The Theory and Practice of Legislation

ISSN: 2050-8840 (Print) 2050-8859 (Online) Journal homepage: https://www.tandfonline.com/loi/rtpl20

The middle-out approach: assessing models of legal governance in data protection, artificial intelligence, and the Web of Data

Ugo Pagallo, Pompeu Casanovas & Robert Madelin

To cite this article: Ugo Pagallo, Pompeu Casanovas & Robert Madelin (2019) The middle-out approach: assessing models of legal governance in data protection, artificial intelligence, and the Web of Data, The Theory and Practice of Legislation, 7:1, 1-25, DOI: 10.1080/20508840.2019.1664543

To link to this article: https://doi.org/10.1080/20508840.2019.1664543

Published online: 18 Sep 2019.

THE THEORY AND PRACTICE OF LEGISLATION
2019, VOL. 7, NO. 1, 1–25
https://doi.org/10.1080/20508840.2019.1664543

Routledge
Taylor & Francis Group

The middle-out approach: assessing models of legal governance in data protection, artificial intelligence, and the Web of Data

Ugo Pagallo [a], Pompeu Casanovas [b,c] and Robert Madelin[d]

[a]Law School, University of Torino, Torino, Italy; [b]Law School, La Trobe University, Melbourne, Australia; [c]Law and Technology Institute, Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Spain; [d]Fipra International, Brussels, Belgium

ABSTRACT

All models of legal governance and most regulatory options have to do with 'top-down' solutions as an essential ingredient of the approach. Such models may include 'bottom-up' forms of self-regulation, such as in forms of ex post regulation, or unenforced self-regulation. This paper focuses on what lies in between such top-down and bottom-up approaches, namely, the middle-out interface of the analysis. Within the EU legal framework, this middle-out layer is mainly associated with forms of co-regulation, as defined by Recital 44 of the 2010 AVMS Directive and Article 5(2) of the GDPR. However, there are also additional models on how we should grasp the middle-out layer of legal regulation, as shown by the debates on the governance of AI and the Web of Data. For example, the debates on issues such as monitored self-regulation, coordination mechanisms for good AI governance, and 'wind-rose' models for the Web of Data make it clear that co-regulation is not the only alternative to both bottom-up and top-down approaches. From a methodological viewpoint, the middle-out approach sheds light on three different kinds of issues that regard (i) how to strike a balance between multiple regulatory systems; (ii) how to align primary and secondary rules of the law; and (iii) how to properly coordinate bottom-up and top-down policy choices. The increasing complexity of technological regulation recommends new models of governance that revolve around this middle-out analytical ground.

KEYWORDS Artificial intelligence; data protection; GDPR; governance; legal design; level of abstraction; middle-out approach; regulatory system; techno-regulation; Web of Data

1. Introduction

Legal regulation plays a crucial role in the toolkit of global governance and, in particular, of 'good enough governance,' as Kofi Annan put it in his

CONTACT Ugo Pagallo ugo.pagallo@unito.it Law School, University of Torino, Lungo Dora Siena 100 A, 10153 Torino, Italy

inauguration speech as UN Secretary-General in July 1997. Merilee Grindle has analysed and distinguished eight different meanings of the notion 'governance' that have emerged in this context. Most meanings and definitions include legal regulation as a key component of the model: for example, in the words of the World Bank, governance refers to 'the process and institutions through which decisions are made and authority in a country is exercised.'[1] Others define governance as 'the formation and stewardship of the formal and informal rules that regulate the public realm, the arena in which state as well as economic and societal actors interact to make decisions.'[2]

Yet legal regulation is a complex notion of its own. It includes not only rules, but also values, principles, standards, protocols and guidelines. A traditional distinction refers to the tripartition of legal regulation, co-regulation, and self-regulation:

(a) Legal regulation can be understood as a form of legal information for reality, namely, a set of rules or instructions for the determination of every legal subject of the system. Examples are the rules of legislators that aim to directly govern social and individual behaviour. Such rules mostly hinge on a normative stance or the threat of physical sanctions, in accordance with Hermann Cohen's and Hans Kelsen's consequentialist formula 'if A, then B ought to follow'[3];
(b) Co-regulation refers to how legal regulation, that is, public hetero-regulation and private self-regulation interact. According to Recital 44 of the 2010 Audiovisual Media Services (AVMS) Directive, namely, D-2010/13/EU, co-regulation provides in its minimal form 'a legal link between self-regulation and the national legislator … In co-regulation, the regulatory role is shared between stakeholders and the government or the national regulatory authorities or bodies';
(c) Self-regulation regards any kind of bottom-up approach. The AVMS directive presents the notion as 'a type of voluntary initiative which enables economic operators, social partners, non-governmental organisations and associations to adopt common guidelines amongst themselves and for themselves.'

In between legal regulation and self-regulation, scholars have provided different kinds of scales and taxonomies in order to understand how top-down forms of legal regulation and bottom-up solutions can be mixed. For example, in Marsden's 'Beaufort scale' of self- and co-regulation, 11 different scales are singled out, from 'pure' unenforced self-regulation, such

[1]See M Grindle, 'Good Enough Governance Revisited' (2007) 25(5) Development Policy Review 533–74.
[2]ibid. See also U Pagallo, 'Good Onlife Governance: On Law, Spontaneous Orders, and Design' in L Floridi (ed), *The Onlife Manifesto: Being Human in a Hyperconnected Era* (Springer 2015) 161–77.
[3]The formula in H Kelsen, *General Theory of the Law and the State* (Harvard University Press 1949).

as in Second Life (scale 0), to an independent body with stakeholder forum, in which top-down regulations of the government are imposed and co-regulated through taxation and/or compulsory levy.[4] These multiple models of regulation overlap with different governance options on how to tackle the interaction between (i) law and ethics; (ii) general vs. sector-specific regulation; (iii) different needs that may be regulated; (iv) different levels of regulation (e.g. global, international, national, or regional); and (v) different ways in which we can modernise the legal framework.[5] These views and models on technological governance and regulation concern design-based or behavioural options, premarket approval systems, RegTech and SuperTech solutions, experimental policy-making and command and control options, much as monitoring and oversight mechanisms (e.g. regulatory bodies), ex post regulation and co-regulative mechanisms, down to such accompanying measures as regulatory agencies, ethical review boards, and so on.

This toolkit of legal governance brings us back to the tripartition of legal regulation introduced above. In the case of governance, the attention of lawyers and policy makers is drawn to the interplay between the regulatory aims of the law and those of further regulatory systems, such as the forces of the market, or of social norms. Legal regulation is a way, although important, in which such a balance between regulatory systems may actually be struck. A model of the EU institutions on co-regulation helps us in setting our own level of abstraction on regulation, co-regulation, and self-regulation. The AVMS definition of co-regulation can indeed be grasped as a layer in between the extremes of a spectrum, with the regulatory powers of the law, especially the 'top down' rules of legislation found on one end, and forms of pure self-regulation on the other. The EU definition of co-regulation thus defines a middle path between the traditional top-down approaches and bottom-up solutions of legal regulation. One of the main assumptions of this paper is that the model of co-regulation is not actually good enough to grasp the complexity of the problems we are dealing with, such as the current initiatives on AI governance and its legal regulation. The aim of this paper is to address and formalise the complexity of today's technological regulation and models of governance, by dwelling on this middle layer of the analysis. Figure 1 illustrates setting the level of abstraction we are referring to:

Following a well-established tradition in computer science, that which lies between the top-down and bottom-up approaches represents the middle-out layer of the model. We borrow this terminology here, because both computer science and practical sciences such as law and economics should address the constraints that arise during the design process when upgrading existing

[4]See Ch Marsden, *Internet Co-Regulation and Constitutionalism: Towards a More Nuanced View* (29 August 2011) <https://ssrn.com/ abstract=1973328>.

[5]See M Ebers, 'Regulating AI and Robotics: Ethical and Legal Challenges' in M Ebers and S Navas Navarro (eds), *Algorithms and Law* (Cambridge University Press 2019 forthcoming).

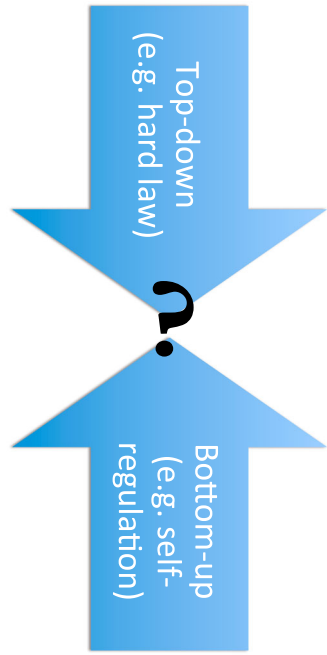

Figure 1. Setting the level of abstraction.

systems. From a legal viewpoint, the aim is to flesh out the set of observables and variables of the analysis, the result of which represents a model for the field.

The paper is organised as follows. Section 2 introduces the middle-out approach, which defines the level of abstraction of the paper. The intent is to formalise the set of rules and procedures that may lie in between the different forms of top-down legislation and unenforced self-regulation. Section 3 presents the law as a regulatory system with its policy options. As regards the middle-out layer of the analysis, such policy options concern the balance between multiple regulatory systems and the mix between primary and secondary rules of the law. The EU model of co-regulation in the field of data protection, i.e. the General Data Protection Regulation, or GDPR, shows how this model works. In particular, Section 4 focuses on the principle of accountability with its technicalities, such as in Article 5(2) of the GDPR. The latter properly reflects the middle-out interface of both top-down and bottom-up mechanisms that lay the groundwork for the co-regulatory model of the EU legislator. Section 5 shows that the GDPR's model of co-regulation, however, offers no magic bullet for today's governance of AI and the Web of Data. We are called on to devise new middle-out approaches, such as forms of 'monitored self-regulation,' or coordinative mechanisms for 'adaptive regulators.' Leaving aside the merit of these

proposals, the intent is to show how today's initiatives and debates on the governance of AI and the Web of Data demonstrate that co-regulation is not the only alternative to the bottom-up and top-down approaches. The complexity of today's legal issues on regulation recommend additional forms of law making that revolve around the middle-out interface of the analysis. The aim should be to identify a good mix between the bottom-up and top-down solutions, and to make this mix our model of good enough governance.

2. Levels of abstraction

From a methodological viewpoint, a 'level of abstraction' offers us the means with which to set the proper level of analysis. The level of abstraction can be considered as a sort of interface, whose function is to define the features representing the observables and variables of the research, thereby providing a model for the area of concern.[6] This methodological approach can be illustrated with the three main components of (i) the interface of the model; (ii) its observables; and (iii) variables.

As to the interface, consider the regulatory aims of the law and in particular, the sets of legal regulation, of co-regulation, and of self-regulation mentioned above in the introduction. We noted that both the top-down and the bottom-up approaches were among the observables of the analysis. As to the top-down approaches, i.e. rules that aim to govern individual behaviour and social interaction, the variables of the analysis may concern different needs or interests that should be regulated, as well as different levels of regulation, such as in international, national, or regional legislation. In the field of technological innovation, more specifically, the hard tools of the law comprise several different techniques. The aim can be to attain (i) particular effects; (ii) functional equivalence between online and offline activities; (iii) non-discrimination between technologies with equivalent effects; and (iv) future-proofing of the law that should neither hinder the advance of technology, nor require over-frequent revision to deal with such progress.[7]

As to the bottom-up approaches, the variables of the analysis can be illustrated with the eight forms of self-regulation in Marsden's 'Beaufort scale', or with Friedrich Hayek's work on self-regulation and the emergence of unintentional orders, i.e. that which he also dubbed as spontaneous orders, or the *kosmos* side of the law.[8] Among the main advocates of self-regulation we find, of

[6]See L Floridi, 'The Method of Levels of Abstraction' (2007) 18(3) Minds and Machines 303–29; and U Pagallo, *The Laws of Robots: Crimes, Contracts, and Torts* (Springer 2013).

[7]See BJ Koops, 'Should ICT Regulation be Technology-neutral?' in BJ Koops et al (eds), *Starting Points for ICT Regulation: Deconstructing Prevalent Policy One-liners* (TMC Asser 2006) 77–108; Ch Reed, *Making Laws for Cyberspace* (Oxford University Press 2012); and U Pagallo, 'The Realignment of the Sources of the Law and their Meaning in an Information Society' (2015) 28(1) Philosophy & Technology 57–73.

[8]The reference text is FA von Hayek, *Law, Legislation and Liberty* (Vol. 1: *Rules and Order* University of Chicago Press 1982).

course, corporations and, more generally speaking, the forces of the market. Still, social self-regulation was one of the most popular models of internet governance in the early 2000s.[9] A vibrant debate on how online communities have, or rapidly develop, their social norms,[10] revolved around some of the ways in which the digital revolution has progressively put social self-regulation in the spotlight. By taking into account the normative challenges brought about by technological innovation, such as AI, this bottom-up approach can be strengthened through participatory mechanisms that aim to ensure alignment with societal values and understanding of public opinion through an ongoing dialogue between all stakeholders.[11] Further mechanisms regard the idea of 'inclusive innovation' and smooth transition to new kinds of jobs via rewarding human-machine collaboration, multi-stakeholder upstream collaboration for risk mitigation, and systems for user-driven benchmarking of all offerings in, e.g. the AI market.

Together with the top-down and bottom-up approaches, e.g. Hayek's *taxis* and *kosmos* sides of the law, we should also explore that which lies in between. This is the problem illustrated in Figure 1 in the introduction. Two magnitudes of complexity are under scrutiny. As regards the vertical dimension of the figure, i.e. the top-down and bottom-up, the intricacy of regulation concerns the interaction between multiple regulatory systems, such as the law, the forces of the market, and of social norms. As to the horizontal dimension of the figure, different sets of legal rules can appear. That which we dub as the middle-out layer of the analysis, following a well-established tradition in computer science, has thus to cast light on how this mix of rules and balances between regulatory systems may address the constraints that arise during the design process. This was, after all, what the EU institutions hoped to achieve when replacing the 1995 directive on data protection with the new set of rules in the 2016 GDPR. These provisions, correspondingly, aim to:

(i) strike a balance between multiple regulatory systems;
(ii) align different kinds of legal rules; and
(iii) propose a governance model on this basis, to help clarify what is at stake in other domains of the legal field, such as in current discussions on the governance of AI and the Web of Data.

[9]See LB Solum, 'Models of Internet Governance' in LA Bygrave and J Bing (eds), *Internet Governance: Infrastructure and Institutions* (Oxford University Press 2009) 48–91.

[10]See, among others, AD Murray, *The Regulation of Cyberspace: Control in the Online Environment* (Routledge-Cavendish 2007); Th Schultz, 'Private Legal Systems: What Cyberspace Might Teach Legal Theorists' (2007) 10 Yale Journal of Law and Technology 151–93; and Y Benkler, *The Penguin and the Leviathan: The Triumph of Cooperation over Self-interest* (Crown 2011).

[11]See L Floridi, J Cowls, M Beltrametti, R Chatila, P Chazerand, V Dignum, Ch Luetge, R Madelin, U Pagallo, F Rossi, B Schafer, P Valcke and E Vayena, 'AI4People – An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations' (2018) 28(4) Minds and Machines 689–707.

The next section aims to deepen our understanding of the law as a regulatory system and hence also of the different kinds of norms the law has for the governance of social and individual behaviour. Section 4 then scrutinises the ways in which the middle-out interface works in the GDPR.

3. Law as a regulatory system

We admit that the law is not a simple set of rules. As shown by different schools – such as the classical and modern natural law tradition, legal realism and the Law and economics view, old and new kinds of institutionalism, etc. – further dimensions of the legal phenomenon do exist. Still, by dwelling on the regulatory side of the law, we can gain a fruitful perspective on how lawmakers set the interface between the top-down and bottom-up approaches. More particularly, the middle-out layer of the analysis draws attention to two crucial facets of the legal phenomenon.

First, the law is not the only regulatory system out there. In addition to the law, we have to take into account other regulatory systems, such as the market and a shared set of social values and principles. According to a popular thesis on law as code, or lex informatica, we should also concede that technology is a regulatory system.[12] In general terms, we may say that every regulatory system claims to govern social behaviour by its own means, so that (i) regulatory systems may compete; (ii) they can even render the claim of another regulatory system superfluous; or (iii) they can reinforce each other. Two examples illustrate these scenarios. On the one hand, the EU e-money directive 46 from 2000 reminds us of how legal regulation may fail: soon after the implementation of the directive, which aimed at expanding traditional forms of centralisation to online interaction, new forms of payment, such as PayPal, forced the EU legislators in Brussels to intervene. They had to amend themselves with a new directive, n. 110 from 2009. On the other hand, Article 8 of the 1996 *Copyright Treaty* and Article 14 of the twin *Performances and Phonograms Treaty* of the World Intellectual Property Organization (WIPO) offer a counter-example of how legal and technological regulations can go hand-in-hand. These provisions represent the legal umbrella for the adoption of such automatic techniques as digital rights management (DRM) in the private sector, which enable copyright holders to monitor and regulate the use of their protected artifacts. Multiple models of regulation, co-regulation, and self-regulation aim to formalise the balance struck on this basis between different regulatory systems. The middle-out layer of the analysis specifies which balance was set out, once forms of top-down legislation and pure bottom-up approaches have been discarded.

[12]See JR Reidenberg, 'Lex Informatica: The Formulation of Information Policy Rules through Technology' (1998) 76(3) Texas Law Review 553–94; and L Lessig, *Code and Other Laws of Cyberspace* (Basic Books 1999).

The second crucial facet of the legal phenomenon has to do with different kinds of legal rules. In addition to the distinction between rules and principles,[13] we should distinguish between primary and secondary rules of the law.[14] The primary rules were introduced above in Section 2, as an illustration of the top-down approaches: their aim is to directly govern individual and social behaviour. The approach refers to the law as a set of instructions or commands for every legal subject of the system, which hinges on the threat of physical sanctions, as summed up with Kelsen's formula 'if A, then B ought to follow.' According to Herbert Hart, the secondary rules of the law include rules of recognition, of adjudication, and of change, i.e. rules that allow for the creation, modification, and suppression of the primary rules regulating people's behaviour. The role and function of the secondary rules of the law and more specifically, the rules of adjudication and change can hardly be overestimated in this context. The complexity of technological regulation has increasingly recommended the adoption of this kind of rule.[15] For example, in the case of the GDPR, there are four different types of secondary rules, namely, mechanisms of (i) delegation of power and of (ii) legal coordination; (iii) procedures for a pre-emptive approach to data protection; and (iv) mechanisms for effective judicial remedies.[16]

This stance partially overlaps with the models of legal governance mentioned in the introduction and, moreover, it systematises them with a well-established distinction of legal theory between different kinds of rule.[17] Regulatory options of governance and multiple scales of self- and co-regulation can indeed be represented as a combination of primary and secondary rules. This combination specifies how the legal system establishes its own interaction with further regulatory systems, such as technology, or the forces of the market, striking a balance between top-down measures (e.g. an enforceable statute), and bottom-up policies (e.g. multiple scales of self-regulation). The middle-out interface that follows as a result provides a model for the field. Of all the possible combinations and taxonomies among the different regulatory systems and alignment of primary and secondary rules of the law, the model specifies the middle-out layer between hard law and policy recommendations as a network of legal norms that strike the balance against technology, market, and social norms. We can then discuss whether the model adequately

[13]The reference is here R Dworkin, *A Matter of Principle* (Oxford University Press 1985).
[14]See HLA Hart, *The Concept of Law* (Clarendon 1961).
[15]This theoretical notion of primary and secondary rules refers to the whole legal framework and should not be confused with the notions recently introduced in algorithmic governance of (i) first-order rules (code automated design principles) and (ii) second-order rules (human response to user/legal requests, i.e. new requirements operating on first-order rules). See B Wagner, 'Algorithmic Regulation and the Global Default: Shifting Norms in Internet Technology' (2016) 1 Etikk i praksis-Nordic Journal of Applied Ethics 5–13.
[16]See U Pagallo, 'The Legal Challenges of Big Data: Putting Secondary Rules First in the Field of EU Data Protection' (2017) 3(1) European Data Protection Law Review 34–46.
[17]See Hart (n 14).

tackles the normative challenges of regulation, and whether or not it is context-dependent, or can otherwise be transplanted into further domains of the legal field. The next section explores how this level of abstraction actually works with the example of the GDPR.

4. The GDPR's middle-out interface

The GDPR hinges on the assumption that the processing of personal data is a risky activity. The term risk appears 75 times in the EU legal text. In some cases, risk is to be understood in terms of the probabilities of events, consequences, and costs, so that liability policies, insurance premiums, or accountability schemes, can be determined according to the level of risk. At other times, risk refers to the logic of risk production and how we intend to manage it. In more general terms, we can associate the notion of risk management with every adaptive attempt to reduce the complexity of the human environment. As some claim, 'risk management has been a fundamental motivation for development of social and governance structures over the last 10,000 years.'[18] Yet, in today's *Risikogesellschaft*,[19] one of the main transformations concerns the ways in which the logic of risk production has prevailed over the logic of wealth production. From an institutional viewpoint, the attention has shifted from matters of risk management to the network of competences and institutions summarised by the idea of risk governance. The regulatory options of risk governance concern (i) forms of self-regulation and its variants; (ii) top-down tools of regulation, such as enforceable acts, statutes, or codes, plus administrative constraints; and (iii) a mix of such forms and tools. Remarkably, the GDPR has adopted this latter regulatory option, according to which public legislation establishes both the principles that have to be followed by data controllers and the outcomes they should abide by. It is up to data controllers, however, as to how they should attain such ends. This form of co-regulation revolves around that which the GDPR calls the 'principle of accountability.' Figure 2 illustrates the middle-out layer of the model.

The principle of accountability is mentioned only twice in the legal text. Recital 85 of the GDPR refers to accountability in connection with responsibility for data breaches and risks for the data subjects' rights and freedoms. Article 5(2) mentions the principle as the way in which data controllers shall be able to prove compliance with the 'principles relating to processing of personal data' pursuant to Art. 5(1). The role of the accountability principle in the GDPR has to be grasped, however, pursuant to the complex network of rules and mechanisms set up by the EU regulation, namely, the set of primary

[18]See T McDaniels and MJ Small, *Risk Analysis and Society* (Cambridge University Press 2004).
[19]See U Beck, *Risk Society: Towards a New Modernity* (Sage 1992).

Figure 2. The GDPR's middle-out approach.

and secondary rules that strike the balance between top-down measures and bottom-up policies. Whereas the EU legislation establishes the principles data controllers should respect – e.g. Art. 12 of the GDPR on duties of transparency and the protection of some data subjects' rights, such as the right to access – data controllers also have the obligation to assess the level of risk triggered by their own data processing. Although not mentioned, the accountability principle is also at work with the provisions of Articles 24(1) and 25(1). In the former case, 'the controller shall implement appropriate technical and organisational measures to ensure and to be able to demonstrate that processing is performed in accordance with this Regulation.' In the latter case, data controllers shall abide by the principle of privacy by design, and by default. Risk assessments on data protection impact do not just regard those directly affected by such data processing, much as privacy by design solutions shall comply with all the requisites of the regulation.

It is then up to the decision-making of data controllers as to how to approach (i) the prevention of risk; (ii) pre-emptive measures by design, and by default; and (iii) corporate organisational measures for the protection and security of personal data processing. From this latter perspective, for example, the aforementioned risk management and assessment of Art. 24 should be distinguished from the 'security of processing' of Art. 32. Although

the regulatory model is still at work, the specific duties and self-regulatory efforts of data controllers change. In particular, the security of processing regards, also but not only, 'the pseudonymisation and encryption of personal data' (lett. a); 'the ability to ensure the ongoing confidentiality, integrity, availability and resilience of processing systems and services' (lett. b); 'the ability to restore the availability and access to personal data in a timely manner in the event of a physical or technical incident' (lett. c); and 'a process for regularly testing, assessing and evaluating the effectiveness of technical and organisational measures for ensuring the security of the processing' (lett. d). Therefore, Articles 5(1)(f) and 32 of the GDPR on security do not just set the conditions for the fairness of the processing of personal data. They also aim at preventing possible risks brought about by inadequate systems and services of data processing.

As to the secondary rules of the law at work with the model, the accountability principle mostly refers to rules of adjudication, such as in Article 77 and ff. of the GDPR. Risks of fragmentation that depend on multiple jurisdictions of national supervisory authorities are tackled with further secondary rules on coordination and procedural regularity, as in Articles 60, 61, 75(4) and 97(2)(b). The model comprises a more complex mix of primary and secondary rules for some specific cases, such as impact assessments and the protection of corporate rights. In the first case, according to Art. 36,

> the controller shall consult the supervisory authority prior to processing where a data protection impact assessment under Article 35 indicates that the processing would result in a high risk in the absence of measures taken by the controller to mitigate the risk.

The purpose is to set up and guarantee a pre-emptive, rather than remedial, protection of personal data, so that privacy safeguards are at work even before a single bit of information has been collected. In the second case, Art. 80 of the GDPR establishes procedures for an effective judicial remedy through a new collective right to lodge complaints. Together with the rules of adjudication, the purpose of the norm is, at least, to partially take into account how Big Data treats types rather than tokens and hence, groups rather than individuals.[20]

On this basis, we can specify the middle-out interface of the GDPR as a (variable of the) model of co-regulation – namely, the principle of accountability – substantiated by a detailed mix of primary and secondary rules (see Figure 2).

On the side of the principles and rules that should be implemented pursuant to the GDPR, Art. 5(1) lists (i) lawfulness, fairness, and transparency;

[20]See U Pagallo, 'The Group, the Private, and the Individual: A New Level of Data Protection?' in L Taylor, L Floridi e B van der Sloot (eds), *Group Privacy: New Challenges of Data Technologies* (Springer 2017) 159–73.

(ii) purpose limitation; (iii) data minimisation; (iv) accuracy; (v) storage limitation; and (vi) integrity and confidentiality. On the side of the measures that are to be taken at both organisational and technical levels, Articles 5(2), 24(1), 25(1) and 32 show data controllers (and processors) the ways in which they shall prove compliance with the six sets of principles of Art. 5(1). The accountability principle is thus the middle-out interface that strikes the balance between the implementation of rules and principles of the GDPR, and how data controllers should organise themselves, i.e. their own data processing.

Naturally, this form of co-regulation has ignited a hot debate over the past years, for example, as to whether this mix of primary and secondary rules provides an appropriate model of legal governance or has set the bar too high. In this context, attention should be drawn to another facet of the debate on models of governance. As already mentioned in the introduction, one of the risks of today's debate concerns the confusion between models of co-regulation and that which this paper dubs as the middle-out layer of the analysis. Although we admit that co-regulation is a sound example of how the middle-out interface works in between the top-down and bottom-up approaches, co-regulation is not the only way in which such an interface can be conceived. In addition to the GDPR and further models of co-regulation, current debate on the legal regulation of AI offers further examples of what a middle-out approach may look like. Several policy documents, guidelines, and declarations on the governance of AI and the Web of Data provide a rich test-bed and an important field of application for further models of legal regulation. They depend on how the middle-out layer is designed.

5. A middle-out interface for AI

The governance of AI is one of the hottest topics in contemporary institutional debate. Three years ago, in 2016, the White House Office of Science and Technology Policy (OSTP) conducted a series of public workshops on questions of AI and policy, culminating with a report that addresses the many ethical issues related to AI, such as fairness, accountability, and social justice, that need to be tackled with increasing transparency. The Trump administration and the Pentagon released similar documents in early 2019. Meanwhile, China declared its ambition to become the AI world leader by 2030, and, in September 2017, the Russian president, Vladimir Putin predicted that the nation becomes the leader in AI, will be 'the ruler of the world.' European institutions have been making significant contributions of their own, such as the European Parliament's Resolution from February 2017, the Economic and Social Committee's Opinion on AI from May 2017, the European Commission's AI Strategy and the Work of

its High-Level Expert Groups on AI in 2018 and 2019, down to the work of the Council of Europe. To this can be added the United Nations' 'AI for Good' global summits, the OECD Reports, and several other corporate initiatives, partnerships, and institutional proposals at the international level ranging from the Global Initiative on Ethics of Autonomous and Intelligent Systems of the Institute of Electrical and Electronics Engineers (IEEE), the Committee on Professional Ethics and the Public Policy Council of the Association for Computing Machinery (ACM), the World Economic Forum's Center for the Fourth Industrial Revolution, the Future of Life Institute's Asilomar Principles, OpenAI, Partnership on AI, the Software and Information Industry Association (SIIS), and the work of the AI4People project.[21]

Against this framework, we can distinguish different models of governance in accordance with the actors that should spearhead cooperation. The 2016 AI Reports of the White House, of the EU Parliament and of the UK House of Commons, for example, mostly revolve around cooperation between the government and private industry in the U.S., the Commission and a new advisory agency in the EU, the government and a standing commission in the U.K.[22] Whilst China and Russia privilege strict top-down approaches – and the approach seems to work the other way around in the U.S. – current debate and initiatives in the EU should be located in between. The co-regulatory model of the GDPR shows, after all, an alternative way to both bottom-up and top-down approaches; moreover, the GDPR's model of co-regulation is already valid law for AI processing of personal data. Could this model be transplanted into the domain of AI?

All in all, three reasons suggest why this is not the case. First, we still lack a list of principles to be enforced through forms of co-regulation in all fields of AI, as occurs with Art. 5(1) of the GDPR. Second, the legal regulation of AI does not just concern personal data issues (e.g. non-discrimination law). Third, current AI regulation is already context-dependent: in addition to the rules on data protection, there are a multitude of rules in the fields of self-driving cars, drones, e-health, financial services, and more. The test and use of, say, autonomous ground vehicles has to do with both national legislations and EU normative acts. In the first case, consider the Spanish instruction approved by the Dirección General de Tráfico (DGT) in November 2015; the Belgian Royal Order from 18 March 2016; the Italian 'Smart Road Decree' from 28 February 2018; the French Law on 'la croissance et la transformation des entreprises' from 11 April 2019; and so forth. In the second case, the EU acts include (i) the Council Directive 85/374/EEC on the approximation of the laws, regulations and administrative provisions of

[21] See Floridi et al (n 11).
[22] See C Cath, S Wachter, B Mittelstadt, M Taddeo and L Floridi, 'Artificial Intelligence and the "Good Society": the US, EU, and UK Approach' (2018) 24(2) Science and Engineering Ethics 505–28.

the Member States concerning liability for defective products; (ii) Directive 1999/44/EC on certain aspects, such as repair and replacement, price reduction and termination, of the sale of consumer goods and associated guarantee; (iii) Directive 2009/103/EC relating to insurance against civil liability concerning the use of motor vehicles, and the enforcement of the obligation to insure against such liability; and (iv) Regulation 2018/858 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles.

The limits of the GDPR's co-regulative approach recommend alternative ways to think about the middle-out layer of our governance model. We have to be attentive to current limits on any clear understanding of the stakes of AI, since, for example, we often lack data about the probability of events, consequences, and costs, in order to determine the level of risk in a given field of technological innovation. Some have proposed a model of 'monitored self-regulation' for AI.[23] This means that principles, organisational measures, and technological solutions would be left up to the forces of the market and of social norms, whilst the role of public institutions would concern the monitoring of these activities. We may opt for fixed or adaptive monitoring, in real time or predictive, automated or used as a recommender system.[24] Still, from a legal point of view, these monitoring functions mostly concern the secondary rules of the system. As worded in the proposal,

> the European Commission should first evaluate the services offered to EU citizens today and their likely evolution over time. And only if it emerges that those services are unlikely to comply with the Guidelines [of the High Group of Experts on AI Ethics], should the Commission consider more policy actions.[25]

Others recommend coordination mechanisms for AI and an alternative form of 'adaptive regulation.'[26] This proposal rests on three basic assumptions. First, we should not overlook a substantial convergence in today's debate about the ethics of AI and the corresponding guidelines. A list of no-regrets actions can reasonably be formulated at the top of the political agenda, in order to prevent the chilling effect of ideological debates and the complexity of the legal environment. This list could contain (i) a sustained, increased and coherent European research effort, which provides for the inclusion of ethical, legal and social considerations in AI research projects, together with research about public perception and understanding of AI and its applications; (ii) the creation of educational curricula and public awareness activities around the impact of AI, involving schools, academia,

[23]See A Renda, *Artificial Intelligence: Ethics, Governance and Policy Challenges* (CEPS 2019).
[24]See K Yeung, '"Hypernudge": Big Data as a Mode of Regulation by Design' (2017) 20(1) Information, Communication and Society (The Social Power of Algorithms).
[25]See Renda (n 23).
[26]The proposal is in the new work of AI4People, *Good AI Governance* (forthcoming).

qualification programmes in business and the public at large; (iii) the idea of 'inclusive innovation' and smooth transition to new kinds of jobs via rewarding human-machine collaboration; and (iv) the capacity of corporate boards of directors to take responsibility for the ethical implications of companies' AI technologies.[27]

Second, we should prevent a misconception in the current debate. Going back to the initiatives of the European Commission on AI, some interpret the work of the High Group of Experts as if the aim were to flesh out the (moral) basis for legal regulation. Current discussions of those experts, however, are not about what should or should not be done against current legislation, or in spite of it. Rather, the debate is about how to complement and strengthen the existing regulation. From both a moral and legal view, the common ground is given by a long-standing tradition in Europe, which is defined by the 1950 Convention on Human Rights and the 2000 EU Charter of Fundamental Rights. Accordingly, both groups of experts on AI & ethics and on AI & the law – set up by the Commission in 2018 – have worked independently over the past months. Several fields of AI are already covered by regulation, after all. Contrary to the approach of 'monitored self-regulation,' the middle-out layer of the model has thus to take into account old and new forms of legal regulation. Amongst the new forms, consider the P2B paradigm and its adaptive rules for emerging innovation.[28] Here the law frames the use of a toolbox that can be adapted and customised for each AI-driven sector through the adoption of codes of conduct, alternative dispute resolution, independent ongoing expert analysis and real-time monitoring, down to fast-to-market rule-making and adjustment. These forms of legal experimentation go hand-in-hand with the creation of lawfully de-regulated special zones, that is, a sort of living lab for the empirical testing and development of AI and robotics.[29] Over the past fifteen years, the Japanese government has set up a number of special zones, or *Tokku*, to improve the understanding of how AI systems may react in specific contexts and satisfy human needs. The toolbox has concerned the fields of road traffic laws (at Fukuoka in 2003), radio law (Kansai 2005), data protection (Kyoto 2008), safety governance and tax regulation (Tsukuba 2011), road traffic laws in highways (Sagami 2013), and so forth. These experiments have been particularly popular, in Europe, in the fields of self-driving cars and drones. In 2016, Sweden sponsored the then world's first large-scale autonomous driving pilot project, whilst Germany allowed a number of tests with various levels of

[27]See Floridi et al (n 11).

[28]The P2B (platform to business) model is discussed in the new work of AI4People (n 26).

[29]See U Pagallo, 'LegalAIze: Tackling the Normative Challenges of Artificial Intelligence and Robotics Through the Secondary Rules of Law' in M Corrales, M Fenwick and N Forgó (eds), *New Technology, Big Data and the Law. Perspectives in Law, Business and Innovation* (Springer 2017) 281–300; and Id, 'From Automation to Autonomous Systems: A Legal Phenomenology with Problems of Accountability' in *International Joint Conferences on Artificial Intelligence Organization (IJCAI-17)* (Melbourne, 2017, 17–23).

automation on highways. The first special zone for the test of drones in open labs was established in the roundabouts of Antwerp in January 2019. Those are all examples of secondary rules of the law employed as adaptive norms for emerging innovation.

Third, the model hinges on coordination mechanisms. They should help us deal with current limits on any clear understanding of the stakes of AI, consolidating forums for collective consultation and discussion. The aim of this middle-out layer is to develop new standards, e.g. social standards in addition to the setting of technological standards, as well as mechanisms for social interaction. Among such coordinative mechanisms, think about a European observatory for AI, participatory procedures for the alignment of societal values and understanding of public opinion, multistakeholder mechanisms upstream for risk mitigation, systems for user-driven benchmarking of all marketed AI offerings, or cross-disciplinary and cross-sectorial cooperation and encouragement of debate.[30] From a legal point of view, we can rationally address on this middle-out basis the challenges of coordination, covering many potential issues raised by the next-generation AI systems and managing such requirements, which often represent a formidable obstacle for this field of technological innovation, such as public authorisations for security purposes, formal consent for the processing and use of personal data, mechanisms of distributing risks through insurance models and authentication systems, and more.[31] This level of abstraction on the middle-out layer of the model can be illustrated with another figure. See Figure 3.

Further details of the model should be elucidated. For example, consider the distinction between the aforementioned European observatory for AI and the development of 'a new EU oversight agency responsible for the protection of public welfare through the scientific evaluation and supervision of AI products, software, systems, or services.'[32] The middle-out approach of coordination mechanisms – contrary to, say, the model of monitored self-regulation – is not incompatible with forms of top-down intervention. Rather, this middle layer functions as the interface of the model between legal regulation and self-regulation. Therefore, the coordination mechanisms of the adaptive regulator may also include the role of a Meta-regulator, which helps the vertical agencies, e.g. data protection boards, do AI right. Still, the coordination tools of the adaptive regulator may also work the other way around with mechanisms of engagement, e.g. forms of 'designing-by-debate,'[33] or 'cooperative

[30]See Floridi et al (n 11).
[31]See Pagallo (n 29).
[32]See Floridi et al (n 11).
[33]See J Ausloos, R Heyman, N Bertels, J Pierson and P Valcke, 'Designing-by-Debate: A Blueprint for Responsible Data-Driven Research & Innovation' in F Ferri et al (eds), *International Conference on Responsible Research and Innovation in Science, Innovation and Society (RRI-SIS2017)* (Edition 1, 2018) 47–64.

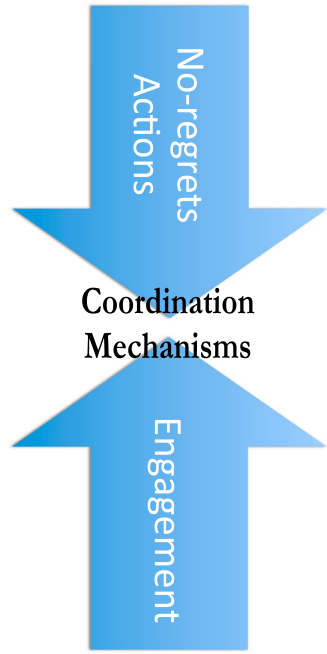

Figure 3. A middle-out approach for AI.

responsibility.'[34] The mechanisms of smart regulation should indeed be (i) clear enough to impose society's preferences on emerging innovation, while (ii) flexible enough to accommodate the uncertainties of innovation and, at the same time, (iii) sufficiently agile to capture expanding understanding with increasing regulatory granularity.

Accordingly, the middle-out approach appears scalable, for growing amounts of work can be suitably addressed by adding resources to the interface of the model, while the model can also be complemented with further mechanisms of systemic oversight. The next section explores this latter aspect of the approach vis-à-vis the complexities of linked data systems, their unintended effects, and the protections that could and should be embedded into both the dimensions and layers of the Web of Data.

6. A middle-out interface for the Web of Data

The middle-out approach has been partially described in today's debate on models of legal governance for the Web of Data. Legal governance can be defined as the twofold process in which (i) rules, principles and values

[34]See N Helberger, J Pierson, and Th Poell, 'Governing Online Platforms: From Contested to Cooperative Responsibility' (2018) 34(1) The Information Society 1–14.

enable regulatory systems to encompass legal instruments, (ii) and legal systems can complementarily be represented, applied and implemented through formal languages, machine-learning algorithms, natural language processing, and computational ontologies. In a digital world, the complexity of today's regulation does not only concern the implementation of the law, but also regards the interface of human and machine behaviour through institutional and social means.

Consequently, the middle-out approach has played so far a relevant role in different fields of expertise, such as socio-technical systems, artificial socio-cognitive systems, human computing interaction, and ontology building. In socio-technical systems, for instance, it has been shown that energy middle actors between technology and implementation – such as congregations, building professionals, and commercial building communities – 'influence upstream (i.e. top actors), downstream (bottom actors), and sideways (other middle actors), through mediating, enabling and aggregating both themselves and others.'[35] This also holds for the interplay between private and public service systems, such as national IT health systems. Whereas governmental providers may have different starting points, goals and resources, government might help in funding the development process and providing incentives that encourage clinical providers to acquire systems technically and legally compliant with interoperative health standards, suitable for building emergent national health information grids.[36]

In human computing interaction (HCI), some have defined the middle-out design for urban HCI as 'the process to draw on the collective knowledge of all actors to provide greater opportunities for more inclusive and collaborative community engagement processes.'[37] Scholars describe their approach as following three stages of design, implementation and deployment, fostering the integration of the objectives defined by top-down decision makers with those of the everyday people represented by citizens and community groups. Likewise, flexibility, intuition and innovation are all properties of the middle-out design strategies, which are prone to incorporate elements that had not been planned in the original design.[38] These are among the relevant features that have proven very useful in ontology building, in which conceptualisation

[35]See Y Parag and KB Janda, 'More than Filler: Middle Actors and Socio-technical Change in the Energy System from the "Middle-out"' (2014) 3 Energy Research & Social Science 102–12.

[36]See E Coiera, 'Building a National Health IT System from the Middle Out' (2009) 16(3) Journal of the American Medical Informatics Association 271–27.

[37]See J Fredericks, G Caldwell, G Amayo and M Tomitsch, 'Middle-out Design: Collaborative Community Engagement in Urban HCI' in OzCHI '16 *Proceedings of the 28th Australian Conference on Computer-Human Interaction* (Launceston, TAS, 2016) 200–4.

[38]See G Cockton, 'The Architectural Bases of Design Re-use' in DA Duce, M Rui Gomes, F Robert, A Hopgood, JR Lee (eds), *User Interface Management and Design*. Proceedings of the Workshop on User Interface Management Systems and Environments Lisbon, Portugal, June 4–6, 1990 (pp. 15–34) (Springer 1991).

often requires the specification of competency questions into glossaries, taxonomies and relations prior to defining axioms and rules.[39]

Against this framework, it is our contention that the middle-out approach provides a unified framework for current debates on socio-technical systems, artificial socio-cognitive systems, HRI, or ontology building, much as the institutional implementation layer that is required to operationalise both projects of linked democracy,[40] and EU policies, such as the Interinstitutional Agreement on Better Regulation.[41] By casting light on that which lies in between the top-down and bottom-up approaches, the middle-out stance grasps the essential components of current models of governance, and what the desirables features of such stratified interaction between bottom-up and top-down solutions may look like. In the first case, focus is on the decomposable and modular features of the approach; in the second case, attention is drawn to its scalability. Although such aspects overlap, let us examine them separately.

6.1 The wind-rose model

We can increase the regulatory granularity of the middle-out approach by distinguishing the essential parts that are needed in order to take into account the specific complexity of the field under scrutiny. In light of the different fields of expertise mentioned above in the previous section, dealing with the governance of the Web of Data, the middle-out layer of the analysis should properly be represented in connection with seven different ingredients. From bottom-up forms of self-regulation to hard law tools of hetero-regulation, such ingredients concern three different layers of modular adaptability that regard (i) organic decentralisation and intermediate conceptualisation; (ii) systemic interdependence and coordinated agency; (iii) semantic interoperability and abductive reasoning. This interdisciplinary, blended and intermediate middle-out layer is able to project intermingled effects both to the enforceable norms of the legal sphere (that is, influencing legislative drafting and case-law outcomes), and to the procedures and policies of self-regulated bodies

[39] See M Uschold and M Gruninger, 'Ontologies: Principles, Methods and Applications' (1996) 11(2) The Knowledge Engineering Review 93–136; and A Gómez-Pérez, O Corcho, and M Fernández-López, *Ontological Engineering* (Springer 2002).

[40] See P Casanovas, D Mendelson and M Poblet, 'A Linked Democracy Approach for Regulating Public Health Data' (2017) 7(4) Health and Technology 519–37.

[41] See, for example, the European Commission Interinstitutional Agreement between the European Parliament, the Council of the European Union and the European Commission on Better Law-Making of 13 April 2016. OJ L 123, 12 May 2016, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2016:123:TOC and European Commission, Better Regulation Toolbox 1, Principles, Procedures & Exceptions, 2016, available at https://ec.europa.eu/info/sites/info/files/file_import/better-regulation-toolbox-1_en_0.pdf. The origins of such a perspective can be found in the seven core principles set nearly twenty years ago by the Mandelkern Group on Better Regulation: necessity, proportionality, subsidiarity, transparency, accountability, accessibility and simplicity. See the Mandelkern Group on Better Regulation. Final Report, 13 November 2001. Available at https://ec.europa.eu/smart-regulation/better_regulation/documents/mandelkern_report.pdf.

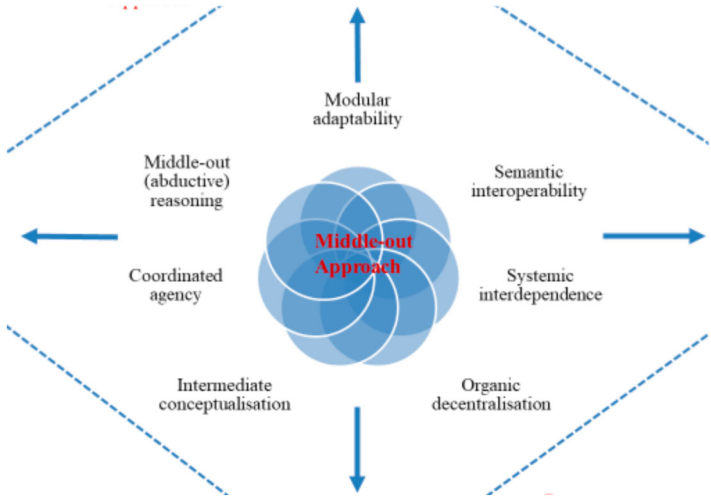

Figure 4. A wind rose for the Web of Data.

(influencing negotiations and collective agreements). Figure 4 plots the mechanisms that should effectively enact and put into practice legal policies on the Web of Data into digitised policy cycles of multi-stakeholder governance.

As a wind rose for the Web of Data, the middle layer portrayed in Figure 4 aims to stress that models of legal governance should be decomposable, modular and scalable, in accordance with the following seven different components:

1. *Modular adaptability*. In ecology, adaptability is deemed to be the ability to cope with unexpected disturbances in the environment. In engineering, modularity refers to the interrelation of the separate parts of a software package or also to the partitioning of the design to make it manageable. In multi-agent systems (MAS), it refers to the efficient usage of computational resources.[42] We can profit from this notion to create adaptable policies that can be combined into regulatory systems for legal governance.
2. *Semantic interoperability*. This notion indicates the ability of computer systems to exchange data with a shared meaning to avoid the ambiguity of natural language. This is an essential requirement to enable machine inferencing and a reliable exchange of data between information systems. Legal ontology building extends the middle-out approach to identify intermediate concepts that can be used to create taxonomies, clusters, classification trees and extended further to specify field concepts at a

[42]See AS Shirazi, S von Mammen and C Jacob, 'Adaptive Modularization of the MAPK Signalling Pathway Using the Multiagent Paradigm' in *International Conference on Parallel Problem Solving from Nature* (Springer 2010) 401–10.

lower abstraction level.[43] Recently, Distributed Ledger Technologies (DLTs) have emerged as a way to manage and exchange digital assets among a large number of agents in a decentralised way in the context of Linked Data as well.[44] This is connected with points n. 3 and 4.

3. *Systemic interdependence*. Dependence between elements of a system defines its degree of complexity. Systemic interdependence in regulatory systems facilitates its decomposition into operational sections to create implementation plans that can evolve separately. Organisational studies have shown the importance of creating layered internal normative bonds between all stakeholders in normative systems. Normative Multi-Agent Systems (NorMAS) develop this interdependence of socio-technical or artificial socio-cognitive systems.[45]
4. *Organic decentralisation*. Decentralisation is the process by which the activities of an organisation are distributed for planning or decision-making purposes. Multi-stakeholder theory, as described by Savage and McConnell, applies to the governance of the Internet,[46] where a large community of companies, researchers and public institutions hold regulatory powers, as occurs with the IETF (Internet Engineering Task Force) or the W3C (World Wide Web Consortium).[47]
5. *Intermediate conceptualisation*. Legal intermediate concepts – such as property, trust, risk or guilt – are essential to apply and implement the content of legal norms and ethical principles. Policies are based and effectively depend on how these concepts are defined from different interpretive standpoints. Non-standard deontic models to instantiate norms by means of formal semantic rules lean on them.[48]

[43]See P Casanovas, N Casellas, JJ Vallbé, M Poblet, F Ramos, J Gorroñogoitia, J Contreras, M Blázquez and R Benjamins, 'Iuriservice II: Ontology Development and Architectural Design' in *Proceedings of the 10th International Conference on Artificial Intelligence and Law* (ACM 2005) 188–94; N Casellas, *Legal Ontology Engineering: Methodologies, Modelling Trends, and the Ontology of Professional Judicial Knowledge* (Springer 2011); M El Ghosh, H Naja, H Abdulrab, and M Khalil, 'Towards a Middle-out Approach for Building Legal Domain Reference Ontology' (2016) 2(3) International Journal of Knowledge Engineering 109–14. An overview on today's state-of-the-art in P Casanovas, M Palmirani, S Peroni, T van Engers, and F Vitali, 'Semantic Web for the Legal Domain: The Next Step' (2016) 7(3) Semantic Web Journal 213–27.

[44]See M Acosta, T Berners-Lee, S Dietze, A Dimou, J Domingue, LD Ibánez, C Janowicz, ME Vidal, A Zaveri, 'Linked Data on the Web and its Relationship with Distributed Ledgers (LDOW/LDDL)' May 2019 WWW '19: *Companion Proceedings of The 2019 World Wide Web Conference, ACM 2019*. See the proof-of-concept for a Linked Data index onto a distributed ledger to query and retrieve data stored on the blockchain in disparate locations, in A. Third, J. Domingue. Linked Data Indexing of Distributed Ledgers, in *Proceedings of the 26th International Conference on World Wide Web Companion* (International World Wide Web Conferences Steering Committee 2017) 1431–6.

[45]See G Andrighetto, G Governatori, P Noriega, P and L van der Torre, *Normative Multi-agent Systems* (Schloss Dagstuhl-Leibniz-Zentrum für Informatik 2013, vol. 4).

[46]See JE Savage and BW McConnell, *Exploring Multi-Stakeholder Internet Governance* (Brown University, East West Institute 2015).

[47]See M Poblet, P Casanovas and V Rodríguez-Doncel, *Linked Democracy. Foundations, Tools and Applications* (Springer 2019).

[48]See D Gabbay, J Horty, X Parent, R van der Meyden and L van der Torre, *Handbook of Deontic Logic and Normative Systems* (College Publications 2013).

6. *Coordinated agency*. In philosophy, agency is the capacity of an agent (natural or artificial) to act in a given environment. Software engineering conceives it as a collection of systems, made of technical and social (humans and/or organisations) components in which human and artificial behaviours interact. The design and analysis of such systems deal with the social coordination of their components. Social coordination refers to the mechanisms and processes mediating the contingent bonds between the individual components, and which are subject to evolution.[49]
7. *Middle-out (abductive) reasoning*. The idea of emergence, i.e. that a group of interacting units, or agents, produces effects that cannot be inferred from the properties or behaviour of any of the individual agents lies at the core of this approach. As some state, 'in a bottom-up approach, basic building blocks are combined to resulting a higher order design complexity, whereas the top-down approach starts with the desired product of great complexity and follows its stepwise reduction into numerous parts of lesser complexity'.[50] Reasoning in a middle-out approach sheds light on the outcomes of a flexible induction vis-à-vis innovation and unintended effects at local level. Emergent phenomena are produced bottom-up, while the behaviour of underlying units follows a top-down direction. Middle-out reasoning uses variables to represent unknown terms and formulae, and can be used to select inductive schemes.[51]

The middle-out approach's wind rose for the Web of Data can be further understood in connection with the desirable features of such stratified interaction which lies in between bottom-up and top-down solutions. The models of governance examined so far can indeed be further integrated with approaches that dwell on the vertical axis, i.e. from top-down to bottom-up solutions, of the figures illustrated in this paper. This sort of vertical perspective sheds more light on the scalability of our approach.

6.2 Cross-fertilisation of the model

The analysis of the institutional layers and procedural mechanisms that are at work with the different models of legal governance examined so far can be integrated with further approaches that expand our understanding of current data-driven challenges with increasing granularity. In the work of

[49]See H Aldewereld, O Boissier, V Dignum, P Noriega, and J Padget (eds), *Social Coordination Frameworks for Social Technical Systems* (Springer 2016).
[50]See S von Mammen, JP Steghöfer, J Denzinger and C Jacob, 'Self-organized Middle-out Abstraction' in *International Workshop on Self-Organizing Systems* (Springer 2011) 26–31.
[51]See I Kraan, D Basin and A Bundy, 'Middle-out Reasoning for Synthesis and Induction' (1996) 16(1–2) Journal of Automated Reasoning 113–45.

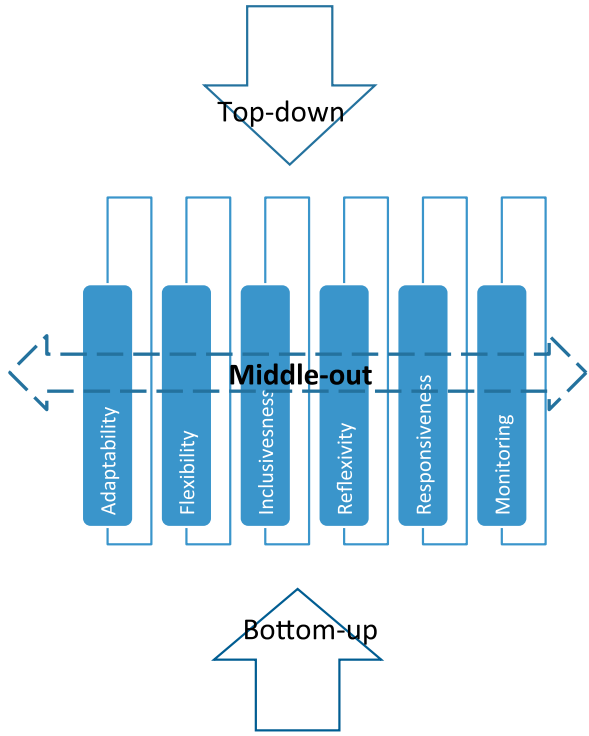

Figure 5. Cross-fertilising the middle layer with the AFIRRM approach.

Blasimme and Vayena,[52] for example, the components of the approach regard oversight structures and processes for such data-intense fields as biomedicine and AI. Such components concern (i) adaptivity; (ii) flexibility; (iii) inclusiveness; (iv) reflexivity; (v) responsiveness; and (vi) monitoring. These features, which are summed up as the AFIRRM approach, can be visualised as intersecting with the middle-out layer of our analysis, as shown in Figure 5.

Correspondingly, the coordination mechanisms seen in Figure 3 in Section 5 above can be further specified according to the ways in which we address the features of this approach.[53] In particular:

1. The coordination mechanisms of smart regulation should be adaptable and flexible enough to accommodate the uncertainties of innovation through appropriate forms of oversight, such as the European AI observatory and the European AI Meta-regulator mentioned in this paper;

[52]See A Blasimme and E Vayena, *The Ethics of AI in Biomedical Research, Patient Care and Public Health* (9 April 2019) Available at SSRN: https://ssrn.com/abstract.
[53]See Blasimme and Vayena (n 52).

2. Such flexibility entails the capacity to treat different technological applications depending both on their data sources and on their actual use, including Blockchain and Distributed Ledger Technologies (DLTs).[54] After all, many of the normative challenges of technology, such as AI and the Web of Data, are context-dependent, from both a moral and legal point of view;
3. Inclusiveness refers to the engagement of all affected parties in deliberations and decision-making practices about the use of data-driven technologies. The mechanisms of the adaptive regulation should be clear enough to impose society's preferences on emerging innovation;
4. Reflexivity concerns the sound scrutiny, assessment and evaluation of risks;
5. Responsiveness refers instead to the aim of mitigating the effects of unintended issues, such as unauthorised access to personal data;
6. Monitoring regards the regular scrutiny of data-driven activities with their effects. The intent is to anticipate the emergence of new vulnerabilities and undesirable outcomes.

Similar considerations could, of course, be extended to the wind-rose model for the Web of Data as illustrated above in Figure 4. For the sake of conciseness, however, we can leave aside details of this cross-fertilisation. From a methodological viewpoint, what is more relevant here has to do with the scalability of the middle-out level of the analysis on models of legal governance for next generation Internet.[55]

7. Conclusions

The complexity of technological regulation has increasingly recommended the adoption of new models of governance that revolve around that which lies between the top-down and bottom-up approaches. This middle-out layer of the analysis has been substantiated with the examination of three legal domains with their corresponding models, namely, (i) the GDPR's accountability model of co-regulation in the field of data protection; (ii) the coordination mechanisms of smart regulation for good AI governance; and (iii) the wind-rose model for the Web of Data. By taking into account the specific complexity of each domain, such approaches aim to formalise the different ways in which principles and rules of the legal system may interact with forms of self-regulation. In the

[54]See M English, S Auer, and J Domingue, 'Blockchain Technologies & the Semantic Web: A Framework for Symbiotic Development' in J Lehmann, H Thakkar, L Halilaj, and R Asmat (eds), *Computer Science Conference for University of Bonn Students* (2016) 47–61.

[55]See the white paper by R Stevens, J Delaney, S Taylor, M Boniface, Monique Calisti, John Domingue, Robert Szuman, B Belter, *Next Generation Internet. Classification and Assessment Methodology* (EU HUB4NGI, D1.1, 2018) <http://hub4ngi-white-paper-d.1.1.-ver.1.2.pdf>.

wording of the AVMS directive, we have shed light on the 'legal link between self-regulation and the national legislator.' The models of governance that follow as a result depend on how their middle-out layer has been set and designed.

The intent of this paper, however, is not to determine whether or not these models of legal governance, such as the GDPR's Art. 5(2) on the accountability principle might properly tackle the challenges of data protection, or of AI, or of the Web of Data. Rather, the purpose is to present the proper level of abstraction needed to address the complexity of today's legal regulation. On the one hand, current debate on the governance of AI and the Web of Data has shown that models of co-regulation, such as in the GDPR, are but an instance of the middle-out approach. Co-regulatory models of legal governance cannot be transplanted as such into other domains of the legal field. On the other hand, regardless of how we design this middle-out layer of legal governance, the stance appears both modular and scalable, since it accommodates the uncertainties of innovation, imposing society's preferences on emerging innovation, while allowing us to capture expanding understanding of technological challenges with increasing regulatory granularity. Figure 3 on the coordination mechanisms of smart AI regulation, Figure 4 on the wind-rose model for the Web of Data, and Figure 5 on the cross-fertilisation of the middle-out approach through the components of the AFIRRM model have all illustrated how this stance actually works. The middle-out approach is indeed a powerful level of abstraction that scholars will increasingly exploit in future years in the field of legal governance. As technological challenges grow increasingly complex, the top-down and bottom-up approaches will become increasingly less fruitful, and the more we should pay attention to the middle-out interface of the analysis.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This article is partially funded by the national project Meta-rule of law. DER2016-78108-P, and the EU Projects LYNX and SPIRIT. We acknowledge the work carried out in the framework of the project AI4People, funded by the European Institute for Science, Media and Democracy (Atomium).

ORCID

Ugo Pagallo http://orcid.org/0000-0001-7981-8849
Pompeu Casanovas http://orcid.org/0000-0002-0980-2371