Computer Law & Security Review 52 (2024) 105895

Contents lists available at ScienceDirect

Computer Law & Security Review: The International Journal of Technology Law and Practice

journal homepage: www.elsevier.com/locate/clsr

Digital distortions and interpretive choices: A cartographic perspective on encoding regulation

Anna Huggins [a,*], Alice Witt [b], Mark Burdon [a]

[a] Professor, Law School, Faculty of Business and Law and Digital Media Research Centre, Queensland University of Technology (QUT), 2 George Street, Brisbane, Australia

[b] Research Fellow, School of Global, Urban and Social Studies, College of Design and Social Context at the Royal Melbourne Institute of Technology (RMIT University), 124 La Trobe Street, Melbourne, Australia

ARTICLE INFO

Keywords:
Rules as code
Encoding regulation
Legal cartography
Digital distortions
Interpretation
Digitising regulation

ABSTRACT

Rules as Code (RaC), which encompasses the conversion of legal and regulatory rules into computer code, is gaining traction internationally. This article analyses 'digital distortions' in RaC, which refer to disconnects between regulation and code that arise from interpretive choices in the encoding process. We contend that Boaventura de Sousa Santos' 'symbolic cartography of law' provides valuable concepts for understanding digital distortions in encoding regulation. Specifically, we argue that the cartographic concepts of scale, projection, symbolisation and orientation highlight distortions that can arise from choices involving the documentation to code, logics to follow, languages to use and coded outputs to present. We demonstrate how these distortions arose in our attempt to convert the ePayments Code, an Australian voluntary code of conduct for consumer electronic payment transactions, into machine-executable code. The article concludes by underscoring the importance of greater awareness of interpretive coding choices and their implications for diverse users of digitised regulation.

1. Introduction

Rules as Code (RaC), which encompasses creating a machine-executable version of legal and regulatory rules, is attracting international interest.[1] RaC initiatives range from digitising prescriptive and transactional rules such as building regulations[2] through to complex and high stakes criminal laws.[3] Encoded rules provide a critical foundation for the development of automated decision-making (ADM) and regulatory technology (RegTech) tools that aim to facilitate more efficient, precise and consistent digital regulatory processes.[4] However, there are myriad legal and technical challenges involved in accurately converting complex regulatory requirements into computer code.[5] Various features

* Corresponding author.
E-mail address: a.huggins@qut.edu.au (A. Huggins).

[1] See, for example, James Mohun and Alex Roberts, 'Cracking the Code: Rulemaking for Humans and Machines' (OECD Working Papers on Public Governance No. 42, 2020) 6-7 <https://dx.doi.org/10.1787/3afe6ba5-en> accessed 13 March 2023. Acknowledging that the definition of RaC is not settled, Mowbray, Chung and Greenleaf define RaC as 'the activity of creating or transforming a legal text which is in natural language (legislation, regulations, or other legal instruments – generically, "law" or "rules"), in or into a representation in computer-processable form (code)': Andrew Mowbray, Philip Chung and Graham Greenleaf, 'Explainable AI (XAI) in Rules as Code (RaC): The DataLex Approach' (2023) 48 Computer Law & Security Review 105571. For the purposes of this article, we refer to encoding regulation and digitising regulation interchangeably.

[2] For example, the Building Information Modelling (BIM)-based building permit system in the Republic of South Korea relies on computer code versions of building regulation: Hyunsoo Lee, Jin-Kook Lee, Seokyung Park and Inhan Kim, 'Translating Building Legislations into a Computer Executable Format for Evaluating Building Permit Requirements' (2016) 71 Automation in Construction 49.

[3] See, eg, Guido Governatori, Pompeu Casanovas and Louis de Koker, 'On the Formal Representation of the Australian Spent Conviction Scheme' in Víctor Gutiérrez Basulto, Tomáš Kliegr, Ahmet Soylu, Martin Giese and Dumitru Roman (eds), *Rules and Reasoning* 12173 (Springer International Publishing, 2020) 177-85.

[4] World Economic Forum, *Regulatory Technology for the 21st Century* (White Paper, March 2022) 4 <www3.weforum.org/docs/WEF_Regulatory_Tech_for_the_21st_Century_2022.pdf> accessed 10 March 2023.

[5] Kevin Ashley, *Artificial Intelligence and Legal Analytics: New Tools for Law Practice in the Digital Age* (CUP 2017); Mireille Hildebrandt, *Law for Computer Scientists and Other Folk* (OUP 2020).

https://doi.org/10.1016/j.clsr.2023.105895

Available online 17 October 2023

of regulation, such as cross-referencing across diverse legislative and regulatory instruments, open-textured and discretionary provisions, and principles-based obligations are challenging to convert into the comparatively narrow and precise vocabulary of computer code.[6] Despite decades of research on how to promote isomorphism[7] – that is, a one-to-one correspondence of meaning between legal sources and encoded rules[8] – it is increasingly accepted that achieving an isomorphic relationship between a natural language regulatory text and the corresponding encoded rules is a difficult or even 'impossible' goal.[9]

Against this backdrop, the interpretive dimensions of RaC warrant further attention. RaC encompasses both the *ex post* conversion of legal rules into machine-executable code and, in its more ambitious forms, co-design approaches in which natural language and encoded versions of regulatory rules are developed in parallel.[10] This article primarily focuses on the former, which is an important subset of RaC given the large corpus of existing legislation and regulation that may be valuably digitised. In line with modern contextual approaches to interpreting regulation, our approach to RaC incorporates interpreting the meaning of regulatory provisions with reference to relevant intrinsic and extrinsic reference points.[11]

To date, the literature on RaC has predominantly focused on the degree to which digitised legislative rules cohere with constitutional values, such as the rule of law.[12] Due to the constitutional backdrop against which legislation is created, interpreted and applied, jurisdictionally-specific public law principles of statutory interpretation and administrative law should arguably shape and constrain the encoding process.[13] However, legislation is but one example of a vast array of regulatory rules that are encompassed by the RaC moniker.[14] Other types of rules that can be digitised include regulatory guidance, directives, policies, operational guidelines, voluntary codes of conduct and standards, to name but a few.[15] In Australia, for example, public law rules and norms do not apply in the same way to non-legislative rules as they do to statutes created by the legislative branch and implemented by the executive arm of government.[16] In the absence of clear legal principles to guide the encoding exercise, there is arguably a greater risk of distortions in converting non-legislative regulation into code. For the purposes of this article, we conceptualise 'digital distortions' as disconnects between the encoded version of regulation and the true complexity of natural language regulation understood in its regulatory context. In contrast to the growing literature on the opportunities and challenges of digitising legislation,[17] far less scholarly attention has been paid to conceptualising and analysing the digitisation of non-legislative regulation.[18] This article contributes to addressing this gap.

The aim of this analysis is to offer one way of understanding the digitisation of regulation that takes inspiration from the field of cartography. While we recognise the diverse ways in which mapping and cartographic concepts can be incorporated in law and technology scholarship,[19] we argue that Boaventura de Sousa Santos' 'symbolic cartography of law'[20] provides a valuable new perspective on the digitisation of regulation. A key contribution of de Sousa Santos' cartographic analysis is that law is a map that distorts the complex flux of reality found in socio-legal life.[21] Three specific yet interdependent mechanisms of distortion used in maps are scale, projection and symbolisation, each of which involves interpretive choices regarding if and how certain features will be represented cartographically.[22] In addition to these mechanisms, de Sousa Santos identifies a fourth feature of maps: the tension between representation and orientation, which underscores that different users of maps may require varying levels of detail for maps to be fit for purpose.[23] We contend that these cartographic concepts can be adapted and applied to shed new light on the digitisation of diverse types of regulation under the RaC moniker.

Specifically, we argue that the cartographic procedures of scale, projection, symbolisation and orientation provide a valuable set of concepts for understanding the ways in which digital distortions can

[6] As Grimmelmann notes, the artificial languages intelligible to computers are more precise and limited than human languages: James Grimmelmann, 'Regulation by Software' (2005) 114(7) Yale Law Journal 1719, 1728.

[7] See, for example, the annals of the *Artificial Intelligence and Law* journal.

[8] See, for example, Thomas Gordon, Guido Governatori and Antonio Rotolo, 'Rules and Norms: Requirements for Rule Interchange Languages in the Legal Domain' in Guido Governatori, John Hall and Adrian Paschke (eds), *Rule Interchange and Applications: International Symposium, RuleML 2009, Las Vegas, Nevada, USA, November 2009 Proceedings* (Springer 2009) 282-96.

[9] See, for example, Tom Barraclough, Hamish Fraser and Curtis Barnes, 'Legislation as Code for New Zealand: Opportunities, Risks and Recommendations' (Brainbox and The New Zealand Law Foundation Report, March 2021) 4 <www.lawfoundation.org.nz/wp-content/uploads/2021/03/Legislation-as-Code-9-March-2021-for-distribution.pdf> accessed 13 March 2023.

[10] Mohun and Roberts (n 1) 18-9.

[11] See Anna Huggins, Mark Burdon, Alice Witt and Nicolas Suzor, 'Digitising Legislation: Aligning Regulatory Mind-Sets and Constitutional Values' (2022) 14(2) Law, Innovation and Technology 325; Mark Burdon, Anna Huggins, Nic Godfrey, Rhyle Simcock, Josh Buckley, Siobhaine Slevin et al, 'From Rules as Code to Mindset Strategies and Aligned Interpretive Approaches' (2023) Journal of Cross-disciplinary Research in Computational Law (forthcoming); Alice Witt, Anna Huggins, Guido Governatori and Joshua Buckley, 'Encoding Legislation: A Methodology for Enhancing Technical Validation, Legal Alignment and Interdisciplinarity' (2023) *Artificial Intelligence and Law*, https://doi.org/10.1007/s10506-023-09350-1. See further Section 4.

[12] See, for example, Lisa Burton Crawford, 'Rules as Code and the Rule of Law' (2023) July, Public Law 402; Mireille Hildebrandt, 'Code-Driven Law: Freezing the Future and Scaling the Past' in Simon Deakin and Christopher Markou (eds), *Is Law Computable?: Critical Perspectives on Law and Artificial Intelligence* (Hart Publishing 2020) 67, 82-83; Lawrence E Diver, *Digisprudence: Code as Law Rebooted* (Edinburgh University Press 2021); Lawrence E Diver, 'Interpreting the Rule(s) of Code: Performance, Performativity, and Production' (MIT Computational Law Report, 2 December 2021) <https://law.mit.edu/pub/interpretingtherulesofcode> accessed 13 March 2023.

[13] Huggins, Burdon, Witt and Suzor (n 11) 325; Witt, Huggins, Governatori and Buckley (n 11); Lyria Bennett Moses, Janina Boughey and Lisa Burton Crawford, 'Laws for Machines and Machine-made Laws' in Janina Boughey and Katie Miller (eds), *The Automated State: Implications, Challenges and Opportunities for Public Law* (Federation Press 2021).

[14] Mohun and Roberts (n 1) 10; Mowbray, Chung and Greenleaf (n 1) 2.

[15] ibid.

[16] Greg Weeks, 'Soft Law and Public Liability: Beyond the Separation of Powers?' (2018) 39 Adelaide Law Review 303.

[17] See n 11.

[18] For the purposes of this article, we refer to 'non-legislative regulation' and 'regulation' interchangeably. For discussion of the overlaps and differences between legislation and (non-legislative) regulation, see Section 2.

[19] Roger Brownsword, *Law 3.0: Rules, Regulation and Technology* (Routledge 2021) 54.

[20] Boaventura de Sousa Santos, 'Law: A Map of Misreading. Toward a Postmodern Conception of Law' (1987) 14(3) Journal of Law and Society 279.

[21] ibid 282-83.

[22] ibid 283.

[23] ibid 282-83. See further the discussion of orientation below.

arise in encoding regulation. Each of these procedures is not neutral.[24] We contend that within each of them, interpretive choices are made relating to documentary scope, the application of different logics and languages, and presentation choices. As a result of these choices, the encoded output reflects only one, simplified representation of the natural language regulation, rather than a comprehensive and neutral translation. Thus, a cartographic perspective on RaC underscores the importance of greater awareness regarding the implications of encoding choices, and the potential need for multiple versions of encoded regulation for different users and purposes.

In this article, we show how the elements of de Sousa Santos' symbolic cartography of law can be adapted to digitising regulation. Applying a cartographic lens, an emphasis on *scale* highlights the documentary choices involved in determining the scope of the encoding exercise, and the relevant regulatory artefacts for encoding. The concept of *projection* surfaces the trade-offs involved in converting natural language regulatory requirements into the deterministic, rules-based logic of computer code. A focus on *symbolisation* underscores the implications of select coding languages and symbols for shaping the digitisation process. Finally, the concept of *orientation* focuses on a map's presentation, which illuminates the ways in which encoding choices are influenced by the purposes and users of digitised regulation, as well as coders' normative standpoints.

We apply these cartographic concepts to our attempt to convert the ePayments Code, an Australian voluntary code of conduct for consumer electronic payment transactions,[25] into machine-executable code. The ePayments Code (the Code) was selected for this exercise as it is relatively self-contained and transactional in nature, and was written in a 'plain English' drafting style.[26] Prima facie, therefore, we anticipated that it would be more amenable to digitisation than highly complex, intertextual and open-textured legislation.[27] Nevertheless, despite the Code's plain English drafting style, we found that a range of ambiguous and discretionary regulatory provisions impeded digitisation efforts, and thus the ability to project an 'if-then' logic on the regulatory instrument. The ePayments Code was encoded using the Turnip language, which implements Defeasible Deontic Logic (DDL) by using deontic and other modal operators like obligations, permissions, prohibitions and exemptions.[28] The use of this coding language shaped the features of the regulatory instrument that were foregrounded in the encoding process. Clarifying the end user of the digitised regulation also influenced the orientation of the encoding exercise and the ultimate presentation of the encoded rules. We conclude by underscoring the importance of greater awareness of digital distortion risks, and the implications of coders' interpretive choices for diverse users of digitised regulation.

2. The regulatory environment: Situating the ePayments Code

As context for the encoding exercise, it is important to outline the background, nature, purpose and operation of the ePayments Code, which is a voluntary industry code. According to the Australian Securities and Investment Commission (ASIC), which administers the Code,[29] a voluntary code of conduct is 'a body of rules that sets enforceable standards across an industry (or part of an industry), and delivers measurable consumer benefits'.[30] Voluntary codes that are enforceable by industry bodies are a form of soft law[31] 'at the apex of industry self-regulatory initiatives'.[32] While such initiatives 'can be seen as towards the more interventionist end of the self-regulatory spectrum',[33] they lack the force of legislation. Notably, we coded the version of the ePayments Code that was issued on 20 September 2011 and amended on 29 March 2016. The latest version of the Code, which was amended on 2 June 2022, incorporates 'some modest improvements' to the previous version in light of the Australian Government's intention to develop and implement a legislatively mandated Code.[34] The implications of developing and potentially digitising a Code with legislative effect are explored below.

The ePayments Code provides a range of protections for consumer electronic transactions,[35] including those facilitated by Automatic Teller Machines (ATMs), credit card transactions, online payments, Electronic Funds Transfer at Point of Sale (EFTPOS),[36] and internet and mobile banking.[37] ASIC introduced the Code in 2011[38] to address concerns around '[t]he rapid adoption of smartphones and other internet enabled

[24] As de Sousa Santos notes, 'Scale, project and symbolization are not neutral procedures': Boaventura de Sousa Santos, *Toward a New Legal Common Sense: Law, Globalization, and Emancipation* (CUP, 3rd ed, 2020) 496, 519.

[25] The Australian Securities & Investments Commission (ASIC), 'The ePayments Code' (Voluntary Code of Practice, 2 June 2022) <https://download.asic.gov.au/media/lloeicwb/epayments-code-published-02-june-2022.pdf> accessed 13 March 2023.

[26] Australian Securities and Investments Commission, '11-205MR ASIC Releases New ePayments Code' (Media Release, 20 September 2011) <https://asic.gov.au/about-asic/news-centre/find-a-media-release/2011-releases/11-205mr-asic-releases-new-epayments-code/> accessed 13 March 2023.

[27] For analysis of the challenges of digitising complex legislation, see Huggins, Burdon, Witt and Suzor (n 11).

[28] See generally Governatori, Casanovas and de Koker (n 3) 177-85.

[29] Note that ASIC does not have to approve industry codes in the financial services sector: Australian Securities and Investments Commission, 'RG 183 Approval of Financial Services Sector Codes of Conduct (RG 183)' (Regulatory Guide, 1 March 2013) [183.3] <https://asic.gov.au/regulatory-resources/find-a-document/regulatory-guides/rg-183-approval-of-financial-services-sector-codes-of-conduct/> accessed 13 March 2023.

[30] ibid [183.19].

[31] Creyke argues that there are eight categories of soft law: procedural rules, interpretive guides, instructions to officials, prescriptive/evidential rules, commendatory rules, voluntary codes, rules of practice, management or operation, and consultative devices and administrative pronouncements: Robin Creyke, 'Soft Law and Administrative Law' (2009) 61 Forum of the Australian Institute of Administrative Law 15. See also Michelle Sanson, *Statutory Interpretation* (OUP 2016) 314-15.

[32] ASIC, 'RG 183' (n 29) [183.2].

[33] Nicola Howell, 'Revisiting the Australian Code of Banking Practice: Is Self-Regulation Still Relevant for Improving Consumer Protection Standards?' (2015) 38(2) UNSW Law Journal 544, 549.

[34] Australian Securities and Investments Commission, 'Response to Submissions on CP 341 Review of ePayments Code: Further Consultation' (Report 718, March 2022) 6 <https://asic.gov.au/regulatory-resources/find-a-document/reports/rep-718-response-to-submissions-on-cp-341-review-of-the-epayments-code-further-consultation/> accessed 13 March 2023.

[35] Australian Securities and Investments Commission, 'Regulation Impact Statement: ePayments Code' (September 2011) 4 <https://download.asic.gov.au/media/1346096/RIS-published-20-september-2011.pdf> accessed 13 March 2023.

[36] EFTPOS is a term describing a network for facilitating electronic payments, typically using debit or credit cards, using payment terminals located at points of sale: ASIC, 'The ePayments Code' (n 25) cl 2.6.

[37] ASIC, 'The ePayments Code' (n 25) cl 2.5.

[38] The ePayments Code was formerly the Electronic Funds Transfer Code of Conduct and has existed in different forms since 1986: see ASIC, 'The ePayments Code' (n 25) 4.

devices used to access banking'.[39] It comprises a total of 45 'plain English'[40] clauses across Chapters A to G and 10 clauses in Appendix A.[41] The six objectives of the ePayments Code are to provide:

> (a) a quality consumer protection regime for payment facilities; (b) a framework to promote consumer confidence in electronic banking and payment systems; (c) effective disclosure of information, to enable consumers to make informed decisions about facilities; (d) clear and fair rules for allocating liability for unauthorised transactions; (e) effective procedures for resolving complaints; and (f) a regime that is flexible and accommodates providers of new payment facilities.[42]

It is important to note that the Code only protects consumers (holders), or users, in dealings with a 'subscriber'.[43] A subscriber, the subject of regulation, is 'an entity that has subscribed to the Code'.[44] Subscribers must warrant in their terms and conditions that they will comply with all transactions that are covered by the ePayments Code, including any future amendments,[45] and can choose to adopt the Code for transactions that are not covered by its clauses.[46] However, the ePayments Code does not apply to transactions by holders (consumers) using a facility that is principally established and designed for business purposes, a facility in which the holder and subscriber do not have a contractual relationship, or biller accounts.[47]

While the ePayments Code lacks the force of legislation,[48] it has a 'patina of enforceability'[49] as a subscriber's potential breach of the Code can, in turn, constitute a breach of their contractual arrangements with consumers. In addition to potential redress under contract law, consumers can complain about a possible breach of the Code by a subscriber to the Australian Financial Complaints Authority,[50] which handles a range of complaints about financial products and services.[51] In some cases, the conduct or transaction at issue may also constitute a breach of ASIC-administered legislation. For example, if a subscriber misrepresents customers' rights under the ePayments Code, this may be a breach of the prohibition against engaging in misleading or deceptive conduct in s 12DA of the *Australian Securities and Investments Commission Act 2001* (Cth).[52] Finally, consumers have access to internal and external dispute resolution processes for any code breaches resulting in direct financial loss, and there is broad standing for consumers to complain about any other breach to an independent body.[53] Enforcement can result in remedies for consumers and sanctions against subscribers.[54] The enforceability of the Code differentiates it from other voluntary industry codes that do not set enforceable standards and are more aspirational in nature.[55]

The success of the ePayments Code, like other voluntary codes of practice, is highly dependent on support and uptake from industry members and their peak bodies. It is significant, then, that the Code's subscribers include dominant actors in the Australian financial services sector, such as the Commonwealth Bank of Australia, American Express and PayPal.[56] ASIC explains that '[w]here they enjoy the support and commitment of the sponsoring industries, codes can deliver real benefits to both consumers and those who are bound by and must comply with the provisions of the code to which they subscribe (subscribers)'.[57] Potential benefits for consumers include regular independent review of the Code in line with technological developments and customer feedback. The ePayments Code is also 'a living document'[58] that must continue to comply with relevant criteria and be responsive to industry-specific issues as they arise.[59] There is also a range of possible benefits for subscribers who might, for example, seek guidance from ASIC on their internal and external practices, participate in the development of industry standards and enhance goodwill towards their business amongst key stakeholder groups.[60]

The ePayments Code is thus non-legislative regulation which was created by private industry actors, yet aspects of its implementation are backstopped by public regulators such as the Australian Financial Complaints Authority and ASIC. It is important to understand the nature

[39] ASIC, '11-205MR ASIC Releases New ePayments Code' (n 26).

[40] The then ASIC Chairman Greg Medcraft commented: 'Our new Code sets out best practice in consumer protection and is product neutral and in plain English. It will encourage consumers to have confidence in our epayment systems. I encourage all providers of consumer payment products to demonstrate they put their customers first and subscribe to the Code. Industry members are important gatekeepers and self-regulation has a role to play in improving industry standards and consumer experiences': ibid.

[41] The clauses in Appendix A largely overlap with Chapter G.

[42] ASIC, 'The ePayments Code' (n 25) cl 1.1.

[43] ibid cl 2.5.

[44] ibid cl 2.6.

[45] ASIC, 'RG 183' (n 29) [183.25(a)].

[46] ASIC, 'The ePayments Code' (n 25) cl 2.3.

[47] ibid cl 2.1. The ePayments Code describes a 'biller account' as 'an internal account maintained by a business for the purpose of recording amounts owing and paid for goods or services provided by the business': ibid cl 2.6.

[48] Commonwealth of Australia, 'Guidelines for Developing Effective Voluntary Industry Codes of Conduct' (Australian Competition & Consumer Commission Guidelines, July 2011) <www.accc.gov.au/system/files/Guidelines%20for%20developing%20effective%20voluntary%20industry%20codes%20of%20conduct.pdf> accessed 13 March 2023.

[49] Creyke (n 31) 16-17.

[50] Note that on 1 November 2018, the Australian Financial Complaints Authority (AFCA) replaced the Financial Ombudsman Service, the Credit and Investments Ombudsman and the Superannuation Complaints Tribunal: AFCA, 'Previous EDR Schemes' (Web Page, 2018) <www.afca.org.au/about-afca/rules-and-guidelines/previous-edr-schemes> accessed 13 March 2023.

[51] AFCA, 'Make a Complaint' (Web Page, 2021) <www.afca.org.au/make-a-complaint> accessed 13 March 2023.

[52] Australian Securities and Investments Commission, *Review of the ePayments Code: Scope of the Review* (Consultation Paper 310, March 2019) 7 <https://download.asic.gov.au/media/5024680/cp310-published-6-march-2019.pdf> accessed 13 March 2023.

[53] ASIC, 'RG 183' (n 29) [183.25(c)-(d)]. According to Creyke, 'administrative law standards apply to soft law', including the previously mentioned doctrine of standing (*locus standi*) for consumers to seek legal redress under a code in a court, tribunal or other form. This could include, for example, action against a non-compliance subscriber': Creyke (n 31) 16.

[54] See generally ASIC, 'The ePayments Code' (n 25) 4.

[55] Andrew Terry provides a helpful taxonomy for industry codes of conduct that differentiates between mandatory codes, which are legislated or co-regulated, enforceable codes, which can be enforced directly or by an industry body, and best practice codes, which do not set enforceable standards: Andrew Terry, 'The Unusual Place of Industry Codes of Conduct in the Regulatory Framework' (2022) 45(2) University of New South Wales Law Journal 649, 687.

[56] For a full list of subscribers, see ASIC, 'ePayments Code subscribers' (Web Page) <https://asic.gov.au/for-consumers/banking/epayments-code-subscribers/> accessed 13 March 2023.

[57] ASIC, 'RG 183' (n 29) [183.1].

[58] ibid [183.8].

[59] In order to be approved by ASIC, a code must meet three different criteria: (a) the threshold criteria for what the Commission considers to be a code; (b) the general statutory criteria for code approval pursuant to the *Corporations Act 2001* (Cth); and any other relevant criteria: ibid [183.20], [183.28]. There is no guarantee that ASIC will approve a code: ibid [183.6].

[60] According to ASIC, 'It is not mandatory for any industry in the financial services sector to develop a code. Where a code exists, that code does not have to be approved by ASIC. However, where approval by ASIC is sought and obtained, it is a signal to consumers that this is a code they can have confidence in. An approved code responds to identified and emerging consumer issues and delivers substantial benefits to consumers': ASIC, 'RG 183' (n 29) [183.3].

of the ePayments Code within the broader regulatory ecosystem to contextualise the following RaC analysis. Previous analyses have predominantly focused on the opportunities and challenges of digitising complex legislation,[61] rather than non-legislative regulation such as voluntary industry codes. Of course, the relationship between legislation and regulation is contested. Some commentators view legislation and regulation as distinct, whilst regulatory governance scholars view regulation as a broad concept encompassing both legislative and non-legislative regulation.[62] Although we acknowledge the limitations of viewing legislation and regulation as distinct,[63] for the purposes of this article we distinguish between legislation and regulation on the basis of the enactor, with regulatory rules being 'considered as regulation as long as they are not formulated directly by the legislature (primary law) or the courts'.[64] The distinction between legislation and regulation is pertinent in the RaC context given the jurisidictionally-specific public law principles that shape how legislation is interpreted and digitised.[65] Moreover, previous analyses suggest that 'regulatory rules that are relatively discrete, self-contained, prescriptive, non-discretionary and transactional in nature' may be better suited to digitisation than complex and discretionary legislation.[66] Although this article discusses a transferable conceptual approach to digitising regulation based on legal cartography, we suggest that the applicability of RaC to specific regulatory instruments needs to be considered on a case-by-case basis, taking into account the nature of the regulation in question.

Despite the important role that voluntary industry codes play in regulatory ecosystems,[67] to date, they have not been a specific focus of conceptual and empirical RaC analyses. We sought to address this gap by encoding the entire ePayments Code in collaboration with the Australian Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Data61. As we elaborate below, we converted the ePayments Code into machine-executable code using the encoding language, Turnip.[68] This language enables interpreters to use deontic modalities, such as obligations [O], prohibitions [F] and permissions [P],[69] to encode regulatory provisions. Our choice of coding language is but one of several important decisions involved in digitising regulation which, as we show below, are valuably illuminated by a cartographic lens.

3. Legal cartography and digital distortions

This Section outlines how de Sousa Santos' influential 'symbolic cartography of law'[70] can be adapted to the context of digitising regulation. We contend that a cartographic perspective offers one valuable way of understanding the digital distortions that arise in the encoding process. A cartographic lens provides an apposite set of concepts for analysing the different interpretive choices involved in encoding regulation, as exemplified by the ePayments Code encoding exercise.

To contextualise this analysis, it is important to recognise that there are a range of mapping approaches in law and technology scholarship, and beyond. For instance, Roger Brownsword contends that the re-imagination of law in environments disrupted by regulatory technologies begins with a general mapping process.[71] This process examines the type of rule or non-rule technologies employed, whether the source of the measure is public or private, the soft or hard nature of any technological measures employed, and whether the locus of intervention is internal or external to regulatees.[72] Mapping has also been proposed as a practical methodology for facilitating the digitisation and automation of legal rules and processes.[73] Beyond law and technology scholarship, cartography has been identified as a valuable device to highlight the interactions between complex Australian corporate regulation, which encompasses the ePayments Code, and corporate practice.[74] Maps can therefore be a useful metaphor for understanding law and legal processes,[75] including digital law.

As de Sousa Santos posits, both law and maps misread or distort reality using certain rules and procedures.[76] A useful map cannot accurately represent every detail of reality; indeed, any attempt to do so would undermine its practical utility.[77] Creating maps of laws and legal systems is a difficult task, involving decisions as to which aspects of the inherently complex and variable subject matter and socio-legal reality will be included and excluded.[78] In a similar vein, we contend that cartographic concepts shed light on the types of distortions that arise in encoding regulation, and the choices involved in deciding which aspects of regulation will be included, and how they will be represented, in a

[61] For examples of analyses of digiting legislation which, like this study, use the Turnip coding syntax, see eg, Huggins, Burdon, Witt and Suzor (n 11); Witt, Huggins, Governatori and Buckley (n 11); Governatori, Casanovas and de Koker (n 3).

[62] For an overview, see Nir Kosti, David Levi-Faur and Guy Mor, 'Legislation and Regulation: Three Analytical Distinctions' (2019) 7 The Theory and Practice of Legislation 169, 170-77. From a regulatory governance perspective, regulation can be 'legislative and non-legislative, formal and informal, and it is either public or private', and may be created by 'various private and societal actors': ibid 175.

[63] ibid 174.

[64] Mattia Guidi, Igor Guardiancich and David Levi-Faur, 'Modes of Regulatory Governance: A Political Economy Perspective' (2020) 33 Governance 5.

[65] See, eg, Witt, Huggins, Governatori and Buckley (n 11).

[66] Huggins, Burdon, Witt and Suzor (n 11) 353.

[67] Terry (n 55) 649.

[68] For a detailed explanation of how the Turnip software can be used for converting regulation into code, see Alice Witt, Anna Huggins, Guido Governatori and Joshua Buckley, 'Converting Copyright Legislation into Machine-Executable Code: Interpretation, Coding Validation and Legal Alignment' in *ICAIL '21: Proceedings of the Eighteenth International Conference on Artificial Intelligence and Law* (New York: Association for Computing Machinery, 2021) 139-48.

[69] See, for example, Governatori, Casanovas and de Koker (n 3) 177; Huggins, Burdon, Witt and Suzor (n 11).

[70] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 286.

[71] Brownsword (n 19) 54.

[72] An 'intervention' is a regulatory measure, which can be external (ie, 'embedded in places and spaces in which regulatees find themselves or with which they interact') or internal (ie, an extension of the human agent or regulatee). The 'locus of intervention' is therefore the main point(s) where the intervention occurs: see Roger Brownsword, 'Law Disrupted, Law Re-Imagined, Law Re-Invented' (2019) Technology and Regulation 10, 20.

[73] See, for example, Scott McLachlan, Evangelia Kyrimi, Kudakwashe Dube, Norman Fenton and Lisa C Webley, 'Lawmaps: Enabling Legal AI Development through Visualisation of the Implicit Structure of Legislation and Lawyerly Process' (2022) Artificial Intelligence and Law 3 <https://doi.org/10.1007/s10506-021-09298-0> accessed 13 March 2023.

[74] Stephen Bottomley argues that cartography is also a valuable device to highlight the interactions between complex Australian financial services regulation and corporate practice: Stephen Bottomley, 'Corporate Law, Complexity and Cartography' (2021) 35(1) Australian Journal of Corporate Law 142, 142. Although the ePayments Code is part of Australian financial services regulation broadly conceived, it is not mentioned in Bottomley's analysis. The digitisation of regulation is also not addressed in his work.

[75] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 286.

[76] ibid 281-82.

[77] ibid 282.

[78] See, for example, William Twining, *Globalisation and Legal Theory* (CUP 2000) ch 3, 50-90; G R Woodman and M Bavinck, 'Can There be Maps of Law?' in F von Benda-Beckmann, K von Benda-Beckmann and A Griffiths (eds), *Law, Justice, and Power* (Ashgate 2009) 195-218; Nicole Reiz, Shannon O'Lear and Dory Tuininga, 'Exploring a Critical Legal Cartography: Law, Practice, and Complexities' (2018) 12 Geography Compass 1, 2-3 <https://compass.onlinelibrary.wiley.com/doi/10.1111/gec3.12368> accessed 13 March 2023.

digitised form. Like creating maps, the process of digitising regulation involves a range of interpretive choices,[79] which may change, distort and oversimplify the natural language regulation.[80] If laws, like maps, create 'ruled distortions or misreadings of social territories',[81] we argue that digitising regulation creates an additional layer of distortions and misreadings arising from the interpretive processes of encoding.

According to de Sousa Santos, maps distort reality through scale, projection and symbolisation, which are three specific yet interdependent 'intrinsic or structural attributes of any map'.[82] The first way in which maps distort reality is through scale.[83] As noted above, maps cannot capture every detail of the physical world. For the map to have useable dimensions, choices must be made regarding the level of detail to be captured and the features that are included or excluded.[84] From a socio-legal perspective, a focus on scale highlights the 'interaction and intersection' between legal and regulatory frameworks and norms. This, in turn, leads to a focus on 'interlaw and interlegality', which refers to the complex and everchanging relations between local, national and international legal orders.[85]

In the context of digitising regulation, scale distortions emerge from the documentary choices in the encoding exercise. A scale conception raises important questions about which aspects of the regulatory landscape will be included in this exercise, and which ones will not. Regulatory requirements are often set out across several legal and regulatory instruments. The elucidation of the scope of regulatory obligations might include reference to statutes, case law and extrinsic materials, in line with statutory interpretation principles.[86] In addition, there is frequently persuasive regulatory guidance in regulations, rules, policy documents and standards that shape how regulatory requirements are interpreted and implemented by both regulators and regulated entities.[87] Against this backdrop, a focus on scale highlights interpretive choices about which legal and regulatory requirements provide 'meaningful details and relevant features'[88] that should inform, or be included in, the digitised version. It draws attention to the importance of understanding regulatory instruments in context, and delineating the scope of intertextuality that is appropriate for the encoding exercise. Moreover, a coder has choices as to which parts within a regulatory instrument will and will not be encoded.

A second way in which maps distort reality is through projection.[89] Maps convert the complexity of a three-dimensional world into a specific graphical representation.[90] There are different types and procedures of projection by which this representation can be achieved. For a symbolic cartography of law, de Sousa Santos conceives of projection as a procedure by which the space inside a legal order is organised and defined.[91] For each legal order, there is a 'specific interpretive standpoint' or *logic* that characterises the type of projection adopted, and shapes the 'centre' and 'periphery' of the regulatory order.[92] Logics that are applied at the centre are often out of context and ill-suited to being imposed upon the periphery.[93]

Similarly, for digitising regulation, there is a dominant governing logic that shapes the interpretive exercise informing encoding choices. We suggest that the fundamental logic governing the conversion of most regulation into computer code is the deterministic 'if-then' logic of rules-based computerised processes.[94] This decisional logic means that the coder determines 'this' as a condition of 'that', thus pre-programming the output of the digitised system.[95] The predetermined logic of rules-based systems shapes a coder's interpretive choices in digitising regulation by bringing to the fore aspects of regulation that are well suited to deterministic logic, such as prescriptive and transactional regulatory requirements. This type of logic is not, however, well suited to open-textured, vague and discretionary provisions, which require the weighing and evaluation of diverse factors and contextual considerations.[96] These types of provisions cannot be reduced to an 'if-then' logic without oversimplifying and potentially fettering discretionary decision-making processes. To avoid projection distortions, a coder can choose to flag the requirement for human input, a workaround that we illustrate below, or algorithmic plug-ins can be developed in an attempt to provide more sophisticated outputs.[97] Whichever workaround is adopted, the deterministic logic of pre-programmed systems can shape a coder's reading of the centre and periphery of the select regulatory instrument based on the extent to which regulatory provisions are compatible with the governing 'if-then' logic.

A third mechanism of distortion is symbolisation.[98] Maps utilise a system of symbols to convey information, often accompanied by a key or legend to explain the symbols' meaning.[99] For legal representations of reality, de Sousa Santos identifies two ideal-typical sign systems: 'instrumental legality', which is abstract, formal and conventional, and 'image-based legality', which is figurative, informal and emotive.[100] The more easily a symbol can be understood, the more effective it is at conveying information.

For digitising regulation, there are different coding languages and modalities that can be used by coders. We draw an analogy between de Sousa Santos' concept of symbolisation and the utilisation of coding

[79] On the interpretive dimensions of RaC, see n 11; Barraclough, Fraser and Barnes (n 9) 58-65; Jason Morris, 'Spreadsheets for Legal Reasoning: The Continued Promise of Declarative Logic Programming in Law' (Master of Laws Thesis, University of Alberta: 2020) 58-60; Ashley (n 5) 54.

[80] Anna Huggins, 'Addressing Disconnection: Automated Decision-making, Administrative Law and Regulatory Reform' (2021) 44(3) University of New South Wales Law Journal 1048, 1058; Danielle Keats Citron 'Technological Due Process' (2008) 85(6) Washington University Law Review 1249, 1261.

[81] de Sousa Santos, *Toward a New Legal Common Sense* (n 24) 498.

[82] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 283.

[83] ibid 283.

[84] Bottomley (n 74) 147-48.

[85] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 288-89.

[86] Sanson (n 31).

[87] In Australia, this regulatory guidance is not, however, legally authoritative or binding: see, for example, *Electricity Supply Association of Australia Ltd v Australian Competition and Consumer Commissio*n (2001) 113 FCR 230, 253 [80]-[81] (Finn J).

[88] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 287.

[89] ibid 284.

[90] Bottomley (n 74) 155.

[91] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 291.

[92] ibid 291-92.

[93] de Sousa Santos, *Toward a New Legal Common Sense* (n 24) 512.

[94] As Bucher explains, 'The "if . . . then statement" is the most basic of all control flow statements, tasked with telling a program to execute a particular section of code only if the condition is deemed "true." However, in order to be able to test and compute a "false" condition, the "if . . . then" statements needs to include an "else" statement, which essentially provides a secondary path of executing. In other words, while the "if . . . then" statement can only compute "true" statements, the "if . . . then . . . else" construct will be able to execute an alternate pathway as well': Taina Bucher, *If... Then: Algorithmic Power and Politics* (OUP 2018) 21-22. Bucher explains that there are, of course, machine learning algorithms that can learn with little to no explicit "if… then" programming: ibid 24.

[95] Mireille Hildebrandt, 'Algorithmic Regulation and the Rule of Law' (2018) 376(2128) Philosophical Transactions of the Royal Society A 1, 2.

[96] See, for example, Grimmelmann (n 6) 1732; Carol Harlow and Richard Rawlings, *Law and Administration* (CUP, 3rd ed, 2009) 221; Justice Melissa Perry, 'iDecide: Administrative Decision-Making in the Digital World' (2017) 91 Australian Law Journal 29, 33.

[97] Huggins, Burdon, Witt and Suzor (n 11).

[98] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 285.

[99] Bottomley (n 74) 149.

[100] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 295. These ideal-typical modes relate to what de Sousa Santos describes as 'the Homeric style of law' and 'the biblical style of law': ibid.

languages. For instance, for the purposes of this study, we selected Turnip software, which facilitates the conversion of legal and regulatory norms into machine-executable code.[101] The use of Turnip software brings to the fore aspects of regulation that create obligations [O], prohibitions [F], permissions [P] and/or exemptions [E].[102] By using Turnip's modalities, a coder privileges certain information, and other aspects of the regulatory text that do not align with Turnip's language become backgrounded in the encoding exercise. As we elaborate in Section 4.3 below, different types of distortions are likely to arise if alternative coding languages are selected. Coders ultimately create one of many potential representations of the regulatory instrument, which is itself a distortion of a complex socio-legal reality.[103]

In addition to these distortions, de Sousa Santos identifies an additional feature of maps: the tension between representation and orientation.[104] This dialectic underscores that different types of maps may be more or less suited to different users and purposes, depending on their orientation.[105] The tension between representation and orientation requires choices and trade-offs, which can be usefully illustrated by an example from the law and technology domain. McLachlan et al. argue that information visualisation, or 'infovis', provides a useful approach that uses visual flow diagrams to reduce complex legal data so that only the core characteristics, patterns and structures are represented.[106] Their 'lawmaps' approach premised on legal infovis involves 'the reduction of complex data and relationships to graphical primitives' to help make complex legal topics accessible for people without legal training.[107] This orientation toward the purposes of promoting accessibility for users without legal training thus involves a choice to reduce the level of legal complexity and detail that is included in the lawmap. Conversely, a map that is rich in specific legal details may more accurately represent the legal context, yet would be largely incomprehensible for non-domain experts. Moreover, in addition to the map's uses, the 'ideology of the cartographer' can also influence the types of choices made in the mapping process.[108]

Similarly, in the context of digitising regulation, the orientation of a map toward particular users and purposes, and coders' normative viewpoints, can shape choices about which features of the regulatory instrument and environment are privileged in the encoding exercise, and how they are presented. If, for example, a regulatory body is relying on a digitised version of regulation to make high stakes enforcement decisions, there are additional due process safeguards that ought to be embedded in encoding choices. However, different safeguards are required if digitised regulation is being used for internal purposes within financial services organisations, or for consumer education purposes. There is thus potentially a need for the presentation of different versions of encoded rules depending on the ultimate end users.

A cartographic perspective on digitising regulation therefore highlights distortions that can arise in the encoding process through interpretive choices involving the documentary sources to code, logics to follow, languages to use and encoded outputs to present. This aligns with insights from critical legal cartography that mapping law does not simply reflect a neutral and objective depiction of legal reality; rather, maps both represent and '*make* reality'.[109] The subjective nature of interpretive choices involved in encoding regulation thus underscores the inherent difficulty of creating a single neutral translation of natural language regulation into computer code. A cartographic perspective reinforces that an encoded version is better understood as one interpretation of regulation, which, in our view, should remain subordinate to the regulatory instrument in the event of inconsistencies between the two.[110] Interpretive choices matter as encoded versions of regulation can underpin the development of automated decision-making and RegTech tools that can have significant, and sometimes deleterious, impacts on citizens if based on flawed encoding decisions.[111] In the following Section, we apply the cartographic concepts of scale, projection, symbolisation and orientation to our attempt to digitise the ePayments Code, which demonstrates the different types of interpretive choices made in an encoding exercise.

4. A cartographic perspective on digitising the ePayments Code

4.1. Scale distortions and documentary choices

For the purposes of digitising the ePayments Code, a focus on scale helped the coding team to clarify documentary choices, particularly in relation to the intra- and intertextual scope of the encoding exercise. 'Intratextuality' focuses on the relationships between the various components of a single legal or regulatory text.[112] In contrast, 'intertextuality' pertains to relationships between legal and regulatory texts, such as when a regulatory instrument refers to another regulatory instrument or Act. Intertextuality is a useful concept given that most legislative and regulatory provisions are 'part of a jigsaw puzzle'[113] of texts. Intertextual links can serve a range of functions: principally, '(1) signal[l]ing textual authority; (2) providing terminological explanation; (3) facilitating textual mapping; and (4) defining legal scope'.[114] As such, intratextuality is concerned with internal linkages, and intertextuality is concerned with external linkages.

[101] See generally Governatori, Casanovas and de Koker (n 3) 177.

[102] ibid.

[103] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 282-83.

[104] ibid 283.

[105] ibid.

[106] McLachlan, Kyrimi, Dube, Fenton and Webley (n 73) 3.

[107] ibid 4.

[108] de Sousa Santos, *Toward a New Legal Common Sense* (n 24) 503.

[109] Reiz, O'Lear and Tuininga (n 78) 4-5. Emphasis in original. See also Theo Kindynis, 'Ripping up the Map: Criminology and Cartography Reconsidered' (2014) 54(2) The British Journal of Criminology 222. There are also pertinent insights from critical cartography studies more broadly: for example, Chris Perkins, 'Critical Cartography' in Alexander Kent and Peter Vujakovic (eds), *The Routledge Handbook of Mapping and Cartography* (Routledge 2017).

[110] For a similar view on RaC, see Barraclough, Fraser and Barnes (n 9) 3.

[111] See, for example, Huggins' analysis of Services Australia's online compliance intervention, colloquially known as 'robodebt': Anna Huggins, 'Executive Power in the Digital Age: Automation, Statutory Interpretation and Administrative Law' in Janina Boughey and Lisa Burton Crawford (eds), *Interpreting Executive Power* (Federation Press 2020) 111. As part of the robodebt controversy, the Australian government raised hundreds of thousands of erroneous welfare debts, ultimately leading to a class action settlement worth more than $1.8 billion. See *Prygodicz v Commonwealth of Australia [No 2]* [2021] FCA 634.

[112] Alison Sharrock, 'Intratextuality', *Oxford Classical Dictionary* (Web Page) <https://doi.org/10.1093/acrefore/9780199381135.013.8281> accessed 13 March 2023; Alex Steel, 'Intertextuality and Legal Judgments' (1998) 2 Macquarie Law Review 87.

[113] Edward Caldwell (1981) quoted in Vijay K Bhatia, 'Drafting Legislative Provisions: Challenges and Opportunities' (2010) 3 The Loophole 5.

[114] Vijay K Bhatia, 'Intertextuality in Legal Discourse' (1998) 22(11) The Language Teacher <https://jalt-publications.org/tlt/articles/2427-intertextuality-legal-discourse> accessed 13 March 2023.

Our encoding exercise encompassed the entire ePayments Code which, as previously noted, comprises a total of 45 clauses across Chapters A to G, as well as 10 clauses in Appendix A. To assist with delineating the scope of the encoding exercise, we undertook an initial analysis of intratextual overlaps and interlinkages in the ePayments Code. Unlike Australian corporations legislation,[115] we found that there are limited overlaps between clauses of the ePayments Code, which simplified the encoding process. Most of the overlaps between constituent clauses occur in Chapters B and C, and Chapter F and Appendix A, respectively. Some overlaps, especially the *verbatim* overlaps between Chapter F and Appendix A, reduced the total number of clauses that we needed to convert into computer code. This intratextual analysis thus helped to clarify the relevant features requiring separate coding, thus narrowing the scope of the encoding exercise. It also highlighted interpretive choices in the encoding process that have the effect of including or excluding different types of regulatory requirements and documentary sources.

Compared to complex legislation,[116] the ePayments Code has limited intertextual connections to other legal and regulatory texts. As a form of non-legislative regulation, the ePayments Code complements legislative requirements in the financial services sector, including consumer credit licensing, advice and disclosure obligations under the *Corporations Act 2001* (Cth) and the *National Consumer Credit Protection Act 2009* (Cth), rather than creating new legislative obligations.[117] Where the ePayments Code references legislation, such as the *Banking Act 1959* (Cth) and *Payment Systems (Regulation) Act 1998* (Cth), and industry standards, like AS ISO 10002-2006 *Customer Satisfaction – Guidelines for Complaints Handling in Organisations* and ASIC Regulatory Guides, they are usually limited to clauses setting out definitions or notes to clauses. We thus chose not to code these complementary definitions and notes, which further limited the scale and complexity of the encoding exercise.

However, in some instances, we cross-referenced other regulatory instruments in an attempt to capture the intended purpose of specific regulatory provisions. Consider, for example, clause 33.1 of the ePayments Code: 'Where the unintended recipient of a mistaken internet payment is receiving Services Australia income support payments or Department of Veterans' Affairs payments, the receiving [authorised deposit-taking institution] must recover the funds from the unintended recipient in accordance with the *Code of Operation: Recovery of debts from customer nominated bank accounts in receipt of Services Australia income support payments or Department of Veterans' Affairs payments* (Code of Operation)'.[118] This means that in addition to determining whether a mistaken internet payment has occurred, in line with clauses 26–36 of the ePayments Code, an authorised deposit-taking institution should attempt to protect unintended recipients at risk of financial difficulty or hardship, as outlined in the Code of Operation. This safeguard aims to ensure that recovery of the mistaken internet payment does not limit the ability of the unintended recipient to 'access basic food and accommodation'.[119] Failure to consider these factors can have detrimental physical, emotional and other impacts on individuals and their communities more broadly. We chose to include these intertextual linkages in our coding of clause 33.1 of the ePayments Code to align the encoded version of the regulatory instrument with its intended purpose.

Thus, a scale perspective draws attention to the intra- and intertextuality of regulatory instruments, and the interpretive choices involved in delineating the scope of the encoding exercise. For instruments like the ePayments Code, which are part of a complex web of corporations regulation in Australia, attempting to reflect every internal and external regulatory linkage is likely to make the encoded version of regulation unwieldy and unworkable. As with maps, decisions need to be made about which regulatory features to include and exclude. Informed by our background as legally trained coders, our scale choices were shaped by the extent to which our legal understanding of intra- and intertextual linkages helped to clarify and promote the ePayments Code's consumer-centric objectives.[120]

4.2. Projection distortions and logic choices

Once the scope of the encoding exercise has been delineated, the concept of projection usefully illuminates interpretive choices involving different logics. In terms of its ostensible suitability for digitisation, it is notable that the ePayments Code was drafted in line with a 'plain language' policy agenda. Under ASIC's Regulatory Guide 183, the Commission must ensure that financial services sector codes meet threshold criteria for approval, including 'plain language provisions that clearly describe what the code is about'.[121] This standard is important as ASIC 'will reject a code submitted for approval that is not written in plain language'.[122] In line with the emphasis on plain language drafting, we found that many parts of the ePayments Code were well suited to conversion into deterministic 'if-then' logic. The Turnip software used for the ePayments Code encoding exercise uses rules that take the form of 'if-then' statements, where 'if' represents the condition(s) of the rule or norm, and 'then' models the effect of the rule or norm.[123] However, there were a range of ambiguous and discretionary terms that could not be easily modelled into 'if-then' rules. In cartographic terms, this

[115] Australian Law Reform Commission, 'Financial Services Legislation: Interim Report A' (Report 137, November 2021) <www.alrc.gov.au/publication/fsl-report-137/> accessed 13 March 2023.

[116] Attempts to encode complex legislation have encountered extensive challenges with intertextuality. For example, the Consumer Data Right (CDR) is a regulatory regime that applies in the banking sector, which aims to enhance consumers' control over their personal data. The regime's regulatory requirements are defined across numerous instruments: the Consumer Data Right Privacy Safeguards, set out in Part IVD of the *Competition and Consumer Act 2010* (Cth); the *Competition and Consumer (Consumer Data Right) Rules 2020* (Cth); the relevant designation instrument; guidelines made by the Information Commissioner; data standards and related regulations; and the Australian Privacy Principles in the *Privacy Act 1988* (Cth): Mark Burdon and Thomas Mackie, 'Australia's Consumer Data Right and the Uncertain Role of Information Privacy Law' (2020) 10(3) International Data Privacy Law 222. Identifying the CDR's operational requirements for digitisation is a highly complex interpretive exercise that requires cross referencing diverse instruments to understand basic obligations, which are very difficult to code: Huggins, Burdon, Witt and Suzor (n 11) 325.

[117] This is, however, likely to change if the ePayments Code becomes mandatory through legislation: ASIC, 'Review of the ePayments Code: Further consultation' (Consultation Paper 341, May 2021) [15] <https://download.asic.gov.au/media/eh2fceff/cp341-published-21-may-2021.pdf> accessed 13 March 2023.

[118] ASIC, 'The ePayments Code' (n 25) cl 33.1.

[119] Australian Government, 'Code of Operation: Recovery of Debts from Customer Nominated Bank Accounts in Receipt of Services Australia Income Support Payments or Department of Veterans Affairs' Payments' (December 2021) <www.servicesaustralia.gov.au/sites/default/files/code-of-operation-2021-2024.pdf> accessed 13 March 2023.

[120] ASIC, 'The ePayments Code' (n 25) cl 1.1.

[121] ASIC, 'RG 183' (n 29).

[122] The then ASIC Chairman Greg Medcraft emphasised the 'plain English' language of the ePayments Code in a media statement announcing its release: ASIC, '11-205MR ASIC Releases New ePayments Code' (n 26).

[123] For a more detailed breakdown of DDL rules using Turnip software, see Governatori, Casanovas and de Koker (n 3) 178-80.

governing decisional logic of rules-based, computerised systems shaped the 'core' and 'periphery'[124] of our encoding exercise.

A frequent interpretive challenge we encountered in the encoding process was ambiguous language. Specifically, we encountered both semantic ambiguity, which pertains to lack of clarity in the meaning of regulatory terms, and structural or syntactical complexity, which relates to the way words are organised (eg, provisions might be conjunctive or disjunctive). Both types of ambiguities can make it difficult to convert regulation into deterministic code.[125] Despite the ePayments Code explicitly aiming to provide 'clear rules', it employs a range of open-textured phrases, such as 'effective and convenient processes' and 'the actual user's capacity to understand the instruction and warning',[126] as well as non-exhaustive lists, which leave alternative situations or matters open to interpretation.

Similarly, we found structurally complex causes and provisions to be challenging to convert into machine executable-code. Consider, for example, the multi-layered preconditions in clause 23.1 of the ePayments Code:

> If this Code requires a subscriber to give a user any information under this Code, the subscriber can give the information electronically by:
> (a) sending the information by a form of electronic communication nominated by the user,
> (b) notifying the user that the subscriber has made the information available electronically, or
> (c) another manner agreed with the user,
> if the following conditions are met:
> (d) the subscriber must provide an effective and convenient process for users to update their contact details,
> (e) it must be easy for users to retrieve, read and store the information,
> (f) if information is given by notifying a user that the information is available electronically:
> (i) the information must be available electronically in that manner (relevant electronic manner) for a reasonable period,
> (ii) unless the user has agreed to receive information, or information of that type, in that manner – the subscriber must have given the user at least seven days' notice that it may use the relevant electronic manner to make the information, or information of that type, available to the user unless the user elects, by a means reasonably specified in the notice, not to receive information in that manner, and
> (iii) the user must not have made an election referred to in clause 21.1(f)(ii), and
> (g) the user must be able to request a paper copy of the information for seven years from the time the information is given.[127]

From both a regulatory and formal logic perspective, the structure of clause 23.1(f) is complex and, at times, confusing. Prima facie, it appears that clause (f)(iii) negatives clause (f)(ii). Here the structural complexity creates additional semantic uncertainty. However, after working back from clause (f)(iii) and through the various preconditions, we interpreted clause (f)(iii) to more narrowly refer to a user electing to not receive information in the relevant electronic manner, which does not negative all other possible means of receiving information under that clause. Yet, by coding this interpretation, the effect was to exclude other potential interpretations. This highlights a disconnect between complex, open-textured provisions which are open to multiple interpretations, and the deterministic 'if-then' decisional logic of code.[128]

In a similar vein, the logic choices in encoding discretionary provisions can lead to a narrowing of options and fettering of discretionary decision-making power. The exercise of discretion, which is 'the space … between legal rules in which legal actors may exercise choice',[129] is particularly difficult to convert into machine-executable code.[130] According to de Smith:

> [The] legal concept of discretion implies power to make a choice between alternative courses of action. If only one course can lawfully be adopted, the decision taken is not the exercise of a discretion but the performance of a duty. To say that somebody has a discretion presupposes that there is no uniquely right answer to … [a] problem.[131]

This underlines that the exercise of discretion can encompass the power of a decision-maker to choose between alternatives, or to choose no alternative (ie, inaction). It can also include situations in which the decision-maker needs to exercise judgment about the application of a regulatory standard or reach a 'state of satisfaction' about whether certain pre-conditions have been met.[132]

The full range of possible discretionary outcomes cannot be determined in advance to inform encoding decisions. At best, a coder might include a general overview of prior relevant decisions in the description of constituent atoms, as part of the knowledge base of encoded rules. Take, for instance, clause 11.9 of the ePayments Code which states that a subscriber 'may reduce the liability of the holder for an unauthorised transaction under clauses 11.2–11.7 by such amount as it considers fair and reasonable, taking into account …' several matters.[133] This type of discretionary provision cannot be fully digitised using a deterministic logic in which decision-making outputs are determined in advance by coding inputs.[134] To avoid unduly fettering discretionary provisions through encoding choices, we flagged the need for human interpretation by adding an asterisk (*) and note in the human-readable description of relevant atoms, as shown below.

We also exercised caution when encoding references to standards of

[124] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 291-92.

[125] Ashley (n 5) 39-42.

[126] ASIC, 'The ePayments Code' (n 25) cl l .1 (d), 17.1 and 12.6(c), respectively.

[127] ibid cl 23.1.

[128] Hildebrandt contrasts the 'ambiguity, multi-interpretability and contestability of natural language' with code-driven legislation, which employs the 'fundamental logic of all algorithmic decision systems' — 'if this then that' — which is 'deterministic, entirely predictable', and forecloses discretionary judgment: Mireille Hildebrandt, 'The Adaptive Nature of Text-driven Law' (2022) 1(1) The Journal of Cross-Disciplinary Research in Computational Law 1, 10; Hildebrandt, 'Algorithmic Regulation and the Rule of Law' (n 95) 2.

[129] Keith Hawkins, 'The Use of Legal Discretion: Perspectives from Law and Social Science' in Keith Hawkins (ed), *The Uses of Discretion* (OUP 1992) 11, 11.

[130] On the difficulties and risks of digitising discretionary powers, see Perry (n 96) 29.

[131] Stanley De Smith and JM Evans, *De Smith's Judicial Review of Administrative Action* (Stevens and Sons Ltd, 4th ed, 1980) 278.

[132] Commonwealth Ombudsman, 'Automated Decision-Making Better Practice Guide' (2020) 9 <www.ombudsman.gov.au/data/assets/pdf_file/0030/109596/OMB1188-Automated-Decision-Making-Report_Final-A1898885.pdf> accessed 13 March 2023.

[133] ASIC, 'The ePayments Code' (n 25) cl 11.9.

[134] Hildebrandt, 'Algorithmic Regulation and The Rule of Law' (n 95) 2; Perry (n 96).

proof and unlawful activity. For example, clause 11.2 of the Code refers to 'where a subscriber can prove on the balance of probability that a user contributed to a loss through fraud, or breaching the pass code security requirements under clause 12' of the ePayments Code.[135] Select atoms and rules for clause 11.2 include:

```
Atom subscriber.provesBalanceOfProbability "*subscriber can prove on the balance of probability. Interpreters should note that 'the balance of probability' is a standard of proof by which a human trier of fact must determine the existence of facts."

Atom user.contributedToLossFraud "*user contributed to a loss through fraud. Human interpretation is needed to determine whether the user contributed to a loss through fraud. Interpreters should note that it is for the courts to determine if potential 'criminal activity, including fraud', has occurred."

Atom holder.potentiallyLiableForLossesBeforeReporting "*holder is potentially liable in full for the actual losses that occur before the loss, theft or misuse of a device or breach of pass code security is reported to the subscriber. Human interpretation is needed because attribution is for the courts to determine."

c_11_2_SituationA: transaction.isUnauthorised & loss.arisingFromUnauthorisedTransaction & subscriber.provesBalanceOfProbability & user.contributedToLossFraud => holder.potentiallyLiableForLossesBeforeReporting & ~holder.potentiallyLiableForLossesExceedingDailyTransactionLimit & ~holder.potentiallyLiableForLossesExceedingPeriodicTransactionLimit & ~holder.potentiallyLiableForLossesExeedingFacilityBalance & ~holder.potentiallyLiableForLossesOnFacilityNotAgreedPerformTransaction
```

As a team of legally trained coders, we decided that it was important to avoid pre-determined coding outcomes given that only the courts can authoritatively determine whether criminal activity, including fraud, has occurred. Before this determination, the presumption of innocence – a fundamental tenet of Anglo-American legal systems[136] – should apply, and the parties to the matter cannot have discharged the relevant standard of proof. Similarly to previous analyses cautioning against converting legislative provisions that require discretionary judgment and have high stakes for individuals into deterministic computer code,[137] we thus eschewed full digitisation of these provisions and flagged the need for human interpretation. As in our view these types of provisions are not compatible with the governing 'if-then' logic adopted for the encoding exercise, they were effectively moved to the 'periphery' due to the need for human interpretation before the code could be used. This example highlights a decision point between two routes based on different logics. As legally trained coders, we chose a legal interpretation over formal logic. Of course, non-legally trained coders may well choose the other route by privileging formal logic over regulatory logic, which reinforces the subjective choices inherent in encoding regulation.

In sum, the concept of projection underscores that the process of digitising regulation is strongly shaped by the 'if-then' logic of rules-based, computerised systems. Projection brings to the fore aspects of regulation that are well suited to this logic, including self-contained, prescriptive and transactional clauses. For clauses that are not compatible with this logic, such as ambiguous and discretionary provisions and standards of proof, we considered that there was a heightened risk of distortion if they were oversimplified to fit a deterministic 'if-then' coding logic. To ameliorate such distortions, we chose to flag the encoded versions of these latter types of provisions as requiring human input. This underscores that the process of digitising regulation is not equally distorting as some types of regulatory provisions are better suited to formal logic application than others.

4.3. Symbolisation distortions and language choices

While the concept of projection illuminates the governing interpretive logic of an encoding exercise, the concept of symbolisation, adapted for the digitising regulation context, clarifies the implications arising from specific coding languages. As foreshadowed above, we used the encoding language 'Turnip' to convert the ePayments Code into machine-executable code. Turnip is based on and implements defeasible deontic logic (DDL),[138] where 'defeasible logic is the logic of default assumptions, i.e. reasoning about what normally is the case',[139] and 'deontic logic is the logic of obligations, i.e. reasoning about what should be the case'.[140] More specifically:

> [D]eontic logic can be defined as the study of those sentences in which only logical words and normative expressions occur essentially. Normative expressions include the words 'obligation', 'duty', 'permission', 'right', and related expressions. These expressions may be termed deontic words, and sentences involving them deontic sentences.[141]

DDL therefore extends defeasible logic 'by adding deontic and other modal operators',[142] such as obligations [O], permissions [P], prohibitions [F] and exemptions [E]; and by representing both definitional norms (ie, those that define and explain norms) and prescriptive norms

[135] ASIC, 'The ePayments Code' (n 25) cl 11.2.

[136] International Covenant on Civil and Political Rights (adopted 16 December 1966, entered into force 23 March 1976) 999 UNTS 171 (ICCPR) art 14(2).

[137] From a legal doctrinal perspective, deterministic computer code is ill-suited for taking into account relevant context and may risk inappropriately fettering discretionary decision-making powers: see, eg, Huggins, Burdon, Witt and Suzor (n 11) 336-7; Perry (n 96) 33.

[138] For a detailed, technical overview of DDL, see Witt, Huggins, Governatori and Buckley (n 68) 139-48. We used the version of the Turnip software provided by CSIRO's Data61 in 2020.

[139] Leendert W N van der Torre and Yao-Hua Tan, 'The Many Faces of Defeasibility in Defeasible Deontic Logic' in N Nute (ed), *Defeasible Deontic Logic* (Springer 1997) 79-121. van der Torre and Tan explain that there are many different types of defeasible logic.

[140] See generally Dagfinn Føllesdal and Risto Hilpinen, 'Deontic Logic: An Introduction' in Risto Hilpinen (ed), *Deontic Logic: Introductory and Systematic Readings* (Springer 1971) 1-35.

[141] ibid.

[142] See Grigoris Antoniou, David Billington, Guido Governatori and Michael J Maher, 'Representation Results for Defeasible Logic' (2001) 2(2) ACM Transactions on Computational Logic 255; Guido Governatori and Antonino Rotolo, 'Possible World Semantics for Defeasible Deontic Logic' (11th International Conference on Deontic Logic in Computer Science, 2012) <www.researchgate.net/publication/253954450_Possible_World_Semantics_for_Defeasible_Deontic_Logic> accessed 13 March 2023.

(eg, those encouraging certain behaviour).[143]

As discussed above, when implementing defeasible deontic logic in Turnip language, a rule takes the form of an if-then statement.[144] To reach a conclusion, coders must define all terms of a constituent rule, in line with the following basic structures:

Type	Keyword	Sample Values
Boolean	Atom	True, False
String	String	"anything in double quotation marks"
Numeric	Numeric	123.456, −5, 0
Date	Date	1992−02−01
DateTime	DateTime	1995−02−01T13:35
Duration	Duration	10 w, 1d, 5 h, 30m

In the ePayments Code encoding exercise, we largely used 'atoms', which are Boolean atomic statements that can be either true or false. The basic structure for atoms is `Type Name description_string` (eg, `Atom subscriber "is a subscriber"`, where a person is either a `subscriber` or not `(~subscriber)`. We also heavily relied on conjunctions (&) or disjunctions (|) of Boolean operators to create condition lists for the many prescriptive and other rules in the ePayments Code. See, for example, rule `c_11_2_SituationA` for clause 11.2 of the Code above. We also used arithmetic operators (ie, `+, -, *, /,`) for numeric terms and values, and comparison operators (i.e., `==, !=, <=, >, >=`) to create Boolean types from numeric and duration terms. Once a coder drafts a set of if-then rules, the Turnip reasoner (an online runtime environment) can take a set of rules and facts, respectively, and produce a set of results that the software infers from applying the facts to the rules.

A strength of Turnip is its utility in enabling coders to directly represent and encode (implement) deontic modalities (eg, [O], [P], [F] and [E]). By using Turnip, the features of a regulatory instrument that create obligations, permissions, prohibitions and/or exemptions are brought to the fore in the corresponding encoded rules. These types of provisions are more likely to align with what de Sousa Santos refers to as 'instrumental legality', which is formal and conventional.[145] However, deontic logic is generally less suited for encoding regulatory provisions reflecting 'image-based legality', which is figurative and informal.[146] There are numerous figurative and expressive signs in the ePayments Code, including 'best endeavours', 'unreasonable burdens', 'exceptional circumstances', 'extreme carelessness', and 'fair and reasonable'[147] that we found to be difficult to digitise using Turnip software. To minimise these distortions, we flagged the need for human input to interpret these terms as described above.

More broadly, not all aspects of regulatory texts fit neatly with deontic language predicated on modalities. For example, the Turnip modalities do not cover defences, which are a common feature of legal and regulatory instruments; the exemptions modality is not a legally accurate way to address this disconnect.[148] Moreover, regulatory rules that confer powers, like clauses in the ePayments Code that give ASIC certain powers,[149] are not well suited to encoding using deontic language.[150] In addition, the ePayments Code contained interpretive notes which clarify the meaning and application of terms, but do not create obligations, permissions, prohibitions and exemptions, and thus are not easily amenable to digitisation using Turnip syntax. To address this disconnect, we included interpretive notes in comments that appear alongside the relevant encoded rules within the relevant coding (.tp) file. This is a useful technique for conveying information that helps to ameliorate symbolic distortions arising through language choices. However, interpretive notes do not become part of the operative encoded version of the regulatory rules. The choice to use the Turnip coding syntax therefore creates uneven distortions as the deontic modal operators apply more readily to some parts of the regulation than others.

Importantly, these distortions may be attributable to a partial mismatch between the nature of the ePayments Code as a non-legislative regulatory instrument and the symbolisation distortions associated with our chosen coding language. In contrast to legal instruments which declare the law and create enforceable obligations,[151] regulatory instruments do not declare the law *per se* but rather promote discourse between regulated entities and regulators.[152] Deontic logic is well suited to modelling the traditional types of laws and rules 'properly so called', such as commands backed by sanctions or consequences for non-compliance.[153] These types of commands are more likely to be found in legislation rather than voluntary self-regulatory instruments. There may well be greater alignment – and fewer distortions – if the version of Turnip we used is applied to legislative instruments[154] rather than a regulatory instrument like the ePayments Code, a significant proportion of which is dedicated to describing rather than prescribing regulatory requirements.

Turnip is, of course, but one of several coding languages that can be used to digitise regulation.[155] Diverse RaC initiatives throughout the

[143] See, for example, Governatori, Casanovas and de Koker (n 3) 178; see also Guido Governatori, Francesco Olivieri, Antonino Rotolo and Simone Scannapieco, 'Computing Strong and Weak Permissions in Defeasible Logic' (2013) 42 (6) Journal of Philosophical Logic 799.

[144] Gordon, Governatori and Rotolo (n 8) 284.

[145] de Sousa Santos, 'Law: A Map of Misreading' (n 20) 295.

[146] ibid.

[147] ASIC, 'The ePayments Code' (n 25) cls 5.1, 5.11, 11.9(c), 17.10, among other examples.

[148] A distinction may be drawn between a defence, which is an action in resistance to another party's attack (eg, in criminal law, a defence can defeat a criminal charge); an exception that might limit the scope of conduct prohibited by regulation (see, eg, cl 4.17 of the ePayments Code); and an exemption (from something), such as (official) permission to not do something ordinarily required: Peter Butt (ed), *Butterworths Concise Australian Legal Dictionary* (Lexis Nexis Butterworths 2004).

[149] See, for example, ASIC, 'The ePayments Code' (n 25) ch G.

[150] While it is relatively straightforward to model these powers as permissions, there is limited practical utility in digitising provisions conferring powers in this way.

[151] Edward L Rubin, 'Law and Legislation in the Administrative State' (1989) Columbia Law Review 369, 372-3.

[152] Burdon, Huggins, Godfrey, Simcock, Buckley, Slevin et al (n 11).

[153] Wilfrid Rumble, *Austin: The Province of Jurisprudence Determined* (CUP 1995).

[154] For examples of Turnip's application to legislative instruments, see Governatori, Casanovas and de Koker (n 3) 177; Huggins, Burdon, Witt and Suzor (n 11) 325.

[155] See, for example, Sotiris Batsakis, George Baryannis, Guido Governatori, Ilias Tachmazidis and Grigoris Antoniou, 'Legal Representation and Reasoning in Practice: A Critical Comparison' in Monica Palmirani (ed), *Legal Knowledge and Information Systems* (IOS Press 2018) 31-40.

world are using various coding languages, including Catala,[156] Datalex,[157] OpenFisca[158] and s(CASP).[159] We suggest that each language is likely to create specific distortions. For example, the types of distortions encountered in applying the Turnip coding language and deontic modal operators to the ePayments Code may differ if an alternative language such as s(CASP) was used. Advantages of s(CASP) include that it is capable of reasoning about variables rather than set values, and justifying conclusions in natural language.[160] Prima facie, the s(CASP) programming language may thus in some ways be suited to digitising non-legislative regulation such as the ePayments Code, which has significant descriptive and discursive elements. However, s(CASP) does not allow for sequential, temporal or procedural logic, unless this logic is manually constructed,[161] which will create its own set of distortions in encoded regulation. This underscores the desirability of a nuanced understanding of both the nature of specific legal and regulatory instruments and the logics underpinning particular coding languages. Such an understanding can in turn inform choices to promote greater alignment between the regulatory instrument and the programming language selected to minimise avoidable distortions.

Thus, adapting and applying a symbolisation lens to digitising regulation illustrates how the selection of coding languages employing certain syntax and modalities shapes encoding decisions. As with choices regarding scale and projection, the choice of coding languages and symbols is not a neutral procedure; rather, it foregrounds and backgrounds different aspects of the regulatory text. These choices ultimately produce encoded rules that are only one of a range of potential representations of the original regulatory instrument.

4.4. Orientation distortions and presentation choices

Choices about scale, projection and symbolisation are in turn shaped by a map's orientation.[162] Clarifying the users of the encoded version of regulatory rules and the purposes for which this version will be employed influences choices about which features of the regulatory instrument and environment are presented in machine-executable format. For the ePayments Code encoding exercise, we produced one set of code for which the predominant purpose was consumer education. However, as we show below, different regulatory features would be emphasised if the encoded version was, for example, to be used for regulatory decision-making purposes by ASIC. Both purposes require different presentations of code.

As outlined above, the ePayments Code focuses on how subscribers conduct themselves in dealings with customers, and obligations in the Code can create contractual obligations between the consumer and their payment facility provider. As our encoded version of the Code was intended to be used for consumers seeking to understand clauses or rules applying to subscribers, we determined that there was little value in encoding some aspects of the Code. For example, it is unlikely that there will be a pressing need for clauses in the ePayments Code that give ASIC certain powers[163] to be digitised for widespread use beyond the relevant regulatory body. The presentation of code in its ultimate coded output can thus be intentionally tailored for its intended user and purpose. In a similar vein, Chapter F requires subscribers to maintain internal dispute resolution procedures.[164] These procedures must comply with AS ISO 10002-2006 consistent with Regulatory Guide 165 *Licensing: Internal and External Dispute Resolution*.[165] We considered that there was limited utility in encoding many of these provisions outlining internal organisational dispute resolution requirements if consumers are the end users of the encoded regulation.

However, some aspects of Chapter F do have direct relevance to consumers. For example, there is a six-year limitation period from the time 'a user first became aware, or should reasonably have become aware, of the circumstances giving rise to the complaint'.[166] If consumers are the intended user of the digitised regulation, this provision can be coded and presented in such a way as to allow an affected consumer to input when they became aware of circumstances giving rise to a complaint. It is not, however, possible to provide coding inputs for these time frames for when a limitation period begins and ends without having identified the relevant user. To address this issue, we opted to code time frames as mere information (ie, as informational atoms) for users, and adopted the present tense for all atoms (eg, 'user.reasonablyBecameAware', which coders can negative with the not (~) operator).

In contrast, the orientation of the encoding exercise changes and different presentations of code are emphasised if the intended end user is a regulatory body such as ASIC. If the digitised version of the Code will be used for regulatory decision-making purposes, from our perspective as legally-trained coders, principles of statutory interpretation ought to guide the encoding exercise. In its current form, the ePayments Code is

[156] Catala is a programming language designed to allow systematic translation of statutory law into machine-executable code and 'express the general case / exceptions logic that permeates statutory law': Denis Merigoux, Nicolas Chataing and Jonathan Protzenko, 'Catala: A Programming Language for the Law' (2021) 5 Proceedings of the ACM on Programming Languages 1.

[157] The Australasian Legal Information Institute (Austlii)'s DataLex project has developed "yscript" to encode legislation, an advantage of which is that encoded rules are more 'English-like' (and thus accessible to a more generalist audience) than 'code-like': Andrew Mowbray, Philip Chung and Graham Greenleaf, 'The DataLex legislation preprocessor for rules as code' (Austlii) <https://austlii.community/foswiki/pub/DataLex/WebHome/ylegis-intro.pdf> accessed 17 July 2023; Mowbray, Chung and Greenleaf (n 1).

[158] OpenFisca is an open-source tool for converting regulation into computer code that can, inter alia, model multiple rules of a select jurisdiction at once (eg, local council laws alongside state or territory laws, and federal laws): OpenFisca, 'Architecture of OpenFisca — OpenFisca documentation' <https://openfisca.org/doc/architecture.html> accessed 17 July 2023.

[159] See, eg, Galileo Sartor, Jacinto Dávila, Marco Billi, Giuseppe Contissa, Giuseppe Pisano and Robert Kowalski, 'Integration of Logical English and s (CASP)' (2022) <www.semanticscholar.org/paper/Integration-of-Logical-English-and-s%28CASP%29-Sartor-D%C3%A1vila/8a871739533ea5d3a4d0db458c7d1ab3b31dee45> accessed 25 May 2023.

[160] ibid.

[161] Sequential logic has previously been constructed using s(CASP). See Dirk Fahland, Daniel Lübke, Jan Mendling, Hajo Reijers, Barbara Weber, Matthias Weidlich et al, 'Declarative versus Imperative Process Modeling Languages: The Issue of Understandability' in Terry Halpin, John Krogstie, Selmin Nurcan, Erik Proper, Rainer Schmidt, Pnina Soffer et al (eds), *Enterprise, Business-Process and Information Systems Modeling* (Springer 2009).

[162] Bottomley (n 74) 150.

[163] See, for example, ASIC, 'The ePayments Code' (n 25) ch G.

[164] See, for example, the Australian Securities and Investments Commission, 'RG Licensing: Internal and External Dispute Resolution (RG 165)' (Regulatory Guide, 30 July 2020) <https://asic.gov.au/regulatory-resources/find-a-document/regulatory-guides/rg-165-licensing-internal-and-external-dispute-resolution/> accessed 13 March 2023.

[165] ibid.

[166] ASIC, 'The ePayments Code' (n 25) cl 38.1.

non-statutory regulation, which is not directly covered by the legal accountability mechanisms, including the courts' statutory interpretation function, under the separation of powers.[167] Arguably, however, it is still best practice to apply statutory interpretation principles given the rule-making function that voluntary codes can serve, especially in setting, monitoring and enforcing standards of behaviour across industries.[168]

The importance of statutory interpretation to digitisation efforts has been brought to the fore with the Australian Government's announcement in early 2022 of its intention to develop and implement a legislatively mandated Code.[169] In the interests of enhancing legal alignment, encoded versions of legislative rules should aim to reflect parliamentary intention, as well as the courts' interpretation of statutory meaning in case law.[170] In Australia, statutory interpretation is 'a combined exercise involving analysis of the *text, context* and *purpose (or policy)* of the statute in question'.[171] The main goal of this 'modern approach to statutory interpretation' is therefore to find the legal meaning of the statutory text in light of its context and purpose.[172] This approach provides a well-established and judicially-favoured process for attempting to resolve ambiguities and inconsistencies in legislation, which can and arguably should be applied to the encoding exercise.[173] Applying this approach increases the intertextual complexity of the encoding exercise given the need to refer to other legislation, such as the *Acts Interpretation Act 1901* (Cth), case law, if any, and extrinsic materials in the statutory interpretation process. If a digitised version of the ePayments Code is intended to be used for regulatory decision-making purposes, statutory interpretation principles ought to shape the intertextual reference points that are taken into account, thus expanding the scale and complexity of the encoding exercise and the ultimate presentation of encoded rules.

Significantly, presenting the code in different ways for specific users may reflect varying interpretations of regulatory meaning. Applying the modern approach to statutory interpretation to the coding exercise aligns with a traditional legal approach to constructing regulatory meaning.[174] Yet this is by no means the only approach to resolving interpretive ambiguities that may apply to digitising regulation.[175] As has been documented in empirical regulatory compliance studies, regulatees construct regulatory meaning based on contextualised understandings of legal requirements, incorporating regulatory guidance materials and business and managerial imperatives.[176] Adapting this approach to digitising regulation would allow for the incorporation of a diverse range of regulatory and non-regulatory interpretive reference points to inform coding choices. A cartographic perspective thus draws attention to different presentations of code reflecting different purposes and interpretive approaches.

In addition to the end uses of the digitised regulation informing encoding choices, the knowledge or positionality of coders can influence what types of information are included and excluded, and how they are presented. For example, if coders are not legally trained, they will lack expertise in interpreting regulation in accordance with jurisdictionally-specific rules and principles of statutory interpretation,[177] and will not be alert to situations in which adherence to such rules and principles is required. Moreover, the choices made in developing computer code can reflect the conscious or unconscious biases of coders.[178] As Kitchin explains:

> Whilst programmers might seek to maintain a high degree of mechanical objectivity – being distant, detached and impartial in how they work and thus acting independent of local customs, culture, knowledge and context – in the process of translating a task or process or calculation into an algorithm they can never fully escape these.[179]

Regulatory meaning can be altered, oversimplified and distorted as a result of coders' preferences, biases[180] and blind spots.[181] The knowledge, values, politics and positionality of coders can thus shape the choices they make,[182] and have significant flow-on consequences for the orientation and application of the encoded regulation.

In sum, a focus on orientation is valuable for highlighting how the purposes for which a digitised version of regulation will be used shape the presentation of encoded outputs. We found it difficult to cater for diverse potential users in a single presentation of the code, underscoring the need for multiple versions tailored to specific end users. Moreover, the knowledge, biases and positionality of coders also influence coding choices, and the orientation of encoded outputs. Paying attention to

[167] Weeks (n 16). As Weeks notes, non-statutory regulation, commonly known as 'soft law', 'amounts to a method of governing the general public that falls wholly outside the tripartite separation of powers: it does not require legislation, is not accountable in the usual manner of executive acts and it is generally irrelevant to considerations of courts exercising judicial review functions': ibid 305.

[168] See generally Scott Burris, Michael Kempa and Clifford Shearing, 'Changes in Governance: A Cross-Disciplinary Review of Current Scholarship' (2008) 41 Akron Law Review 1, 9, citing Scott Burris, Peter Drahos and Clifford Shearing, 'Nodal Governance' (2005) 30 Australian Journal of Legal Philosophy 30, 30; Huggins, Burdon, Witt and Suzor (n 11).

[169] ASIC, 'Response to Submissions on CP 341 Review of ePayments Code' (n 34) 6.

[170] See Witt, Huggins, Governatori and Buckley (n 68); Barraclough, Fraser and Barnes (n 9) 58-65.

[171] The Hon Michael Kirby AC CMG, 'Statutory Interpretation: The Meaning of Meaning' (2011) 35 Melbourne University Law Review 113, 116.

[172] Sanson (n 31) 62.

[173] Witt, Huggins, Governatori and Buckley (n 11).

[174] Huggins, Burdon, Witt and Suzor (n 11) 9-10.

[175] Burdon, Huggins, Godfrey, Simcock, Buckley, Slevin et al (n 11).

[176] Lauren B Edelman, 'The Endogeneity of Law', in Lauren B Edelman, *Working Law: Courts, Corporations, and Symbolic Civil Rights* (University of Chicago Press 2016) 21. See also Lauren B Edelman and Shauhin A Talesh, 'To Comply or Not to Comply – That Isn't the Question: How Organizations Construct the Meaning of Compliance' in Christine Parker and Vibeke Nielsen (eds), *Explaining Compliance* (Edward Elgar Publishing 2011) 114.

[177] Perry (n 96) 32; Citron (n 80) 1261.

[178] Batya Friedman and Helen Nissenbaum (1996) 'Bias in Computer Systems' 14(3) ACM Transactions on Information Systems 334.

[179] Rob Kitchin, 'Thinking Critically about and Researching Algorithms' (2017) 20(1) Information, Communication and Society 14, 17-18 (citations omitted).

[180] Take, for example, artificial intelligence (AI) bias research on race, gender and disability: Ruha Benjamin, *Race After Technology* (Polity 2019); Safiya Nobel, Algorithms of Oppression*: How Search Engines Reinforce Racism* (NYU Press 2018); Meredith Whittaker, Meryl Alper, Cynthia L Bennett, Sara Hendren, Liz Kaziunas, Mara Mills et al, 'Disability, Bias, and AI' (AI Now Institute Report, 2019) <https://ainowinstitute.org/disabilitybiasai-2019.pdf> accessed 13 March 2023.

[181] Citron (n 80) 1262.

[182] See generally Stephanie Hare, *Technology Is Not Neutral: A Short Guide to Technology Ethics* (London Publishing Partnership 2022).

orientation is important as the presented uses of the encoded version of the regulatory rules are interconnected with how the concepts of scale, projection and symbolisation are applied in the encoding exercise. Thus, a key benefit of analysing the digitisation of regulation through a cartographic lens is that it underscores the subjectivity of interpretive choices, and the desirability of different versions of encoded rules for different end users and purposes.

5. Conclusion

A cartographic perspective valuably illuminates the ways in which digital distortions can arise in encoding regulation. As illustrated by the ePayments Code case study, in relation to each of the cartographic elements, coders make important interpretive choices in the encoding process. A scale conception draws attention to documentary choices about which aspects of the regulatory instrument and broader regulatory ecosystem provide relevant features for the encoding exercise. The concept of projection underscores the tension between governing logics, particularly the 'if-then' logic of rules-based computerised processes, and the interpretive logic that applies to open-textured and discretionary regulatory provisions. A symbolisation lens highlights that the use of a specific coding language brings to the fore certain features of the regulatory instrument, such as Turnip deontic modalities. Finally, the concept of orientation emphasises that the ultimate presentation of code reflects end users and purposes, as well as coders' normative standpoints.

Cartographic concepts therefore highlight that digitising regulation can distort the meaning of a regulatory instrument in diverse and uneven ways. A cartographic lens reinforces that an encoded version reflects one interpretive representation of the regulatory instrument, and the concomitant limits of attempts to achieve a one-size-fits-all isomorphic translation of natural language regulation into machine-executable code. This underscores the importance of coders becoming more aware of the interpretive choices they are making, and their implications. Capturing and documenting these choices is valuable to not only ensure the internal coherence of coding practices, but also to enable external review of such choices, thereby contributing to broader transparency and accountability goals. Moreover, documenting the choices made allows for subsequent updates as regulatory rules and coding languages evolve. Like maps that are temporally specific and need to be kept up to date, RaC approaches should include a record of decisions made to facilitate revisions.

Applying a cartographic lens also opens up new lines of enquiry for future RaC research. For instance, it encourages experimentation with alternative 'cartographic methods and representations',[183] such as digital mapping tools that visually depict regulatory patterns, intersections, overlaps and sources. One such avenue is examining the overlaying of maps to allow multiple layers of regulation to be represented in visual form, informed by critical awareness of the stakes and parameters of encoding choices. Secondly, while this article focuses on digitising non-legislative regulation using an Australian case study, the analysis would be valuably enriched by further research into the applicability of a cartographic perspective to digitising legislation across different legal systems. Finally, the subjectivity of encoding decisions provides scope for embedding normative choices. As non-statutory regulation, the ePayments Code is not automatically subject to the legal accountability mechanisms under the separation of powers in Australia.[184] This does not, however, answer the question of whether public law principles and safeguards should apply to digitised versions of this regulation, given its role in setting, monitoring and enforcing industry standards of behaviour.[185] Particularly if encoded regulation will be used to exercise power over individuals, it is arguably desirable for rule of law values such as transparency and accountability, predictability and consistency, and equality before the law to inform encoding choices.[186] In this way, cartographic concepts can be applied to design digitised regulation to align with specific end uses, purposes and values.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Acknowledgements

The research leading to this article received funding from the Commonwealth Scientific Industrial Research Organisation (CSIRO)'s Data61 for a project entitled 'Classifying the Legal and Coding Challenges of Digitising Commonwealth Legislation' (approval number C024166). It is also informed by research for the Australian Research Council project entitled 'Optimising Digital Compliance Processes in the Financial Services Sector' (project LP210301088). The authors received ethics approval for this research at QUT (approval number 2000000763).

The authors would like to thank Professors Nicolas Suzor (QUT) and Guido Governatori (then CSIRO's Data61) for their excellent guidance on the technical dimensions of the ePayments Code encoding exercise. We would also like to thank Jasmin Percy, Lucinda Nelson, Rhyle Simcock and Tom Mackie for their high-quality research assistance.

[183] Reiz, O'Lear and Tuininga (n 78) 7.

[184] Weeks (n 16) 305.

[185] See n 168.

[186] On the opportunities and limits associated with achieving rule of law values 'by design' in technological systems, see Monika Zalnieriute, Lyria Bennett Moses and George Williams, 'The Rule of Law "By Design"?' 95(5) Tulane Law Review 1063. Hildebrandt advocates for 'legal protection by design', which includes embedding rule of law safeguards in the design of code-driven law: see, eg, Hildebrandt, 'Code-Driven Law' (n 12) 82-83. See also Diver's analysis of embedding constitutional safeguards in design processes in *Digisprudence* and 'Interpreting the Rule(s) of Code': Diver (n 12).