (Irwin, 2002), which among other things laid down the challenge of the red pill and the blue pill. Taking the latter allows the character to live peacefully in the virtual paradise, while the former shows him or her the true nature of reality – an allegory that challenges digital modernity while accepting its being and the force of its representational abilities. Hence the trope attempts to turn spatial digital modernity on itself by allowing the possibility that it is "only" virtual. However, digital modernity wins out in the end. Consistent with the temporal narrative of disruption, the "red pill" has become a popular online meme for introducing new converts to the aggressive heterodoxy and rejection of social norms characteristic of the alt-right brand of Internet activism (Aiken, 2019; Tait, 2019, 194–195), such as the claim that men's rights and identity are being undermined by feminism and political correctness (Dignam and Rohlinger, 2019). "Red-pilling" seems to require the online environment to spread (Tait, 2019; Teitelbaum, 2019).

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9

Related Concepts

I have reconstructed the digital modernity narrative in this monograph as a development of reflexive modernity (Beck, 1994a; Giddens, 1994), showing continuity in some respects with that narrative, and discontinuity in others. However, there are other competing narratives with which digital modernity can be contrasted. Each of these is valid in many respects, and the explanatory power of such narratives will depend to an extent on one's perspective. In Section 9.1, I will discuss the major competitor to modernity, postmodernism, which continues the discussion in Section 8 because of its peculiar stance on truth and science. Section 9.2 will review a series of alternative views of modernity, while Section 9.3 will briefly note the Western-centrism of many of these accounts. For further discussion, narratives of the so-called "information society" are also analysed in (Lupton, 2015, 20–41; Webster, 2014).

As noted earlier, all explanatory narratives, even the narrative that there are no grand narratives, are highly selective, choosing to regard a few things and to ignore many. As the purposes and perspectives of these narratives changes, so will their appropriacy for particular contexts. There is no right or wrong here. However, the perspective of this monograph is the digital modernity viewpoint, especially as it drives

present-day policymakers and decision-makers, and so the emphasis here is less on a comparative approach, and more on how the gaps in the other approaches supported the postulation of digital modernity. This account is therefore merely a prolegomenon to a genuine comparative account of narratives of our present and near-future.

9.1 Postmodernism

The first contrast is between narratives of modernity and *postmodernism*, which claims that totalising narratives have no validity in a world of fragmented ideology, politics, psychology and symbolism (Lyotard, 1984). It follows of course that adherence to the latter necessarily involves rejection of the former. In this section, I will put forward an interpretation of what I believe to be the most relevant strand of postmodernism, and (i) consider how it accounts for a number of the features of the modern world, and (ii) try to follow its normative direction. As a narrative that eschews grand narratives, postmodernism shouldn't really have a teleological dimension. I will therefore compare it with the digital modernity narrative in its descriptive and normative guises.

Postmodernism is a fragmented movement, and so I need to specify exactly what flavour will be considered. Postmodernism first appeared as a reaction against the aesthetic modernism of Joyce, Picasso, Stravinsky, Le Corbusier, Eisenstein and Eliot, that sought to expand artistic expression with the techniques made available in the 20th century, including rigorous scholarship, mass production, psychoanalysis, secularity, mathematics, artificiality and technology. In contrast, postmodern art was playful, ironic, self-consciously lowbrow and self-referential. Although modernism in art has a connection with social and political modernity, and although postmodernists of all stripes discuss art, language and symbols in excruciating detail, I will not address this strand. A second type of postmodernist produces analyses of our current society, not only rejecting the narratives of modernity, but also the methods of modern science and social science; they embrace the spirit of postmodernity in their works and their (lack of) method. This type is also not my concern.

The type of postmodernism relevant to this review concerns those thinkers who use the methods of modern philosophy and social science to maintain that there has indeed been a rupture between modernity (roughly, the post-medieval or Enlightenment world) and postmodernity – in other words a *postmodern condition* (Lyotard, 1984), see also Harvey (1990) and Jeffries (2021). This path was paved by earlier work that argued that the Enlightenment was a self-contradictory movement, where new methods of rational engagement turned out to be instruments of oppression (Adorno and Horkheimer, 1972), or misused by untrustworthy elites (Hind, 2008). Evidence for such theses was amply provided by the horrors of technological warfare in the 20th century, murderous totalitarianism of left and right, imperialism and its failure to improve the lives of the colonised, the poor outcomes of planned economies, brutalist and inadequate housing and town planning, and the failure and collapse of Marxism. Such accounts of the postmodern condition reject "totalising" narratives of modernity as assuming that the world is knowable, that there is a reality behind linguistic and aesthetic constructions of it, that meanings and symbols are stable, and that there is a discernible human nature that can be relied upon and worked around. Note that postmodernism counts as a rejection of both optimistic and pessimistic narratives of digital modernity.

Any kind of narrative of modernity is treated by most postmodern thinkers as totalitarian, essentially restricting freedom by enforcing certain perspectives and assumptions. This is one of the sillier postmodern ideas; any society will restrict the freedom of its members in certain ways, perhaps by regulation, or incentive, or peer pressure. To suggest that the freedom of someone living in Manhattan or Paris is in any way commensurate with that of those living in Moscow, Xinjiang, Caracas or Pyongyang is morally and politically haywire.

Nevertheless, the fundamental postmodern question is whether it is possible to have a social bond that is non-totalitarian in this broad, almost meaningless, sense. The postmodern condition is characterised by suspicion of authority or standards, including scientific, cultural (taste) and political, and branding these as tyranny. Against this, postmodernism celebrates relativism, difference, pluralism, superficiality and freedom from interference. Truth is an expert construct, and so

itself a kind of tyranny; ditto reason. Authenticity is rejected, because there is no standard against which to be authentic. We copy, parody, experiment and mix-and-match. What about authenticity to one's self? No, even the self is a tyrannising psychological construct; we are just as fragmented as the cultures which we inhabit, and to which we owe no loyalty. I am a timid academic, but online I posture as a brave, bold risk-taker. Which is the "real me"? Neither, or both (Žižek, 1997, 137)? Placed in a context, people are creative – sometimes they follow their habits, sometimes they explore and try out new things (de Certeau, 1984). Actions and objects have personal meanings for people that are always subject to change or adaptation. Nothing has an essence. Everything is mediated through language, discourse, signs, symbols and images (Baudrillard, 1994). Nothing is revealed by them – they are the experience we have.

It should be clear from this account that postmodernism has much to say about our information-heavy world, and a number of common concerns with digital modernity. On the other hand, digital modernity is the kind of grand narrative that postmodernists reject. How do they interact? Let us look at two example issues.

First, postmodernists lay great stress on the abundance of signs in modern societies, and the ubiquity of symbolism, creating what has been called a "society of the spectacle" (Debord, 1970). To suggest that there is a reality or a truth beyond or underlying these signs is to make a category error; any critique of the signs (for instance, of fake news or advertising) merely creates more signs, even if those signs claim to take better account of reality. We pile sign upon sign, without approaching reality any more closely. The idea that we can make a connection with reality through signs is a dream, and in fact no-one expects to; in our postmodern society, people (all people) are aware of the games we play with signs, and don't worry about whether there is a reality underlying adverts, political interviews, news reports or whatever. Signs have no significance, they simulate rather than represent. We have a hyper-reality, in which signs refer to nothing but themselves (Baudrillard, 1994).

In one sense, this claim – which pre-dates digital modernity – parallels the narratives given above in Section 3.2. In digital modernity there

is a plethora of uninterpreted data which is interpreted by systems. This process of interpretation is the basis for the creation of cyberspace and ultimately the metaverse, which might be taken as a type of postmodern hyper-reality. However, the data and information of digital modernity do not provide a spectacle, they are the means of disrupting existing institutions and controlling the metaverse. The information provided by a piece of data certainly depends on how it is interpreted by a system, and those interpretations in general are as free as the interpretation of signs in postmodernism; this is a complex hermeneutic matter in digital modernity, but it is not the case that anything goes. In the first place, we have seen that misinformation is an important issue in digital modernity, but the idea behind it – misleading information – cannot be expressed in postmodernism, because on that view there is nothing beyond the information for it to be misleading about. Nevertheless, it is a key part of the digital modernity narrative that information can mislead. It is, on that narrative, false to say that carbon emissions are not warming the planet, even though as a matter of fact that judgment is mediated through a complex set of information models based on sensor and other data. It is false to say that COVID-19 vaccines are part of a plot to sterilise Muslims, because there is no such plot. It is false to say that the 2020 US Presidential election was fraudulently stolen from the winner. Of course, such false claims have their uses for those who wish to spread them, and the place of misinformation within the digital modernity narrative is not straightforward. But it doesn't disappear.

Digital modernity narratives take the production of data, especially when automated by sensors, e-commerce sites, smartphones, etc., as a broadly neutral endeavour. The devices are no doubt designed and built for a purpose, by actors with interests to pursue (Langlois *et al.*, 2015). The way the data is used is also a hermeneutic activity that can be designed to persuade or confuse. And of course data can be misleading when it is interpreted – a person may not be co-located with their smartphone, or a sensor may be incorrectly calibrated. A camera may be pointed at one part of a scene and miss another. But digital modernity makes space for there to be a technically-detectable difference between a piece of video and a deepfake. Postmodernists

tend to focus on statements that are, to an extent, dependent on perspective – "Guinness is good for you", "the Democrats are liars" – but while these are certainly statements open to interpretation from different perspectives, if we look at sentences such as "this smartphone is at position xyz", "the temperature of this room is 21°" or "$10 has been transferred from account X to account Y", their interpretation is constrained by a transfer function that models the output for every possible input to the relevant device. If a sensor is connected to an actuator, then the data may directly act upon an environment (e.g., turning the heating down if the temperature exceeds a particular level), and then we can talk in terms, not of truth or falsity, but appropriateness or otherwise. Interpretations are also constrained operationally. A large piece of data that is an MP4 file could be interpretable in any number of ways, but actually the software that will turn the data into a video image will probably be one of only a few programs that can take such data as input, and give coherent output. Neither will those few alternatives do as interpreters of the data; they may output something, but it would most likely be nonsense (for instance, if we viewed the data through word-processing software).

Postmodernism already deals with information conceived as signs, and hence takes interpretation as read – it then refuses to accept that some interpretations may be more legitimate than others. In digital modernity, the focus is on the data which constitutes information, and so the process of interpretation is not assumed in advance. Yet finding an interpretation for a piece of data is non-trivial. The notion of an underlying reality need not be jettisoned, as it is in postmodernity. Reality can certainly be challenged or improved, as with principle (5) – but that assumes that the digital analyses available in cyberspace are improvements on, and can be used to improve, reality, not that reality does not exist or is not amenable to inspection.

The different perspectives of postmodernity and digital modernity can be seen if we consider a YouTube video in which a person sits in front of the camera and defends the QAnon conspiracy theory that a cabal of paedophile, Democrat-voting, Devil-worshipping cannibals controls the American state. In the world of analogue modernity, we would probably say that this statement was false, because there is no evidence

for it and plenty against it, not least common sense. A postmodernist would reject the idea that the statement could be compared with an authenticating reality and therefore be shown to be true or false, and instead claim that it plays a role in certain types of behaviour and ways of life, and signifies a whole range of things, including attitudes to politics, economics, authority and so on. It makes sense to adopt the claim if you are on one political side, and not if you are on the other (and indeed we can see that apparently rational individuals do give such claims house room because it suits their political agendas).

Under digital modernity, in contrast, the focus is at a much lower level. There is an underlying reality, which is that a person did sit there in front of a camera uttering those statements about QAnon. That action, plus the functionality of the device, created data which can be turned into information, a video image, by appropriate software. Then a human observer, able to understand the language and read the body language and facial expressions of the speaker, interprets the video as someone making a statement. The data can also be altered, to create a deepfake (for example, making the face of the speaker appear to be that of a celebrity), and the deepfake will be interpreted accordingly, perhaps as a record of the celebrity speaking, or as a deepfake, and if the latter, the deepfake might be seen as a sinister libel on the celebrity, or a hilarious joke with them as the butt. The question of whether the statement about the cabal of cannibals is true or false is not something that digital modernity deals with directly, but the interpreted information (the video) can itself generate still more data, such as numbers of downloads and likes. This can be calibrated with other data, for example by clustering videos to find which are being watched by similar viewers, which then can generate new realities by recommending new videos to watch, recommending to others that they might enjoy the video, or suggesting conspiratorial phrases in the autocomplete function of search engines (Houli *et al.*, 2021). This iterative data generation and interpretation at scale will eventually produce a rich landscape of context and background which itself may become the underlying reality of a discourse analysis – for instance, if information is censored, the censorship itself could be detected from the data and reasoned about (Aceto and Pescapé, 2015). The data not only

reflects the reality of the process by which it was created, it constitutes a reality about which we can reason.

Hence the digital modernity narrative, unlike postmodernism, leaves room for the condemnation of conspiratorial or otherwise false content, as well as abusive, racist or sexist content, but these will depend on the evaluative rules of systems (particularly content moderation), not on an official epistemology. Online censorship may then be carried out by governments, which have the legitimacy, or platforms, which have the expertise, or by no-one at all, in a libertarian spirit (Gillespie, 2020). Hence, while conspiracy theory is rejected and condemned under analogue or high modernity, and accepted as a point of view under postmodernism, it isn't addressed in these terms by digital modernity at all. Rather, its role in the metaverse is tracked and traced by the ambient data infrastructure.

Our second example of the contrast between postmodernism and digital modernity concerns accounts of everyday life, where digital modernity brings to the fore an implicit contradiction of postmodern thinkers. The work of Michel de Certeau and others brings out some of the variation in everyday life to criticise modernist accounts. Everyday activities tend to be described and prescribed under modernity by professionals, such as planners, lawyers and social scientists, as if they are rule-governed, and their essence contained in their rules. The rules of the activities then become means to regulate them. However, individuals insert their own meaning into their activities, imaginatively integrating them with other activities and providing pleasure in particular ways. Walking, driving, eating, shopping, gambling all become creative, not simple functions brought into being by impartial descriptions.

> In reality, a rationalized, expansionist, centralized, spectacular and clamorous production is confronted by an entirely different kind of production, called 'consumption' and characterized by its ruses, its fragmentation (the result of the circumstances), its poaching, its clandestine nature, its tireless but quiet activity, in short by its quasi-invisibility, since

> it shows itself not in its own products . . . but in an art of using those imposed on it.
>
> (de Certeau, 1984, 31)

Such is the postmodernist critique of high modernity's accounts of social behaviour, which seems a reasonable one. A second postmodern observation, equally plausible, is that in the modern world, the nature of information and knowledge are affected by a *principle of performativity*, they are considered more valuable if they contribute to "the optimization of the global relationship between input and output" (Lyotard, 1984, 11) of a system. This is a fair point, which is why, in Section 3.2, I defined knowledge in terms of usable or useful information (O'Hara, 2002). Furthermore, where the production of data or information requires some kind of equipment, expertise or technology, there will be a bias toward the production of performative or useful information, because that will generate the revenue to maintain the equipment. "A technological apparatus requires an investment; but since it optimizes the efficiency of the task to which it is applied, it also optimizes the surplus-value derived from this improved performance" (Lyotard, 1984, 45). Incidentally, this idea of performativity has led many commentators mistakenly to assume that postmodernism necessarily requires capitalism (Jeffries, 2021); it clearly doesn't, as the performativity principle will make a difference in any resource-limited area with feedback mechanisms, not only capitalist ones.

When we consider the situation in digital modernity, the range of uses of objects or types of behaviour that de Certeau describes is still present – each smartphone, each Fitbit, each car, each e-book is consumed by its user idiosyncratically, with personalised significance. Yet the ambient data infrastructure collects data from those uses, and interprets it using ML in the context of giant quantities of data from analogous behaviours of similar users, in order to provide more services and more objects, and a wider set of possible uses, ideally to monetise the information and entice more people into the network (Zuboff, 2019). If the data did not support such analysis, then ultimately it would not be collected (even given the assumption of digital modernity that all data is potentially useful in at least some, possibly unforeseen,

circumstances). The range of behaviours noted by de Certeau still occurs, but decisions can still be made about the avatar on the basis of the data generated by those behaviours. The data generated constitutes a type of essential description of the behaviour (a type considered illegitimate by de Certeau), grounded in its performativity. But the circle can be squared, because (a) there is no in principle limit to the data that can be gathered and considered performative, and (b) the data is gathered at such a scale as to be able to respect *both* the similarity of one piece of behaviour to others, *and* its uniqueness and individuality. Nothing in the data processing conducted by, say, Facebook or Google suggests that the behaviour of their users is not uniquely significant to them. Indeed, their business models depend on treating their users as unique individuals.

Hence we might say that digital modernity takes on some of the insights of postmodernism, while curbing some of its excesses. It may even be the saviour of modernity from the postmodern critique. The report by Jean-François Lyotard that launched postmodernism in social science (Lyotard, 1984) took the effects of technology, especially AI, databases and the knowledge economy, on 20th century modernity as its starting point, and the role of technology remains an important theme (Anderson, 1998). Yet Lyotard may have misrepresented developments in a technology with which he was admittedly unfamiliar (cf. Anderson, 1998, 24–27). It has been suggested that the longer perspective afforded us in the 21st century may enable us to argue that the phenomena that the postmodernists had spotted were signs, not that modernity was over, but merely that it was morphing into a new form, courtesy of digital technology (O'Hara, 2020a, 206), a "self-clarification of modern thought, as the remnants of tradition and providential outlooks are cleared away" (Giddens, 1990, 51). Lyotard's report on technology was therefore prescient, even though he misconstrued his observations.

9.2 Other Perspectives

In this section, I will review alternative ideas about the information society and the knowledge economy. I will not either endorse or critique these theories in any depth, but merely state them and discuss how they

compare, or need to be adapted, to the narrative of digital modernity. Of course, in these short statements, their subtleties are lost in inevitable caricature. The theory of reflexive modernity is an additional perspective discussed in more detail in Sections 2 and 3.

9.2.1 The Post-Industrial Society

The main theorists of the post-industrial society were Alain Touraine and Daniel Bell, who developed their ideas in the 1960s and 1970s (Bell, 1973; Touraine, 1971). This was an evolutionary account of the progress of society from an agricultural stage, marked by a majority of employment on the land, to an industrial stage, marked by a majority of employment in manufacturing, to a post-industrial stage, marked by a majority in services. Each stage rests on innovations creating increases in productivity in the previous stage, so increased agricultural productivity (the Agricultural Revolution) created surplus food within a subsistence economy, which freed workers to move to cities and start making goods for a consumer economy. Then increased industrial productivity (the Industrial Revolution) created surplus goods, which freed workers to start providing for others' non-material needs. The post-industrial society is effectively an information-based society, because services are based around information rather than land or raw materials.

Bell thought that post-industrial society would be a final stage, since services are hard to automate and non-tangible needs and wants are effectively insatiable across society. However, it is clear that digital modernity has undone many of the theory's assumptions. In particular, the sheer quantity of data gathered from all aspects of service provision has placed even the highly senior professional services upon which Bell laid such stress in the crosshairs of automation (Susskind and Susskind, 2015). This has concerned many, with its implication that there is no longer an inexhaustible supply of service jobs for people to occupy. It has led to an increase in interest in a universal basic income, a non-means-tested stipend paid to all members of society whose labour would now be superfluous, funded from taxation of profits or incomes of the extremely wealthy few who retain jobs in a highly centralised

and automated economy (Dermont and Weisstanner, 2020; McAfee and Brynjolfsson, 2016; Nieswandt, 2022).

Hence digital modernity cannot easily be fitted into the theory of post-industrial society, and, thanks to the capacity for automating knowledge-based services, implies a stage of development unanticipated in the theory.

9.2.2 The Network Society

Manuel Castells developed the theory of the network society, emphasising the network structures that had been enabled at the close of the 20th century by ICT (Castells, 2000a,b, 2004). In this society, capitalism had to adjust to new threats and opportunities, as hierarchical control ceased to be adequate to create value, and the dissolution of national boundaries exposed all corporations to relentless global competition. Power is multidimensional, distributed across financial, political, security, media and dark criminal networks (Lupton, 2015, 20–21). Those who thrived in the network society were highly connected across networks, able to create value from pursuing informational tasks, moving from project to project without any special loyalty or necessary connection to any organisation, and learning new skills and making new connections flexibly as economic conditions demanded. The morphology of the network society is transformative; it helps information to flow freely across networks. However, the focus on information doesn't make the network society different *per se*, given that all societies revolve, perhaps in different ways, around information and knowledge.

The advent of digital modernity tests Castells' findings in interesting ways. Certainly the network structures he discusses remain important, although whether they are quite as new as he maintains is an interesting question (Ferguson, 2017). The issue for this monograph is how far the data revolution can be incorporated into the theory. For instance, Castells at the turn of the century laid stress on the Cisco model of global networked business, and claimed that, however corporations responded to the challenges of the network society, "under different organizational arrangements, and through diverse cultural expressions,

they are all based on networks" (Castells, 2000a, 180). The vertically-arranged organisation is a thing of the past; now we have essential decentralisation, autonomous units, and fluid boundaries around the corporation. This ignores three key developments related to the arrival of data.

First, there are network effects, of which Castells is certainly aware (Castells, 2000a, 71), but rather underplays – he writes as if networks were made of connections between people which can be dropped, added or moved between, so that network effects are generally benign and positive. If one increases the size of one's network, then one gets exponentially greater benefit. Networks are often emergent from the connections one makes, managed by technology which allows instant communications and information storage. This soft-pedals the idea of a platform creating a network; and the idea of someone constructing a network or walled garden to reap benefits him- or herself. Network effects are positive for the network member, but they can also be a trap; the benefits can be so high that it can be costly to leave. To be on the network, individuals may have to connect using the technological infrastructure that facilitates it, so any attempt to connect on a different infrastructure may have to take place without technical support, memory of previous encounters, or links to other network members. It also raises privacy problems, as the infrastructure stores the previous interactions, a history which, while it has value for the network members, may also become the property of the platform owner as part of the contractual arrangement between the network members. Hence the interactions within the network may not be private, and may also be monetised by the infrastructure owners.

Second, as ownership of the infrastructure confers benefits, we see the most valuable companies – the tech giants who provide the infrastructure – become masters (more rarely mistresses) of their companies, and the old vertical pattern seems to revive. The names of Zuckerberg, Page, Brin, Schmidt, Gates, Musk, Bezos, Jack Ma, Pony Ma, Jobs and Dorsey resonate far more clearly than the corporate giants of analogue modernity. Their powers are greater, and their control more absolute. They can of course fail, as did Travis Kalanick of Uber (pushed out because of the dysfunctional corporate culture over which he presided, though he left a billionaire) or Adam Neumann of WeWork (ditto),

but it seems misleading to see such figures as absorbed into horizontal structures and less influential than, say, Jack Welch of General Electric, Walt Disney, Lou Gerstner of IBM or Gianni Agnelli of Fiat.

Third, as a result of the first two developments, it is possible for the tech giants to police the boundary between the corporation and the outside world by simply buying up disruptors, as Facebook bought Instagram (Frier, 2020). Such decisions can be taken quickly (by all-powerful CEOs and founders). The network effects provide a means for smaller startups to get noticed, by building interesting and potentially disruptive networks through blitzscaling, often with the express aim to be bought out. The smaller network is absorbed into the larger, creating more value for network members and increasing the network effects on the whole. Facebook/Meta clearly has a model for massive vertical integration, although it is held back by US antitrust (competition) law, but this is the norm in China, as for example with Tencent's various apps including WeChat, TenPay, Tencent Weibo, and a suite of financial and e-health services (this norm will always be subject to the tolerance of the Communist Party – O'Hara and Hall, 2021, 134–135). In India, Reliance Jio is pursuing the same strategy, as is Sea of Singapore, GoTo of Indonesia, and Grab, which operates across Southeast Asia.

The advent of data, and surveillance capitalism, based on an ambient data infrastructure to support the networks that Castells identified, has therefore been influential in the further development of network society, which operates (in some ways at least) differently under digital modernity than it did under analogue modernity. Castells' network emergent from the interactions of people and corporations seems almost a Platonic view, whereas the data infrastructure makes a network more concrete, and allows the development of parallel networks (perhaps one on Facebook, another on LinkedIn) with overlapping and even competing structures.

9.2.3 Actor-Network Theory

It will have been noticed that the ambient data infrastructure plays an important role in the digital modernity narrative. Yet political theories tend to focus on the actions of individuals, sociology on interactions

between social groups, and computer science on the affordances of the technologies on which the narrative depends. One of the basic assumptions of Web Science is that each of these perspectives, while adding much, is individually inadequate, and by now in this monograph it should be clear why.

One theory that has taken this critique on board is Actor-Network Theory (ANT – Latour, 2005). ANT takes its lead from network theories of society, but adds the axiom that non-human actors also have agency within networks, and both influence and are influenced by the human actors and groups with which they are connected. Clearly the non-humans include the infrastructure itself, data-creating technologies such as sensors, browsers, like buttons and so on, standards and protocols that govern the flow of data, and the data itself, which as argued in Section 3.2 has essentially material form; ANT would add that ideas, background conditions and the natural world also play their parts in how the relationships in networks evolve (for instance, the SARS-CoV-2 coronavirus was an actor in the COVID-19 pandemic just as much as the WHO, Donald Trump and Anthony Fauci). Latour coined the word "actant", to mean anything with agency in a network, human or otherwise, with intentionality or otherwise, a term that deliberately underplays the association of agency with humanity. Networks are often called "assemblages", to convey their dynamic, precarious and contingent nature.

The inspiration of ANT has produced a focus on the intertwining of virtual and physical reality. For instance, spaces such as shops and offices are transformed into specific types of workplace by the action within them of computers or computer-supported systems (Kitchin and Dodge, 2011), while digital divides should be conceived as a complex intermingling of social inequalities, ranging from income to education, and access to the technology itself, influences upon which might range from price to linguistic assumptions embedded in interfaces (Halford and Savage, 2010). The HTP model, inspired by ANT, focuses on *heterogeneous* networks of actants, *translations* of their activities into a temporarily stable structure (or social machine), and different *phases* of the network's structure as its environment, constitution and activities change (Tinati *et al.*, 2013).

ANT and similar theories are valuable in reminding us of the important of the nature of the ambient data infrastructure, and how much its properties and evolution contribute to digital modernity. No narrative could be complete if it only focused on the people and organisations. However, ANT's agnosticism about humanity and intentionality is perhaps an over-correction – digital modernity is if nothing else a set of narratives about human societies, and the human factor is essential (Shadbolt *et al.*, 2019, 21–23). ANT is also generally descriptive, whereas digital modernity can come in both teleological (HTP also includes teleological factors) and normative guise. Normativity is important, especially for those who wish to critique digital modernity ethically or politically.

Furthermore, where a narrative can be selective about what first-class objects it includes, ANT will struggle to avoid infinite regresses – after all, practically everything is a factor, to some degree, in the properties of a network, once the theoretical door is opened to include environmental, symbolic and technological factors. The Internet depends not only on the specific technology that is generally taken as constitutive of it, but also fibre-optic cabling, WWII (which accelerated the development of the computer) electricity, mining and metals, and ultimately the history of the Earth as a site for human evolution and natural resources. Where exactly does one stop?

A corollary of ANT's open-endedness is that it denies the existence of exogenous social forces, except as theoretical constructs that have no independent existence (Latour, 2005). This again will make it harder to maintain narratives of digital modernity, which often include the intervention of exogenous forces and influences that cause contingent, surprising or unanticipated changes. Most obviously in recent years these have included the US-China trade war, which threatens global technology supply chains, Chinese threats to Taiwan, which threaten the structure of the global semiconductor industry, and the COVID-19 pandemic, which shut down much offline behaviour, pushed interactions online, and incentivised the development and improvement of software for remote and real-time access. While one can always turn exogeneity into endogeneity by widening the system (which ANT advocates), the question remains of how helpful this is, if we end up insisting that the

SARS-CoV-2 coronavirus is a first-class object in digital modernity. What purpose would a digital modernity narrative serve if it was so inclusive?

9.2.4 Information and Capital

Much Marxian writing about information and modernity has focused on the role of capitalism, often exclusively in its American form, not infrequently describing the global media world as an organ of American imperialism (McPhail, 1987; Schiller, 1976; Tunstall, 1977), and almost always critically (Tunstall, 2006). Even non-American views of information capitalism decry the influence of private companies, despite their record of innovation. For instance, one account of the privatisation of British Telecom (BT) in the 1980s claimed "there was no comparable push [to BT's focus on business customers] to improve services to everyday domestic users" (Webster, 2006, 141), ignoring the fact that when telecommunications was a nationalised monopoly there was a years-long waiting list, sometimes in excess of 100,000 would-be customers, simply to receive a telephone (Thatcher, 2000, 35, 115, 271),[1] while post-privatisation phone use, ownership and functionality took off like a rocket. Even if BT didn't care at all about domestic service, the level of service rose on the back of its products dramatically, and whatever one thinks about capitalism versus public service, the British telecommunications industry is unequivocally a story about capitalist success and the failure of the 1970s state.

In general, in literature of this kind, the fact that a billion smartphones are sold annually is taken, not as evidence of capitalism being uniquely clever and adaptable enough to create and distribute complex technology to the enormous number of people who want it, but rather as "unmask[ing] how new media technologies are a strategic part of neoliberal globalization's architecture for the expansion of global capital" (Moyo, 2018, 136). It can't be as simple as that lots of people want them.

[1] A book by Mark Thatcher, but not *that* Mark Thatcher! This one is a Professor of Politics at the London School of Economics.

It is short-sighted to argue that capitalism is the only factor in the evolution of digital modernity, although it is clearly a major one. And not all capitalism is of the Anglo-Saxon type – Alibaba of China, Orange of France and Safaricom of Kenya are all extremely influential and bring their own characteristics, and it might reasonably be suggested not only that such firms are different from Meta or Alphabet, but also that all of them contrast with, say, ExxonMobil or Philip Morris. But there are no doubt profit motives at work (though see the discussion of blitzscaling below), and inequalities, as in analogue modernity, so the Marxian interest in power, control and interests will always be of analytic value, as long as not augmented by the Marxian vices of cynicism and determinism.

The prominent role of the private sector means that capitalist techniques can be applied in the new knowledge economy. There is a difference of opinion on whether the abundance of data has led in essence to a new style of capitalism, cognitive capitalism (Boutang, 2011) or surveillance capitalism (Zuboff, 2019), or whether it is basically a few new twists on older models (Ekbia and Nardi, 2017; Morozov, 2019). We can see that the companies that dominated the economies of analogue modernity for many decades – Siemens, Ford, General Electric, IBM, Coca-Cola, Proctor & Gamble, ICI, Shell – have been eclipsed in a remarkably short period of time by new tech behemoths such as Alphabet, Amazon, Apple, Meta and Netflix. Even areas which are not strictly information-based have succumbed to Silicon Valley methods, so that for example Tesla is one of the world's most valuable car manufacturers, while Silicon Valley entrepreneurs have pioneered a viable private sector space travel industry.

The growth of data as a resource has led to some surprising change. For instance, under analogue modernity, the entertainment sector was seen as a key part of the information space, leading to rather snobbish attacks on "a preponderance of sensationalist and action-packed adventures, soaps and serialisations, sports and more sports, intellectually undemanding and politically unthreatening programming, all of which is aimed to command the largest-possible audience ratings of the sort that most appeals to advertisers and corporate sponsors" (Webster, 2006, 131). However true that was in the 20th century, it cannot be

endemic to capitalism, as the quality of recent programming has led many to conclude we live in a golden age of television, with shows such as *Breaking Bad*, *Fleabag*, *Game of Thrones*, *Orange is the New Black*, *Shameless*, *Sherlock*, *Ugly Betty* ... and *Black Mirror*, which chronicles the dystopian aspects of digital modernity. These are widely seen as enabled by technological advances in hardware, distribution methods and not least in the data created by the streaming revolution (Waldfogel, 2017). Furthermore, many non-English TV programmes have become international successes, such as *The Bridge* (Denmark/Sweden), *Le Bureau des Légendes* (France), *The Killing* (Denmark), *Lupin* (France), *Paranormal* (Egypt) and *Trapped* (Iceland). Finally, of course, content production is also far more democratised, with video sharing platforms such as YouTube and TikTok, although one could be even more snobbish about much of that.[2]

There is a new business model in play, where companies provide services which generate data from customers, in return, not for money, but for the use of the information gathered. The services are free in monetary terms, but customers waive their data protection rights to allow companies to gain value from analysing the data (or sharing it, selling it, or selling services to other companies based on it). Note in passing that this removes some of the inequalities that worried 20th century commentators about the poor excluded by the price of quality information (Mosco, 1989; Webster, 2006); with a free service, one donates one's data, which is far more evenly distributed than money. In part, the argument over whether this is a new stage of capitalism rests on how value is achieved by companies – is it basically gathered to allow effective, targeted and measurable advertising and marketing (Nelson-Field, 2020), or is there another factor involved?

[2]To confirm that statement, search YouTube for "squeezing blackheads". Edward Shils noted that until recently, freedom of expression as a component of liberalism was aimed at protecting important, publicly valuable communications, such as scientific, moral, political and religious ideas (Shils, 1997b, 149). More recently, the scope of freedom of expression has widened to include therapeutic and emancipatory expression of affective states, championed on the left, and corporate communications, including absurdly large political donations, championed on the right. Neither has added much to our discourse.

One important difference between capitalism under digital modernity is that current profits seem to be less important than the size of the network created by new-style companies. These networks lead to network effects – the larger the network, the more value it provides for customers, which makes switching networks costly, as noted in Section 9.2.2. Many startups therefore aim to blitzscale, building networks as their first priority, even before they know how to monetise them. Consequently, we see companies that have never made a profit (indeed, often without serious business plans at all – Au-Yong-Oliveira *et al.*, 2018) receiving investors' money, and boasting extraordinarily high market value in monetary terms, justified by current uncertainty about which networks will be valuable in the future. There is also uncertainty about their "real" value, as they are not obliged to release financial information while they remain in private hands and shares are not traded on an exchange (Fan, 2016). Digital modernity has bequeathed us the concept of the "unicorn", a privately-held startup valued at over $1bn (Kenney and Zysman, 2019), the number of which is growing at an accelerating rate.

However, only some networks ensnare their members, and it may be that a blitzscaling company needs to adapt its network to new circumstances. Uber, for instance, after spending heavily to build its network finally became profitable in 2021 (it was founded in 2009), but only after it adapted during the COVID-19 pandemic to include the food delivery service Uber Eats, which was responsible for half its sales. The Uber network was not secure against defections, as customers could easily defect to other ride-hailers such as Lyft, or other delivery services such as DoorDash.

Market dynamics mean that such companies, though they will not return dividends to investors any time soon, may well increase investors' returns in the short-to-medium term as they grow (Brown and Wiles, 2020), and so growth becomes a proxy for value (Hogarth, 2017). Whether such market dynamics are clearly distinct from bubbles in past markets is less clear (Gornall and Strebulaev, 2020). Some commentators have drawn analogies with the 19th century railway boom in Britain, when companies competed to build a railway network that in itself was valuable, but which bankrupted most of the rail

infrastructure companies (Knee, 2021). It may be that the financial conditions allowing investors to pour money into blitzscaling companies that don't make money include the historically low interest rates that followed the financial crisis of 2007–8. As interest rates look likely to rise in the 2020s, capital may be placed more cautiously in the near future.

At this point, I should add that there have also been attempts to revitalise the traditional supply-and-demand model of creating exchange value in scarcity, via *non-fungible tokens* (NFTs). Whereas digital objects are indefinitely reproducible and therefore abundant non-rival goods, NFTs are blockchain-authenticated certificates of ownership of digital items, which are therefore rendered unique, and via the blockchain transparent (Wilson *et al.*, 2021). NFTs have been sold, on the back of early hype, for eye-popping amounts of money, and may be a means of developing markets in digital art, for example (Kugler, 2021). Whether NFTs have a future as a major type of digital asset is another question (although there are other hypothesised roles for them, such as a means to security for the IoT – Arcenegui *et al.*, 2020; Omar and Basir, 2020).

However that may be, the capitalist element is clearly important for the new abundance of data, which is needed, on the digital modernity narrative, to secure the potential of the technology. There are many issues concerning privacy, confidentiality and other concerns with sharing and amalgamating data, as well as shabby practices and plain abuses, such as the Facebook/Cambridge Analytica scandal of 2018, in which data was collected, processed and used for political advertising without data subjects' consent (Bömelburg and Gassmann, 2021; Venturini and Rogers, 2019). This has led to various campaigns in which senior academics and technologists (sometimes from the private sector) have tried to promote individuals' control of their data, under lofty-sounding banners such as *The Web We Want*,[3] *The New Deal on Data* (Pentland, 2014, 180–182), or the Onlife Manifesto (The Onlife Initiative, 2015). The latter, for example, suggests that individuals have the rights to possess data about them, to full control over its use, and to distribute it or dispose of it.

[3] https://webwewant.org/.

The problems of this position are threefold. In the first place, the required changes in the law are not within the campaigners' gift, so at a minimum these can only be lobbying efforts. Secondly, there is little evidence that many individuals care very much about such issues, with few people quitting Facebook after the Cambridge Analytica scandal despite a high profile campaign to get people to do just that (Afriat *et al.*, 2021; Brown, 2020; Hinds *et al.*, 2020).

Thirdly, most importantly, if large numbers of individuals did care and had such rights, there would be a serious chance that those rights would be exercised. This would decrease the value of the data for the companies currently collecting it, because (a) they may not be allowed to extract value via analysis or selling it, and (b) it might actually be donated free or cheaply by data subjects to their competitors. Since the capture and curation of data is a cost, there is a danger that in that case free services would no longer be provided, and/or that data, even if it was collected because it was required for service provision or auditing, might not be kept, and might instead simply be discarded. Why should a company bother to collect data that it could not be confident that it would be able to monetise? The promise of data, we are told, is its abundance, but it still has to be collected and curated by a company at a cost to itself, while the proposed rights remove the associated income stream. It is presumably no coincidence that the supply of data increased dramatically when the tech giants found ways to monetise it. Furthermore, individual data subjects, even if they allowed data to be collected about them at all, might simply hoard it, rather than distribute it to deserving projects. The result, then, could – in the event of high uptake of such rights – be a diminution of the quantity (and quality) of data available, and ultimately a decrease in the potential of digital modernity. The assumption that such rights could make digital modernity more privacy-protective depends crucially on the extra assumption that digital modernity itself does not depend on the rights' absence. If the quantity and quality of data is to be assured under this scenario, either the companies running the digital infrastructure would need another form of compensation, or the infrastructure would need to be put into public hands (which may be problematic in itself, partly because governments are not very entrepreneurial, and partly

because the state's misusing information would be far more serious than private enterprise). This is another version of Glaucon's dilemma (Section 7.3).

Approaches that see digital modernity as a variant of capitalism, with few exceptions, are highly critical of capitalism as a system. However, with even fewer exceptions, they offer neither serious alternatives capable of avoiding Glaucon's dilemma, nor constructive suggestions as to how to reform the system acceptably. This point also applies to the critical approaches I will look at briefly in the next section.

9.2.5 Critical Approaches

Engineers aim to employ their technical skills for human benefit. However, the benefits are often underspecified. Allowing networks to flourish at scale, lowering barriers to participation, so that individuals and communities can communicate and collaborate inclusively (Mossberger *et al.*, 2008) is generally taken for a good. Harms are expected, such as cybercrime and invasions of privacy, but they may also be open to technological intervention. In the context of digital modernity, in each dimension the perspective of the engineer dominates. On the temporal dimension, the aim of developers is disruption; they decide what to disrupt and how (whether they succeed or not, of course, is not in their gift). On the spatial dimension, the aim is control, to maximise and distribute the benefits.

Critical approaches address this optimistic and self-serving view, for example looking at inequalities and uneven access to technology. Methodologically, there are many ways of doing this, usually pitching digital modernity as perpetuating certain structural flaws or inequalities in different ways. For instance, the theory of social construction of technology (Bijker *et al.*, 1987) sees technologies as having contested meanings in complex social contexts. Even if these tend towards a dominant consensus over time (about what the technology means and does, whether it was successful or a failure, what problem(s) it was meant to solve, and who was supposed to benefit), the consensus is always under challenge from new or newly-empowered groups, which spark fresh debate and conflict. On this reading, digital modernity is a

record of a consensus among certain elite groups, always open to fresh contestation (Kretchmer, 2018).

Classification theory considers the citizen as a subject whose relation to the state and other authorities is mediated by sociotechnical infrastructure (Bowker and Star, 1999; Kitchin, 2014; Scott, 1998). Understanding the nature of these relations, and the assumptions encoded into the technology, helps to place the citizen within this nexus (Hjelholt and Schou, 2018). For example, the nature of the citizen/avatar in a smart city is strongly connected with how the narrative of digital modernity plays out.

A third theory sees digital modernity as an arena of recognition for individuals, communities and their concerns, a set of interactions with others mediated by technology. When recognition and respect are struggled for and realised, individuals achieve self-confidence, self-respect and self-esteem (Honneth, 2005). The importance of recognition emerged in Hegel's *Phenomenology of Spirit* (Brandom, 2019, 235–312), and it was also the basis of Francis Fukuyama's premature claims of the triumph of liberal democracy in *The End of History*. Such a view would involve looking at digital modernity in the context of its support or otherwise for intimate relationships, individuals' legal rights, and the community values affecting how positively individuals are viewed; as we have seen, narratives of digital modernity have been both positive and negative in these respects. This may be a useful explanatory conception to describe and address digital divides for example (Klinkisch and Suphan, 2018).

Or digital modernity could be seen as "an undemocratic, colonial and exclusive model of the information society produced by a discriminatory Western modernity project" resulting in the privileging of colonising European languages and interests over those of the global South, "a product of a conscious logic of coloniality, marginalization, exclusion, and digital apartheid by the West" (Moyo, 2018, 143). This can be remedied by

> democratizing [the Internet] beyond its neo-liberal character by confronting its various colonialities [and] re-conceptualizing it as a truly autonomous space for many languages,

> cultures, identities, and knowledges. . . . European languages must stand side-by-side with languages from the border. This is already happening with languages like Mandarin in China and Korean/Hangul in Korea. This kind of information society is not top down, divisive, and colonially structured, but truly democratic, decolonized, multicultural and lateral.
>
> (Moyo, 2018, 143)

The remedy would require

> redistribution of the ownership of the fixed infrastructure of the Internet as well as a reimagining of the ways in which information and data are organized online. . . . [T]here is a philosophy of praxis at play here: that being, that in order to improve digital inequalities, it is necessary to transform the practice of Internet infrastructure planning and development to match a more just philosophy of anti-capitalist and anti-colonial social processes.
>
> (Haffner, 2018, 114)

The problems with these anti-colonial calls to arms are twofold. First, the preponderance of languages such as English, Spanish and French online is a result of there being more speakers of those languages than of, say, Hausa or Tagalog, and the Internet is a democratic medium where links are made according to people's interests. Furthermore, more valuable networks connect heterogeneous people, and they are more likely to be able to communicate with a *lingua franca*, than a language spoken by a relatively small and homogeneous community. It may be regrettable that minority languages are edged out, and it may be desirable to do something about it (Cunliffe and Herring, 2005), but how exactly to do it while retaining the Internet's fundamental operating principle of democratic bottom-up construction of links is left entirely unexamined.

Second, the mere fact of redistributing infrastructure will not solve the problems cited unless there are other changes made to their operation. But then, yet again, we walk into Glaucon's dilemma (Section 7.3): there is no means of guaranteeing that we can reproduce the benefits

of the old system if we excise its costs, and no evidence that any other system than multistakeholder governance in a capitalist and democratic context can provide those benefits.

Critical theory, after calling for an alternative, leaves the issue of exactly how to implement it hanging in the air. At some point, it will be necessary to think about how to integrate abstract models with specific case descriptions, and how to incorporate experiences from the user community and other affected groups with the developers' work. Development needs to be teleological, reflective and pluralistic, certainly (Hirsch Hadorn *et al.*, 2008; O'Hara and Hall, 2010, Poser, 2013). Such aims will tend to cut the link between innovation and disruption, as their whole point is to ease the introduction of technology with as little friction with existing society as possible; on the temporal dimension, reflective practice will be conservative. Similarly, an insistence on pluralism will reduce engineers' ability to exert control. Hence, if these values can be inserted into engineering practice, the narrative of digital modernity will be diluted.

However, critical approaches struggle with each of these aims. Critical theory is critical not just of technology, but of wider society; disruption of capitalist liberal democracy as a whole is often its goal, and it is highly antipathetic to conservative forces. It resists "the market" and other decentralised resource allocation mechanisms. Critical theorists tend to support equality of access and outcome, oppose consumerism and social conformity, and so on, yet without exerting the control they profess not to want with power they wish to abolish, they risk outcomes that would be the opposite of those they seek. Even if it were possible to redistribute the ambient infrastructure as they suggest away from capitalist companies and towards unspecified but democratic institutions, it is not clear that critical theorists have much desire to challenge the basic principles of the digital modernity narrative (Mason, 2013; Williams and Srnicek, 2019). They may wish to disrupt different things and to achieve different outcomes, but disruption and control are precisely what they argue for, and would implement if they had the power to do so.

9.2.6 Engineering Ideologies

The ideologies governing digital modernity help evaluate the Internet, the role it is allowed to play with respect to society and commerce, the amount of regulation and the mix of public and private enterprise and investment in the technology. These interact in complex ways, affecting the reach and effectiveness of the data analysis infrastructure (Bratton, 2015, 10–11; Mac Síthigh, 2021), and are held by a range of actors of varying influence, including technologists, telecommunications companies, Internet governance organisations, businesses, advertisers, security agencies, criminals, the military and states (Ball, 2020), as well as the billions of users from whom the network is emergent.

Most narratives of digital modernity focus particularly on a Silicon Valley-type boosterism about technology as a liberator and data as free-flowing, whether they support or critique it. However, the *Silicon Valley Open Internet* (O'Hara and Hall, 2021, 51–58) is only one model of Internet governance, though influential (a) because it was historically the first to arrive, and (b) because it took some time for governments to work out how to impose their will on cyberspace (Bill Clinton famously but incorrectly suggested that trying to control the Internet would be like "nailing Jello to a wall"). However, there are other models, depending on how governments intervene to suppress, constrain or foster private activity, shown in Figure 9.1.

In Europe, a strong concern with human rights, especially privacy, and other rights such as copyright, have resulted in a complex but globally-influential regime in which the General Data Protection Regulation interacts with the creation of big datasets, where even privacy-protecting processes such as anonymisation are regarded as data processing, and are therefore highly regulated (Bradford, 2020; O'Hara, in press; O'Hara and Hall, 2021, 88–91). This may complicate the creation of big datasets (Bonatti and Kirrane, 2019; Lee, 2018; Zarsky, 2017), and possibly handicap the development of the inferential tools that drive narratives of digital modernity. In their geopolitical survey of digital modernity, O'Hara and Hall call this the *Brussels Bourgeois Internet* (O'Hara and Hall, 2021, 77–91).

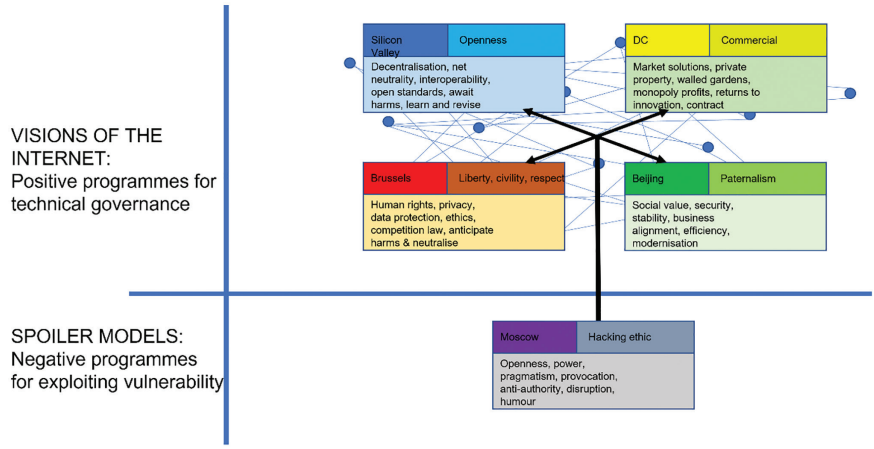

Figure 9.1: Four visions of the Internet and a spoiler.
Source: O'Hara and Hall (2021, 68, Figure II.1).

At the other end of the spectrum, Chinese data collection and AI have been transformed by the activities of vertically-integrated apps (so-called super-apps) such as WeChat for instant messaging, social media and payments, and tech giants such as Tencent (which owns WeChat), Alibaba and Baidu. These are ubiquitous, enabling the creation of data troves within these organisations suitable for ML analysis (Lee, 2018). However, Chinese business has always had to adapt to the requirements of the Communist Party government of China (Jiang and Fu, 2018; O'Hara and Hall, 2021, 134–135; Zhang, 2020b), which has made it its business to secure access, when needed, to any information about Chinese people it may find useful (Lehr, 2019, 169–179, Qiang, 2019), and in 2020 began to press Chinese IT businesses to cleave to its line (O'Hara and Hall, 2021, 135). Government access to the enormous data troves of the private tech giants is rendered easier by laws that ensure that data concerning Chinese people is stored on Chinese territory (Chander and Lê, 2015; Daskal and Sherman, 2020; O'Hara and Hall, 2021, 200–203). Data already available to the government, including from face recognition technology and special-purpose human and machine surveillance, has been used to create a surveillance state in Xinjiang

province (Leibold, 2020), while its mooted social credit system has in effect gamified social control, and government through voluntary obedience and self-censorship (Mac Síthigh, 2021, 212–216; Zhang, 2020a). Hence on the Chinese model, while data creation is outsourced across an oligopoly of tech giants, the government can get at it relatively quickly and easily. O'Hara and Hall call this model, which will serve as a template for authoritarian control, the *Beijing Paternal Internet* (O'Hara and Hall, 2021, 125–144).

At an intermediate point on the spectrum is the United States, where what O'Hara and Hall call the *DC Commercial Internet* (O'Hara and Hall, 2021, 103–116) facilitates the regulation of cyberspace as property. The US government is both strongly restrained by the Constitution from using the Internet as a means of getting data about American citizens, while, via the Supreme Court's influence and its own dominance of Internet governance institutions, is highly influential on the global Internet's structures and form (and of course, the National Security Agency can hoover up data about foreigners to its heart's content through mass surveillance). The system allows large companies to create vertically-integrated walled gardens, but interoperability across the gardens is minimal. Amalgamation happens rather through mergers and acquisitions, such as Facebook's acquisitions of messaging app WhatsApp and photo-sharing network Instagram (Kumar, 2019, 235–241, 321–327).

Finally, as related in Section 8.2, there is a hacking culture or ethic that aims to undermine but not destroy the Internet, which has been called the *Moscow Spoiler Model* (O'Hara and Hall, 2021, 154–172). This is not a vision for the Internet, but needs an Internet to be parasitic on; its aim is to use the functionality of the Internet against itself. Russia has also experimented with cutting off its Internet (the RuNet) entirely from the rest, although this appears to be unfeasible for a number of reasons (O'Hara and Hall, 2021, 173–176).

These ideologies may spread in various ways across the globe. India's Internet has the largest room to grow, and its development will be influential (O'Hara and Hall, 2021, 183–199). It is likely to take elements from all the above models, although under Prime Minister Modi it is looking more authoritarian on the Chinese model than anything else,

with closures of the Internet and beefed-up surveillance laws. China itself is exporting its paternal vision along with its technology in its Belt and Road Initiative (Ginsburg, 2021; O'Hara and Hall, 2021, 143–144). There has been a concerted effort to take control of the Internet further away from the US and lodge it with the International Telecommunication Union (ITU), a UN agency whose current (2022) Secretary General is Chinese (Bader, 2019; Glen, 2014; Negro, 2020). If this effort succeeds, it is likely to have the effect of sidelining companies, engineers and civil society groups, and increasing the already loud voice of governments, especially authoritarian ones. It would be likely to make Internet communications more traceable and less anonymous as government surveillance is enabled.

More nuanced narratives of digital modernity go beyond the Silicon Valley Open Internet to consider the roles of other countries, China in particular. And clearly the rise of the Internet as a component of lives across the planet has affected the capabilities of the state in a range of ways. However, the Four Internets model implies a certain resilience of the Westphalian state, at a time at which we are seeing the retreat of globalisation in the face of the rise of what has been called the *civilizational state* (Coker, 2019), the state as a representative of a complex society with a powerful identity sustained through centuries of history (e.g., China, Russia, Turkey, India, Egypt, Iran, as well as the US and arguably the EU, France and the UK). Such civilizations are more naturally organised around ideology than territory. It may well be that the Internet, by fostering public opinion, has helped this process. Bratton writes of the affordances of the Internet in creating new territorialities for geopolitical entities, or indeed a new geopolitics (Bratton, 2015, 34–40), but the radical effects that he highlighted are arguably subsumed by a powerful assertion of sovereignty by traditional entities. Yes, there is a new interaction between the local, the national and the global, but – despite the obsequies for the nation state having been written over and again – the national remains *primus inter pares*. Civilizational states perhaps need less democratic, strongman leaders, perhaps with Weberian levels of charisma, and Bratton cites Carl Schmitt's theory of the sovereign as "he who decides on the exception" (Bratton, 2015, 23–31). As such, there is a threat to the global liberal order, but whether

states like China and Russia would ever have cooperated with it fully is unclear.

Political and geopolitical developments at the time of writing, including the paralysing polarisation in American politics, Brexit, after which the UK government has pondered altering GDPR, the trade dispute between the US and China that is disrupting global technological supply chains, and the unprovoked invasion of Ukraine by an emboldened Russia are likely to exacerbate these ideological differences, and undermine visions of a single integrated cyberspace or metaverse. Whether the Internet will fragment entirely is perhaps unlikely, but it is likely to get harder for data to pass across its infrastructure.

9.3 A Note on Western-Centrism

Consideration of the global range of engineering ideologies reminds us that most accounts of digital modernity and related ideas are developed with the Western democracies in mind, using them as empirical bases, and their symbolic space as canonical for the global information space. This is an error for a number of reasons, most obviously because the Internet and Web are not only governed by representatives of international governments, companies and civil society representatives, but they are networks whose shape and existence are emergent from the people who join and make links (O'Hara and Hall, 2021, and Section 9.2.6). Certainly the numbers of users in the US, Europe, Australia and New Zealand, Japan and so forth are high and influential, but when one considers firstly that nations such as India and Russia (Pomerantsev, 2019; Soldatov and Borogan, 2015) also bring a lot of users and have strong views about Internet governance, and secondly that as the Internet grows it will of necessity grow mostly in hitherto neglected areas such as sub-Saharan Africa (Arora, 2019), it is clear that digital modernity is likely to morph as it evolves.

Most obviously, China, which contains the highest number of Internet users, is becoming a powerful influence with its innovative commercial companies, its expertise in areas from AI to surveillance (Lee, 2018; Qiang, 2019), its attempts to insulate its own Internet from foreign intervention (Griffiths, 2019), and the Belt and Road Initiative. As its

own version of the metaverse develops, it focuses on the need for risk countermeasures to be "deployed in advance" (The Economist, 2022). While its private sector is the motor for innovation, the price of working in China in the age of Xi Jinping is that companies need to align their principles, behaviour, communications and products with the goals of the Communist Party (Liu, 2022; O'Hara and Hall, 2021, 132–133). Failure to do that to the satisfaction of the government led to a costly crackdown on the industry in 2020–22 and the withdrawal of Chinese firms from international stock exchanges (Mark, 2021; Pearson *et al.*, 2021; Ye, 2022).

The styles of Internet governance favoured by different nations will affect both the common information space that is the Internet, and the relationships between the various networks of which it is made up. Western democracies, particularly the US, built the Internet, but its ongoing development will depend on various struggles over standards, including the unbelievably misguided attempts to bring Internet governance under the administration of the ITU. Digital modernity – which as argued earlier seems to have a more global character than other species of modernity, at least at the time of writing in 2022 – cannot be understood as settled in those nations. The contributions of other nations, and particularly emergent markets and the global South, will be important to understand.

Data, the central resource for digital modernity, is distributed unevenly. This is a factor within countries, as richer people tend to leave richer data trails because of their deeper engagement with technology, while the data trails left by the poorest may well be biased in the direction of their dealings with welfare agencies (Coles-Kemp *et al.*, 2019; Eubanks, 2019). It is also a factor between countries, as poorer nations lack infrastructure, skills and scale to gather much data, and the institutional resources to regulate it and build trust (World Bank, 2021). For instance, sub-Saharan African nations' welfare services struggled to identify their poorest citizens during the COVID-19 pandemic because they simply had not been able to afford effective data collection and retrieval prior to the emergency (Gelb and Mukherjee, 2020; Rogger and Somani, 2018), and Internet penetration levels were some of the lowest in the world (Granguillhome Ochoa *et al.*, 2022). The government of

Togo was unusually creative (Blumenstock, 2021), exploiting sources such as satellite imagery to identify poor communities based on population density and activity (Yeh *et al.*, 2020), and mobile phone data to assess consumption patterns (Aiken *et al.*, 2021; Bahia *et al.*, 2021). Like the technology and the data underlying it, digital modernity itself is unevenly distributed, and the European and American experiences don't translate easily to those parts of the world from which the Internet's future growth must be expected.

Joseph Henrich, in his discussion of the historically-based peculiarity of WEIRD (white, educated, industrialised, rich and democratic) communities, sees the WEIRD as individualistic, control-oriented and analytical, a profile that maps partially onto human and machine capabilities (Henrich, 2020). Recall the discussion of the digital body politic from Section 6.1, and the brain whose different hemispheric capacities inspire different views of culture and the world, which can fall out of balance to create social disutility (McGilchrist, 2019). It is arguable on this sort of account (which may itself be taken as another kind of myth) that the Western bias of digital modernity narratives privileges the abstraction-oriented left hemisphere, and a rebalance to other kinds of reasoning is required.

None of this is to say, however, that any future Internet will or should usher in a global common information space, whether through globalisation, cosmopolitanism or neocolonialism. Language remains a divider, even as technology enables more effective search that is less dependent on specific linguistic forms. We can expect localisation of technologies, behaviour, business models and much else. Indeed, many governments now resort to shutting the Internet down temporarily at least, while Russia, North Korea and Iran have experimented with various versions of a sovereign Internet. The point here is that the digital modernity narrative has tended (like most narratives) to emerge from sources in Western democracies, and to be influenced by these more than other forms of governance. Given the preponderance of Western influence on the development of technology, this helps make the digital modernity narrative predictive, and Western-centric at the same time. Whether it is an ideal situation is a moot point, certainly doubted by many. But narratives which attempt to decolonialise the Internet

tend to focus on, even revel in, resistance and activism, rather than engineering solutions, getting things done, and building an ecosystem in which technology becomes self-sustaining (e.g., Bidwell, 2016; Moyo, 2018) – not an oversight that one would find Apple or Microsoft guilty of, so much so that some argue that development must slow (Schia, 2018). Glaucon's dilemma will always be present.

10

Conclusion

The transition from analogue to digital modernity can be seen as a progression, although certain aspects of digital modernity (such as the surprising reappearance of magic and the disappearance of privacy) hark back to the pre-modern. With tongue in cheek, we can capture the progression, as well as the reappraisal of older traditions, in the following example of altering interpretations and attitudes.

- **Pre-modernity:** St Nicholas' practice of secret gift-giving, even if legendary, is a template for doing good without creating obligations for the receiver, or placing him or her in the position of accepting charity, and therefore it expresses piety (in the sense of respect for our moral responsibilities) and solidarity (social responsibilities and fellow-feeling).
- **Modernity:** There ain't no Santa Claus.
- **Digital modernity:** From information about your previous behaviour and the behaviour of others like you, here is a ranked list of the presents that you would like to receive, and a link to this list will be disseminated across your social network.

The narrative of digital modernity has adapted narratives of modernity to a world shaped by an ambient data infrastructure. It has both continuities and discontinuities with analogue modernity, which valorised ICT but not at such scale, with less of a focus on ubiquitous data. Through the course of this monograph, we saw the characteristics of digital modernity unscroll, via some perhaps surprising principles.

(1) The quantity of data being produced in the world has enabled, and been enabled by, technological, social, economic and cultural change, and as such is a marker of a qualitative change in modernity (Section 3.4).

(2) Digital modernity is a subjunctive world in which reflexivity and choice are outsourced to the ambient data infrastructure (Section 4.1).

(3) Since personalisation replaces choice in digital modernity, and since effective personalisation demands knowledge about the individual on the part of the personalised service provider, privacy is now an obstacle to the delivery of digital modernity (Section 4.2).

(4) To exist is to be backward (Section 5.2).

(5) In digital modernity, the best that hapless reality can achieve is to get closer to the perfection of the algorithm and the data (Section 6.1).

This world can be seen either positively or negatively, as well as either a conservative development of human nature and society, or a major turning point which will change humanity forever (the singularity). It depends on the increasing spread of data-driven technology, which is currently in a productive cycle, in that each application of data technology creates more data and a richer set of resources for the technology to work on. The disruptive aspects of digital modernity mean that more and more offline activities, practices and institutions are forced online, creating even more data.

Digital modernity also received the mother of all exogenous pushes when the COVID-19 pandemic made offline interaction riskier, and

often illegal, accelerating the migration online (indeed, the development of e-commerce in Eastern Asia was kick-started in the first place by the smaller-scale disruption of the SARS epidemic of 2002–04). And with the quantity of data created and the increased amount of processing required, the cloud, or more accurately clouds, are only going to grow in the medium term – especially given the successes, failures and potential of the ambient data infrastructure in combating COVID-19 itself, for example in data science (Dayan *et al.*, 2021; Podder *et al.*, 2021), epidemiology (Khakharia *et al.*, 2021; Rahimi *et al.*, 2021), tracking and tracing (Abbas and Michael, 2020), and monitoring public attitudes (Perrotta *et al.*, 2021; Zhang *et al.*, 2022). Of course, it was also used for misinformation (Brennen *et al.*, 2020; Shahi *et al.*, 2021).

Digital modernity therefore is a powerful narrative going forward into the post-COVID world. It also comes in various flavours, depending how business-friendly it is, how nationalistic, how respectful of human rights, and so on. That is not to say that is cannot be resisted globally or adapted locally, only that, given its support from policymakers and innovators, it is likely to be the backdrop of social, economic and geopolitical interaction for the foreseeable future.

Envoi: Soft Despotism or Deft Soporifics?

It is, however, a development that had been anticipated, not 30 years before the Web but 150. Alexis de Tocqueville voyaged from France to America in order to discover the politics and sociology of the new democratic world, which he thought anticipated the future of Europe. In 1840, he wrote the following account of what he called "soft despotism", the complex steering of people by rules and norms that became possible once they, as individuals, were detached (or, as liberal theory would have it, liberated) from contingent and non-chosen social groups – families, neighbourhoods, tribes, guilds, religions, nations – and became equal cosmopolitans situated (but not immersed) in democratic communities of similarly liberated souls.

Even though it pre-dated the invention of the World Wide Web by a century and a half, it is eerily reminiscent of the lives we lead today, compulsively scrolling our smartphones.

> I wish to imagine under what new features despotism might appear in the world: I see an innumerable crowd of men, all alike and equal, turned in upon themselves in a restless search for those petty, vulgar pleasures with which they fill their souls. Each of them, living apart, is almost unaware of the destiny of all the rest. His children and personal friends are for him the whole of the human race; as for the remainder of his fellow citizens, he stands alongside them but does not

see them; he touches them without feeling them; he exists only in himself and for himself; if he still retains his family circle, at any rate he may be said to have lost his country.

Above these men stands an immense and protective power which alone is responsible for looking after their enjoyments and watching over their destiny. It is absolute, meticulous, ordered, provident, and kindly disposed. It would be like a fatherly authority, if, fatherlike, its aim were to prepare men for manhood, but it seeks only to keep them in perpetual childhood; it prefers its citizens to enjoy themselves provided they have only enjoyment in mind. It works readily for their happiness but it wishes to be the only provider and judge of it. It provides their security, anticipates and guarantees their needs, supplies their pleasures, directs their principal concerns, manages their industry, regulates their estates, divides their inheritances. Why can it not remove from them entirely the bother of thinking and the troubles of life?

Thus, it reduces daily the value and frequency of the exercise of free choice; it restricts the activity of free will within a narrower range and gradually removes autonomy itself from each citizen. Equality has prepared men for all this, inclining them to tolerate all these things and often even to see them as a blessing.

Thus, the ruling power, having taken each citizen one by one into its powerful grasp and having molded him to its own liking, spreads its arms over the whole of society, covering the surface of social life with a network of petty, complicated, detailed, and uniform rules through which even the most original minds and the most energetic of spirits cannot reach the light in order to rise above the crowd. It does not break men's wills but it does soften, bend, and control them; rarely does it force men to act but it constantly opposes what actions they perform; it does not destroy the start of anything but it stands in its way; it does not tyrannize but it inhibits, represses, drains, snuffs out, dulls so much effort

> that finally it reduces each nation to nothing more than a flock of timid and hardworking animals with the government as shepherd.
>
> (de Tocqueville, 2003, 805–806)

This remarkable passage evokes not only the social world that we see unfolding around us, described by such titles as *Alone Together*, but also the subjunctive world where our preferences are not judged, but anticipated and catered for in all areas of life. The second paragraph might have been downloaded without editing from Mark Zuckerberg's brain.

Tocqueville's account misses a few things. First, he assumed that soft despotism needed centralised control that would be governmental (although his term "ruling power" does not necessarily imply the state); he did not see that competition between walled gardens could produce the same effects, rather more effectively. However, he was remarkably accurate in understanding that the ruling power would be totalising, "the only provider and judge" of people's happiness such that the range of free will would be reduced daily. Second, he assumed that the suppression of autonomous and authentic activity by people would be achieved by detailed rules, which is only part of the story; the complexity of digitally modern life is also aggravated by its disruptive nature, which makes it decreasingly legible to netizens. Every time we think we have learned a new type of behaviour or skill, the whole activity is disrupted once more to create new apps and ways of doing things. We spend so much of our lives either ascending learning curves, or being denied experiences because we don't have access to the relevant app. Third, although the account does not rule this out, it pays no heed to the ruling power having an immense knowledge of its citizens. The account is not about knowledge and surveillance of the citizens, but what they are prepared to put up with as atomic individuals of equal status. Finally, digital modernity has unfolded differently in different jurisdictions – in a commercial/capitalist context in the US, a human rights setting in Europe, in an authoritarian way in China, a global variation which Tocqueville doesn't address.

Democracy in America, written a generation or two after the French Revolution, was not hostile to democracy, but espoused a quasi-determinism that it would take us to this end-point if we were not careful. He wrote of "the pressure of a kind of religious terror exercised upon the soul of the author by the sight of this irresistible revolution" (de Tocqueville, 2003, 15) and called for "a new political science . . . needed for a totally new world" (de Tocqueville, 2003, 16) to educate, purify and adapt modernity to serve our purposes, not its. His worry that "positioned as we are in the middle of a rapid stream, we stare fixedly at a few ruins we can still see on the shore as the current drags us away backward toward the abyss" (de Tocqueville, 2003, 16) anticipates Benjamins' Angel of History (Section 5.3), of exactly a century later.

It is extraordinary to note how accurately (in sum if not in detail) Tocqueville read the unfolding transition from pre-modernity to modernity. This should remind us that the events and structures we experience are relatively new and fleeting, but underlain by social structures and forces extending over centuries. Smartphones and social media, while they inherit assumptions generated across many generations and parts of the world, have been with us for a few years only. The chances that we have reached a final stage, that modernity might reach an eschatological climax that just happens to culminate in the metaverse, iPhone 13 Pros, TikTok and *Hitman 3*, are pretty slim. Our narratives will change, partly driving, partly driven by, innovation. We should beware of pronouncing the end of history.

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