Part I

Computational Legalism and the Rule(s) of Code

2

A Design Perspective: Code is *More* than Law

> The swift effectiveness of a technological code, which cannot, when seen through legal eyes, appear as anything other than uncanny, renders any possible competition between law and computer pointless.[1]

This chapter sets out how code has a direct, concrete effect on the behaviour of end-users, viewed from the perspective of design theory and the philosophy of technology. I pick up this contribution later in Chapter 6 where I use these same concepts to set out the framework of digisprudential affordances. Engagement with these theories in the legal literature is minimal; the tendency so far has been to treat design only in the abstract, without a concerted engagement with the theory on what things actually do, and how they do it. Without that, the legal view of technology is limited to that of an outside observer, rather than one that can engage with the material processes of production from which the effects of code ultimately flow. As I suggested in Chapter 1, and will consider again in Chapter 5, a focus on production is critical if the aspiration of computational legitimacy is to be realised.

Throughout the book I refer to the concept of 'technological normativity'. Borrowed from Hildebrandt,[2] the term usefully implies a contrast between code's normativity and the legal normativity that lawyers are more familiar with.[3] Her definition of it is also closely linked to the theory of affordance, which I explore in detail below. Technological normativity is 'the way a particular technological device or infrastructure actually constrains human actions, inviting or enforcing, inhibiting or prohibiting types of behaviour'.[4]

[1] C Vismann and M Krajewski, 'Computer juridisms' (2007) *Grey Room* 90, 93.

[2] M Hildebrandt, 'Legal and technological normativity: more (and less) than twin sisters' (2008) 12 *Techné: Research in Philosophy and Technology* 169.

[3] On the latter, see N MacCormick, *Institutions of Law: An Essay in Legal Theory* (Oxford University Press 2007) part 1.

[4] Hildebrandt, 'Legal and technological normativity' (n 2) 173.

These effects can be intentionally or unintentionally imposed by the designer, and can be an immediate or emerging characteristic of the code she creates.

The bulk of this chapter sets out three primary and interconnected theories: affordance, inscription, and the theory of technological mediation. Taken together, they provide us with the conceptual tools to consider the ways in which an artefact's design constitutes and delimits its user's possibilities for action. We can then appreciate the same issue from a normative standpoint, considering how, in the process of producing code, one might consciously embody those possibilities, aiming towards the goal of producing legitimate normative architectures. That will be the topic of Part III of the book.

2.1 Affordance

The facilitation by an artefact's design of a particular action or behaviour for a particular individual is known as an 'affordance'. The concept was originally developed in the late 1960s by Gibson, a perceptual psychologist, who defined affordances collectively as what an artefact '*offers* the animal, what it *provides* or *furnishes*, either for good or ill'.[5] The theory of affordance was developed and introduced into the design sphere by Norman, who defines the concept as 'a relationship between the properties of an object and the capabilities of the agent that determine just how the object could possibly be used'.[6] A common representation of the concept of affordance compares two doors, one with a panel for pushing, and another with a handle that can be pulled (Figure 2.1).[7]

All things being equal, the door on the left can only be pushed – that is, it only affords pushing – because there is no part of it that affords pulling (unless one manages to grip the edges of the panel). The handle on the door on the right affords both pulling and pushing – the ability to grasp it readily enables the individual to pull the door towards her (assuming of course that the door's hinges themselves afford pulling in that direction). The door on the right has at least two affordances for a non-disabled person: one of pulling, and another of pushing. (For a disabled person, it might be that neither door affords pulling or pushing, highlighting the contingent relationality of affordance, discussed next.)

[5] JJ Gibson, *The Ecological Approach to Visual Perception* (classic edn, Psychology Press 2015) 119 (emphasis supplied). For a valuable discussion of the ecological foundations of affordance theory, see M Heras-Escribano, *The Philosophy of Affordances* (Springer 2019) chapter 2.

[6] DA Norman, *The Design of Everyday Things* (MIT Press 2013) 11.

[7] Norman discusses this ibid. 15. See also W Hartzog, *Privacy's Blueprint: The Battle to Control the Design of New Technologies* (Harvard University Press 2018) 13.

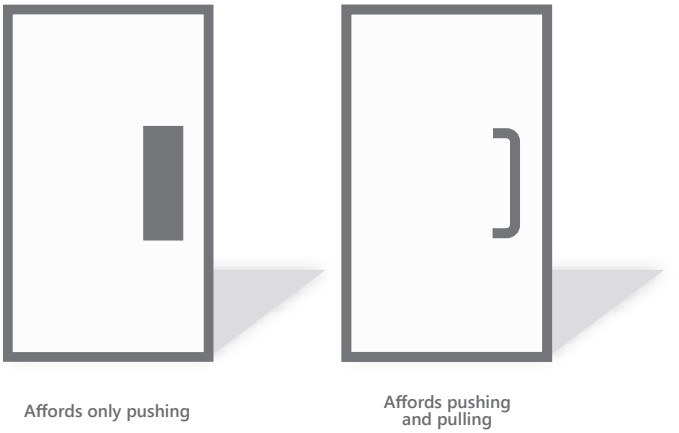

Figure 2.1 Affordances of pushing and pulling

Individual affordances can be both positive and negative, which is to say beneficial and injurious to the individual, each to varying degrees. Gibson seeks to avoid the value judgements suggested by the terms 'positive' and 'negative', stating instead that such descriptions can be applied objectively if their meanings are 'pinned down to biological and behavioral facts'.[8] So, for example, a fire can afford the warmth that is necessary to life, but it can also afford burning, which can mean injury, and potentially death.[9] The extent of the benefit or injury will depend on the organism in question. Crucially, then, affordances are not objective physical properties of the artefact, but rather they arise through the relationship between it and a particular individual, as governed by those properties. Gibson illustrates this relationship through the examination of a hypothetical walking surface:

> Note that the four properties listed – horizontal, flat, extended, and rigid – would be *physical* properties of a surface if they were measured with the scales and standard units used in physics. As an affordance of support for a species of animal, however, they have to be measured *relative to the animal*. They are unique for that animal. They are not just abstract physical properties. They have unity relative to the posture and behavior of the animal being considered. So an affordance cannot be measured as we measure in physics.[10]

[8] Gibson (n 5) 129.
[9] Ibid. 128–9.
[10] Ibid. 120 (emphasis supplied).

A surface that affords support to a domestic cat (that is, it is 'stand-on-able'[11]) may or may not afford the same to an adult elephant; the particular mix of physical properties and the size and weight of both animals will determine which use-possibilities are afforded to each. It can be seen then how the concept of affordance highlights the inherent and simultaneous objectivity and subjectivity of an artefact's potential effects in the world. As Norman puts it,

> [t]he presence of an affordance is jointly determined by the qualities of the object and the abilities of the agent that is interacting . . . We are used to thinking that properties are associated with objects. But affordance is not a property. An affordance is a relationship. Whether an affordance exists depends on the properties of both the object and the agent.[12]

With these definitions in mind, one can appreciate that designers must include the necessary properties in the artefact in order for the desired relationship between it and the intended end-user to arise. This is inevitably a contingent exercise: the designer cannot anticipate the properties of every conceivable end-user. Nevertheless, a central aspect of the design enterprise is imagining certain classes of end-user to whom the process will be oriented, the properties of those proxies implying the properties that the code must have in order to bring about the affordance relationships the designer wishes there to be.[13] The interfaces of products are built around this central notion, translating the state of the underlying code that the designer wishes the end-user to see into some form that is likely to make sense to her.

(a) Real and Perceived Affordance

Importantly, an affordance need not be perceived to exist; it is a fact about how the properties of the artefact and the organism relate to one another.[14] Affordances are potentials that may not be within the organism's awareness and may never be realised, but nevertheless the relationship is always present and ready to be acted upon for as long as the properties necessary for it are extant in both the artefact and the organism.[15]

[11] Ibid. 119.

[12] Norman, *The Design of Everyday Things* (n 6) 11.

[13] JR Maier and GM Fadel, 'Affordance-based methods for design' in *Proceedings of DETC* (The American Society of Mechanical Engineers 2003) 4. See also LA Suchman, *Human–Machine Reconfigurations: Plans and Situated Actions* (2nd edn, Cambridge University Press 2007) chapter 11.

[14] Norman, *The Design of Everyday Things* (n 6) 13.

[15] See P Nagy and G Neff, 'Imagined affordance: Reconstructing a keyword for communication theory' (2015) 1 *Social Media + Society* 3; S Faraj and B Azad, 'The materiality of technology: An affordance perspective' in PM Leonardi, BA Nardi and J Kallinikos (eds),

This is what Norman refers to in later work as 'real', as opposed to 'perceived', affordance.[16] For example, a particular fruit may afford nutrition to a particular species of animal, but if the animal is unaware of this the relationship will never be acted on, despite its extant potentiality. Perceived affordances are those which the organism 'picks up on', which, as the example just given demonstrates, do not necessarily represent the full range of relationships that exist between it and the thing in question. The distinction is crucially important in the digital context because, as Norman puts it, 'in graphical, screen-based interfaces, the designer primarily can control only perceived affordances [because] the computer system already comes with built-in physical [i.e. real] affordances'.[17] The potential discrepancy between real and perceived affordances is especially marked in code artefacts, such as the Internet of Things, that have no interface at all (the form of opacity this creates will be discussed in more detail in Chapter 6).

Norman's comment hints at an important truth about the power of the designer to shape end-users' perceptions through the choices they make in designing the interface, or boundary, between the interior of the artefact and those who might use or otherwise be affected by its operation. A corollary of this is that in shaping the end-user's perceptions of what actions the artefact makes possible, other underlying (real) affordances can be hidden from sight. Consider, for example, the ability to view and alter the source code of a webpage via the developer tools built into modern web browsers, or the ability to submit false details to an email registration system to preserve anonymity. More abstractly, but no less powerfully, the 'stickiness' of an artefact's default configuration might suppress any tendency the individual has to question and to imagine whether there might be some configuration that better reflects her interests or preferences. This relates closely to the issue of 'dark patterns' in design, discussed below. I will say more about the normative role of default configurations later,[18] but one can appreciate the importance of the relationship between an artefact's real affordances and how these are communicated to the end-user. That communication might be anywhere between clear, unambiguous, and isomorphic with the system's true state on the one hand, and deceiving, obfuscatory, abstract, and concealing of the real affordance on the other. The crucial point is that in most cases the extent and quality of that communication is defined at the outset by the designer.

Materiality and Organizing: Social Interaction in a Technological World (Oxford University Press 2012) 250–1.

[16] DA Norman, 'Affordance, conventions, and design' (1999) 6 *interactions* 38.

[17] Ibid. 39.

[18] See 'Default Configurations' in Section 3.2.

Signifiers

The design of the artefact can incorporate signifiers which communicate to the end-user what affordances are present and thus how the artefact 'should' be used (this is an important part of the artefact's normativity and is connected to technological intentionality, discussed below).[19] For example, if we return to Figure 2.1 above, the panel on the door on the left signifies where to push, while the handle on the door on the right signifies where to grasp (which in turn signifies pulling). Another common example on the web is the use of underlining to signify hyperlinks, in contrast to the plain surrounding text.[20] Of course, in order to act as a signifier, that element of the artefact must be perceived by the end-user (it can, however, be ambiguous – the hinges of the door might afford pushing, despite the handle only signifying the affordance of pulling). The presence of signifiers is an important element of communicating to the end-user how the artefact works, but a signifier's utility is also contingent on its accuracy, honesty, and completeness.[21]

The fact that function or capability *x* is signified to the end-user of course does not entail that function or capability *y* is also signified – the appropriate functions and capabilities must be signified at the appropriate moment. The question of what to signify, and when, is therefore extremely important in helping the end-user form an accurate mental model of the system;[22] designs often afford functionalities without signifying them, perhaps to hide complex functionality from end-users, or to provide the functionality required by some external force (for example a regulatory or ethical norm) without advertising it because its use is at odds with the commercial interests of the supplier. Consider, for example, the complex cookie preference notices that appeared following the coming into force of the General Data Protection Regulation (GDPR) in 2018. While these often provide an interface for choosing which cookies are set on the end-user's computer (that is, they afford a means of control), the mechanism of accessing this interface, usually a textual link, is often much less clearly signified than the option to accept all cookies. The latter is of course perceived to be more profitable for the website operator, since

[19] Norman, *The Design of Everyday Things* (n 6) 13 *et seq*.

[20] For a fascinating discussion of hypertext and the 'signifying strategies' of text, see NK Hayles, 'Print is flat, code is deep: The importance of media-specific analysis' (2004) 25 *Poetics Today* 67.

[21] The efficacy of a signifier also relies on tacit cultural knowledge; a panel on a door is unlikely to signify 'push' uniformly across all cultures (or even age groups). This highlights the role of the designer's assumptions in targeting a given class of end-user. See F Flores et al., 'Computer systems and the design of organizational interaction' (1988) 6 *ACM Transactions on Information Systems (TOIS)* 153, 156–8.

[22] Hartzog (n 7) 27.

it enables targeted behavioural advertising.[23] This type of adversarial design is an example of a 'dark pattern', which will be discussed in the next section.[24] In summary, then, one can appreciate how important signifiers are in assisting the end-user to develop an appropriate mental model of the system she is interacting with.[25]

2.2 Infusing Code with Normativity

Affordances are relationships that arise as a result of the particular characteristics of an individual and an artefact. In many cases they exist simply by virtue of those properties, as in the example of the surface that can bear the weight of – afford support to – an elephant. If that surface is, say, a rocky outcrop, then the affordance does not arise through any conscious decision-making on the part of a 'designer'; it just is. When it comes to code-based artefacts, however, affordances can of course be designed consciously, in order to make them 'usable' and create new behavioural possibilities for a certain class of end-user: 'technology is not the design of physical things . . . It is the design of practices and possibilities to be realized through artifacts.'[26] From the perspective of regulating what end-users can do, the conscious choices about how to make an artefact useful can develop into mechanisms that actively constitute, constrain, or suggest particular courses of action, thus infusing the design not just with usefulness but also with normative effect. These 'grammars of action' inevitably reflect the assumptions of the designer around who will use the system and what it should, will, and ought to be used for.[27] Those assumptions can of course be problematic; in the next chapter I relate this to code's limited representation of the world.[28] These assumptions are what a legitimately designed artefact will allow to be challenged by the end-user, whoever she may be, and with whatever particular characteristics she may have.

[23] Whether or not such advertising is effective is a separate (and open) question.

[24] For a study of dark patterns in cookie notice design, see P Grassl et al., 'Dark and bright patterns in cookie consent requests' (PsyArXiv 2020) preprint <https://osf.io/gqs5h> last accessed 4 March 2021.

[25] The role of signifiers in achieving digisprudential legitimacy is discussed further in 'Opacity' in Section 6.3.

[26] Flores et al. (n 21) 153. See also Norman, *The Design of Everyday Things* (n 6) chapter 6. The notion of 'usability' in design has developed into a significant field in its own right, particularly in relation to 'user experience' ('UX') on the web.

[27] PE Agre, 'From high tech to human tech: Empowerment, measurement, and social studies of computing' (1994) 3 *Computer Supported Cooperative Work (CSCW)* 167, 184–5.

[28] See 'Limited Ontology' in Section 3.2.

(a) Disaffordance

Gibson's notion of the positivity or negativity of affordances is concerned with their outcome (for example a fire warming an organism versus burning it). This must be distinguished from both (1) the fact that interaction is prevented and the affordance relationship does not exist (what Norman terms an 'anti-affordance'[29]), and (2) the subjective misapprehension of the end-user as to the existence of the affordance, where she misinterprets the information she is receiving and believes there to be a particular relationship between herself and the artefact when in fact there is no such relationship (or not the one she thinks there is). Both Gibson and Norman discuss the example of a glass pane covering an opening, giving an erroneous impression of the affordance of passage. Norman's notion of an anti-affordance points simply to the objective fact that there is no such affordance, whether or not the end-user is aware of this (a blind person, for example, is simply not afforded passage, regardless of the fact she cannot see the glass to perceive its affordances).[30]

Lockton draws on Lessig's discussion of 'architectures of control'[31] to take the notion of 'anti-affordance' further, adding the element of intention that is less evident in Norman's analysis. Architectures of control are 'features, structures or methods of operation designed into any planned system with which a user interacts, which are intended to enforce or restrict certain user behaviour'.[32] His discussion centres on DRM, including the Sony BMG scandal discussed in Chapter 1. Lockton's notion of positivity refers to what is ex ante permitted by the designer, versus what is not – there is, in other words, the intended, positive affording of a particular action by the designer (cf. Gibson's notion of 'positive'). The corollary for Lockton is that 'negative' affordance is about the 'engineering of obedience'.[33] He is concerned with the intent of the designer, which of course chimes with my central theme of code's production. Lockton suggests the term *disaffordance* to describe designs that have 'functionality deliberately removed . . . or with the functionality deliberately hidden or obscured to reduce users' ability to use the product in certain ways, or a combination of the two'.[34] Disaffordances are thus

[29] Norman, *The Design of Everyday Things* (n 6) 11.

[30] Gibson (n 5) 133–4; Norman, *The Design of Everyday Things* (n 6) 11–12.

[31] L Lessig, *Code: Version 2.0* (Basic Books 2006) chapter 4.

[32] D Lockton, 'Architectures of control in product design' (2006) *Engineering Designer: The Journal of the Institution of Engineering Designers* 28.

[33] D Lockton, 'Disaffordances and engineering obedience' *Architectures* (22 October 2006) <http://architectures.danlockton.co.uk/2006/10/22/disaffordances-and-engineering-obedience/> last accessed 4 March 2021.

[34] Ibid.

'deliberate, intentional, and strategic', as opposed to inadvertent or the result of incompetent design. They therefore embody a conscious value in a way which Gibson explicitly, and Norman implicitly, avoid. The term disaffordance has gained only modest traction,[35] but it is instructive in encapsulating the idea of how an artefact can conceal, discourage, or forbid the possibility of certain behaviours as a result of conscious design decisions. In aggregate, one can appreciate the role played by disaffordances in constraining end-users in their interactions with an artefact. As Longford puts it,

> [t]he reconfiguration of the terms of cybercitizenship which these technologies effect is achieved via a gradual process in which new habits, expectations and practices on the part of web users are cultivated and/or inculcated through subtle mechanisms of inducement, coercion, and reward designed into the very experience of cyberspace.[36]

When disaffordances are designed that are contrary to the end-user's interests, they are sometimes termed 'abusive design', and examples that exploit commonly used design conventions against the end-user have come to be known as 'dark patterns'.[37] Such practices demonstrate the power of the designer to exploit the end-user for purposes which may not be in her interests; Conti and Sobiesk describe the 'intent on the part of the designer to deliberately sacrifice the user experience in an attempt to achieve the designer's goals ahead of those of the user'.[38] They set out a taxonomy of approaches used in malicious web interfaces, and provide representative examples that most end-users will be familiar with. These include making form fields mandatory (coercion), use of double or triple negatives in questions (confusion), advertising (distraction), delaying access until an advert is watched (forced work), covering desired text with popups (interruption), hiding access to the free version of an application deep within a website's navigation (manipulating

[35] See DE Wittkower, 'Principles of anti-discriminatory design' *2016 IEEE International Symposium on Ethics in Engineering, Science and Technology (ETHICS)* (IEEE 2016) 2 (acknowledging this fact in a discussion on how to avoid unethical discrimination in design).

[36] G Longford, 'Pedagogies of digital citizenship and the politics of code' (2005) 9 *Techné: Research in Philosophy and Technology* 68, 77.

[37] A Narayanan et al., 'Dark patterns: Past, present, and future' (2020) 18 *ACM Queue* 25; Consumer Council of Norway (Forbrukerrådet), 'Deceived by design: How tech companies use dark patterns to discourage us from exercising our rights to privacy' (Consumer Council of Norway (Forbrukerrådet) 2018) <https://fil.forbrukerradet.no/wp-content/uploads/2018/06/2018-06-27-deceived-by-design-final.pdf> last accessed 4 March 2021.

[38] G Conti and E Sobiesk, 'Malicious interface design: Exploiting the user' in *Proceedings of the 19th International Conference on the World Wide Web* (ACM Press 2010) 271.

navigation), reducing the contrast of closure buttons on adverts (obfuscation), and designing adverts to appear to be news content (trickery).[39] These approaches will often be data-driven, which is to say different versions of the same dark pattern will be served to different users in what are known as 'A/B tests', with the resulting data analytics being used to determine the most effective design (as determined from the perspective of the commercial enterprise's business model, of course).[40]

A recent example that exhibited some of these characteristics was the popup GDPR acceptance screen shown to Facebook users following the Regulation's coming into power in May 2018. The interface misleadingly displayed red notification circles behind the acceptance screen, including to users who in reality had no notifications waiting for them. This was a clear attempt to manipulate the end-user into accepting the new terms as quickly as possible, in order to gain access to the awaiting 'notifications'.[41] As Conti and Sobiesk note, such design practices can increase frustration and even render parts of the web inaccessible for certain classes of end-user, and their primary aim is generally to increase revenue for website operators.[42]

(b) Postphenomenology and Code's Mediation of Reality[43]

Postphenomenology explores the relationships between individuals and artefacts, with an emphasis on the material qualities of particular artefacts *per se*.[44] Verbeek describes postphenomenology as the analysis of the 'role played by specific technologies in specific contexts',[45] which asks what the normative effects are of their materiality on the mediation of the relationship between

[39] Ibid. 273.

[40] Narayanan et al. (n 37) 75–6, 80–1.

[41] Consumer Council of Norway (Forbrukerrådet) (n 37) 29. This report gives a detailed account of the interfaces Facebook used to communicate their GDPR update, including numerous examples of dark patterns and manipulative design.

[42] Conti and Sobiesk (n 38) 278–9. Interestingly, around a year after the GDPR came into force the Deceptive Experiences to Online Users Reduction Act was introduced to the US Senate, although it has not progressed from there. See <https://www.congress.gov/bill/116th-congress/senate-bill/1084/text> last accessed 4 March 2021.

[43] For a useful survey of the various overlapping terms in this field, see P-P Verbeek, 'Materializing morality: Design ethics and technological mediation' (2006) 31 *Science, Technology, & Human Values* 361, particularly at 368.

[44] P-P Verbeek, *What Things Do: Philosophical Reflections on Technology, Agency, and Design* (Penn State Press 2005) 3. Ihde, the 'father' of postphenomenology, discusses how the theory seeks to draw together classical phenomenology (Husserl, Heidegger, and Merleau-Ponty) and pragmatism (Peirce, James, and Dewey) in his *Postphenomenology and Technoscience: The Peking University Lectures* (SUNY Press 2009).

[45] Verbeek, *What Things Do* (n 44) 7.

humans and reality. A central claim is that technologies are neither wholly neutral nor wholly deterministic, and the ways in which their designs mediate reality are fundamentally more complex and ambiguous than either a simple socially or technologically deterministic view would suggest.[46] The relationships between humans and artefacts are grouped into those of perception – what the individual thinks she can do with the artefact – and those of action – what she can actually do with it (there is a parallel here with the distinction between real and perceived affordances). Technological mediation is the ongoing construction and manipulation of these two relationships by and through artefacts, the result of which is the co-constitution of reality for the end-user. The end-user and the artefact, in bringing together their particular characteristics, constitute a new reality through their relationship. We can conceptualise the relationship as in Figure 2.2.

One can appreciate the parallels with affordance theory; indeed, affordances are the individual building blocks that in aggregate make up the totality of technological mediation between a particular artefact and a particular end-user.[47] As discussed above, designers play a central role in defining what a given artefact affords, and thus the reality that the artefact's mediation of perception and action contributes to is to a significant degree determined by choices made by the designer, for better or worse.[48] This connects with the idea of constitutive normativity built into the architecture of an artefact, a topic I will discuss below.

(c) Code Mediating Perception

Perception is mediated by technology through the amplification or reduction of aspects of the world.[49] This relates to the signifiers discussed above: their design can draw the end-user's attention to the possibility of a particular use, or perhaps ward her off or distract her from perceiving it. Signifying by itself has no direct coercive effect on the end-user, but by mediating her perception it does play an important role in shaping her comprehension of an artefact and her ability to form an accurate mental picture of how it works and what

[46] D Ihde, *Technology and the Lifeworld: From Garden to Earth* (Indiana University Press 1990); Verbeek, 'Materializing morality' (n 43). On the latter point see Verbeek, *What Things Do* (n 44) 11.

[47] AH Kiran and P-P Verbeek, 'Trusting our selves to technology' (2010) 23 *Knowledge, Technology & Policy* 409.

[48] As Robertson notes, designers can 'privilege the agency of their users by providing resources for awareness in their systems'. See T Robertson, 'The public availability of actions and artefacts' (2002) 11 *Computer Supported Cooperative Work (CSCW)* 299, 311.

[49] For an in-depth discussion of the forms of perceptual mediation, see Ihde, *Technology and the Lifeworld* (n 46) 72 *et seq*.

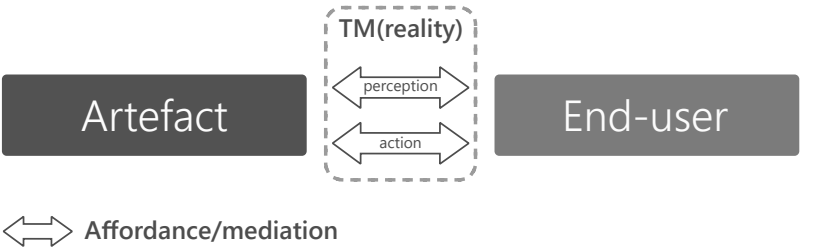

Figure 2.2 Artefact ↔ end-user relationships of technological mediation

she can and ought to do with it.[50] This ability to affect (and effect) reality as it is experienced by the end-user is one aspect of the power of design, particularly when it goes beyond what she can perceive of reality to include how she can and cannot act, at least within the bounds of the artefact's geography.[51] The manipulation of how reality is constructed, both perceptually and in terms of behavioural agency, demonstrates 'an important aspect of the non-neutrality of technology',[52] and points to the significant power that inheres in the designer who determines those mediations.

(d) Code Mediating Action

Whereas the technological mediation of perception amplifies or reduces what can be comprehended of reality, the technological mediation of action invites or inhibits specific behaviours. This form of mediation exerts a physically or logically compelling force on the agency of the end-user, rather than merely a signal that requests a particular type of action. It is here, then, that the regulative nature of code is most apparent: the coercion of action by code (its 'moreness') can be contrasted with the mere signal provided by a textually bound legal norm. The important distinction between constitutive and regulative rules, and their respective instantiations in code and in text, will be discussed later.

Code embodies a particular idea of how the designer intends the artefact to be used. This is what Latour calls a 'program of action',[53] which, like the

[50] Norman, *The Design of Everyday Things* (n 6) 26, 31. See also Hartzog (n 7) 278.

[51] For a rich account, building on Merleau-Ponty's phenomenology, of the role of perception in the design of such 'geography', see Robertson (n 48).

[52] Verbeek, *What Things Do* (n 44) 131. Verbeek speaks of perception being 'transformed', while Latour talks of action being 'translated'. See B Latour, 'Where are the missing masses? The sociology of a few mundane artifacts' in WE Bijker and J Law (eds), *Shaping Technology/Building Society: Studies in Sociotechnical Change* (MIT Press 1992) 174 *et passim*.

[53] Latour, 'Where are the missing masses?' (n 52). See also M Akrich, 'The de-scription of technical objects' in WE Bijker and J Law (eds), *Shaping Technology/Building Society: Studies in Sociotechnical Change* (MIT Press 1992).

script of a film or play, describes how the designer intends the artefact to be used or what its envisaged effect in the world ought to be. Akrich makes explicit use of this metaphor in her analysis of 'inscription': 'like a film script, technical objects define a framework of action together with the actors and the space in which they are supposed to act'.[54] Designers envisage these elements of the 'script' when they design the artefact's (dis)affordances: the framework for behaviour, the actors involved (both human and non-human[55]), and the space for action.[56] The various constituents of the script will be determined according to the envisaged uses of the artefact and the business model the designer seeks to follow.[57]

To give an example, a speed bump in a road has the inscription of 'slow down when you approach me',[58] and its physical properties invite in the strongest terms a particular action – slowing down – on pain of serious damage otherwise being done to the vehicle.[59] Latour might also say that the enforcement of that action is 'delegated' to the speed bump (indeed, the description of the latter in the UK as 'sleeping policemen' implies this reassignment of the task from a human to a non-human agent).[60] This coercion of action by the speed bump can be contrasted with the merely signifying effect of a speed limit sign, whose inscription only describes, rather than physically mandates, the desired action.[61]

In other work, Latour describes the example of the Berliner lock, whose design means that once its user is inside the room, if she wishes to close the

[54] Akrich (n 53) 208. See also Verbeek, 'Materializing morality' (n 43) 362.

[55] Actor network theory, to whose literature Akrich and Latour are central contributors, explicitly avoids the creation of a hierarchy between humans and non-humans, instead using the model of a flat web to describe the influences operating between disparate 'actants'. See generally Latour, 'Where are the missing masses?' (n 52).

[56] Akrich (n 53) 208. Latour terms this anticipation 'preinscription'. See Latour, 'Where are the missing masses?' (n 52) 172.

[57] B van den Berg and RE Leenes, 'Abort, retry, fail: Scoping techno-regulation and other techno-effects' in M Hildebrandt and J Gaakeer (eds), *Human Law and Computer Law: Comparative Perspectives* (Springer 2013) 76.

[58] Verbeek, 'Materializing morality' (n 43) 366.

[59] Latour, 'Where are the missing masses?' (n 52) 166. See also Lessig (n 31) 128, 135–6.

[60] Latour, 'Where are the missing masses?' (n 52) 157–8 *et passim*. See also Verbeek, *What Things Do* (n 44) 159–60. For a salient legal analysis, see K de Vries and N van Dijk, 'A bump in the road. Ruling out law from technology' in M Hildebrandt and J Gaakeer (eds), *Human Law and Computer Law: Comparative Perspectives* (Springer 2013) 114 *et seq*.

[61] See C Gavaghan, 'Lex machina: Techno-regulatory mechanisms and rules by design' (2017) 15 *Otago Law Review* 123, 130–1. The connection of these concepts to the legal notions of constitutive and regulative norms and the jurisprudential concept of the internal and external perspective of norms is discussed below.

door she is forced also to lock it.[62] The inscription in the lock's design thus limits the possible states that the user can leave the door in to one of either (1) open, or (2) closed and locked. There is no in-between state permitted by the design of the lock (namely closed and unlocked). This is a physical example of the binary 'ruleishness' of code, a core element of computational legalism discussed in the next chapter.[63]

These concepts of inscription, programs of action, and delegation are closely related to the postphenomenological idea of 'technological intentionality', where technologies encourage (if not necessarily mandate) some form of use distinct from all the contingent possibilities there might be. Ihde contrasts, for example, the technological mediations of a fountain pen and a word processor.[64] The pen implies a slower pace of action that inclines the writer towards taking time and considering her sentences before putting pen to paper, while the word processor permits writing at something closer to the speed of the spoken word, with added facilities (affordances) allowing for easy and fast text editing and recomposition. Neither the pen nor the word processor conclusively predetermines the mode of writing, but their respective designs do nevertheless '*promote* or *evoke* a distinct way of writing'.[65]

More overtly political, Verbeek describes the shortening of municipal gardeners' rake handles in the city of Cluj, intended to prevent them from leaning and thus to discourage laziness: '[t]he rake *mediates* the relation between the workers and the public gardens; it is not merely a means but plays an active role in the way this relation takes shape.'[66]

Similarly, Winner's classic discussion of the bridges on Long Island suggests the politicisation of artefacts. The bridges were reportedly designed to be too low for public buses to pass beneath them, thus preventing those reliant on public transport, which meant to a disproportionate degree the poor and racial minorities, from accessing the public beaches to which the roads led.[67]

The examples above demonstrate the first postphenomenological sense of 'intention', where through the provision of 'a framework for action, [artefacts] do form intentionalities and inclinations within which use-patterns take dominant shape':[68] the speed bump 'intends' to slow drivers down, the

[62] B Latour, 'The Berlin key or how to do words with things' in P Graves-Brown (ed.), *Matter, Materiality and Modern Culture* (Routledge 2000). See also Latour, 'Where are the missing masses?' (n 52) 172 *et seq*.

[63] See 'Ruleishness' in Section 3.2.

[64] Ihde, *Technology and the Lifeworld* (n 46) 141–2.

[65] Verbeek, *What Things Do* (n 44) 114–15 (emphasis supplied).

[66] Ibid. 115 (emphasis supplied).

[67] L Winner, 'Do artifacts have politics?' (1980) *Daedalus* 121.

[68] Ihde, *Technology and the Lifeworld* (n 46) 141.

Long Island bridges 'intend' to prevent access by the poor and minorities to public beaches, et cetera. This first sense refers to 'a certain directionality, inclination or trajectory that shapes the ways in which [artefacts] are used',[69] and is of course intimately connected with what (dis)affordances the designer embodies in the design.

The second sense of intentionality refers not to a property of the artefact but rather to the end-user's intention, and how the artefact mediates her relationship with the world by shaping what she can and cannot do.[70] The end-user's sense of her own agency, and of the possibilities in the world which that agency can interact with, are mediated by the artefact, thus blurring the line between subjectivity and objectivity.[71] When she sets about to achieve something, her perception of what she can do and what the world permits is mediated by the artefact, and thus so too is her understanding of her self and her world co-constituted through the lens of that mediation.[72] The operation is mutual and bi-directional – she makes her world and her world makes her, and that 'making' is pushed this way or that by the artefact's technological mediation, as comprised by its (dis)affordances.

Contextual changes result in different configurations of mediation, of both perception and action. This is what Ihde terms the 'multistability' of an artefact: it can facilitate different acts depending on the context of use, the individual using it, and the configuration of the artefact itself. A designed artefact exists for a purpose, but that purpose is not determined entirely by the artefact itself but also by how a particular end-user approaches it at a particular time and within a particular context.[73] The Long Island bridges demonstrate this contextual dependency: over time their normative effect has lessened as those who were intended to be excluded have become wealthier

[69] Verbeek, *What Things Do* (n 44) 114.

[70] Ibid. 116; Ihde, *Technology and the Lifeworld* (n 46) 25.

[71] Shedding the post-Enlightenment, 'Modern' dichotomy of subject and object is a central goal of postphenomenology (and indeed much other philosophy inspired by Continental traditions). See Ihde, *Postphenomenology and Technoscience* (n 44) 9 *et seq*.; Verbeek, *What Things Do* (n 44) 161 *et seq*.; Faraj and Azad (n 15) 237–8. More generally, see B Latour, *An Inquiry into Modes of Existence: An Anthropology of the Moderns* (Harvard University Press 2013).

[72] Verbeek, *What Things Do* (n 44) 116. This echoes Cohen's suggestion that 'as we struggle to shape our technologies and configure our artifacts, they also and quite literally configure us'. See JE Cohen, *Configuring the Networked Self: Law, Code, and the Play of Everyday Practice* (Yale University Press 2012) 27.

[73] Verbeek, 'Materializing morality' (n 43) 371.

and less reliant on public transport.[74] Multistability refers to how differing contexts can result in different concrete uses of an artefact, the sum of which implies the absence of an 'essential' purpose. Akrich makes a similar argument in relation to inscription: while the designer will envisage some kind of role for the end-users of the artefact she creates, and it is from this image of the end-user that the inscription of the design is ultimately derived, in practice the domain of action is not absolutely predetermined and will to some extent be adapted 'in the wild'.[75]

Although the absence of an essential purpose implied by the notion of multistability means that the mediating effect of an artefact is not entirely within the ex ante control of the designer, she will nevertheless 'inscribe scripts and delegate responsibilities' in and to the artefacts she designs – if she did not, the artefact could sensibly be envisaged and then brought into existence. There is also the logical necessity that in creating one particular configuration of normativity – even one that is multistable – the designer is making a decision that *a priori* excludes at least some others.[76] To a greater or lesser degree, the design of an artefact will '"groom" the user',[77] shaping her perception and her scope for action in ways that may not be legitimate according to any external standard. As Akrich notes, 'the designer not only fixes the distribution of actors, he or she also provides a "key" that can be used to interpret all subsequent events. Obviously, this key can be called into question – consumer organizations specialize in such skepticism.'[78] This 'key' is the inscription embodied in the design, one that I am arguing ought always to be complemented by affordances that facilitate the kind of scepticism Akrich refers to.

[74] D Ihde, 'The designer fallacy and technological imagination' in *Ironic Technics* (Automatic Press/VIP 2008) 21. Ihde argues that the interstate initiative, which mandated higher bridges under which vehicles carrying ballistic missiles could pass, was a 'counter-strategy [that] defeated whatever politics were first employed' (ibid.). This may be historically true, but it points only to the evolution of political context, rather than any diminution in the role of the designer's intent in the initial exercise of designing the bridges (something Ihde concedes: ibid. 22 n 1).

[75] Akrich (n 53) 208. Cf. Suchman (n 13) 192 *et seq.*, arguing that scripts are inherently vague. For a contrasting argument that designers ought to take prospective responsibility for the moral role their technologies will come to play, see T Swierstra and K Waelbers, 'Designing a good life: A matrix for the technological mediation of morality' (2012) 18 *Science and Engineering Ethics* 157.

[76] I return to this theme below in the discussion of defaults and the spectrum of normativity.

[77] Akrich (n 53) 218.

[78] Ibid. 216.

This means that an implicit and unavoidable part of the designer's job when defining the artefact's spaces for action is the determining of the threshold between what is strictly inscribed and what can be (re)interpreted by the end-user. The very existence of a designed artefact means that these choices have been made and those thresholds set, whether done intentionally or otherwise. I return to this theme shortly, but first it is worth summarising the relevance of the relationship between affordance theory and technological mediation.

Affordance and Technological Mediation

Following the analysis above, we can conceptualise affordances as the underlying building blocks of inscription and technological mediation.[79] They are a powerful unit of analysis for identifying and critiquing the inscriptions of code which come together in aggregate to mediate the co-constitutive relationship between the end-user and the world.

Both real and perceived affordances are evidence of the second form of technological intentionality, where the artefact mediates the individual's understanding of what she can do in the world as she perceives it.[80] This connects closely with multistability, where a congruence between the artefact's perceived and real affordances provides a margin of opportunity within which the end-user might adapt her response to the predetermined script of the artefact. Unless the artefact embodies 'real' affordances that lie outside the designer's intended inscription, the end-user will by definition be unable to do anything with the artefact that the designer did not intend. In such a case her behaviour vis-à-vis the artefact will be constituted entirely according to the decisions made by the designer. The corollary is that where the designer leaves 'space' for creative interpretation and action – through the conscious (or unconscious) provision of real affordances and their signifiers – the end-user will be able to express her autonomy (within the wider constraints of the artefact's mediation).

Real (dis)affordances are the bread and butter of the first form of technological intentionality: to inscribe a particular programme of action in the artefact, its design must afford that course of action for a particular (class of) end-user; similarly, to proscribe a particular course of action, the designer must either elide the affordances that it would require or, if that elision is not possible, actively disafford it for a particular class of end-user, as in the cases of the Long Island bridges, the Berliner lock, or the shortened rake handles.

[79] See Kiran and Verbeek (n 47).

[80] Ibid. 415 *et seq*.

The existence of an affordance is an objective fact about the relationship between a particular artefact and individual in a particular context, which when taken in aggregate with any other (dis)affordance results in a particular assemblage of technological mediation. And, as discussed above, affordances are not fixed attributes of an artefact, rather they come about as relations between particular artefacts and particular individuals in particular contexts, albeit that (as we saw above) designers will anticipate what these are likely to be when they are considering the 'program of action', 'script', or 'use-pattern' they want the end-user to follow.

(e) A Spectrum of Technological Normativity

We have seen how inscriptions and affordances as their building blocks exist on a spectrum, from 'harder' implementations that admit of no choice to softer ones whose normativity is suggestive rather than coercive.[81] The former conception of normativity sees the artefact's 'scripts' as 'wired in', where the end-user has no choice but to follow a succession of code norms as they are presented to her.[82] This is the most 'ruleish' and immediate aspect of technological normativity: the rule is clearly defined (in code for the machine to follow, if not necessarily for the attention of the end-user) and it is applied immediately at runtime with no opportunity for further consideration. These characteristics of code (ruleishness, opacity, and immediacy) are central elements of the concept of computational legalism that I develop in the next chapter.

Less strict are code-based suggestions which 'nudge' the end-user towards a particular course of action, whilst permitting her to express choice or to 'disobey' the default configuration by choosing between two or more options. Despite this notional scope for exercising autonomy, various biasing effects have been shown to operate which render the default setting very 'sticky', implicitly discouraging the end-user from exercising her autonomy and making any change.[83] One approach to minimising this effect is to force a choice at the moment of installation or setup, without any preferred option being suggested.[84] As we have seen in the section on disaffordance, however,

[81] Van den Berg and Leenes (n 57) 74–5.

[82] J Kesan and R Shah, 'Setting software defaults: Perspectives from law, computer science and behavioral economics' (2006) 82 *Notre Dame Law Review* 583. See also Fogg's discussion of 'tunnelling' users in *Persuasive Technology: Using Computers to Change What We Think and Do* (Morgan Kaufmann Publishers 2003) 34 *et seq*.

[83] See the discussion in 'Default Configurations' in Section 3.2.

[84] Microsoft were forced to do this when the European Court of Justice found in *Microsoft Corp. v Commission of the European Communities* (2007) T-201/04 that the company's inclusion of its web browser Internet Explorer as the default in the Windows operating

enterprise will often interpret even strict regulations requiring the protection of end-user autonomy in ways that subtly (or not so subtly) favour its interests over those of the end-user – the ubiquitous post-implementation GDPR privacy notices are an example of this.[85] This connects with the contemporary evolution of design practices, such as the adversarial interfaces mentioned above, which may provide notional choice but which are in reality targeted at capturing end-users' attention (often using psychological research to refine the interface's affordances in a behaviourist attempt to maximise attention capture through 'operant conditioning'[86]). The extent to which such approaches have moved beyond the 'libertarian paternalism' of so-called 'nudging' (intended as it was to strike a balance in the civic sphere between the individual's freedom to choose and 'better' societal outcomes[87]) and into the realm of manipulation and even the cultivation of 'tech addiction'[88] is an emerging topic in both the academy and civil society.[89] Whether the analyses that emerge from these new, more critical explorations will break from the behaviourist underpinnings of nudge theory remains to be seen.

Towards the more open end of the spectrum of normativity, code's inscriptions can provide space for interpretation, reinvention, and 'resistance' by the end-user – albeit that once she is using an artefact, such resistance will always be limited reflexively to what the space left for it makes possible within the inherent boundaries of its geography.[90] In many cases the distinctions here will be on the level of the user interface (UI) that guides to varying

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system was an abuse of its dominant market position. The agreed solution was to provide end-users with a 'ballot' screen asking them to choose from a randomly ordered range of browsers. See J Brodkin, 'EU fines Microsoft €561 million for not giving users a browser choice' *Ars Technica* (6 March 2013) <https://arstechnica.com/tech-policy/2013/03/eu-fines-microsoft-e561-million-for-not-giving-users-a-browser-choice/> last accessed 4 March 2021.

[85] C Utz et al., '(Un)Informed consent: Studying GDPR consent notices in the field' in *Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security* (ACM 2019).

[86] Fogg (n 82) chapter 3 *et passim*. See also van den Berg and Leenes (n 57) 71–2.

[87] CR Sunstein and RH Thaler, 'Libertarian paternalism is not an oxymoron' (2003) 70 *University of Chicago Law Review* 1159; van den Berg and Leenes (n 57) 72–3.

[88] See for example S Parkin, 'Has dopamine got us hooked on tech?' *The Observer* (4 March 2018) <https://www.theguardian.com/technology/2018/mar/04/has-dopamine-got-us-hooked-on-tech-facebook-apps-addiction> last accessed 4 March 2021.

[89] For examples see, respectively, J Williams, *Stand Out of Our Light: Freedom and Resistance in the Attention Economy* (Cambridge University Press 2018); Center for Humane Technology, 'The problem' (Center for Humane Technology) <http://humanetech.com/problem/> last accessed 4 March 2021.

[90] Van den Berg and Leenes (n 57) 77.

degrees the end-user's interactions with the system. There, the role of signifiers is particularly relevant: the end-user cannot avail herself of an affordance if she does not know it is there. The business model underlying the design of the artefact will determine the extent to which it is multistable. Take, for example, the smartphone application Instagram, whose inscription might be framed as one of 'upload photos and videos to be viewed by other end-users', which in turn is made possible by a set of affordances for selecting a file, perhaps making some basic edits, transferring it to a remote server, providing a title, description, and tags, and then publishing it. Within the geography of that application, no amount of 'resistance' by the end-user can rewrite that inscription to enable the calculation of a tax return or the mapping of her route to work. That being said, there nonetheless might lie within that inscription some scope for reinterpretation, for example using the layout of galleries within the application to imagine new expressive possibilities unintended by the application's designers. This can often be observed on Twitter, for example, when images are manipulated such that when displayed in its grid gallery layout they relate to one another like stills from a film. In that case the gallery feature is multistable, having been repurposed beyond its original function of displaying arbitrary images alongside one another in a simple grid.

This is a frivolous example, but it does demonstrate the scope of action possibilities that a given code artefact can provide. We can see how the spectrum of normativity moves from the most 'ruleish' of code norms to the least, with the overall 'density' of the constraints on the behaviour of the end-user lessening from one point to the next.[91] The placing of the thresholds between these represents a crucial choice in the process of designing an artefact. Affordances can thus be distinguished according to their normative effect.[92] Davis and Chouinard, for example, suggest that affordances exist on a spectrum, from 'request' to 'refuse'. They give the example of a set of stairs that might afford easy or difficult climbing depending on the angle of their construction. For them, affordances can be characterised under one of six mechanisms: request, demand, allow, encourage, discourage, and refuse. Adding one of these modifiers adds useful depth to the bare concept of affordance, enabling a more intuitive understanding of a given individual–artefact relationship. For the example of the stairs above, then, they might allow the

[91] The concept of 'normative density' is one of the intersections between legal and design theory explored later.

[92] JL Davis and JB Chouinard, 'Theorizing affordances: From request to refuse' (2017) *Bulletin of Science, Technology & Society* 241. See also JL Davis, *How Artifacts Afford: The Power and Politics of Everyday Things* (MIT Press 2020) *passim*.

non-disabled to climb, discourage careless or fast climbing (if they are particularly steep), and refuse climbing to those who require a wheelchair. Here we get an immediate sense of three normative affordance relationships that exist between the artefact and three hypothetical classes of end-user.

Considered through these affordance mechanisms, it becomes easier to discern the particular makeup of a given artefact's normativity, and from the preceding discussion we can see how wired-in functions tend towards the 'harder' mechanisms of request, demand, allow, and refuse, while the mechanisms of encouragement and discouragement are more likely to be found where the artefact's affordances are designed around nudging and, implicitly, multistability. As previously mentioned, it is important to note that the design of an artefact will always embody some mix of these characteristics, because as soon as code is laid down choices have been made and some configuration of normativity – be it open or closed, strictly ruleish or multistable – has come into existence. As Lessig puts it, 'there is no choice that does not include some kind of building. Code is never found; it is only ever made.'[93]

Constitutive and Regulative Normativity

This spectrum of normativity connects with the theoretical distinction between constitutive and regulative rules.[94] Whereas constitutive rules define how a construct or 'thought-object'[95] may be brought into being (for example a valid game of chess, or a marriage), regulative rules merely request action or inaction on the part of an individual or class of individuals (for example a speed limit on a road, or a rule that bottlebanks should not be used at night). If the requirements of a constitutive rule are not met, then the relevant construct does not and cannot come into being; the mere assertion that a couple is married is insufficient to make it so in the eyes of the relevant order from which the concept derives, which is to say the legal system. At the same time, although a regulative rule can seek some (in)action from the individual (for example not to drive above 70 miles per hour on the motorway), it has no ability directly to impose that requirement – the individual must acquiesce and alter her behaviour accordingly (recall the discussion above of a speed limit sign as a signifier, as compared with the speed bump).

A similar distinction applies in the design sphere; code can initiate both constitutive and regulative normativity, and the decision of where to draw the

[93] Lessig (n 31) 6.

[94] I discuss the relevance of this distinction from a legal-theoretical perspective in 'Constitutive and Regulative Rules' in Section 3.2.

[95] O Weinberger, 'The norm as thought and as reality' in N MacCormick and O Weinberger, *An Institutional Theory of Law: New Approaches to Legal Positivism* (Springer 1986).

line between the two is within the gift of the designer. As Hildebrandt notes, 'it makes sense to discriminate between socio-technical arrangements that are constitutive and those that are regulative of our interactions, if only to make clear that technology does not necessarily rule out choice in comparison to law'.[96]

As we have seen, the (dis)affordances and inscriptions embodied in the artefact's design can be constitutive or regulative of the end-user's behaviour.[97] Of course, the very existence of the artefact and its functions are the subject of a set of basic constitutive affordances, for example that it can be seen, that it can be touched, opened, executed, et cetera. The boundaries of the artefact represent a set of foundational 'rules' which define its very nature from the outset – the form of its interface, the platforms it can run on, its physical dimensions, et cetera. Operating above this low-level sense of constitutive affordance, however, are the specific (dis)affordances and scripts that constitute the behavioural possibilities open to the end-user when she is interacting with the artefact.[98] As with the example above, she may wish very much to find her way to work using Instagram, but the code's constitutive norms do not permit such a use. The possibility is simply not within the 'constitution' of the code. Although the designers of Instagram (presumably) did not consciously decide not to include mapping or tax calculation functionality in their code, the example underlines the point that design always involves the privileging of one configuration of normativity – one 'technical constitution' – over the near-infinite alternative possibilities that code would otherwise have allowed them to build.[99] This speaks to code's plasticity – 'programmers can implement almost any system they can imagine and describe precisely',[100] but of course that very precision will necessarily exclude a huge range of other possibilities.

From the perspective of regulative normativity, some measure of choice is left open to the end-user in how she behaves within the geography set up by the code. For example, she is free to choose from a palette a highlight colour for her social media profile, and to attach up to five photos (or indeed no photo at all) to her social media post. Such 'regulative latitude', however, always operates within constitutive outer boundaries beyond which choice

[96] Hildebrandt, 'Legal and technological normativity' (n 2) 175.

[97] M Hildebrandt, 'A vision of ambient law' in R Brownsword and K Yeung (eds), *Regulating Technologies: Legal Futures, Regulatory Frames and Technological Fixes* (Hart 2008) 177–8.

[98] Flores et al. (n 21).

[99] J Weizenbaum, *Computer Power and Human Reason: From Judgment to Calculation* (Freeman 1976) 37–8, 113.

[100] J Grimmelmann, 'Regulation by software' (2005) 114 *The Yale Law Journal* 1719, 1723.

is unavailable – for example, there is no freedom to choose colours that are not included in the selection provided, or to attach a ZIP file or executable programme to the social media post.

All of these behavioural (dis)affordances are contingent on the choices made by the designer. She can enable a particular functionality or close it off entirely, or perhaps hide it from view. In each case she has exercised her private power to constitute the range of behaviour that the end-user can engage in.[101] She might also opt for affordances that are merely regulative of behaviour, using one of the less ruleish mechanisms above to allow the end-user to change the configuration (defaults) of the code or reinvent the space it opens up in ways unforeseen by the designer (multistability). I will return to these possibilities in Chapter 6 in the discussion of the digisprudential affordances.

(f) Technological Constitutionalism

So far, this chapter has explored how the normativity embodied in an artefact's design enables and constrains the behaviour of the end-user, focusing on relationship (d) of Figure 1.1 in Chapter 1. But there is, however, another aspect through which the designer is herself made to comply. Further back in the chain of production, the designers of products are themselves subject to normativities created by the designers of the more fundamental, 'infrastructural' elements of the process.[102] Not only are end-users subject to the effects of (dis)affordance, inscription, and mediation, but so too are product designers within the environments that they in turn use to create artefacts intended for end-users. The product designer is thus herself rendered a type of user by those described by Vismann and Krajewski as the 'programmer of the programmer' ('PoP'):

> The programmer of the programmer, designing the tools and methods of a coding language (such as the compiler, code syntax, abstract data types, and so on) maintains the ultimate power because he or she, as the constructor of the programming language itself, defines what the 'normal' programmer, as a user, will be able to do. Both types of programmers establish the conditions for using the computer, and, as such, they behave like lawmakers or, rather, *code*-makers. Implemented within the CPU and the hierarchy of the file system is the law governing communication with and through the computer. In this respect, code and law maintain a relationship of more than structural homology. The code *is* a law – as Lawrence Lessig pointed out

[101] Van den Berg and Leenes (n 57).

[102] This is relationship (e) of Figure 1.1 in Chapter 1.

> when he described 'code' metaphorically as a synonym for the conditions under which the computer runs.[103]

In the hierarchy thus developed, the product designer-as-user is beholden to the (dis)affordances and inscriptions in the design environment that are themselves chosen and designed by the PoP.

Product designers do not operate in a vacuum, developing their products and services each time as if from a *tabula rasa*. To do so would in many cases mean reinventing the wheel – a costly, inefficient, and even dangerous prospect in the case of fundamental technologies that have developed over decades of research, such as networking and encryption. Designers utilise existing hardware, programming languages, libraries, and habitual development practices that are in place well before they embark upon the development of new code. Situated within a context of decades of this prior art, a designer's approach to her work will to a greater or lesser extent be guided by all those practices that have gone before, and the technological mediations that bear upon her ability to solve the problem at hand. The result is often a bricolage of the old and the new, brought together with the 'glue' of that particular designer's skills, knowledge, and interpretation of the brief she is required to implement.[104] Before she considers her immediate task, then, she is starting out within a context that is itself replete with inscription and (dis)affordance, which mediates how she goes about her work.

In this sense we can start to see that the PoP is not a single individual but rather the complex of tools and practices that frame the work of the designer before it begins. These include programming languages and their internal 'habits', development paradigms such as agile and waterfall, the integrated development environments (IDEs) where code is actually written, third-party libraries and application programming interfaces (APIs), and the design patterns used by programmers and designers to solve common programming problems or to build common inscriptions. Each of these is to some extent designed, and to a greater or lesser degree plays a role in the product designer's practice, structuring it both from the outset and while she works. Some elements of the PoP are of course more susceptible than others to themselves being structured towards some normative end, but at this point what is interesting is the idea of 'constitutionality' within the design process itself. Recall

[103] Vismann and Krajewski (n 1) 100 (emphasis supplied).

[104] P Swartz, 'White boys' code' in *Division III: Essays in Programs as Literature* (Hampshire College 2007) 34–6.

the model of normative relationships in Figure 1.1 in Chapter 1.[105] We can start to see a parallel between on the one hand the top-down arrangement of constitutive rules that bind the state 'to the mast' in its exercise of legislative and executive power,[106] and on the other a bottom-up framework of constitutive normativity that enables and constrains the scope of generativity available in the first place to the product designer. The (dis)affordances and inscriptions created by the PoP create a kind of *de facto* constitution, delimiting the framework within which the day-to-day 'parliamentary' work of the product designer takes place. The normative power of design is thus deeper than just that of the product designer; it extends into the technical 'constitution' that makes up the foundation of the design process itself. Like a legal constitution, this technical foundation has implications for the artefacts built upon it in the higher levels of the technical 'stack'.

This is only a very brief introduction to the notion of the PoP and the concept of technological constitutionality that it represents. In Chapter 7 I discuss in more detail elements of the PoP that can facilitate a desirable technological constitutionalism, whereby the privileged position of the PoP enables the imposition of limits on the product designer that can be leveraged for normatively desirable purposes, binding the work of the latter so that the code she produces exhibits the qualities of legitimacy that I set out in later chapters. In this way, just as a constitution binds the work of a legislature ex ante, so too can the design environment contribute to the creation of legitimate code.

2.3 Conclusion

The discussion in this chapter has set out how code constitutes and regulates the behaviour of end-users, as framed by the theories of affordance, disaffordance, inscription, and technological mediation. The more a design is constitutive of behaviour, the more the balance of power favours the designer – in this sense, code is thus 'more' than law in its capacity to regulate. It is possible, however, for design to embody regulative rather than constitutive normativity, thus shifting (some) power back to the end-user. Redressing this balance is essential to the notion of legitimacy I am advocating. Given that design environments themselves have a regulating effect on the work of product designers, this paves the way for a consideration of how the production of user-facing affordances might be guided by the 'constitutionality'

[105] See 'Normative Relationships in Code and Law' in Section 1.4.

[106] The Odyssean idea of constitutional binding is discussed in Section 3.1.

of designer-facing affordances. The latter act as guard rails, delimiting and constraining the possible shapes that code can legitimately take. In the next chapter, I deepen the theoretical connection between law and design, proposing the concept of 'computational legalism' as a foundation for the synthesis of the later chapters of the book.