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Abstract

Abdi Aidid and Benjamin Alarie's *The Legal Singularity* (2023) is the most developed statement of an institutional design programme that would reorganise legal reproduction around computational specification and real-time prediction. The book sorts existing critics into two camps: essentialists (Pasquale, Hildebrandt, Cobbe, Deakin and Markou) and rule-of-law theorists (Weber) and rebuts each on its own terms. This article develops a third kind of critique, structural rather than essentialist or principles-based, that the book's defensive architecture is not calibrated to engage. Drawing on Luhmann's account of legal autopoiesis and on Golia Jr and Teubner's reconstruction of societal constitutionalism, it argues that the legal singularity is not a perfected version of legality but a substitution. The diagnosis the article offers is one of engineered autopoiesis: a mode of social reproduction that retains legality's vocabulary while substituting cybernetic control for its constitutive operations, and in which discretion is relocated into the politics of measurement. The programme is best refused not because it cannot deliver what it promises but because what it promises is no longer law.

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Introduction

Abdi Aidid and Benjamin Alarie open *The Legal Singularity* with a claim of unusual reach.[1] Computation, properly deployed, will deliver a stable and complete legal order in which legal uncertainty is resolved on demand, in real-time, and with the appropriate substantive outcome. Predictive systems will replace the coarse standards and reasoned indeterminacy of contemporary legality with fine-grained, *ex ante* specification; the alignment problem in artificial intelligence — the problem of ensuring that systems act in accordance with what their principals want — will, in the legal domain, be solved by making law itself an instrument of alignment.[2] The cumulative product of these developments will be what the book calls 'functional completeness': a legal order in which practically any legal question has an instantaneous and just resolution.[3] The promise is universal legal literacy, the elimination of legal uncertainty, and the transformation of the rule of law from aspiration into operational fact.

Whether it is an account of law at all is the question the present article presses. Aidid and Alarie's book is the most developed statement in print of a research programme — call it *the singularity programme* — that has been gathering institutional momentum for the better part of a decade.[4] The programme has its own foundational claims, its own institutional vehicles, its own commercial ecosystem and, in *The Legal Singularity*, its own canonical defence. It also has, as Chapter 5 of the book attests, its own catalogue of critics: a 'reductionist' camp comprising Pasquale, Hildebrandt, Cobbe, and Deakin and Markou, and a 'rule-of-law' camp represented by Weber, met by defensive strategies calibrated to deflect each in turn.[5] The argument developed here belongs to neither camp. It is a third kind of critique, structural rather than essentialist or principles-based, which the book's defensive architecture is not equipped to engage.

The article's central claim can be stated up front. The legal singularity, as Aidid and Alarie describe it, is not a perfected version of the legal order it would replace. It is a substitution. The vocabulary of legality is retained (rules, facts, reasons, application) but the operations through which legal reproduction has historically been sustained are progressively displaced. Selection moves upstream into infrastructures of measurement; coupling is mediated through standardised interfaces; second-order observation is thickened by predictive and evaluative metrics; and temporality is compressed into feedback loops that favour continuous steering over episodic judgment. The result is what this article calls *engineered autopoiesis*: a mode of social reproduction that retains legality's vocabulary while substituting cybernetic control for the communicative, programme-mediated, temporally structured operations through which legal communications are ordinarily generated and connected. Discretion is not eliminated. It is relocated: into feature selection, training corpora, thresholds, and exception handling. What is lost in this relocation is not an unquantifiable essence of legal reasoning, nor a particular substantive principle of the rule of law, but the architectural conditions under which legal reproduction has historically remained revisable, contestable, and capable of being irritated into change.

1.1 On the figure of the jurist

'Jurist' is used in a functional rather than occupational sense, to denote the actors who sustain juristic communication (judges, advocates, regulators engaged in reasons-giving interpretation, legal academics) and who keep legality cognitively open through argument, justification, and contestation. 'Autopoiesis without jurists' is therefore a diagnosis of institutional redesign, not a forecast of professional obsolescence.

1. 2 On the relationship to a body of prior work

The structural-operational argument developed here builds on earlier work in the legal singularity literature that characterised legal reasoning as evolutionary learning.[6] That account distinguished a *backpropagation* function — the backward-looking error-correction performed by appellate review and serial litigation, analogous to the gradient-descent algorithms at the heart of contemporary machine learning — from what was termed *forward-propagation*: the generative capacity of legal language to extrapolate from existing precedents to novel facts and thereby to break from precedent in the very act of applying it.[7] Machine learning, on that account, models the first but cannot capture the second; the singularity programme's ambition is intelligible only as an attempt to perfect backpropagation while dispensing with forward-propagation altogether. The argument here extends that diagnosis from legal reasoning to legal reproduction. Aidid and Alarie's reading of the earlier work as supporting Pasquale's claim about judicial subtext misplaces a structural argument among essentialist ones, and the misreading is informative: Chapter 5's defensive architecture has no vocabulary for structural critiques because its taxonomy is built around essence and principle.

1.3 On the relationship to Mireille Hildebrandt's parallel critique

Hildebrandt's COHUBICOL research programme has produced the most sustained existing engagement with the differences between text-driven, data-driven, and code-driven normativity.[8] The argument is phenomenological: text-driven law has affordances — ambiguity, open texture, multi-interpretability, contestability — that code- and data-driven normativities cannot reproduce, and those affordances are constitutive of the rule of law as we know it. The argument developed here operates at a different level. It does not depend on any claim about the affordances of text or about the irreducibility of natural-language interpretation to computational form. The primary question is structural: what kind of *operations* legal reproduction consists of, and what is altered when those operations are reorganised around computational infrastructure. The two arguments are complementary, not competing. Naming the difference matters because Chapter 5 treats both as variants of the same essentialist appeal, and a defence of one that does not specify how it differs from the other will be absorbed into the same defensive frame.

The normative claim follows from the structural one. Legal legitimacy depends on what may be called *structured friction*: procedural time, reasons-giving practices, interpretive openness, and the temporal architecture through which expectations can be disappointed, revised, and re-stabilised. These features are not inefficiencies to be engineered away; they are the operational conditions under which legal reproduction sustains itself. The legal singularity is best refused not because it cannot deliver what it promises but because what it promises is no longer law.

The claim that such a system is 'no longer law' is structural rather than formal. Automated outputs need not be doctrinally invalid or institutionally unrecognisable; the legal/illegal code may continue to operate, and the vocabulary of rules, facts, reasons, and application may remain intact. The point is that the operations through which legality has historically reproduced itself, in the autopoietic sense developed by Luhmann, would have been displaced. The institutional form remains; the mode of reproduction that gives it its distinctive legal character does not. It is in this sense that the singularity is best understood as a substitution — what the article characterises as *engineered autopoiesis*.

A system organised around continuous prediction, real-time specification, and the elimination of interpretive variance is not a perfected legal order; it is a different kind of social object altogether, one that lacks the structural features by which legality has historically remained accountable to those it governs. To treat structured friction as a costly residue rather than as a constitutive feature of legality is not to perfect the rule of law. It is to retire it.

The article proceeds in seven steps. Section 2 reconstructs the legal singularity as Aidid and Alarie present it, identifies the four argumentative moves of the programme, and maps the two-camp critical taxonomy of Chapter 5 against which it defends itself. Section 3 develops the systems-theoretic account of legal reproduction on which the structural critique depends, drawing on Luhmann's *Law as a Social System*[9] and on Angelo Golia Jr and Gunther Teubner's reconstruction of societal constitutionalism[10] for the normative bridge between description and critique. Section 4 traces the infrastructural mechanisms through which contemporary algorithmic governance is reconfiguring the conditions of legal autopoiesis: upstream selectivity, anticipatory observation, interface-mediated coupling, and temporal compression. Section 5 examines three sites where these dynamics are already visible: predictive analytics in courts, algorithmic eligibility administration in regulatory contexts, and automated private ordering. The structural problem has been registered in doctrinal form in recent decisions and inquiries — *SyRI* (Netherlands),[11] *Schufa* (CJEU),[12] and the Robodebt litigation and Royal Commission (Australia)[13] — though the present argument operates at the level of operational reconfiguration rather than doctrinal exegesis. Section 6 develops the normative critique, arguing that structured friction is not an inefficiency to be optimised away but a condition of legality's social credibility. Section 7 sketches

design principles aimed at preserving contestability under conditions of technological mediation. Section 8 concludes.

2. The Singularity Programme and its Critical Reception

1. Reconstructing the programme

The argument in *The Legal Singularity* is best read as four sequential moves rather than a single thesis. Together they amount to an institutional design programme, not a prediction, and each is carried forward into the defensive architecture of Chapter 5. Setting them out in sequence does real work: it exposes where the programme rests on contestable assumptions its proponents treat as settled, and shows where this article's critique cuts in.

(a) The diagnostic move

The programme begins with a diagnosis of the existing legal order. Contemporary legality is characterised, on Aidid and Alarie's account, by pervasive uncertainty, uneven access to legal services, inconsistent application of legal rules across cases, and a chronic mismatch between the speed of legal adjudication and the speed of the social and commercial activity it purports to govern.[14] Legal uncertainty, on this account, is not merely a regrettable feature of the system but a primary source of injustice: it allows powerful actors to manipulate legal indeterminacy in their favour, prices legal advice beyond the reach of ordinary subjects, and produces outcomes whose quality depends more on the parties' wealth than on the merits of their claims. The diagnostic move is presented as descriptive but functions normatively. It conditions the reader to treat uncertainty as a deficit to be eliminated rather than as a feature whose function must be assessed before it is condemned. Deakin and Markou have made precisely this point at a foundational level: legal uncertainty is a constitutive condition of legal evolution, the medium through which legal categories adapt to changing social referents.[15] A diagnosis that treats uncertainty as pathology in advance of theorising what it does has already smuggled in the conclusion it claims to be reasoning towards.

The diagnostic move's failure is therefore not in the conditions it describes. Contemporary legal systems are expensive, slow, and unevenly accessible, and these are real harms whose victims are disproportionately those least equipped to absorb them. The structural critique developed in this article does not deny the diagnosis. It denies that the prescription follows from it. The singularity programme proposes to address the inequalities of the existing legal order by displacing legal reproduction into infrastructures whose access is, on any honest accounting, even more unevenly distributed than access to litigation: the procurement processes, vendor relationships, model governance arrangements, and data partnerships through which infrastructural legality is constituted are not democratically open in the ways the legal order they

would replace is, however imperfectly, democratically open. The diagnosis points to a problem; the prescription compounds it. What is needed is not the substitution of one inegalitarian system for another, but the development of institutional resources for addressing inequality within a legal order that remains legible, contestable, and revisable.

(b) The desirability move

The second move builds on the first. If contemporary legality is afflicted by uncertainty, and if uncertainty is the source of the injustices identified, then the elimination of uncertainty is presumptively desirable. Aidid and Alarie press this further: a legal order in which uncertainty has been progressively eliminated would be not merely more efficient but more *just*, because the predictability it generates would constrain arbitrary power, equalise access to legal knowledge, and deliver what they call 'universal legal literacy'.[16] The desirability move converts what might have been a narrow operational claim — computation can resolve certain kinds of legal questions faster — into a sweeping normative one: the singularity is good because it would produce a better legal order. The conversion is rhetorically powerful and analytically slippery. It treats 'better' as a property of legal orders that can be evaluated against external criteria (efficiency, predictability, accessibility) without engaging the prior question of what a legal order *is* such that those criteria are even the right ones to apply. The structural critique developed in this article presses precisely that prior question.

(c) The feasibility move

The third move asserts the technical possibility of the programme. Machine learning techniques, Aidid and Alarie argue, have advanced to the point where legal outcomes can be predicted with high accuracy in defined domains; the case study of the economic substance doctrine in U.S. federal tax law, where their own predictive models achieve accuracies above ninety per cent, is offered as a proof of concept.[17] The feasibility move is essential because without it the programme is utopian rather than imminent. But the move depends on a specific characterisation of what is being predicted. The accuracy figures derive from prediction *of judicial outcomes* given past data, that is, from what Deakin and Markou characterise as *backpropagation*: the backward-looking error-correction performed by appellate review and serial litigation, which machine learning can plausibly model because its statistical architecture is, in effect, a version of the same process.[18] The feasibility move treats backpropagation as the whole of legal reasoning. It does not, and on its own terms cannot, address what Deakin and Markou term *forward-propagation*: the generative capacity of legal language to extrapolate from existing precedents to novel fact situations, to cognise new social referents, and thereby to break from precedent in the very act of applying it.[19] Models capable of the first are not, by virtue of that capability, capable of the second. The gap is not a technical lag but a difference of operation. Binns reaches a closely related conclusion from a different direction, observing that 'in machine learning, one new data point may not be enough to effect the same change in all similar cases in future'; old precedents

in case law can be ‘contradicted and superseded by new ones’, while in machine learning ‘fresh data adds to, but does not overrule the model globally’.[20] The feasibility move collapses these distinctions and presents what is in fact a partial capability as the foundation for a comprehensive programme.

(d) The defensive move

The fourth and final argumentative move is the one developed at length in Chapter 5. It anticipates objections to the first three moves and meets them. The existing critical literature is sorted into two camps: reductionists who argue computational law misses something about legal reasoning, and rule-of-law theorists who argue the singularity threatens specific normative principles, and each is met by a defensive strategy calibrated to deflect it.[21] The two-camp taxonomy is itself a piece of analytical work: it organises the conversation in a way that makes the programme appear robust against the existing critical literature, and it does so by constructing categories within which any given objection can be located and dismissed. The defensive move is, in effect, a closure operation. It establishes the conditions under which a critique of the programme will be recognised as a critique at all. This article’s central observation is that this closure operation works only against objections of the kinds it anticipates. A critique that operates outside the taxonomy (neither essentialist nor principles-based but structural) is not engaged by Chapter 5 because it has no place for it.

The four moves constitute the singularity as a design programme rather than a thesis: a diagnosis (uncertainty as pathology), a desirability claim (its elimination as good), a feasibility claim (backpropagation as proof), and a defensive structure (the two-camp taxonomy as closure). Each move’s plausibility is reinforced by the next, and the architecture is tightly integrated — the source of both its rhetorical power and its analytical vulnerability. A critique that engages any one move on the terms the programme offers will be absorbed by the others. The present article displaces the framing by pressing the prior question of what legal reproduction *is*.

3. The existing critical landscape and its defensive reception

Chapter 5 of *The Legal Singularity* is organised around the most strategically revealing manoeuvre in the book. Aidid and Alarie sort the existing critical literature into two camps: a ‘reductionist’ camp comprising Pasquale, Hildebrandt, Cobbe, and Deakin and Markou, and a ‘rule-of-law’ camp represented by Weber, and meet each with a defensive strategy calibrated to deflect it on its own terms.[22] Read together, these strategies and the taxonomy that organises them define the space of objections the book is calibrated to handle. They also expose a third space the book does not enter: the space in which the present article situates its critique.

(a) The reductionist camp and its rebuttal

The first camp is treated under the heading 'Law's Unquantifiable Essence'.[23] Pasquale is the standard-bearer; Hildebrandt, Cobbe, and the Deakin and Markou chapters in *Is Law Computable?* are positioned as fellow travellers. The unifying characterisation (Aidid and Alarie's, not the critics') is that this literature appeals to something about legal reasoning that computation cannot replicate: its subtext, its hermeneutic depth, its political and social embeddedness, its situation-specific character.

The rebuttal proceeds in three steps. First, the critique is re-described as a defence of complexity for its own sake: a posture that, on Aidid and Alarie's reading, casts judges and lawyers as elite decipherers and ordinary subjects as bit-players. Pasquale's framing of lawyers as members of a shared vocation rather than service providers is read as elitism; the Deakin and Markou description of legal reasoning as experimentation is read as indifference to litigants whose 'life, liberty or property' are being experimented with.[24] Second, the empirical record is mobilised against the critics: misclassification studies in U.S. federal courts show, on Aidid and Alarie's account, that the modes of legal reasoning the reductionists defend produce predictable injustices, particularly for women and people of colour.[25] Third, and most strategically, the critique is met by a definitional reassurance: computational law makes use of the same building blocks as traditional legal reasoning, namely established rules of law and established facts.[26] On this reading, what looks like a missing essence is merely traditional legal reasoning operating at higher speed and finer grain.

The strategic effectiveness of this rebuttal depends on a particular reading of what the reductionist critics are saying. The critics are read as making an *essence-claim*: that legal reasoning possesses some property, qualitative and ineliminable, that algorithmic methods cannot reproduce. So characterised, the rebuttal lands: if the essence-claim is rejected and the same-primitives point conceded, the appeal to indeterminacy looks like elite mystification.

A first observation matters here. The characterisation is, with respect to the Deakin and Markou chapters in *Is Law Computable?*, importantly inaccurate. Those chapters do invoke law's social embeddedness, but their structural argument is different. The argument developed in *Ex Machina Lex*, drawing on Luhmann's account of law as an autopoietic social system, identifies operational features of legal reasoning that distinguish it from machine learning: legal categories are constructed by the same process that applies them; the 'ground truth' against which legal classifications are tested is not external to the legal system but is itself generated by legal communication; legal evolution proceeds through a variation-selection-retention dynamic in which environmental pressures (litigation, legislation, lobbying, academic commentary) are translated into juridical form, and the doctrine of precedent provides retention.[27] That is not an essence-claim. It is a structural-operational claim, and Aidid and Alarie's footnote treatment, citing the Deakin and Markou chapters as supporting Pasquale's view about judicial subtext,[28] does not engage it.

The same is true, in a different register, of Hildebrandt's argument. In 'The Adaptive Nature of Text-Driven Law' Hildebrandt argues that text-driven legal infrastructures generate a particular kind of normativity, characterised by four affordances: the ambiguity of natural language, the open texture of legal concepts, the multi-interpretability of legal norms, and the contestability of their application.[29] Legal certainty, on this view, *thrives on* the need to interpret, the ability to contest, and the concomitant need to decide; ranking certainty above justice and purposiveness, rather than treating them as antinomian goals, collapses legality into legalism.[30] The argument is phenomenological rather than essentialist: it identifies properties intrinsic to text as medium and works out their normative implications, including the ways in which code- and data-driven law would generate different and impoverished normativities. To treat this as a claim about law's 'unquantifiable essence' is to mistake the level of the argument. The misreading and the dismissal of the Deakin and Markou work share the same structural feature: they assume that any critique of computational legality must be a claim about a metaphysical residue, and they have no vocabulary for critiques that operate at the level of operations, affordances, or system architecture.

The misreadings are informative rather than dismissible. They indicate that the defensive architecture of Chapter 5 is calibrated for essence-claims and lacks a vocabulary for structural and phenomenological ones. The vocabulary it does possess (primitives, building blocks, established rules and facts) operates at the wrong level of description to engage arguments about *operations* rather than about *contents*. The present article's task, accordingly, is to make this level-confusion legible: to develop a critique whose object is the architecture of legal reproduction rather than the substance of legal reasoning, and whose conclusions cannot be deflected by reassurances about computational primitives.

(b) The rule-of-law camp and its rebuttal

The second camp is represented by Weber, whose 2020 article in the *Michigan Technology Law Review* argues that the legal singularity would dissolve the predictability and universality principles which Weber identifies, following a Lockean tradition, as the normative pillars of the rule of law.[31] The argument is recognisably liberal-jurisprudential: legal predictability is valuable because it operates as a check on arbitrary governmental power; legal universality is valuable because it expresses a logic of political connectedness; and the singularity, on Weber's account, hollows out both by replacing reasoned legality with computational specification.

Aidid and Alarie's response to Weber is two-pronged. First, they argue that the predictability principle is already a fiction in contemporary legal systems: empirical literature consistently demonstrates that citizens, jurors, and even lawyers struggle to identify the content of the law; the proliferation of statutes and precedents has made legal information practically inaccessible; and the kind of predictability Weber defends has, on their view, never existed in the form he supposes.[32] Second, they argue that the universality principle is similarly available for critical reconstruction: decades of

critical legal theory, of which Angela Harris's critique of MacKinnon is offered as one example, have shown that universal claims about 'the community in general' rest on the silence of disparate groups; and day-to-day legal doctrine — standards of care, tax differentiation, negligence — already personalises in ways that suggest 'particularistic equality' rather than 'abstract equality' might be the appropriate aspiration.[33]

Both moves are designed to deflect Weber's argument by attacking its empirical and normative premises. If the predictability principle is already absent in present-day legal practice, the singularity's enhancement of predictability cannot be said to threaten what is not there. If universality is already an aspiration honoured in the breach, computational personalisation cannot be said to undermine what is already compromised. Weber's normative architecture is read as an idealisation against which the singularity compares favourably rather than poorly.

A second observation matters here. Weber's critique, like the reductionist critique, is calibrated against a particular conception of what the rule of law requires. It identifies *substantive principles* — predictability, universality — and argues that the singularity violates them. The rebuttal accordingly engages those principles substantively. Weber's argument is met not by reassurances about computational primitives but by empirical disagreements about whether the principles he defends are realised in the present legal order. The architecture of the rebuttal is symmetrical with the architecture of the critique: principle versus principle, premise versus premise, normative claim versus normative reconstruction. This symmetry is, again, informative. It suggests that the defensive architecture of Chapter 5 is well calibrated against rule-of-law critiques framed in terms of substantive normative principles. What it does not engage, and what it has no vocabulary for, is a critique that does not begin from such principles at all, a critique that treats the question of *what the singularity does* as logically prior to the question of *which principles it violates*.

(c) A third critical space

The two camps Aidid and Alarie identify exhaust the existing critical literature, but they do not exhaust the conceptual space of possible objections. Each rebuttal in Chapter 5 works against a particular kind of argument: the first against essence-claims about legal reasoning, the second against substantive normative claims about specific rule-of-law principles. Neither works against an argument that grants the same-primitives premise of the first defence and remains agnostic about the rule-of-law principles addressed by the second.

That third kind of argument, structural rather than essentialist, descriptive rather than principles-based, is what the present article develops. Its claim is not that legal reasoning possesses some ineffable property that computation cannot capture, nor that the singularity violates predictability or universality as Weber understands them. Its claim is that legal reproduction is a particular kind of social operation (communicative, programme-mediated, temporally structured, recursively connected) and that the

singularity programme, treated as institutional design rather than as a thesis about computational possibility, proposes to substitute a different kind of operation while retaining the vocabulary of law. What is at stake is not whether some unquantifiable residue is lost, nor whether the singularity is compatible with one or another rule-of-law principle, but whether the social object it produces is one a legal theorist working with a defensible account of legal autopoiesis could recognise as law.

This is the argument the next section develops. Aidid and Alarie's reassurance that computational law uses the same building blocks as traditional legal reasoning is not a rebuttal to a claim about operations; it is a non-sequitur, because the question is not what the primitives are but how they are connected, stabilised, and made revisable. The rebuttals to Weber turn on the substance of the predictability and universality principles; they do not address whether a system organised around computational reproduction would still be a legal system in the sense in which the principles ordinarily operate. The misreading of the Deakin and Markou argument as supporting Pasquale's hermeneutic claim, and the analogous mischaracterisation of Hildebrandt's phenomenological argument, are symptomatic of a deeper category problem: Chapter 5 has no place for structural or phenomenological critiques because its taxonomy is built around essence and principle, and these alternatives are neither.

3. Autopoietic law and the operations of legal reproduction

The structural critique developed in this article depends on a particular account of what legal reproduction consists of, and on a particular argument about why that mode of reproduction is normatively significant. This section develops the account and makes the argument. The exposition draws on Luhmann's theory of law as an autopoietic social system, on the growing systems-theoretic literature on algorithmic governance, and on Angelo Golia and Gunther Teubner's reconstruction of societal constitutionalism. The aim is not to defend Luhmannian sociology comprehensively — the systems-theoretic literature is large enough to support its own debates — but to assemble the apparatus that the critique in the following sections requires.[34] The argument proceeds in four steps. First, the operational character of legal autopoiesis is set out: legal communications reproduce as legal because they connect to other legal communications, not because they manipulate any particular primitives. Second, the temporal structure of legal reproduction is examined, with attention to the role of procedural time in sustaining normative expectations. Third, the question of structural coupling is taken up, and the interface layer is identified as a site at which algorithmic governance reconfigures the conditions of legal responsiveness. Fourth, Golia and Teubner's account of societal constitutionalism is introduced to make the normative bridge from description to critique. Each subsection ends with a brief signal of how the framework cashes out against the singularity programme; the full application is developed in section 4.

3.1 Operational closure and the work of legal communication

The starting point of Luhmann's theory is the observation that modern law operates as a functionally differentiated social system whose unity is sustained by a single coded distinction: legal/illegal. Legal communications (pleadings, judgments, statutes, contracts, regulatory determinations, administrative decisions) connect to other legal communications because they are recognised, within the system, as legal. They are processed through the binary code; they are stabilised through programmes; they are linked to prior legal communications in a recursive network that has no external anchor.[35] This is what is meant by operational closure: not isolation from the environment, but the property that legal communications connect only to other legal communications in their reproduction as legal. Closure in this sense is compatible with, indeed requires, cognitive openness: the system can observe, take in, and respond to events in its environment, but it does so by translating those events into legally relevant distinctions through legal communications.

The distinction between code and programme is critical to what follows. The code legal/illegal is too abstract to decide any particular case. It must be operationalised through programmes (doctrines, rules, principles, procedural norms, evidentiary standards) that specify how the code applies to specified circumstances.[36] Programmes are the workhorses of legal reproduction. They are also, importantly, themselves the product of legal communication: they evolve through interpretation, contestation, doctrinal innovation, statutory drafting, and judicial revision. The legal system reproduces itself not by applying a fixed set of programmes to varied facts, but by continuously generating, refining, and replacing the programmes through which the code does its work.

This has a precise implication for the critique developed in the present article. The same-primitives reassurance offered in Chapter 5 of *The Legal Singularity*, that computational law uses 'the same building blocks as traditional legal reasoning, namely established rules of law and established facts',[37] operates at the wrong level of description. The legality of a legal communication is not a property of its primitives. It is a property of the operation through which the primitives are connected, stabilised, and connected to other primitives, and through which the programmes that govern those connections are themselves revised. A system that manipulates the same primitives but does not sustain the operation does not, on a Luhmannian account, reproduce law. It produces something else: an artefact that looks like a legal output but is generated by a different kind of process. The structural critique developed here is not the claim that the singularity programme lacks the primitives. It is the claim that the operation it proposes is a different operation.

The work of legal communication is carried out, in the present article's functional sense of the term, by jurists.[38] The point bears restating because it is easy to misunderstand. Juristic communication is not the same as the speech-acts of any particular professional group; it is the practice through which legal communications are produced, contested,

and connected. It includes the work of judges and tribunal members, advocates and solicitors, regulators and administrators engaged in reasons-giving interpretation, legal academics whose commentary feeds back into doctrinal development, and the procedural and institutional infrastructure that supports all of these. The point of 'autopoiesis without jurists' as a diagnosis is that the operation of juristic communication is what is being displaced when legal reproduction is reorganised around infrastructural execution. The jurists themselves may persist, there will continue to be judges, lawyers, regulators, but the operations through which their communications connect to one another, and through which the programmes that govern those connections are revised, are reorganised around a different logic.

3.2 Temporal structure and normative expectations

A second feature of legal autopoiesis is its temporal structure. Luhmann distinguishes between two kinds of expectations that social systems sustain. Cognitive expectations are revised when disappointed: when reality diverges from the expectation, the expectation is corrected to track the world more accurately. Normative expectations, by contrast, are *maintained* even when disappointed: they are precisely the expectations whose disappointment is read as a breach of the expectation rather than as a reason to revise it.[39] When the rule 'thou shalt not steal' is broken by an instance of theft, the response is not to update the rule; it is to apply the rule and process the theft as illegal. This is what makes normative expectations normative. They generate their own counterfactual force.

But maintenance is not petrification. Normative expectations are maintained across disappointment through specific mechanisms: procedure, appeal, contestation, doctrinal interpretation, evidentiary refinement, and the slow accretion of judgments into precedent. These mechanisms work in time. They create temporal slack between events and decisions, between decisions and finality, between finality and possible revision. The procedural time of legal reasoning, what some have called the 'frictions' of law, is not a deficit to be optimised. It is the operational form through which normative expectations are sustained while remaining open to revision. Procedural time is what enables a legal system to *both* maintain its norms in the face of disappointment *and* revise its norms when revision is needed. Compress the time, and one or the other capacity is lost.

The Deakin and Markou account of legal reasoning as evolutionary learning sharpens this point. Legal evolution proceeds through a variation–selection–retention dynamic in which the variation is provided by the diverse fact patterns brought before courts, the selection by adjudication and appeal, and the retention by doctrine and precedent.[40] The retention function is temporally distinctive. Legal concepts encode information about past decisions in a form that can be redeployed in future cases, but the form is open-textured: it can be re-described, narrowed, distinguished, extended. The temporal

structure of legal reasoning is not merely backward-looking (the application of past rules to present facts) but also forward-looking: it generates expectations that orient future conduct without foreclosing the possibility that those expectations will themselves be revised. The capacity that Deakin and Markou term *forward-propagation*, the generative extrapolation from existing precedents to novel situations, is sustained by precisely this temporal structure.[41]

Hildebrandt's account of text-driven law reaches a closely related conclusion from a different direction. On her account, legal certainty 'thrives on the need to interpret, the ability to contest and the concomitant need to decide';[42] legal certainty is not the elimination of interpretive variance but the institutional space within which interpretation can occur and decisions can be made and revised. Hildebrandt arrives at this point through an analysis of the affordances of textuality as medium: ambiguity, open texture, multi-interpretability, contestability. The present account arrives at the same point through an analysis of the operational character of normative expectation-maintenance under conditions of social complexity. The two routes are complementary. Where Hildebrandt's argument bears on the medium through which legal communications are articulated, the argument developed here bears on the operations through which those communications are connected and sustained.

The connection to the singularity programme is direct. A legal order in which directives are issued in real time, executed instantaneously, and continuously updated does not sustain the temporal structure through which normative expectations are maintained across disappointment. It collapses the maintenance function into the execution function. What looks, from inside the programme, like a perfected legal order (uncertainty eliminated, enforcement immediate, prediction calibrated) is, on the Luhmannian account, a different mode of social reproduction in which normative expectations have been replaced by what amounts to cognitive expectations under continuous revision. Whether this is desirable is a question for section 6. The descriptive point here is that it is not the same operation.

3.3 Structural coupling and the interface layer

A third feature of legal autopoiesis is structural coupling. Operational closure does not mean that law is sealed off from other social systems. On the contrary: law remains responsive to politics, the economy, science, and other functionally differentiated systems through coupling at specific institutional interfaces. Legislation translates political demands into legal form; contract translates economic transactions into legal form; expert testimony and statutory definitions of scientific concepts translate scientific findings into legal form.[43] The coupling is structural rather than substantive: law does not absorb political content, economic content, or scientific content directly, but takes in events from these environments through interfaces that translate them into legally processable communications.

Two implications follow. First, the interfaces are sites of consequential decision-making. Whoever sets the conditions under which environmental events become legally observable is exercising a form of power that is not always recognisable as legal power but that has legal consequences. Second, the interfaces are themselves subject to change. The institutional forms through which law couples with its environment have changed substantially across the modern period, the rise of administrative law, the proliferation of regulatory agencies, the emergence of expert tribunals, and each such change has reconfigured the conditions under which law is responsive.

Under conditions of algorithmic governance, the interface layer is increasingly mediated by computational infrastructures. Risk-scoring systems translate social and economic data into eligibility determinations; compliance dashboards translate regulatory standards into machine-readable performance metrics; automated reporting systems translate the operations of regulated entities into pre-formatted data structures.[44] Each of these interfaces is a site at which the conditions of legal observability are determined. They are also, in many cases, sites that are largely insulated from conventional legal contestation: the question of whether a particular feature should count for the purposes of a particular regulatory regime is not, on its face, a legal question, even though its consequences are legal. The displacement of discretion into the politics of measurement — feature selection, threshold-setting, training data curation, exception handling — is, at the level of structural coupling, a reconfiguration of where coupling happens and on whose terms.

This insight matters for the diagnosis of engineered autopoiesis. The singularity programme does not (necessarily) eliminate operational closure. Legal communications continue to connect to other legal communications; the legal/illegal code continues to function. What changes is the interface layer: the conditions under which environmental events are translated into legally relevant distinctions. As selection moves upstream into computational infrastructure, the events that can become legally salient are pre-filtered by what the infrastructure can render observable. The legal system retains its autonomy in a formal sense — closure is preserved — but the channels through which it is irritated by its environment are narrower, more technical, and less contestable through ordinary legal means.[45] Closure is reinforced, but at the cost of responsiveness.

3.4 Societal constitutionalism and the normative bridge

The Luhmannian framework, taken on its own, is descriptive. It tells us *how* legal autopoiesis works, but it does not, on its own, tell us *why* that mode of reproduction is normatively significant or why a different mode, an engineered substitute, would be worse. To make the bridge from description to critique, the present article draws on the reconstruction of societal constitutionalism developed by Gunther Teubner and elaborated with Angelo Golia Jr.[46]

The argument can be sketched in three steps. First, constitutionalism is reconceived as a sociological rather than purely political phenomenon. Where the classical political-constitutional tradition addressed the relation between the state and its citizens, societal constitutionalism addresses the relations between functionally differentiated sub-systems of society — law, the economy, politics, science, the media, religion — each of which has developed in modernity its own operational logic, its own modes of reproduction, and its own potential for hegemonic expansion. Second, the threat addressed by societal constitutionalism is the colonising tendency of any sub-system that has acquired sufficient power to override the operational integrity of other sub-systems. Teubner's paradigm case has been the global economic system, whose colonising effects on law, on science, on education, and on the media have been the subject of his sustained critical engagement.[47] Third, the constitutional response to such colonisation consists not in the imposition of a single sovereign legal order but in the development of self-limiting mechanisms within each sub-system: 'constitutional fragments' that protect the integrity of the sub-system's operations from being subordinated to the logic of another. Constitutional protection, in this register, is the protection of operational integrity.

This framing supplies the normative bridge that the structural critique requires. The legal singularity programme can be productively read as a colonisation attempt — not by the economy, in this instance, but by computational logic understood as a quasi-autonomous form of social organisation with its own operational requirements (specification, prediction, optimisation, real-time intervention) and its own colonising tendencies. The programme proposes to subordinate the operations of legal reproduction to the requirements of computational specification: legal communications are to be reorganised around the goals of predictability, granularity, and continuous execution. What is at stake in this reorganisation is exactly what societal constitutionalism is concerned with: the integrity of legal autopoiesis as a particular mode of social reproduction with its own grammar, temporality, and constitutive friction. The programme does not merely change what law looks like. It changes what kind of social object law is.

A clarification is needed. The argument is not that computation as such poses a constitutional threat to law. Law has always coupled with its environment through technologies — writing, printing, mass media, digital records — and each such coupling has reconfigured the conditions of legal reproduction without subordinating those conditions to the logic of the technology.[48] The constitutional question arises only when the coupling tips into substitution: when the technology is no longer the medium of legal communication but the form of legal reproduction itself. The diagnosis of engineered autopoiesis is precisely the diagnosis of this tipping point. It is the claim that the singularity programme, treated as institutional design, proposes a reorganisation of legal reproduction in which the operations of legal communication are progressively displaced by computational execution, and in which the programmes that govern the application of the legal/illegal code are no longer themselves the

product of juristic communication but are pre-specified, fixed, and updated by mechanisms outside the legal system's capacity for self-correction.

A further clarification distinguishes the present argument from the parallel critique developed by Mireille Hildebrandt and Laurence Diver. On Diver's account, code-driven legal systems instantiate 'computational legalism': an extreme form of rule-following in which the affordances of textual law — interpretive openness, contestability, temporal evolution — are systematically dissolved.[49] The Hildebrandt–Diver framework is normative in a particular sense: it specifies the criteria that legitimate legal norms must meet (drawing on Fuller, Radbruch, and Wintgens) and shows how computational systems systematically fail those criteria. The argument is powerful and the diagnosis is largely shared. What the present article adds is a different theoretical apparatus. Where the Hildebrandt–Diver critique works through the legitimacy criteria of legality as aspiration, the structural critique works through the operational architecture of autopoiesis as system. The two routes converge on the proposition that the singularity programme would not perfect law but transform it; they differ in how they get there. For a defender of the programme who has rebutted the Hildebrandt–Diver critique on its own terms — by, for example, denying that the Fullerian criteria are the right ones, or by arguing that some forms of computational legality satisfy them better than text-driven legality does — the structural critique remains untouched. It operates at a different level of analysis.

The apparatus is now in place. Section 4 turns to the mechanisms through which contemporary algorithmic governance is reconfiguring the conditions of legal autopoiesis: upstream selectivity, anticipatory observation, interface-mediated coupling, and temporal compression.

4. The Mechanisms of Engineered Closure

This section traces the mechanisms through which contemporary algorithmic governance is reorganising the conditions under which legal communications are selected, connected, and stabilised. The argument is not that algorithmic systems have wholly replaced juristic communication — they have not — but that specific operational features of legal reproduction are being progressively displaced by infrastructural execution. Four mechanisms are decisive. First, selection is relocated upstream of legal communication, embedded in infrastructures of measurement, classification, and eligibility. Second, expectations are increasingly stabilised in anticipatory form, through risk scores and predictive systems, in ways that condition behaviour and institutional response before formal legal decision. Third, structural coupling is mediated through technical interfaces whose categories and thresholds determine what can enter the legal system as a contestable communication. Fourth, legal temporality is compressed, with feedback loops of monitoring and intervention displacing the episodic temporality of adjudication. Each mechanism is intelligible on

its own terms, and the singularity programme is intelligible as institutional design precisely because it proposes to consolidate all four.

4.1 Upstream selectivity

Legal autopoiesis depends on the capacity of the legal system to select environmental events as legally relevant — to translate heterogeneous social, economic, scientific, or technological phenomena into communications that can be processed through the legal/illegal code and the programmes that operationalise it.[50] The classical institutional channels for this selection — pleadings, statutes, regulatory proceedings, expert testimony — share an important feature: they admit of contestation. Whether a fact is legally relevant, whether a category applies, whether a programme has been correctly invoked, are all questions that can be raised and argued within the legal system itself.

Algorithmic infrastructures reconfigure this by relocating selection upstream of the moment at which legal communication can engage. Eligibility engines, triage systems, risk classifiers, and scoring infrastructures translate heterogeneous circumstances into pre-defined feature spaces, thresholds, and outputs.[51] By the time a case becomes legally observable, much of what would once have been a matter for legal characterisation has already been settled by the infrastructure. The legal system's selection function is preserved formally — closure is intact, the legal/illegal code continues to operate — but the conditions under which selection can occur have been reconstituted before legal communication is reached.

The quantification literature has long documented the reactive effects of measurement on the social phenomena it purports to describe.[52] Indicators are not neutral; they shape the behaviour of those who are evaluated by them, generate organisational incentives to manage the indicator rather than the underlying activity, and constitute the categories through which institutional attention is allocated. Power's account of the audit society documents how reasons-giving practices are progressively displaced by indicator-based accountability across whole institutional fields.[53] When these dynamics are translated into legal-administrative contexts, the displacement is precisely what the present article is concerned with: the conditions under which legality observes its environment cease to be determined by legal communication and are determined instead by the infrastructure that renders the environment legally observable.

A specific dimension of this displacement is captured in Hedler's recent analysis of the European and Brazilian regulatory responses to algorithms in courts. Hedler argues that regulatory texts — the European Ethical Charter on the use of artificial intelligence in judicial systems, and the Brazilian National Council of Justice's Resolution 332/2020 — attempt to convert the unknown *danger* posed by algorithmic systems into *manageable risk*: that is, into categories of expected harm that can be subjected to institutional decision-making.[54] The Luhmannian distinction between risk and danger here does specific analytical work. Danger refers to negative outcomes that arise from

sources outside the system's decision-making capacity; risk refers to negative outcomes that can be attributed to the system's own decisions and therefore managed.[55] The regulatory response to algorithmic governance is to draw as much of the danger as possible into the legal system's risk repertoire, but the conversion is itself partial, and what cannot be converted remains as danger, often invisibly. The structural critique developed here notes a further consequence: even where conversion succeeds, the categories through which conversion occurs are themselves products of the infrastructure rather than of legal communication. The legal system's repertoire of manageable risks is increasingly populated by categories supplied from outside it.

What the singularity programme proposes, treated as institutional design, is the consolidation of upstream selectivity as the principal mode of legal selection. Aidid and Alarie's vision of fine-grained, real-time legal specification depends on the comprehensive infrastructural rendering of social activity as legally observable.[56] The legal/illegal code persists; what changes is that almost everything that determines its application has been settled before legal communication begins.

4. 2 Anticipatory observation

The second mechanism concerns the temporal direction of legal observation. Luhmann's account of normative expectations emphasised their counterfactual structure: a normative expectation is maintained even when disappointed, because its function is precisely to survive disappointment.[57] The temporal architecture of legal reproduction supports this counterfactual function through the institutionalisation of episodic adjudication: moments at which expectations are confirmed, revised, or extended in the light of particular events.

Algorithmic governance progressively replaces this episodic temporality with continuous anticipation. Predictive systems, risk scores, compliance dashboards, and automated reporting infrastructures stabilise expectations in advance of any particular decision. The phenomenon has been described in recent systems-theoretic scholarship as the emergence of 'algonormative expectations': expectations stabilised by algorithmic systems that condition behaviour and institutional response prior to formal legal decision.[58] The point is not that anticipation is new — legal systems have always generated forward-looking expectations through doctrine, precedent, and regulatory guidance — but that algonormative expectations are stabilised infrastructurally rather than communicatively. They do not pass through the interpretive contestation that doctrinal expectations historically required.

The consequences for legal reproduction are operational rather than merely behavioural. When expectations about future legality are stabilised infrastructurally, the interpretive contestation through which doctrine evolves is partially displaced. Actors orient their behaviour to predicted outcomes rather than to articulated normative arguments; regulators allocate attention according to scoring systems rather than according to substantive engagement with the cases that scoring systems flag. The

system continues to produce legal communications, but a portion of what would once have been adjudicated as legal conflict is filtered out before it crystallises as conflict at all.

This filtering effect intensifies operational self-reference. The legal system's communications become increasingly oriented to managing its own indicators rather than to engaging with substantive disputes; predictions about legal outcomes feed back into the production of present legal communications, contracting the space in which doctrinal innovation or interpretive surprise can take hold. What looks, from inside the system, like increasing efficiency is, from a Luhmannian perspective, an attenuation of the system's capacity to be irritated by counter-argument. Binns's observation that 'fresh data adds to, but does not overrule the model globally' captures, in a different register, the same phenomenon: legal evolution through case-by-case displacement of precedent is replaced by statistical re-weighting that does not distinguish material from immaterial difference.[59]

4.3 Interface-mediated coupling

Section 3 introduced the concept of structural coupling and identified the interface layer as a site at which the conditions of legal responsiveness are determined. The argument can now be made more specifically. Under conditions of algorithmic governance, coupling between law and its environments — politics, the economy, science, technology — is increasingly routed through standardised technical interfaces: scores, dashboards, compliance APIs, automated reporting channels, and machine-readable regulatory frameworks. Each interface is a site at which environmental events are translated into communications the legal system can process. And each interface is a site at which significant decisions are made about what counts as a relevant event, who can trigger review, and which forms of conflict can be articulated.

The political significance of interface-mediated coupling is that the categories embedded in the interface — features selected, thresholds set, exceptions handled — exercise a function that has historically been performed through legal communication. They specify, in advance and without the contestability that legal communication affords, what counts. The discretion that legal theory has traditionally attributed to judges and regulators is not eliminated by such infrastructures; it is displaced into the politics of measurement and system design, often beyond the reach of conventional legal challenge. This displacement is the central operational feature of engineered autopoiesis. Closure is preserved — the legal/illegal code continues to function — but its operational conditions are reconstituted at a level the legal system cannot easily reach.

The phenomenon is visible across institutional contexts. In welfare administration, eligibility engines translate the heterogeneous circumstances of claimants into pre-defined feature spaces that determine entitlement before any reasons-giving determination has occurred.[60] In financial regulation, automated compliance systems

translate the activities of regulated entities into machine-readable indicators that determine enforcement attention. In platform governance, content moderation systems classify communications according to categories whose application is, for practical purposes, beyond the reach of judicial review. In each case, the legal system continues to operate — appeals can be brought, decisions can be challenged, regulators can intervene — but the conditions under which intervention is possible have been determined infrastructurally. The most consequential normative work has been done in places that legal communication cannot easily address.

The structural critique of the singularity programme can now be stated more precisely. Aidid and Alarie's vision is not merely a vision of more efficient or more accurate legal decisions; it is a vision in which the interface layer becomes the dominant site of legal selectivity. The promise of real-time legal specification depends on comprehensive infrastructural translation of social activity into machine-readable form; the promise of universal legal literacy depends on legal categories being rendered in ways that the infrastructure can process. What is presented as the perfection of legality is, on the present analysis, the migration of constitutive legal operations into infrastructural form: the same migration the foregoing has described as engineered autopoiesis.

4.4 Temporal compression

The fourth mechanism concerns the temporal structure of legal reproduction. Section 3 argued that procedural time — the institutional slack between events, decisions, and finality — is not an inefficiency to be eliminated but a constitutive condition of how normative expectations are maintained across disappointment.[61] Algorithmic governance reconfigures this temporal architecture in two ways. First, it reduces the distance between detection and intervention. Where legal processes historically institutionalised delay between observation and response, algorithmic regulation tends towards cybernetic intervention: detection triggers near-immediate response, often without intervening adjudication.[62] Second, it shifts the temporal centre of gravity from retrospective judgment of past conduct to anticipatory shaping of future behaviour. Governance becomes increasingly oriented towards continuous steering rather than episodic adjudication.

The cybernetic temporality of algorithmic regulation is incompatible with the temporal architecture of normative expectations. Continuous steering presupposes that the relevant expectations are cognitive rather than normative: that they are to be updated as data accumulates rather than maintained across disappointment. The procedural time of legal reasoning is treated as inefficiency; the institutional space within which contestation can occur is compressed or eliminated; and the orientation of governance shifts from sustaining normative expectations to optimising future outcomes. The reorientation is presented, in the singularity programme, as an improvement on contemporary legality. On the present analysis, it is a substitution of a different mode of social reproduction in which the operations that sustain normative expectations have been replaced by operations that manage cognitive ones.

A particularly acute form of this compression occurs where detection, decision, and enforcement are integrated into single automated processes. In such cases, the institutional separation that has historically allowed reasons-giving to intervene between observation and consequence is dissolved by design. The result is not merely faster legality but a different kind of operation: one in which the temporal architecture through which legal communications have historically been generated, contested, and revised has been collapsed into the execution of pre-specified directives. What was once the operation of legal reproduction is replaced by what is, structurally, the execution of a control system.

4.5 Engineered closure

The four mechanisms operate together. Upstream selectivity reconstitutes the conditions of legal observation; anticipatory observation displaces episodic decision; interface-mediated coupling relocates discretion into measurement and design; temporal compression collapses the procedural slack through which contestation has historically been possible. Each mechanism is intelligible on its own terms, but their convergence is what makes the singularity programme coherent as institutional design. The programme does not propose any single mechanism. It proposes the consolidation of all four as the dominant mode through which legal reproduction is sustained.

The result is engineered autopoiesis. Legal reproduction continues: the legal/illegal code operates, programmes are applied, decisions are generated. But the operations through which the code is applied, through which programmes are interpreted and revised, and through which decisions are connected to past authority and oriented towards future conduct: these operations have been progressively reorganised. Closure is reinforced; cognitive openness is attenuated; the conditions of structural coupling are reconstituted infrastructurally; the temporal architecture of normative expectation-maintenance is collapsed. What persists has the formal features of legality but lacks the operational features through which legality has historically remained contestable and revisable.

The argument carries: the singularity programme is best understood not as the perfection of legality but as a project of institutional substitution that retains the vocabulary of law while transforming the operations through which law has historically reproduced.

5. Sites of Engineered Closure

This section turns from mechanisms to sites. Three institutional contexts are examined: predictive systems in courts, algorithmic administration of welfare and regulatory eligibility, and private ordering through platform governance and decentralised infrastructures. The choice is not exhaustive; it is illustrative. Each site shows the mechanisms operating in characteristic combinations, and together they show that

engineered closure is not a hypothetical future but a description of changes already underway.

A distinction runs through the analysis. In public-law settings, the migration of legal reproduction into infrastructural form is partly constrained by procedural duties — reasons-giving, reviewability, institutionalised avenues for challenge — that keep legality publicly contestable even when computational tools enter the decision environment. The cost of closure is legibly registered, and its consolidation meets institutionally entrenched resistance. In private ordering, by contrast, the relevant obligations are typically contractual and platform-defined, and the closure that public-law settings approach asymptotically is already substantially realised. The contrast matters for the normative argument developed in section 6: the singularity programme, treated as institutional design, proposes to bring the operational features of private-ordering closure into public legality, and the visibility of the resulting changes will depend in part on how durably public-law procedural duties resist the transformation.[63]

5.1 Courts and the re-description of judicial futures

Courts are often treated as the institutional home of juristic communication: the site at which interpretive disagreement is formalised, reasons are demanded, and authority is stabilised through procedures that make decision-making slow, public, and contestable. For that reason, the ambition of the singularity programme can seem least plausible here. Aidid and Alarie themselves are careful to present their vision as compatible with continued judicial activity; their argument is not that judges are to be replaced but that judging is to be progressively better-informed by computational systems whose predictions, classifications, and analyses become routine inputs to decision.[64] Within their taxonomy of critics, anyone who insists that this is more than an informational supplement is read as making either an essentialist claim about what judges *uniquely* contribute or a rule-of-law claim about predictability and universality. The structural critique developed here is neither.

The point is that the introduction of predictive systems into adjudicative environments alters the operational conditions under which judicial communication is produced and stabilised, irrespective of where formal authority continues to reside. Risk assessment tools in sentencing, exemplified by the COMPAS system upheld in *State v Loomis*,[65] are the most-discussed instance, but the dynamic is general. A score, once embedded in a court's information environment, functions communicatively even when formally non-binding. It alters which dispositions appear administratively prudent, which departures from a benchmark distribution require justificatory work, and which explanations will read as professionally defensible to colleagues, appellate panels, and disciplinary processes. This is not a claim about cognitive bias. It is a claim about operational re-orientation: the production of judicial reasons becomes entangled with a second-order observation of the case (and of the decision-maker) that purports to characterise the future as a managed variable.[66]

The structural critique here is not that the score is inaccurate, opaque, or unfair, though it may be all three.[67] It is that the score introduces, into the operational architecture of adjudication, a substitute currency of legitimacy. A disposition can be defended not only by reference to doctrine, fact, and proportionality, but by reference to validated calibration, benchmark consistency, or 'evidence-based' alignment with statistical baselines. The justificatory centre of gravity drifts: from reasons that bind past authority to present decision, towards reasons that manage anticipated futures relative to model-supplied expectations. The reorientation is captured in the temporal mechanism identified in section 4: episodic judgment is partly replaced by continuous calibration to a distribution, and the decision is increasingly evaluated against representations of the system's own performance rather than against the contested grounds of the particular case.[68]

Aidid and Alarie are likely to respond that this is a transitional artefact, a feature of the partial and primitive systems currently in use rather than of computational legality at maturity. The mature singularity, on their account, is one in which the system's outputs become rich enough, transparent enough, and well-aligned enough that they can be treated as genuine inputs to legal reasoning rather than as substitutes for it.[69] The structural critique grants the possibility of that improvement and remains untouched by it. Even a perfectly calibrated, transparent, well-aligned predictive system reconstitutes the conditions under which judicial communication occurs: it relocates portions of legally relevant reality into computational pre-specification, embeds anticipatory observation in the routine production of reasons, and reorients the temporal architecture of judgment from retrospective evaluation to prospective alignment. What is changed is not the quality of decisions but the kind of operation through which they are produced.

In the public-law setting, this transformation runs up against the procedural duties through which adjudication has historically been kept contestable: the obligation to give reasons, the availability of appeal, the visibility of decisions to public review. These duties do not prevent the transformation, but they slow it, expose its costs, and create institutional resources for resisting its consolidation. The visibility of *Loomis* as a case — the fact that COMPAS could be challenged at all, that the Wisconsin Supreme Court was obliged to address the challenge, that the decision generated a substantial critical literature — is itself evidence of the procedural friction through which courts remain partially open to the kind of contestation engineered closure tends to dissolve.[70] The structural critique is not that this friction has been eliminated but that the singularity programme is, by design, a programme for its progressive reduction.

5.2 Eligibility infrastructures and the operationalisation of legal relevance

The second site is administrative: the welfare and regulatory infrastructures through which eligibility determinations, risk classifications, and compliance assessments are generated. Here, the structural mechanisms operate in a different combination. The dominant features are upstream selectivity and interface-mediated coupling: the legal

relevance of a person's circumstances, or of an organisation's conduct, is operationalised in advance through feature spaces, thresholds, classification schemes, and reporting formats that determine what can become legally observable before any reasons-giving determination is made.

The dynamics are by now reasonably well-documented across welfare administration, immigration enforcement, child protection, and regulatory compliance. Eligibility engines translate the heterogeneous circumstances of claimants into pre-defined feature spaces; automated triage systems determine which cases receive attention and which are processed at machine speed; risk-scoring infrastructures determine where regulatory effort is concentrated.[71] In each case, the legal system formally retains its decision-making authority — an officer makes the determination, an appeal is available, a tribunal can review — but the conditions under which the determination is made have been reconfigured upstream. The categories that determine entitlement have already been operationalised by the time the determination is reached; the question for the officer is whether the case fits the operationalised category, not whether the category is the right one for the case.

This is the precise operational signature of engineered closure. Legal communication continues to occur — files are reviewed, decisions are made, reasons are given, appeals are lodged — but its selection function has been displaced. The displaced function reappears, in altered form, in the design and maintenance of the infrastructure: in the politics of feature selection (what data is collected, what counts as relevant, what is treated as missing), in threshold-setting (where eligibility lines are drawn, what scores trigger review or denial), in training data curation (whose histories are taken as the baseline against which present cases are evaluated), and in exception handling (what circumstances are coded as outside the system's scope and how they are processed when they appear).[72] These choices are, in a Luhmannian sense, programme decisions: they specify how the legal/illegal code is to be applied in particular contexts. They are also, in the contemporary setting, choices that are typically made outside the institutional channels through which legal programmes have historically been generated and revised.

The point is not that such choices are illegitimate by virtue of being technical. It is that their migration into infrastructural form changes how the legal system can engage with them. Doctrine cannot easily reach feature engineering; appeal cannot easily reach threshold-setting; judicial review of administrative action presupposes a decision whose architecture is articulable in the terms in which review operates. The legal system retains its capacity to challenge particular determinations, but its capacity to challenge the operational conditions under which determinations are produced is structurally limited. When the conditions of decision are themselves the most consequential normative choices, the contestability that public-law procedure preserves at the moment of decision is operating downstream of where the relevant action has occurred.[73]

Aidid and Alarie's programme generalises this dynamic. Their vision of fine-grained legal specification depends on the comprehensive infrastructural rendering of social activity as legally observable — on the development of feature spaces and classification schemes capable of mapping the entirety of social and economic life into machine-processable form.[74] Their argument that this represents an improvement on contemporary legality presupposes that the migration of programme-decisions into infrastructural form is acceptable provided that the infrastructure is well-designed, well-governed, and broadly accurate. The structural critique resists this presupposition: the migration is itself the question, and a well-designed migration is still a migration. The legal system is not improved by the relocation of its programme-decisions into channels it cannot reach; it is, on the contrary, deprived of the operational capacity through which programmes have historically been kept revisable.

5.3 Private ordering and the prefiguration of closure

The third site shows what engineered closure looks like when the public-law procedural duties that have historically constrained its consolidation are largely absent. Platform governance — content moderation, account suspension, visibility ranking, transaction blocking — operates through continuous monitoring, automated classification, and near-instant intervention at scales no public-law adjudicative system can match. The same is true, in different form, of decentralised financial infrastructures, where the rules of permissible interaction are encoded in smart contracts and enforced by the execution environment rather than by adjudication.[75]

These are not legal systems in the doctrinal sense, but they matter for the present argument because they show what the operational architecture of engineered closure looks like when it is not constrained by the institutional resources that public legality has historically provided for its own contestation. The structural features are unmistakable. Selection is comprehensively upstream: the categories through which conduct becomes platform-relevant are encoded in the system's classification schemes, and the events that fall outside those schemes are invisible to the platform's enforcement architecture. Coupling is interface-mediated: reports, flags, scores, and automated assessments are the only channels through which conflict can enter the system, and the form of the channel substantially determines what can be said within it. Anticipatory observation is dominant: users orient their behaviour to predicted enforcement and to algorithmically inferred reach, and platform governance increasingly proceeds through pre-emptive intervention rather than retrospective sanction. Temporal compression is total: detection, decision, and enforcement are typically integrated into single automated processes that operate in real time, with appeal procedures that are themselves time-compressed and typically routed through the same infrastructure that produced the initial determination.[76]

The systems-theoretic literature on these phenomena is by now substantial. Paterson's analysis of decentralised finance reads smart contracts as a case of intensified internal differentiation within the economy: where traditional contracts depend on legal and

political systems for enforcement, self-executing smart contracts aggregate the functions of law and politics into the economic transaction itself, attempting to carve out an order in which legal and political enforcement is rendered structurally unnecessary.[77] The challenge this poses for regulation is, on Paterson's account, not that decentralised finance lies outside law but that it exerts structural pressure on law's coupling with the economic and technological environment: pressure that traditional regulatory interventions, premised on linear cause-and-effect between policy and conduct, are not equipped to address. The pressure works in both directions: law is asked to recognise platform determinations as legally consequential, and platforms are asked to recognise legal categories in their classification schemes. The interface is the site at which the negotiation occurs, and the structural critique notes that the negotiation is increasingly conducted on the infrastructure's terms.

The relevance to the singularity programme is direct. Aidid and Alarie's vision of real-time legal specification, continuously updated and granularly enforced, is structurally homologous with the operational architecture of advanced platform governance. The vocabulary is different — what the platform calls 'community standards' enforcement, the singularity programme calls fine-grained legal directives — but the operations are recognisably the same: comprehensive observability through infrastructural translation, anticipatory expectation-stabilisation through prediction, interface-mediated coupling between rule and enforcement, and temporal compression into continuous steering.[78] What the platform achieves through the absence of public-law procedural constraints, the singularity programme proposes to achieve through their reorganisation. The diagnosis of engineered autopoiesis is the diagnosis of this homology.

5.4 Pattern across sites

The three sites are heterogeneous in institutional character and in the visibility of their operations, but what unites them is the pattern of operational reconstitution traced in section 4. The four mechanisms (upstream selectivity, anticipatory observation, interface-mediated coupling, and temporal compression) are not site-specific; they recur in different combinations across courts, administration, and private ordering. In each, legal reproduction continues, decisions are made, reasons are given, appeals are processed, regulators intervene, but the operations through which legal communications are selected, connected, and stabilised have been progressively reorganised around infrastructures of measurement, prediction, and continuous execution. The legal/illegal code is preserved; what changes is the operational architecture through which the code does its work. The singularity programme, treated as institutional design, proposes the consolidation of all four mechanisms across all institutional sites of legal reproduction. The next section addresses that proposal directly.

6. The Normative Case for Structured Friction

The preceding sections have been substantially descriptive. They have argued that legal reproduction is a particular kind of social operation, that contemporary algorithmic governance is reorganising the conditions of that operation, and that the singularity programme — understood as institutional design — proposes the consolidation of the reorganisation as the dominant mode through which legal reproduction is sustained. The descriptive claim is, on its own, not yet a critique. A defender of the programme might accept the description and respond that what is being lost is precisely what should be lost: that the operations the structural account treats as constitutive are the very operations that make contemporary legality slow, expensive, inconsistent, and inaccessible to those who most need it. The improvement, on this view, just is the substitution of those operations for ones better suited to contemporary social complexity. The normative work this section undertakes is to explain why that response is inadequate, and to explain it in terms that do not rely on the essentialist or rule-of-law commitments that Aidid and Alarie's Chapter 5 taxonomy is calibrated to rebut.

The argument proceeds in four steps. First, the operational character of structured friction is set out: friction is not a cost imposed on legal reproduction by inadequate institutional design but the operational form through which legal reproduction is sustained. Second, the question of displaced discretion is taken up directly: the singularity programme's claim to reduce discretion is rejected as misdescription, and the consequences of relocation rather than reduction are traced. Third, the equality and democratic implications of engineered closure are examined, not as principles imposed from outside but as features that follow from the operational reorganisation. Fourth, the analysis returns to the constitutional bridge introduced in section 3.4, and develops the claim that the singularity programme is best understood as a colonisation attempt against which constitutional protection of legal operational integrity is the appropriate response.

6.1 Friction as operational form

The standard defence of legal frictions — procedural time, reasons-giving, appeal, the costliness of contestation — operates by trade-off. Friction generates legitimacy, it is said; legitimacy is worth its cost; therefore friction is justified despite its inefficiency. The argument is correct so far as it goes, but it concedes too much. It accepts the framing on which friction is, in the first instance, a cost: something that legal institutions accept reluctantly because the alternative would be worse. The structural account developed in this article rejects that framing. Friction is not a cost that legal reproduction pays for its legitimacy; it is the form in which legal reproduction occurs.[79]

The point can be put precisely. The operations of legal autopoiesis — the connection of legal communications to other legal communications, the application and revision of programmes, the maintenance of normative expectations across disappointment — are *temporal* operations. They take time because the operations are themselves

temporal: a normative expectation cannot be maintained instantaneously, because maintenance involves the survival of the expectation across the event that would disconfirm it. A programme cannot be applied without time because the application involves the redescription of the event in terms the programme can process, and redescription is a communicative operation that proceeds through interpretation, contestation, and stabilisation. A legal communication cannot be revised without time because revision involves the system's reflexive engagement with its own prior operations.[80] Time is not an inefficiency to be reduced; it is the operational medium in which the relevant operations are carried out.

This has a sharp consequence for the singularity programme's normative pitch. The programme is presented as an improvement on contemporary legality because it eliminates the costs of uncertainty, delay, and procedural overhead. But the costs being eliminated are not costs of legality, on the present account; they are constitutive of legality. The 'improvement' is therefore not an improvement on legality but a substitution of legality for something else. Whether the substitute is better or worse than legality is a question that can be debated — perhaps real-time directives would be better, on the merits, than legal reasoning would be — but the question cannot be settled by treating it as a question internal to legal improvement. It is a question about whether legality is what we want.[81]

The argument is structural rather than essentialist in a precise sense. It does not claim that legal reasoning involves some ineffable quality that resists computational reconstruction. It claims that the *operations* through which legal reasoning sustains normative expectations have a temporal architecture that the singularity programme proposes to dissolve, and that the dissolution is not a perfection of the operations but a substitution of different operations in their place. A defender of the programme who concedes the substitution but argues that the substitute is preferable has accepted the structural critique and moved the debate to a different ground: whether legality, in the sense developed by Luhmann and the systems-theoretic tradition, is something we should want. That is a debate worth having, but it is not the debate Aidid and Alarie offer; their Chapter 5 reads the critique as either essentialist or principles-based and rebuts accordingly. The substitution argument is neither, and the rebuttal does not reach it.

6.2 Discretion: relocation as concealment

A central rhetorical move of the singularity programme is the promise of reduced discretion. Discretion, in the programme's framing, is the locus of inconsistency, bias, error, and discrimination; computational specification reduces or eliminates discretion and thereby improves legal outcomes.[82] The structural critique rejects this framing not by defending discretion against the criticisms but by denying that the programme reduces it.

Discretion in legal reproduction is not a quantity that can be added or removed but a function that can be located in various institutional positions. The classical critique of administrative discretion — that it is unaccountable, inconsistent, and corruption-prone — assumes that discretion is exercised in particular institutional sites (the inspector's visit, the officer's interview, the magistrate's determination) and that legal reform consists in subjecting these sites to procedural and substantive constraint. The singularity programme proposes to relocate discretion out of these sites and into the design of the systems through which their work is now performed. The discretion does not disappear; the visibility, contestability, and accountability of its exercise change.[83]

Section 5 documented the relocation across three institutional contexts. The point can now be made directly. When a court's sentencing decisions are shaped by a risk assessment system, discretion has not been removed from sentencing; it has been distributed across the development of the risk assessment system (which factors are included, how they are weighted, what historical data is used to train the model), the institutional process through which the system was procured and adopted, and the ongoing maintenance of the system through updating, validation, and audit. When eligibility determinations are made through automated triage, discretion has not been removed; it is exercised in feature engineering, threshold-setting, exception handling, and the periodic revision of the underlying classification schemes. When platform governance proceeds through automated content moderation, discretion is exercised in the design of the moderation system, in the construction of the training corpora through which it learns, and in the appeal mechanisms that determine which determinations can be revisited.[84]

The structural concern is not that this relocation is in itself illegitimate. It is that the relocated discretion is now exercised in institutional positions that the legal system cannot easily reach. Doctrinal argument addresses meanings; procedure addresses decisions; judicial review addresses the exercise of public power in identifiable institutional sites. None of these instruments is well-positioned to address feature selection, model architecture, or training data curation, even where these are the choices that most consequentially determine legal outcomes. The legal system retains its formal capacity to challenge particular determinations and remains structurally unable to challenge the conditions of decision. The visibility of discretion has not been reduced; it has been displaced into channels that are insulated from the institutional resources through which legal communication has historically held discretionary judgment accountable.[85]

The consequence is path-dependence. Once a particular operationalisation of legal categories is embedded in infrastructure, the institutional incentives to retain it grow rapidly. The system generates the data that justify its continuation; alternative descriptions become progressively less legible; organisational practices reorient around the indicators the system supplies. Reform becomes a matter of system replacement rather than communicative argument, and system replacement carries costs (procurement, transition, retraining, validation) that legal institutions are not

well-equipped to bear. What was once a question of statutory interpretation or doctrinal revision becomes a question of infrastructure investment, and the political economy of infrastructure is not the political economy of legal communication. Legal reproduction becomes hostage to procurement.[86]

6.3 Equality and democracy under engineered closure

Two further normative consequences follow. The first concerns equality. Legal procedure has, at its best, functioned as a mechanism through which inequality can be named as a legal claim: a person whose circumstances diverge from the institutional expectation can articulate the divergence in legally recognisable form, and the articulation can become the basis for revision of the expectation. The mechanism is imperfect — access to legal procedure is itself unequally distributed, and the institutional capacity to absorb dissident claims is structurally limited — but the imperfection has been understood as a defect to be addressed rather than as a feature of the design. What engineered closure proposes, in effect, is to replace the imperfect mechanism with one whose imperfections are differently structured.[87]

Specifically, infrastructural legality tends to privilege legibility over voice. The capacity to be processed favourably by the system depends on whose circumstances fit the categories and data traces the system can reliably process. Those whose lives are well-documented, regularly observed, and consistently registered in the data sources from which the system draws its training and operational inputs are well-served by it. Those whose circumstances are irregular, poorly documented, or systematically misrepresented in the underlying data environment are not. The resulting inequality is not always experienced as discrimination in a doctrinal sense; it is experienced as administrative inevitability: a sequence of determinations whose accumulated effect is unfavourable but whose individual components are difficult to identify as wrong. That is precisely what makes the inequality normatively troubling on a structural account: the harm is not only the unfavourable outcome but the contraction of the institutional space in which the outcome can be redescribed as a legal claim.[88]

The second consequence concerns democracy. The decisive normative choices in an infrastructurally constituted legality — what to measure, how to classify, where to set thresholds, what to treat as exception — are not made through the legislative, administrative, or judicial processes that democratic theory has historically taken as the sites at which public authority is exercised. They are made in procurement processes, vendor relationships, model development cycles, data partnerships, and platform agreements. These are sites of significant power, but they are not sites that democratic institutions are well-equipped to govern. The result is a distinctive form of legitimacy displacement: legal authority is preserved formally, but the channels through which the polity can shape its content are progressively narrowed. What looks, from inside the singularity programme, like the strengthening of legality by elimination of arbitrary discretion is, from a democratic perspective, the relocation of authoritative decision-making into channels that democracy has not yet learned to address.[89]

Aidid and Alarie's response would presumably be that these are governance challenges to be met by better institutional design: that the procurement processes, model governance arrangements, and audit mechanisms through which infrastructural legality is constituted can themselves be subjected to democratic accountability. The response is not unreasonable, and section 7 takes up some of the design principles that would be required if it were to be pursued seriously. But the response concedes the central structural point: the consolidation of engineered closure as the dominant mode of legal reproduction relocates decisive normative authority into institutional positions from which legal communication has historically been excluded, and the recovery of democratic governance over those positions is a project of substantial institutional construction whose success is not guaranteed by the programme's promises of accuracy, granularity, and consistency.

6.4 The constitutional move

The argument can now be drawn back to the bridge introduced in section 3.4. Societal constitutionalism, in Teubner's reconstruction, is the project of identifying and resisting the colonisation of one functionally differentiated sub-system of society by the operational logic of another.[90] The paradigmatic case has been the colonisation of law, science, education, and the media by the operational logic of the global economic system, but the framework is general: any sub-system that has acquired sufficient power to override the operational integrity of others is a candidate for constitutional resistance, and the resistance proceeds through the development of self-limiting mechanisms within the colonising sub-system as well as through the strengthening of operational integrity within the colonised one.

The singularity programme can be productively read in these terms. It is, on the present analysis, a proposal to subordinate the operational logic of legal reproduction to the operational logic of computational specification: legal communications are to be reorganised around the requirements of measurability, predictability, and continuous execution; legal programmes are to be operationalised in machine-processable form; legal temporality is to be compressed into feedback loops compatible with the cybernetic governance forms computation makes possible. What is at stake is exactly what societal constitutionalism is concerned with: the integrity of legal autopoiesis as a particular mode of social reproduction with its own grammar, temporality, and constitutive friction. The constitutional response is not to refuse computation — law has always coupled with its technological environment, and the present argument does not deny that productive coupling is possible — but to refuse the *substitution* of computational reproduction for legal reproduction.

This colonisation argument requires a clarification. Computation is not, strictly speaking, a Luhmannian functional subsystem with its own binary code in the way that the economy (have/have not) or science (true/false) are. The claim here is not that computational logic has acquired the standing of a differentiated social system. It is that computational infrastructures increasingly operate as a cross-systemic organising

logic, structuring observation, classification, and execution across subsystems. Although not subsystem-like in Luhmann's strict sense, this organising logic exerts colonising effects analogous to those Teubner identifies, in *Constitutional Fragments* and elsewhere, in relation to economic rationality. The constitutional response to computational colonisation is therefore homologous to, rather than identical with, the response to economic colonisation: the integrity of legal autopoiesis is at stake in both cases, but the colonising logic is differently structured.

The refusal of substitution is normatively grounded in the same considerations that ground constitutional resistance to economic colonisation. Law is valuable, on a societal-constitutional account, not because it is intrinsically better than other modes of social organisation but because the differentiation of social systems is itself valuable: the maintenance of distinct operational logics in different sub-systems is what allows complex societies to address heterogeneous problems without collapsing them into a single operational frame.[91] When law's operational integrity is subordinated to the requirements of another sub-system — economic, computational, or otherwise — the differentiation that constitutes modernity's institutional achievement is eroded, and the capacity of the social order as a whole to address heterogeneous problems is diminished. The structural critique of the singularity programme is, in the end, a constitutional critique: it argues that the programme proposes a form of subordination that the differentiated structure of modern society has reason to refuse.

The critique does not depend on any particular value that legal reasoning is said to embody, only on the claim that legal reproduction is a specific kind of operation whose integrity is worth preserving for the sake of the differentiated social order. The defender of the programme must answer not the essentialist's challenge but the constitutionalist's: why the operational integrity of legal autopoiesis should be subordinated to the requirements of a different operational logic, and what social capacities are sacrificed when the subordination is consolidated as institutional design.

7. Designing Against the Singularity

The structural critique developed in the preceding sections leaves open a difficult question. If algorithmic governance is reconfiguring the operational conditions of legal reproduction across the institutional sites examined in section 5, and if the singularity programme proposes the consolidation of the reconfiguration as institutional design, then resistance must take some institutional form. Refusing the programme is not, in itself, a programme. This section sketches six design principles that would orient institutional development against the consolidation of engineered closure. The principles are not offered as a complete regulatory programme. They are constraints on the direction of travel: ways of preserving the operational architecture of legal reproduction under conditions of technological mediation. Each principle responds to one or more of the mechanisms identified in section 4, and each is framed in operational

rather than principles-based terms, as a design choice that protects specific features of legal autopoiesis from being progressively displaced by infrastructural execution.

7.1 Contestability of the infrastructure, not only the output

The first principle is the most foundational. Wherever an algorithmic system pre-selects legal relevance, the conditions of pre-selection must themselves be contestable through institutional channels that are not internal to the system. The principle is not the familiar demand for algorithmic transparency, which addresses outputs and the reasoning that produced them. It is a demand for contestability of the infrastructure through which legal observation occurs: the feature spaces, classification schemes, threshold rules, and exception protocols through which environmental events are translated into legally processable communications.[92]

The principle has several institutional implications. Where automated systems make eligibility determinations, the feature engineering through which eligibility is operationalised must be subject to public review and revisable through procedures that do not depend on the cooperation of the infrastructure's operators. Where predictive systems inform judicial decision-making, the validation and update regimes through which the systems are maintained must be open to independent assessment, and the institutional process through which a particular system was adopted must be subject to the same kind of scrutiny that has historically attached to substantive legal change. Where platform governance produces enforcement effects of significant legal consequence, the categorisation schemes through which conflict is rendered processable must be subject to challenge through procedures that are not channelled exclusively through the platform's own appeal mechanisms.[93]

The point of the principle is to preserve, within legal communication, the institutional capacity to address operational choices that are currently being made outside it. The challenge is institutional design: legal communication has not historically been equipped to engage with feature engineering or model architecture, and the development of the institutional capacity to do so is itself a substantial project. But the project is the right one, because the alternative is the progressive insulation of the most consequential normative choices from legal contestation.

7.2 Reasons as the currency of legitimacy

The second principle concerns the form in which legal authority is articulated. The argument of section 6.1 was that procedural time is the operational medium in which legal reproduction occurs; the corollary is that reasons-giving — the articulation of justifications that can be contested, refined, and extended through subsequent legal communication — is the operational form in which authoritative legal communication is produced. Automated legality tends to substitute outputs (scores, rankings, flags, directives) for reasons; the substitution must be resisted as a matter of institutional design.[94]

The principle does not require that automated outputs be refused as inputs to legal decision-making. It requires that they be treated as triggers for reasons-giving rather than as substitutes for it. When a risk assessment is used in sentencing, the obligation to articulate reasons for the disposition cannot be discharged by reference to the assessment alone; the reasons must address how the assessment was treated as legally relevant, how it was weighed against other considerations, and what alternative descriptions of the case were rejected. When an eligibility determination relies on automated classification, the reasons must address the classification itself, not only the determination it produced. When platform enforcement is challenged, the reasons must articulate the categorical judgments embedded in the enforcement system and not only the application of those judgments to the case.

The principle is demanding, and it would substantially constrain the institutional uptake of automated systems in legally consequential decisions. That is the point. The constraint is not an external imposition on a project that would otherwise proceed unimpeded; it is a recognition that the project, if it proceeds without the constraint, ceases to be a legal project. Reasons-giving is not an ornament of legal authority. It is the operational form in which legal authority is constituted.

7.3 Temporal slack as design choice

The third principle responds to the temporal compression identified in section 4. The general form is straightforward: institutional procedures should preserve, deliberately and by design, the procedural slack through which contestation has historically been possible. The specific implementations vary by context. In administrative settings where automated detection triggers sanction, mandatory review windows should be institutionalised between detection and enforcement. In adjudicative settings where predictive systems shape decision-making, the institutional pressure to use prediction as a decision accelerator should be resisted in favour of using it as a prompt for reflective justification. In platform governance, the integration of detection, decision, and enforcement into single automated processes should be subject to procedural constraints that re-introduce time for contestation, even at the cost of system efficiency.[95]

The principle is not the claim that legal processes should always be slow. Some forms of rapid intervention are clearly justified, and the institutional resources for emergency action are well-developed in many legal systems. The principle is that speed should not be allowed to become a unilateral design virtue. Where speed is institutionally appropriate, the case for it should be made and the institutional design should accommodate it. Where speed is the result of infrastructure design that has eliminated the procedural slack through which contestation occurs, the loss of slack should be visible and the case for it should be required. The default should not be that the absence of temporal friction is institutional success.

7.4 Architectural separation of detection, decision, and enforcement

The fourth principle is architectural: the institutional separation between the functions of detection, decision, and enforcement should be preserved against the integrative pressure that algorithmic governance exerts. Self-driving legality, as Aidid and Alarie describe it, collapses these functions into single processes: norms are operationalised in computational form, detection occurs continuously through monitoring, decisions are produced automatically by classification, and enforcement is integrated into the system's execution. The collapse is precisely what makes engineered closure attractive as institutional design.[96]

The principle of architectural separation is the requirement that, wherever the technical conditions for such integration exist, institutional procedures must be designed to maintain the distinctions between the functions. Detection should not automatically trigger decision; decision should not automatically trigger enforcement. The institutional space between the functions is where legal communication has historically intervened: where reasons-giving occurs, where contestation can be lodged, where decisions can be reviewed before they crystallise as enforcement. The space is not preserved by accident; it is preserved by design, through procedures that require the active intervention of legally responsible actors at each transition.

A related implication is what might be called a 'right to a second system': an entitlement, where automated classification produces a legally consequential determination, to review by a system that is not the same as the one that produced the initial determination. An appeal that re-runs the same model or applies the same feature space is not, on the present account, an appeal in the legally significant sense; it is a loop. The institutional alternative is procedurally and architecturally distinct review: review by a different system, operated by a different institutional body, applying a different set of programmes. The alternative is more expensive than internal appeal but it is what is required if the appeal is to do the work that appeal has historically done.

7.5 Public governance of the proxy

The fifth principle responds directly to the displacement of discretion identified in section 6.2. If the substantively decisive choices in an infrastructurally constituted legality are now made in feature selection, threshold-setting, training data curation, and exception handling, then those choices must be governed as public choices rather than as technical-managerial ones. The institutional implication is that the design and maintenance of legally consequential infrastructure must be subject to forms of public scrutiny, participation, and accountability comparable to those that have historically attached to legal change through legislation, doctrinal development, and administrative rule-making.[97]

The principle does not require that all measurement be subject to direct democratic control, which would be neither feasible nor desirable. It requires that the institutional

channels through which infrastructure is developed and maintained be sensitive to the legal significance of the choices they make. The specific design questions are substantial: what forms of public consultation are appropriate to feature engineering; how the technical character of the work is to be combined with the democratic character of the choices; how the institutional positions in which the work is currently done are to be reformed to make democratic accountability operationally possible. These are open questions. They are, however, questions that should be addressed under the assumption that the choices in question are legally significant, rather than under the assumption that their technical character exempts them from the institutional treatment that legal significance has historically required.

7.6 Plural description and the irritation of law

The sixth principle is epistemic and concerns the capacity of the legal system to be irritated by descriptions of its environment that are not pre-formatted by the infrastructure through which it observes. Algorithmic governance tends to narrow the range of legally observable description because it privileges what can be commensurated, classified, and processed at machine speed. The institutional resources through which legal communication has historically been irritated — pleadings written in natural language, evidence presented in heterogeneous forms, expert testimony that resists reduction to standardised categories, lived experience articulated through narrative — are progressively displaced by formats designed for infrastructural compatibility.[98]

Designing against the singularity therefore requires the deliberate preservation of plural description as a feature of legal procedure. Where evidence can be presented in non-standardised form, it should be. Where pleadings can be written in narrative rather than checkbox form, they should be. Where the categories supplied by infrastructure are inadequate to the case before the court, the inadequacy should be recordable as a legal claim rather than dismissed as user error. The institutional implication is that legal procedure must retain, as a matter of design, the capacity to absorb descriptions that resist infrastructural translation, and the discipline to take such descriptions seriously when they appear.

The principle is connected to the equality concern developed in section 6.3. Those whose lives are well-served by infrastructural categorisation can articulate their claims in the categories the system supplies. Those whose lives are not so served depend on the legal system's residual capacity to absorb descriptions that the infrastructure cannot process. The progressive narrowing of that capacity, as legal communication is reorganised around infrastructural compatibility, is therefore not only an epistemic loss but a distributive one.

7.7 A programme of friction

The six principles are deliberately conservative. They do not propose new institutions; they propose constraints on the direction of institutional development. They do not refuse computation; they refuse the consolidation of computational execution as the dominant mode through which legal reproduction is sustained. Their cumulative effect, if they were taken seriously, would be to slow the migration of legal reproduction into infrastructural form — to preserve, by design, the operational architecture through which legal autopoiesis has historically been sustained, while permitting computational mediation where it can be incorporated without consolidating the substitution the singularity programme proposes.

The principles do not, of course, resolve the question of where the line falls. That question is for institutional development and political contestation, not for academic argument. The contribution of the present analysis is to identify the line as one that institutional design ought to draw — to provide a structural reason, grounded in the operational character of legal autopoiesis, for refusing to treat the singularity as the horizon of legal modernisation. The constitutional move developed in section 6.4 supplies the normative ground for the refusal. The design principles sketched here supply the institutional vocabulary in which the refusal can be made operational.

8. Conclusion

Aidid and Alarie's *The Legal Singularity* is the most fully developed statement of an institutional design programme that would reorganise legal reproduction around computational specification, real-time prediction, and continuous enforcement. The book's Chapter 5 sorts its critics into two camps — essentialists who deny that legal reasoning can be computationally reconstructed, and rule-of-law theorists who argue that the singularity violates the predictability and universality principles Weber identified as constitutive of modern legality — and rebuts each on its own terms. The present article develops a third critique the book's defensive architecture does not address.

The critique proceeds from a particular account of what legal reproduction consists of. Drawing on Luhmann's theory of legal autopoiesis and on Golia and Teubner's reconstruction of societal constitutionalism, the article has argued that legal communications reproduce as legal because they connect to other legal communications through programmes that are themselves the product of legal communication; that the temporal structure of legal reasoning is the operational form in which normative expectations are sustained across disappointment; that structural coupling with environmental sub-systems occurs through interfaces whose configuration is itself a site of consequential decision-making; and that the constitutional integrity of legal reproduction consists in the maintenance of these operational features against the colonising pressure of other sub-systems' operational logics. Each feature is being progressively reconfigured by algorithmic governance

through four mechanisms: upstream selectivity, anticipatory observation, interface-mediated coupling, and temporal compression. The singularity programme, treated as institutional design, proposes the consolidation of all four mechanisms as the dominant mode through which legal reproduction is sustained.

The substitution the article diagnoses is engineered autopoiesis. The singularity programme is not the perfection of legality, on the present analysis, but a substitution: an institutional reorganisation in which the operations through which legal communications have historically been generated, contested, and connected are progressively displaced by the operations through which computational systems generate, classify, and execute. What persists is law in computational clothing. The formal features of legality remain — the legal/illegal code continues to operate, programmes are applied, decisions are produced — but the operational architecture through which those features have historically been sustained has been reorganised around a different logic. The substitution is what the structural critique identifies as a colonisation in Teubner's sense, and it is the candidate for constitutional resistance through the development of self-limiting mechanisms within the colonising sub-system and the strengthening of operational integrity within the colonised one.

The article's normative argument has been calibrated to evade the rebuttals that Aidid and Alarie develop. It does not depend on the claim that legal reasoning involves some ineffable quality that resists computational reconstruction; it depends only on the claim that legal reproduction is a specific kind of operation whose integrity is worth preserving for the sake of the differentiated social order in which legal communication has its place. It does not depend on a commitment to particular values that legal reasoning is said to embody; it depends only on a commitment to the maintenance of differentiated social systems as a feature of modern institutional design. A defender of the singularity programme who accepts the structural critique and argues that the substitution is preferable to the operations it would displace has moved the debate to genuinely contested ground: whether legality, in the sense developed by the systems-theoretic tradition, is something contemporary societies should want. That is a debate worth having. It is not, however, the debate Aidid and Alarie offer, and the present article has argued that the alternative debate — between the perfection of legality and its computational improvement — is conducted on terms that mistake substitution for improvement.

Proponents of the singularity programme will also reply that the limits identified here are temporary: what computational systems cannot do today they will do tomorrow. That reply is probably right in some form, and the structural argument developed here does not depend on denying it. The diagnosis is not that infrastructural legality cannot be built but that building it substitutes one mode of legal reproduction for another, and that the substitution should not be naturalised as the inevitable next step in legal modernisation. Whether such an order arrives because it was chosen, or because the operational capacities through which alternative arrangements might have been

sustained were allowed to atrophy, is itself a question for institutional design, and one the structural critique is meant to keep open.

A further point follows. The technical conditions sufficient for the singularity programme (comprehensive observability of social activity, real-time predictive modelling of human conduct, continuous infrastructural execution at scale) are not legal-institutional capabilities. They are general-purpose capabilities whose deployment in law would be one application among many. They presuppose a broader socio-technical transformation whose properties the programme does not theorise. The legal singularity, if it arrives, will not arrive discretely into the social order against which Aidid and Alarie ask it to be measured. It will arrive into the order produced by the conditions of its own possibility, and that order's properties cannot be evaluated by the legal-institutional criteria the programme proposes. The programme thus presents itself as a discrete legal reform whose terms of evaluation presuppose a continuity its own conditions would dissolve.

Two implications follow for further work. The first is empirical. If the structural mechanisms identified in section 4 are operating across the institutional sites surveyed in section 5, then socio-legal research must develop the analytical apparatus to track them: not only the outputs of automated systems but the infrastructural choices through which those outputs are produced, and not only individual decisions but the operational conditions under which decisions become possible. The displacement of discretion into the politics of measurement is where much of the consequential normative work is done. The institutional capacity to study this work, and to subject it to forms of public contestation, is itself underdeveloped, and its development is a research and policy priority.

The second implication is jurisprudential. The legal singularity debate has, to date, been substantially organised around the binary suggested by Aidid and Alarie's Chapter 5: either legal reasoning has some essential feature that computational reconstruction cannot capture, or the singularity is compatible with the principles of legality and represents an improvement upon contemporary institutional arrangements. The argument developed here cuts across this binary and suggests a different conceptual vocabulary for the debate. The relevant question is not whether the singularity is faithful to the essence of legal reasoning or to the principles of the rule of law. It is whether the institutional design the programme proposes preserves the operational features through which legal reproduction has historically been sustained, or whether it substitutes a different mode of social reproduction that retains the vocabulary of law while transforming the operations through which law has historically reproduced.

The present article has argued for the second description. The argument does not require the rejection of computation as a feature of legal practice; it requires the refusal of the consolidation of computational execution as the dominant mode through which

legal reproduction is sustained. Autopoiesis, on Luhmann's account, describes how modern law reproduces under conditions of social complexity. It is not, and should not become, a design ideal. The danger the singularity programme presents is not that law will run without humans but that law will increasingly run without the structured frictions through which humans have historically been able to contest, revise, and re-anchor legality. The constitutional defence of legal operational integrity under algorithmic governance is the institutional task to which the structural critique points.

Notes

[1] Abdi Aidid & Benjamin Alarie, *The Legal Singularity: How Artificial Intelligence Can Make Law Radically Better* (Toronto: University of Toronto Press, 2023) at 3.
[2] Ibid at 8-13, drawing on Brian Christian, *The Alignment Problem: How Can Machines Learn Human Values?* (New York: WW Norton, 2020).
[3] Aidid & Alarie, *supra* note 1 at 8.
[4] Benjamin Alarie, "The Path of the Law: Towards a Legal Singularity" (2016) 66 UTLJ 443; Anthony J Casey & Anthony Niblett, "Self-Driving Laws" (2016) 66:4 UTLJ 443; Anthony J Casey & Anthony Niblett, "The Death of Rules and Standards" (2017) 92:4 Ind LJ 1401.
[5] Aidid & Alarie, *supra* note 1 at 93-117.
[6] Simon Deakin & Christopher Markou, "From Rule of Law to Legal Singularity" in Simon Deakin & Christopher Markou, eds, *Is Law Computable? Critical Perspectives on Law and Artificial Intelligence* (Oxford: Hart, 2020) 1; Christopher Markou & Simon Deakin, "Ex Machina Lex: Exploring the Limits of Legal Computability" in Deakin & Markou, eds, *ibid*, 31; Simon Deakin & Christopher Markou, "Evolutionary Interpretation: Law and Machine Learning" (2022) 1 J Cross-disciplinary Research in Computational L 2.
[7] Deakin & Markou (2022), *supra* note 6.
[8] Mireille Hildebrandt, *Law for Computer Scientists and Other Folk* (Oxford: Oxford University Press, 2020); Mireille Hildebrandt, "The Adaptive Nature of Text-Driven Law" (2020) 1 J Cross-disciplinary Research in Computational L 1; Mireille Hildebrandt, "Code-driven Law: Freezing the Future and Scaling the Past" in Deakin & Markou, eds, *Is Law Computable?*, *supra* note 6, 67; Mireille Hildebrandt, "Grounding Computational 'Law' in Legal Education and Professional Legal Training" in Bartosz Brożek, Olia Kanevskaia & Przemysław Pałka, eds, *Research Handbook on Law and Technology* (Cheltenham, UK: Edward Elgar, 2023) 99; Mireille Hildebrandt, "The Future of Computational Law in the Context of the Rule of Law" (2024) 2 J Cross-disciplinary Research in Computational L 2.
[9] Niklas Luhmann, *Law as a Social System*, translated by Klaus A Ziegert (Oxford: Oxford University Press, 2004).
[10] Angelo Golia Jr & Gunther Teubner, "Societal Constitutionalism: Background, Theory, Debates" (2021) 15:4 ICL J 357.
[11] *NJCM v Netherlands (SyRI)*, Rechtbank Den Haag, 5 February 2020, ECLI:NL:RBDHA:2020:1878.
[12] Case C-634/21, *OQ v Land Hessen (SCHUFA Holding)*, [2023] ECLI:EU:C:2023:957.
[13] Commonwealth of Australia, *Royal Commission into the Robodebt Scheme: Report* (Canberra: Commonwealth of Australia, 2023); *Prygodicz v Commonwealth (No 2)*, [2021] FCA 634.
[14] Aidid & Alarie, *supra* note 1 at 25, 54-56; 143-156.

[15] Deakin & Markou (2022), *supra* note 6.
[16] Aidid & Alarie, *supra* note 1 at 156-161.
[17] Ibid at 76-79; 170-172.
[18] Deakin & Markou (2022), *supra* note 6.
[19] Ibid.
[20] Reuben Binns, "Analogies and Disanalogies between Machine-Driven and Human-Driven Legal Judgement" (2020) 1 J Cross-disciplinary Research in Computational L 1 at 6.
[21] Aidid & Alarie, *supra* note 1, ch 5.
[22] Ibid.
[23] Ibid at 95-102.
[24] Ibid at 98.
[25] Ibid at 103 citing Charlotte S Alexander & Mohammad J Feizollahi, "Decisional Shortcuts and Selection Effects: An Empirical Study of Ten Years of US District Courts' Employee Misclassification Decisions" (2020) [unpublished manuscript]; Charlotte S Alexander, "Misclassification and Antidiscrimination: An Empirical Analysis" (2017) 101 Minn L Rev 907.
[26] Aidid & Alarie, *supra* note 1 at 104.
[27] Markou & Deakin, *supra* note 6 at 57-63, drawing on Luhmann, *supra* note 9 at 250, 255, 257.
[28] Aidid & Alarie, *supra* note 1, ch 5, citing Robert F Weber, "Will the 'Legal Singularity' Hollow Out Law's Normative Core?" (2020) 27:1 Mich Tech L Rev 97.
[29] Hildebrandt, "Adaptive Nature", *supra* note 8 at 7-9.
[30] Ibid, citing Gustav Radbruch, "Legal Philosophy" in *The Legal Philosophies of Lask, Radbruch, and Dabin* (Cambridge, MA: Harvard University Press, 1950) (reprinted 2014); Laurence E Diver, *Digisprudence: Code as Law Rebooted* (Edinburgh: Edinburgh University Press, 2022).
[31] Aidid & Alarie, *supra* note 1 at 94 citing Weber, *supra* note 28.
[32] Ibid at 108-117.
[33] Ibid at 113-116 citing Angela P Harris, "Race and Essentialism in Feminist Legal Theory" (1990) 42 Stan L Rev 3; Anthony Casey & Anthony Niblett, "A Framework for the New Personalization of Law" (2019) 86:2 U Chicago L Rev 333.
[34] For a contemporary engagement with Luhmann's framework as applied to algorithmic governance, see L Hedler, "Risk and Danger in the Introduction of Algorithms to Courts: A Comparative Framework between the EU and Brazil" (2024) 14:5 Oñati Socio-Legal Series 1315; G Schwartz & R Almeida da Costa, "Algonormative Expectations" (2024) 14:5 Oñati Socio-Legal Series 1337.
[35] Luhmann, *supra* note 9 at 80-89, 142-58.
[36] Ibid at 195-230.
[37] Aidid & Alarie, *supra* note 1 at 104.
[38] See further the discussion in section 1, above.
[39] Luhmann, *supra* note 9 at 142-49.

[40] Deakin & Markou (2022), *supra* note 6.
[41] Ibid.
[42] Hildebrandt, "Adaptive Nature", *supra* note 8.
[43] Luhmann, *supra* note 9 at 381-422.
[44] For analysis of these dynamics in specific domains, see Hedler, *supra* note 34; Schwartz & Almeida da Costa, *supra* note 34. See also Karen Yeung, "Algorithmic Regulation: A Critical Interrogation" (2018) 12:4 Regulation & Governance 505.
[45] The point is developed in more detail in section 4, below.
[46] Golia Jr & Teubner, *supra* note 10. The reconstruction draws on Teubner's earlier monograph: Gunther Teubner, *Constitutional Fragments: Societal Constitutionalism and Globalization* (Oxford: Oxford University Press, 2012).
[47] Teubner, *Constitutional Fragments*, *supra* note 46.
[48] This is, in effect, the point about coupling between law and information and communication technologies developed in Hildebrandt's earlier work. See Mireille Hildebrandt, *Smart Technologies and the End(s) of Law: Novel Entanglements of Law and Technology* (Cheltenham, UK: Edward Elgar, 2015).
[49] Laurence E Diver, *Digisprudence: Code as Law Rebooted* (Edinburgh: Edinburgh University Press, 2022); see also Hildebrandt, *Law for Computer Scientists*, *supra* note 8. Diver's account develops the framework first sketched in his doctoral thesis: Laurence E Diver, "Digisprudence: The Affordance of Legitimacy in Code-as-Law" (PhD Thesis, University of Edinburgh School of Law, 2019) [unpublished]. For Hildebrandt's invocation of the framework, see Hildebrandt, "Adaptive Nature", *supra* note 8.
[50] Luhmann, *supra* note 9 at 381-422; on the role of programmes in operationalising the code, see ibid at 195-230.
[51] For analyses of these infrastructures across domains, see Hedler, *supra* note 34; Schwartz & Almeida da Costa, *supra* note 34.
[52] Theodore M Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995); Wendy Nelson Espeland & Michael Sauder, "Rankings and Reactivity: How Public Measures Recreate Social Worlds" (2007) 113:1 Am J Sociol 1.
[53] Michael Power, *The Audit Society: Rituals of Verification* (Oxford: Oxford University Press, 1997); for a contemporary account of digital measurement and classification, see Marion Fourcade & Kieran Healy, *The Ordinal Society* (Cambridge, Mass: Harvard University Press, 2024).
[54] Hedler, *supra* note 34 at 1322-25.
[55] Ibid at 1322, drawing on Niklas Luhmann, *Risk: A Sociological Theory* (Berlin: de Gruyter, 1993).
[56] Aidid & Alarie, *supra* note 1 at 114-115.
[57] Luhmann, *supra* note 9 at 142-49.
[58] Schwartz & Almeida da Costa, *supra* note 34.
[59] Binns, *supra* note 20.

[60] The leading case is the SyRI decision, *NJCM v Netherlands*, *supra* note 11.
[61] See section 3, above, subsections 1 ("Operational closure and the work of legal communication") and 2 ("Temporal structure and normative expectations").
[62] Yeung, *supra* note 44 at 507-12.
[63] On the asymmetries between public-law procedural duties and private-ordering accountability infrastructures, see Frank Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (Cambridge, MA: Harvard University Press, 2015); for the structural contrast as applied to platform governance, Kate Klonick, "The New Governors: The People, Rules, and Processes Governing Online Speech" (2018) 131:6 Harv L Rev 1598.
[64] Aidid & Alarie, *supra* note 1, presenting the vision as complementary to existing judicial practice rather than as substitution.
[65] *State v Loomis*, 881 NW (2d) 749 (Wis 2016).
[66] For the rendering of futures as managed variables in judicial contexts, see Hedler, *supra* note 34 at 1322-30.
[67] See Pamela Ugwudike, "Predictive Algorithms in Justice Systems and the Limits of Tech-Reformism" (2022) 11:1 International Journal for Crime, Justice and Social Democracy 8, arguing that technical reforms (audit, transparency, debiasing) leave the structural conditions of algorithmic injustice intact.
[68] On the displacement of doctrinal currency by metric-based justification, see Wendy Nelson Espeland & Michael Sauder, "Rankings and Reactivity: How Public Measures Recreate Social Worlds" (2007) 113 Am J Sociol 1; Power, *supra* note 53.
[69] Aidid & Alarie, *supra* note 1, on the maturation of the programme beyond present-day systems.
[70] For critical reception of *Loomis* and the limits of judicial engagement with algorithmic systems, see "Beyond Intent: Establishing Discriminatory Purpose in Algorithmic Risk Assessment" (2021) 134:5 Harv L Rev 1760; Han-Wei Liu, Ching-Fu Lin & Yu-Jie Chen, "Beyond *State v Loomis*: artificial intelligence, government algorithmization and accountability" (2019) 27:2 Int'l JL & Info Tech 122; Ugwudike, *supra* note 67.
[71] On the operationalisation of eligibility in welfare contexts, see Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York: St Martin's Press, 2018); on triage and classification in administrative settings, see the literature surveyed in Hildebrandt, *Law for Computer Scientists*, *supra* note 9.
[72] For the analytical category of the politics of measurement, see Porter, *supra* note 52; applied to algorithmic governance, see Espeland & Sauder, *supra* note 52.
[73] The limits of doctrinal reach into infrastructural design are explored in Jennifer Cobbe, "Legal Singularity and the Reflexivity of Law" in Deakin & Markou, eds, *Is Law Computable?*, *supra* note 6, 107.
[74] Aidid & Alarie, *supra* note 1, chs 5-6.

[75] For platform governance as quasi-legal ordering, see Klonick, *supra* note 63; for decentralised finance, John Paterson, "Decentralised finance, regulation, and systems theory" (2024) 14:5 Oñati Socio-Legal Series 1296.
[76] For the integration of detection, decision, and enforcement in platform contexts, see Yeung, *supra* note 44.
[77] Paterson, *supra* note 75.
[78] The structural homology between platform governance and the singularity programme is noted but not pursued in Aidid and Alarie themselves; see Aidid & Alarie, *supra* note 1, where platform-like governance is treated as a transitional form.
[79] The argument here departs from the more common framing of frictions as a legitimacy cost developed in, e.g., Jeremy Waldron, "The Rule of Law and the Importance of Procedure" (2011) 50 Nomos 3, by treating procedural time as constitutive rather than instrumental.
[80] Luhmann, *supra* note 9, especially on the temporal architecture of legal operations.
[81] The framing of substitution-versus-improvement as the relevant analytical distinction draws on Teubner, *Constitutional Fragments*, *supra* note 46, particularly the discussion of differentiation and its limits.
[82] Aidid & Alarie, *supra* note 1, treating discretion-reduction as a central virtue of the programme.
[83] For the relocation rather than reduction of discretion, see Hildebrandt, *Law for Computer Scientists*, *supra* note 8; Cobbe, *supra* note 73.
[84] The institutional dispersal of discretion across the lifecycle of algorithmic systems is documented in Pasquale, *supra* note 63; see also Michael Veale & Lilian Edwards, "Clarity, Surprises, and Further Questions in the Article 29 Working Party Draft Guidance on Automated Decision-Making and Profiling" (2018) 34:2 Computer L & Security Rev 398.
[85] For the limits of judicial review when applied to infrastructural design choices, see Cobbe, *supra* note 73; Mireille Hildebrandt, "Algorithmic Regulation and the Rule of Law" (2018) 376:2128 Phil Transactions Royal Society A 20170355.
[86] On 'constitution by procurement', see Deirdre K Mulligan & Kenneth A Bamberger, "Procurement as Policy: Administrative Process for Machine Learning" (2019) 34:3 Berkeley Tech LJ 773.
[87] For the contrast between voice and legibility as modalities of equality under algorithmic governance, see Eubanks, *supra* note 71; for the underlying analytical framework, James C Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998).
[88] On administrative inevitability as the experiential form of infrastructural inequality, see Eubanks, *supra* note 71.
[89] The democratic implications of infrastructural legality are developed in John Morison, "Towards a Democratic Singularity? Algorithmic Governmentality, the Eradication of Politics — and the Possibility of Resistance" in Deakin & Markou, eds, *Is Law Computable?*, *supra* note 6, 85.

[90] Teubner, *Constitutional Fragments*, *supra* note 46; Golia & Teubner, *supra* note 10.
[91] The valorisation of differentiation in social-theoretic terms is developed in Niklas Luhmann, *Theory of Society*, 2 vols, translated by Rhodes Barrett (Stanford: Stanford University Press, 2012-2013); for application to law specifically, Luhmann, *supra* note 9.
[92] The distinction between output-transparency and infrastructure-contestability is developed in Jennifer Cobbe, Michael Veale & Jatinder Singh, "Understanding Accountability in Algorithmic Supply Chains" in *Proceedings of the 2023 ACM Conference on Fairness, Accountability, and Transparency* (New York: ACM, 2023) 1186; see also Mike Ananny & Kate Crawford, "Seeing without Knowing: Limitations of the Transparency Ideal and Its Application to Algorithmic Accountability" (2018) 20:3 New Media & Society 973.
[93] For institutional implementations of infrastructure contestability in platform contexts, see Klonick, *supra* note 63; for adjudicative contexts, Ugwudike, *supra* note 67.
[94] On reasons-giving as constitutive rather than ornamental, see Moshe Cohen-Eliya & Iddo Porat, *Proportionality and Constitutional Culture* (Cambridge: Cambridge University Press, 2013); for systems-theoretic articulation, Luhmann, *supra* note 9.
[95] For temporal slack as a regulatory design principle, see Yeung, *supra* note 44; for adjudicative implementations, Judith Resnik, "Procedure as Contract" (2005) 80:2 Notre Dame L Rev 593.
[96] Aidid & Alarie, *supra* note 1, presenting the integration of these functions as a central feature of the mature singularity.
[97] The case for governing infrastructural design as legally significant choice is developed in Mulligan & Bamberger, *supra* note 86; see also Sylvie Delacroix, "Automated Systems and the Need for Change" in Deakin & Markou, eds, *Is Law Computable?*, *supra* note 6, 161.
[98] On the constitutive role of plural description in legal procedure, see Lyria Bennett Moses, "Not a Single Singularity" in Deakin & Markou, eds, *Is Law Computable?*, *supra* note 6, 205; for the narrowing effect of infrastructural translation, Hildebrandt, *Law for Computer Scientists*, *supra* note 8.