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The different facets and roles of interoperability

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Fostering innovation and trade in the global information society: The different facets and roles of interoperability

URS GASSER AND JOHN PALFREY*

A. Introduction

Interoperability has become an important feature of information and communication technology (ICT) products, services, applications, and organisations in the digital age. Travellers around the world, for instance, book their flights online, pay hotel bills by credit cards, or make international calls with mobile phones as they move across nations. All these transactions require the meaningful and organised flow of data across systems. The role that interoperability plays in today's information society becomes particularly visible when it fails. Examples of limited interoperability in everyday life in a digital age include attempts to transfer a video purchased from a popular online store to a player manufactured by a competitor, the trouble of rendering certain websites even with standard web browsers, or the formatting hassle associated with changing file-formats from one version of software to the next, to name just a few.

In contrast, a broad range of applications on the Internet demonstrate the power of interoperability. Thousands of user-created applications for social networking sites, such as Facebook and other platforms, maps-based geolocation applications for information and entertainment purposes, emerging business models based on interoperable identity management systems, and even basic services such as email, illustrate the enormous benefits of high levels of ICT interoperability.[1] Electronic health records and smart energy grids are current, big-picture examples that illustrate the power of ICT interoperability as well as some of the key challenges associated with it.

In this chapter, we explore the various facets and roles of interoperability and its relevance for innovation, competition, trade, and economic growth. More specifically, we will argue that makers of public policy should craft national policies and legal frameworks in such ways that, at least by default, they encourage higher levels of interoperability among ICT-relevant systems, applications, and components.[2] Further, we will argue that policy-makers should not only aim for technical interoperability, but also for legal and, eventually, policy interoperability, which can be achieved through unilateral design of interoperable laws and policies or by global harmonisation of national standards, among other means. All of these

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[1] Interoperability is what enables the generative Internet; see J. Zittrain, *The Future of the Internet – And How to Stop It* (New Haven, CT: Yale University Press, 2008). On open architecture, innovation, and economics, see also B. Van Schewick, *Internet Architecture and Innovation* (Cambridge, MA: MIT Press, 2010).

[2] The concept of legal interoperability not only applies to public policy making. Equally important and sometimes even more powerful are private-sector driven approaches to increase legal interoperability; Creative Commons can be seen as such a case study of introducing a layer of legal interoperability at the content layer of the Internet among private actors.

goals require that makers of public policy gain a deeper understanding of and ultimately master the multifaceted interplay between law and interoperability – aspirations to which this chapter seeks to contribute.

The chapter is structured as follows. It starts with an introduction to the concept of interoperability and discusses its relevance from a public policy perspective by exploring its relationship with innovation, competition, and economic growth. Next, the paper addresses the interaction between interoperability and the legal system by analysing its multifaceted and bi-directional character. In this context, we introduce the concept of legal interoperability in greater detail and illustrate it using examples from European Union (EU) law. Further, the relationship between interoperability and trade will be explored and exemplified by reference to international intellectual property rights (IPR) treaties. The chapter ends by discussing an example of a recent technological innovation – cloud computing – in order to weave together the core themes presented in the previous sections and illustrate the importance of interoperability as well as the role and responsibility of policy makers in achieving it.

B. Interoperability and innovation

I. Interoperability

The examples provided in the introduction illustrate that interoperability plays a key role across a diverse set of ICT phenomena, including financial transactions, mobile communication, web services, e-commerce, e-health and smart energy, to name but a few areas of application. Not surprisingly, definitions of interoperability vary. Based on earlier research on this topic,[3] we define interoperability as the ability to transfer and render useful data and other information across systems (including organisations), applications, or components,[4] while also maintaining, if not enhancing, the core effectiveness of the services sharing the data. It encompasses, in other words, interoperable ICT products and services, but also the meaningful exchange of information among organisations.

Perhaps more important than a uniform definition of ICT interoperability is a series of characteristics that policy makers should keep in mind. Interoperability has multiple layers.[5] Typically, interoperability in a given context consists not only of a technical layer, but carries also an organisational, human, institutional, and often a legal dimension. This 'cake' model of interoperability is illustrated by the above-mentioned example of e-health records. Electronic health records require that computers, software, and various other technical systems are able to exchange useful data. In addition, the workflows of physicians, laboratories, hospitals, and insurance companies, among others, need to be interoperable. Further, these exchanges of information and the synchronisation of workflows need to be backed up by organisational and legal safeguards to ensure security and privacy, among other things. Finally, the people involved in the various institutions need to have the necessary degrees of digital literacy to harness the full benefits provided by e-health records.[6] Embedded in this human layer lies a

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[3] U. Gasser and J. Palfrey, 'Breaking Down Digital Barriers: When and How ICT Interoperability Drives Innovation', *Berkman Center for Internet and Society Research Publication Series* 8 (2007), 1–28.

[4] As an example of this type of interoperability, consider the recent proliferation in both E-book readers and formats. E-book readers such as the Amazon Kindle and Sony Reader are capable of reading a multitude of formats, such as PDF and TXT files, in addition to their own native formats.

[5] See e.g. S. A. Baird, 'Government Role and the Interoperability Ecosystem', *Journal of Law and Policy for the Information Society* 5 (2009), 219.

[6] M. J. Ball and J. Lillis, 'E-health: Transforming the Physician/Patient Relationship', *International Journal of Medical Informatics* 61 (2001), 1–2.

crucial series of cultural issues that can lead to the success or failure even of an otherwise 'perfect' system when viewed solely from a perspective of technical interoperability.

Interoperability is not an all-or-nothing concept. Different degrees of interoperability exist. The example of document formats is illustrative in this context: it might well be possible to save a document created using one word processing software package in another file format and to use this file with different software, but one might lose some or all of the text formatting. The same logic also applies from a macro-perspective when looking at the interoperability level of particular market segments such as the market for online music. Some providers and vendors of online music stores and players provide high level of interoperability by allowing users to transfer songs from one device to another without any restriction; other competitors are creating and operating in a closed environment tightly controlled by digital rights management (DRM) and with low levels of interoperability across systems.

Further, any given level of interoperability is likely to be the result of a complex interplay among various factors. The analysis of a series of case studies suggest that not only the maturity of a given technology, market structure (e.g. the existence of strong network effects) and corresponding market incentives, but also the contours of the legal regime, including intellectual property and competition law, interact to determine the degree to which ICT systems, applications, or components are interoperable.

Finally, and related to the previous point, ICT interoperability can be achieved by multiple means. In some instances, single companies might decide to unilaterally design and market interoperable products and applications, for example by using open application programming interfaces (APIs). In other settings, higher levels of interoperability are achieved based on private-sector driven collaborative mechanisms such as standard-setting processes. But governments play a key role too, and can push for more interoperability by using their procurement power, enforcing competition law, requiring companies to disclose interoperability information to competitors, or – in extreme cases – to mandate standards.

II. Benefits to be gained from interoperability

Why should policy-makers care about ICT interoperability? Previous and ongoing research efforts suggest that society generally benefits from higher levels of interoperability because it is a means of achieving economic growth through innovation, competition, and trade. While there is little empirical data available, strong anecdotal evidence from both the analogue and the digitally networked world demonstrates the positive correlation between ICT interoperability and innovation. The link between ICT interoperability and innovation is evident in a broad range of phenomena. Railway interoperability, bar codes, air traffic control, standardisation of shipping containers, web services, identity management systems, the Internet of Things, or most recently cloud computing, are just a few examples of this relationship.[7]

Several theoretical models of innovation are helpful to explain how greater ICT interoperability may result in increased innovation. Jonathan Zittrain's theory of the Generative Internet puts emphasis on the importance of having ICT platforms that remain open and permit the various users of the infrastructure to make creative developments on top of it.[8] Barbara Van Schewick demonstrates how the Internet's original architecture affected

[7] U. Gasser and J. Palfrey, *Interop: The Art and Science of Working Together* (forthcoming, 2012).
[8] Zittrain, supra note 1.

innovation, in particular the development of new applications.[9] Eric von Hippel's theory of horizontal innovation networks describes and explains situations in which innovation does not occur within a traditional firm, but is generated by users of the product, since the provider of the product has opened itself up to outside contributions.[10] Clay Christensen's incremental improvement of products and services offers another theoretical account that demonstrates how interoperability may increase the possibilities for incremental improvements on ICT-relevant products or services.[11]

In addition to economic growth, research leads to the conclusion that increased levels of interoperability tend to enhance users' choice and autonomy. In an interoperable ecosystem, users are more likely to choose among competitive and efficient options with regard to systems, applications, and components that may be tested, mixed, and matched for specific purposes. This choice, on the part of the consumer, can focus on the quality of the service or product, rather than on its format or mode, in an interoperable system. Ease of use, enhanced access, greater diversity, and increased openness are additional socially desirable outcomes supported by higher levels of interoperability.[12]

III. Potential drawbacks

While ICT interoperability has proven to be a solid mechanism by which to contribute to the various policy objectives mentioned above, it is important to note that it is not without challenges and potential drawbacks. Arguably, the exchange of data across systems, applications, and components increases the number of access points and may therefore increase risks to privacy and security.[13] At the systemic level, highly interoperable systems may be more likely to play a role in 'domino effects' by infecting one system based on defective data imported from a connected system. Some observers, albeit indirectly, have argued that the financial crisis has in part been the result of the interconnectedness of various parts of the financial and economic system.[14]

There are also circumstances under which higher levels of interoperability, at least at the outset, do not necessarily lead to more innovation and competition. This is particularly the case in situations where companies have incentives, for example vis-à-vis strong network effects, to compete for the entire market, and not just for a share of it.[15] Apple's iTunes strategy with its non-interoperable kernel, aimed at revolutionising the online music industry, is a key case that illustrates the underlying dynamics of this type of (Schumpetrian) competition.[16]

In the light of these and related caveats, we do not see ICT interoperability as a one-size-fits-

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[9] Van Schewick, supra note 1

[10] E. von Hippel, 'Open Source Projects as Horizontal Networks – by and for Users', *Industrial and Corporate Change* 16 (2007).

[11] C. M. Christensen, *The Innovator's Dilemma: The Revolutionary Book that Will Change the Way You Do Business* (New York, NY: Harper Collins, 2003).

[12] Gasser and Palfrey, supra note 3, 15.

[13] See e.g. R. Campbell, J. Al-Muhtadi, P. Naldurg, G. Sampermane and M.D. Mickunas, 'Towards Security and Privacy for Pervasive Computing', *Lecture Notes in Computer Science* 2609 (2003), 3–5.

[14] H. S. Scott, 'The Reduction of Systemic Risk in the United States Financial System', *Journal of Law and Public Policy* 33 (2010), 675–676; M. F. Hellwig, 'Systemic Risk in the Financial Sector: An Analysis of the Subprime-Mortgage Financial Crisis, *De Economist* 157 (2009), 169.

[15] A. Slowak, 'Standard-Setting Capabilities in Industrial Automation: A Collaborative Process', *Journal of Innovation Economics* 2 (2008), 147–169.

[16] U. Gasser and J. Palfrey, 'DRM-Protected Music Interoperability and e-Innovation' *Berkman Center for Internet and Society Research Publication* 9 (2007), 17.

all or silver-bullet solution. Instead, we argue based on a broad range of examples from various areas that interoperability, in most circumstances and if implemented properly, is a sound public policy approach that contributes to innovation in the ICT space, enhances competition, and leads to economic growth.[17]

IV. Approaches towards interoperability

If increasing the level of ICT interoperability is accepted as a means towards the end of sound public policy making, the question arises how policy makers can work towards more interconnectedness. Before taking a look at the different approaches available, it is worth noting that an analysis of various case studies and a review of a rich body of theoretical literature acknowledge the key role of the private sector in increasing ICT interoperability. More specifically, the analyses suggest that the private sector, generally speaking, is best suited to establish thriving ICT interoperability through various instruments, including unilateral design of interoperable services, cross-licensing, technical collaboration, and industry-led open standard processes.[18] It is also possible that interoperability can be seen as deriving successfully from a bottom-up, consumer-driven process, rather than from a top-down, policy-maker-driven process. Consumer demand for interoperable systems, for instance among document formats, may be a primary driver of sustained interoperability and innovation.

That being said, public policy makers have an important role to play by creating a legal and regulatory ecosystem that incentivises the private sector to work towards higher levels of interoperability. A well-balanced IP regime that not only allows for efficient licensing and adequate incentives for creators, but also establishes appropriate exceptions and limitations (e.g. for reverse-engineering) is a useful example in this context.[19] Further, governments play a key role where dominant market players work against interoperability in a given segment of the ICT market. Here, competition law-based interventions may become necessary and effective instruments, as the antitrust actions against Microsoft in Europe illustrate.[20] Governments might also decide to intervene where powerful players seek to hijack industry-led standard setting processes.[21]

In some cases, the government may seek to foster interoperability in more specific ways. Again, a series of instruments is available, ranging from mandating standards (e.g. in the context of emergency communication[22]) to using its procurement power in cases where the government purchases IT systems, applications, or components.[23]

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[17] Gasser and Palfrey, supra note 3, 14.
[18] Ibid., 8.
[19] J. Band and M. Katoh, *Interfaces on Trial 2.0* (Cambridge, MA: MIT Press, 2011).
[20] T. Takigawa, 'A comparative analysis of U.S., EU, and Japanese Microsoft cases: How to Regulate Exclusionary Conduct by a Dominant Firm in a Network Industry', *The Antitrust Bulletin* 50 (2005), 237–266.
[21] The European Commission's investigation against Qualcomm Inc. over Qualcomm's royalties and licensing terms serves as an interesting example of this type of intervention and context. See also *Qualcomm, Inc. v. Broadcom Corp.,* 548 F.3d 1004 (Fed. Cir. 2008). For a general discussion, see M. A. Carrier, *Innovation for the 21st Century* (Oxford: Oxford University Press, 2009), 323–344.
[22] See V. Mayer-Schoenberger, 'Emergency Communications: The Quest for Interoperability in the United States and Europe', *John F. Kennedy School of Government Discussion Paper* 7 (2002).
[23] °V.°Kundra,°'State°of°public°sector°cloud°computing',°http://www.info.apps.gov/sites/default/files/StateOfCloudComputingReport-FINALv3_508.pdf, 3–5.

C. Interoperability and law

I. Overview

Makers of public policy shape the levels of interoperability in a given ICT ecosystem in important ways and by various means, including (but not limited to) law-making. Against this backdrop, the following section examines the interplay between ICT interoperability and the law in greater detail and suggests that policy-makers, considering any such intervention, should gain a deeper understanding of the dynamics at play. We start with a brief overview of the two characteristics that are particularly noteworthy from a policy perspective: first, the bi-directional relationship between interoperability and the law and second, the multilayered nature of this relationship. Building upon this interaction map, the section then focuses on legal interoperability as one key facet of the relationship.

II. Characteristics of the relationship between law and interoperability

The relationship between interoperability and the legal framework is bi-directional. On the one hand, the law shapes the state of ICT interoperability. A good illustration of the various ways in which a given level of interoperability is the result of a particular legal and regulatory regime is the current state of legitimate distribution of copyrighted content such as music, videos, or e-books. An in-depth case study of Apple's iTunes online store exemplifies how market players can strategically use the current contract and IP law regime in order to create a closed, non-interoperable online content distribution system. In this particular example, the level of non-interoperability was achieved by relying on DRM systems and their protection under the so-called anti-circumvention laws as incorporated in the Digital Millennium Copyright Act [24] or the EU Copyright Directive, [25] which ban both the trafficking in circumvention devices as well as the act of circumvention of copy or access controls.[26] A combination of such legal protection schemes and contract law strategies has also been used to overwrite traditional copyright limitations and exceptions, such as fair use and reverse-engineering, which could otherwise be used by users and/or competitors to create interoperable applications.[27]

As mentioned above, the legal system can also have a positive effect on the current state of ICT interoperability. Staying with the iTunes example; the French legislator enacted an IP-relevant provision on DRM interoperability in 2006, which empowers software publishers, manufacturers of technical systems, and service providers to request from a competitor, via a newly created regulatory body, the disclosure of interoperability information for a fee.[28] Regardless of the relative merits of the specific approach to mandate the disclosure of interoperability information, it is important to understand that law may shape ICT interoperability by way of ex ante (e.g. IP exemptions or limitations) or ex post (e.g. competition law-based) interventions.[29]

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[24] Chapter 12, Digital Millenium Copyright Act of 1998, 17 USC § 512.

[25] Article 6, Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the Harmonisation of Certain Aspects of Copyright and Related Rights in the Information Society, OJ 2001 No. L 167, 22 June 2001.

[26] U. Gasser, D. Bambauer, J. Harlow, C. Hoffmann, R. Hwang, G. Krog, S. Mohr, I. Reidel, D. Slater, C. L. Wilson and J. Palfrey, 'iTunes: How Copyright, Contract, and Technology Shape the Business of Digital Media – A Case Study' (2004), 36–37.

[27] J. Mazzone, 'Administering Fair Use', *William and Mary Law Review* 51 (2009), 404.

[28] A. Orloski, 'France Votes for DRM Interop', *The Register*, 21 March 2006.

[29] Gasser and Palfrey, supra note 3, 11.

On the other hand, a given level of ICT interoperability may influence the shape and the contours of the legal framework (or even its performance, in the case of legal information), either by increasing the demand for new rules or leading to the adjustment or reinterpretation of existing legal norms.[30] For example, as barriers to information flows shrink through ICT- and interoperability-driven cross-border exchanges, concerns about data protection have increased. As a result, the EU and the US have agreed to multilateral agreements like the EU–US Safe Harbor Framework to ensure compliance with standards of data protection.[31] Legal and soft norms aimed at regulating records and document-management practices of corporations[32] or newly introduced provisions concerning e-discovery[33] are other examples (many more could be added) that illustrate how increased interoperability of ICT infrastructures may have direct or indirect feedback effects on the legal system.

The second, and, in the specific context of this chapter, arguably more important, feature of the relationship between interoperability and the legal framework is its multilayered character. As mentioned above, the interoperability framework consists of multiple layers (the 'cake' model) including a legal layer. But interoperability is also a possible feature of the legal system aimed at regulating information society phenomena. The latter is called legal interoperability and can be broadly defined as the working-together among legal norms, either within a given legal system of a nation state (e.g. federal and state legislation) or across jurisdictions or nations. The next paragraphs take a closer look at this newly introduced concept by discussing its characteristics, potential benefits, and the ways in which it can be achieved.

III. Legal interoperability

Legal interoperability enables the flow of goods, services, and information across legal systems.[34] Consider, for example, the ways in which different levels of interoperable laws (including soft laws) across nations on drug or food safety issues influence the flow of products across jurisdictions.[35] Or take the case of interoperable levels of legal protection for creative works and its impact on the communication of ideas and information across legal systems. [36] Harmonised requirements regarding qualifications of professionals such as physicians or lawyers are a third illustration of the power of legal interoperability, this time

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[30] U. Gasser and H. Burkert, 'Regulating Technological Innovation: An Information and a Business Law Perspective', in Rechtswissenschaftliche Abteilung der Universität St. Gallen (ed.), *Rechtliche Rahmenbedingungen des Wirtschaftsstandortes Schweiz*, (Zurich: Dike, 2007), 503–523.

[31] H. Farrell, 'Constructing the International Foundations of E-Commerce – The EU-U.S. Safe Harbor Arrangement', *International Organization* 57 (2003), 285–288.

[32] See e.g. D. O. Stephens, 'The Sarbanes-Oxley Act: Records Management Implications', *Records Management Journal* 15 (2005), 98–103; J.C. Ruhnka and S. Weller, 'The Ethical Implications of Corporate Records Management Practices and Some Suggested Ethical Values for Decisions', *Journal of Business Ethics* 9 (1990), 81–92.

[33] T. Y. Allman, 'Managing Preservation Obligations After the 2006 Federal E-Discovery Amendments', *Richmond Journal of Law and Technology* 13 (2007), 1–35.

[34] A particularly interesting subset of legal interoperability issues is interoperability among legal norms aimed at regulating information. Such an information law approach to interoperability, which would have to differentiate among the different types and contexts of information, still needs to be developed. The broader framing in this chapter might serve as a starting point. On the information law approach more generally, see e.g. H. Burkert, 'The Information Law Approach: An Exemplification', in U. Gasser (ed.), *Information Quality Regulation: Foundations, Perspectives and Applications* (Baden-Baden: Nomos, 2004), 75–90.

[35] S. Henson and J. Caswell, 'Food Safety Regulation: An Overview of Contemporary Issues', *Food Policy* 24 (1999), 598–599.

[36] P. E. Geller, 'Rethinking the Berne-Plus Framework: From Conflicts of Laws to Copyright Reform', *European Intellectual Property Review* 31 (2009), 391–395.

with respect to the flow of workers across nations, as the case of Switzerland and the EU currently demonstrates.[37] Conversely, examples such as the famous French *Yahoo!* case[38] illustrate how non-interoperable legal systems may negatively affect cyber-trade across countries, especially under circumstances in which traditional legal mechanisms designed to negotiate such conflicts between local laws fail.[39]

The core hypothesis in this part of the chapter is that policy-makers in the digital age should not only aim for higher levels of technical and related layers of interoperability, but should by default also seek to increase legal and, eventually, policy interoperability, particularly as we move towards multi-level governance systems.[40] The reason is at least threefold:[41] first, legal interoperability is a mechanism that reduces the costs associated with cross-jurisdictional business transactions. Consider, for instance, potential trademark regimes in the EU. The registration of several national trademarks is more expensive than the registration of a single community trademark effective across Europe.[42] The transaction cost argument holds true particularly for ICT-based services. Second, anecdotal evidence suggests that legal interoperability, at least in the ICT space with its unique characteristics, drives innovation, competition, trade, and economic growth.[43] Take, for instance, a recent Chinese study, which suggests that China's entry into the WTO in 2001, symbolising its comprehensive integration into the global market, led to a surge of foreign direct investment (FDI) inflow. In order to be legally interoperable, China amended a number of its laws, including its Joint Venture Law and its Foreign Capital Enterprise Law, and pledged to give 'citizenship treatment' to foreign-invested firms, among other things.[44] Third, increased levels of best-practice-oriented legal interoperability may also foster fundamental values and rights, such as information privacy and freedom of expression. The safe harbour provisions for Internet service providers stipulated in the EU E-Commerce Directive that harmonise the laws of the individual EU Member States offer an interesting example to illustrate this third category of positive

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[37] Switzerland and the EU have a list of professions which they mutually recognise. See Database of regulated professions in the EU Member States, EEA countries and Switzerland, http://ec.europa.eu/internal_market/qualifications/regprof/index.cfm?fuseaction=home.home

[38] *Ligue Internationale Contre le Racisme et l'Antisémitisme et Union des étudiants juifs de France v. Yahoo Inc.,* Tribunal de grande instance [T.G.I.] [Superior Court] Paris, 22 May 2000. The case proceeded essentially as follows. Yahoo Inc. hosted an auction site with multiple auctions. One of these auctions sold Nazi paraphernalia. In 2000, two French groups – the League Against Racism and Anti-Semitism (LICRA) and the Union of French Jewish Students (UEJF) – sued Yahoo Inc. The theory was that the auction constituted a display of Nazi paraphernalia, which French law prohibits. The two groups also sued Yahoo France for linking to the auction site. The auction and the link did not constitute crimes in the US, where Yahoo Inc. was based. French courts, finding for LICRA and the UEJF, directed Yahoo Inc. to block the relevant auction site for all French users.

[39] M. H. Greenberg, 'A Return to Lilliput: The LICRA v. Yahoo! – Case and the Regulation of Online Content in the World Market', *Berkeley Technology Law Journal* 18 (2003), 1198–1199.

[40] We propose to include interoperability as an additional design principle for both Type I and Type II multi-governance systems as a means to address the respective coordination problems; see L. Hooghe and G. Marks, 'Unraveling the Central State, But How? Types of Multi-Level Governance', *American Political Science Review* 97 (2003), 233–243.

[41] For a different angle (i.e., the 'breakdown between text and technology', see M. J. Radin, 'Online Standardization and the Integration of Text and Machine', *Fordham Law Review* 70 (2002), 1125–1148.

[42] C. Smets-Gary and K. von Woellwarth, 'Pros and Cons of a Community Trademark', *Franchise Law Journal* 20 (2000), 17.

[43] See e.g. J. de Werra, 'What Legal Framework for Promoting the Cross-Border Flow of Intellectual Assets (Trade Secrets and Music)? A View from Europe towards Asia (China and Japan)', *Intellectual Property Quarterly* (2009), 27–76.

[44] See L. Xue and Z. Liang, 'Relationships between IRP and Technology Catch-Up: Some Evidence from China', in H. Odagiri, A. Goto, A. Sunami, and R. R. Nelson (eds.), *Intellectual Property Rights and Catch-Up: An International Comparative Study* (Oxford: Oxford University Press, 2010), 317–360.

effects.[45]

Like ICT interoperability, legal interoperability is not a binary concept. Rather, legal interoperability maps onto a continuum. On the one hand, the laws 'on the books' might reach different degrees of interoperability, ranging from roughly harmonised norms to identical provisions. On the other hand, even interoperable legal norms might be enforced differently across jurisdictions, resulting in lower levels of interoperability "in action". The WIPO Internet Treaties, further discussed below, provide a case in point in the trade-relevant context. These treaties are aimed at levelling the playing field regarding copyright in the digital age. National legislators, however, have implemented provisions such as the right of making available to the public or the anti-circumvention provisions in different ways, which in turn are interpreted differently by different courts, resulting in "medium" levels of interoperability.[46]

There are several approaches to achieve interoperability among legal norms, and each approach comes with characteristics that need to be matched with the specific factors of the information society phenomenon one seeks to address. Top-down approaches usually involve the creation of international law administered by international organisations. The International Telecommunications Union (ITU), a UN agency, is one example. Aside from dealing with global technology standardisation and radio spectrum allocation, the ITU has played a role in harmonising legislation against cybercrime across countries.[47] In contrast, bottom-up approaches to legal interoperability usually involve international cooperation in standard-setting processes.[48] The history of the EU Data Protection Directive illustrates that the achievement of certain levels of legal interoperability often involves the preparatory work ('setting the stage') of several institutions. In this case, the Organisation for Economic Co-operation and Development (OECD) promulgated influential privacy guidelines while the Council of Europe produced the Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data.[49]

It is important to emphasise that legal interoperability does not automatically mean the creation of new international law or the establishment of international organisations. Which approach should be pursued in the context of a given governance issue – like the regulation of the Internet of Things (IoT) or cloud computing, to name just two emerging examples – depends on an in-depth analysis of the various technological, market, and legal factors that characterise the ICT phenomenon at issue and varies based on the particular objectives a national policy-maker wishes to pursue. The general point is that the promise of legal interoperability for innovation and economic growth suggest it as at least a *default* principle[50] when considering national laws and policies – not unlike, for example, how the Swiss

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[45] L. Edwards, 'Articles 12-15 EDC: ISP Liability – The Problem of Intermediary Service Provider Liability', in: L. Edwards (ed.), *The New Legal Framework for E-Commerce in Europe* (Oxford: Hart, 2005), 93–136.

[46] See for an overview U. Gasser, 'Legal Frameworks and Technological Protection of Digital Content: Moving Forward Towards a Best Practice Model', *Fordham Intellectual Property, Media & Entertainment Law Journal* 17 (2006), 39–113.

[47] 'About ITU', http://www.itu.int/net/about/

[48] See e.g. L. Atzori, A. Iera and G. Morabito, 'The Internet of Things: A Survey', *Computer Networks: The International Journal of Computer and Telecommunications Networking* 54 (2010), 2797–2798; A.C. Sarma and J. Girão, 'Identities in the Future Internet of Things', *Wireless Personal Communications* 49 (2009), 353–363 (discussing different interoperable identities schemes in Internet of Things frameworks).

[49] See OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data, adopted on 23 September 1980; Council of Europe, Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data, Strasbourg, 28 January 1981, in force 1 October 1985.

[50] The famous *Cassis de Dijon* (mutual recognition) principle is an illustration *mutatis mutandis* of such a default mechanism aimed at increasing legal interoperability (here: world of goods), with the possibility of an 'overwrite of default' in case of certain types of higher-order public interests.

government considers the *acquis communautaire* in the context of each proposed legislative project,[51] or how governments around the world have introduced environmental impact assessments as an integral part of the law-making process.[52] The decision how to best achieve legal interoperability, considering the various options available, needs to be part of the proposed analysis.

IV. Example: EU law

Among the most illustrative, albeit far-reaching, examples when it comes to the aims, modes, benefits and challenges of legal interoperability is the EU. Arguably, the EU is a unique institutional setup. It makes substantial use of legal interoperability as a means to work towards economic integration, which in turn can help create de facto solidarity among Member States. More specifically, legal interoperability is among the key tools used to establish the EU Single Market, which allows for the free movement of goods among Member States as well as the free movement of the factors of production. It is intended to increase competition and specialisation, create larger economies of scale, and lead to greater efficiency as far as resource allocation is concerned. The EU framework sets forth several modes by which legal interoperability can be achieved.[53] Among the most powerful approaches are regulations and directives. Regulations have general application, are binding, and directly applicable in all Member States. Directives are binding as to the result to be achieved. However, national authorities have discretion as to the forms and methods of implementation of the directive.[54]

The EU-style directive is a particularly interesting instrument from a legal interoperability perspective. It illustrates that the 'working together' of legal norms requires only that norms are 'harmonised'; they do not need to be identical. It supports the notion that legal interoperability is not an all-or-nothing concept, but rather a continuum. It should be noted, however, that directives sometimes only slowly lead to the desired levels of legal interoperability – or may even fail. The transposition process of the EU Data Protection Directive has been challenging and arguably has even blocked some cross-border activities within the EU.[55] The EU Copyright Directive has effectively harmonised the scope and duration of copyright protection, but failed to create legal interoperability regarding limitations and exceptions.[56]

Further, the EU case demonstrates that legal interoperability, once established, needs to be managed and maintained. Two mechanisms are particularly interesting: first, the European Commission closely monitors the transposition process and has the power and obligation to start a multi-step non-compliance procedure in case of deviation by a Member State.[57] Second, national courts can ask the European Court of Justice (ECJ) for a preliminary ruling,

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[51] R. Petrov, 'Exporting the Acquis Communautaire into the Legal Systems of Third Countries', *European Foreign Affairs Review* 13 (2008), 38–39.

[52] See e.g. N. A. Robinson, 'International Trends in Environmental Impact Assessment', *Boston College Environmental Affairs Law Review* 19 (1992), 591.

[53] Article 288, Consolidated version of the Treaty on the Functioning of the European Union, Lisbon, 13 December 2007, in force 1 December 2009, 2008/C 115/01 (hereinafter TFEU).

[54] Article 288 TFEU.

[55] See e.g. European Commission Vice-President for the Digital Agenda, N. Kroes, 'Cloud computing and data protection', Les Assises du Numérique conference, Université Paris-Dauphine, SPEECH/10/686, 25 November 2010.

[56] B. Hugenholtz, Study on the Implementation and Effect in Member States' Laws of Directive 2001/29/EC on the Harmonisation of Certain Aspects of Copyright and Related Rights in the Information Society, http://www.ivir.nl/publications/guibault/Infosoc_report_2007.pdf

[57] Article 260 TFEU.

in which the ECJ provides guidance as to how to interpret a particular norm. This mechanism aims to ensure that EU law is applied consistently across the EU, thus maintaining high levels of legal interoperability.[58]

As mentioned above, legal interoperability may also come with costs. For instance, the enforcement of legal interoperability can prevent the development of more efficient, suitable or appropriate legal norms. It may create legal 'lock-in'.[59] For example, the harmonisation of EU takeover law was very controversial because of fears that it would hinder productive regulatory competition, or competition among jurisdictions.[60]

D. Interoperability and trade

I. Interplay

In the previous sections of this chapter, we have argued that increased levels of ICT interoperability among systems, applications, and components tend to be good for innovation, competition, and economic growth. We have also made the case that makers of public policy in the digital age should not only aim for higher levels of technical and related layers of interoperability, but also seek to increase legal and, eventually, policy interoperability. Economic theory suggests that both types of interoperability are also likely to have a positive effect on trade.

First, increased ICT interoperability fosters innovation in goods and services as well as processes, which in turn leads to technological advantage. Together with differences in factor endowments, technological advantage is among the core sources of a country's comparative advantage that drives international trade.[61] In fact, such technology gaps have been found to be key determinants of trade and investment. Companies from innovative countries tend to export high-technology goods and services to less-innovative countries through exports, investments abroad, or licensing of their technologies in order to exploit the benefits of their innovations. Conversely, increased trade and investment are expected to have a positive effect on innovation through various means such as technology transfer, competition effects, scale economies and spill-over effects.[62]

Second, interoperability, as outlined in the previous section of the paper, comes into play when breaking down protectionist legal barriers on the one hand and facilitating cross-border trade by providing a legal infrastructure aimed at reducing uncertainty on the other hand.[63] The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), the General Agreement on Trade in Services (GATS), regional agreements such as the EU's

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[58] Article 267 TFEU.

[59] See also D. L. Burk, 'Law as a Network Standard', *Yale Journal of Law and Technology* 8 (2005), 76.

[60] G. Hertig and J. A. McCahery, 'Company and Takeover Law Reforms in Europe: Misguided Harmonization Efforts or Regulatory Competition?' *European Business Organization Law Review* 4 (2003), 187–189.

[61] See e.g. P. Krugman and M. Obstfeld, *International Economics: Theory and Policy,* 8th edn (Boston, MA: Pearson Addison-Wesley, 2009), 50–82.

[62] See e.g. O. Onodera, 'Trade and Innovation Project, A Synthesis Paper', *OECD Trade Policy Working Paper* 72 (2008).

[63] Our focus in this section is on *legal* interoperability. However, it is important to note that *technical* interoperability may also lead to the removal of *legal* barriers as described here. Consider the example of a global, interoperable ICT infrastructure that enables the distribution of electronic books across borders, which will put pressure on attempts at fixing book prices – despite efforts by the Swiss parliament to reinstate fixed book prices. See e.g. A. DeMarco, 'Swiss to Reinstate Fixed Book Prices', 31 March 2011, http://publishingperspectives.com/2011/03/swiss-to-reinstate-fixed-book-prices/

Single Market, the North American Free Trade Agreement (NAFTA) or the Central American Free Trade Agreement (CAFTA-DR), as well as a series of bilateral free trade agreements designed to create free trade zones including trade in services are examples of how legal interoperability fosters trade by dismantling national legal barriers.[64] Harmonisation efforts such as the WIPO Internet Treaties or the Anti-Counterfeiting Trade Agreement (ACTA) are related (and contested) attempts at creating highly interoperable frameworks in order to increase legal certainty in cross-border trade of products and services.

Third, both technical and legal interoperability are likely to increase trade efficiency by reducing transaction costs. ICT interoperability has arguably led to increased application and diffusion of informatics and telecommunications in international transactions. Legal interoperability, including for instance the development of interoperable 'behind-the-border' infrastructure or interoperable customs procedures, has significantly reduced trade costs by eliminating certain trade frictions, thus contributing to international trade and economic growth as for example studies from Asia illustrate.[65]

II. Trade 2.0

The interactions between interoperability of systems, applications, and components and trade outlined in the previous section will arguably become even more important as we move towards a trade 2.0 environment in which services in general and ICT services in particular, which rely on certain degrees of interoperability, constitute an increasingly important part of economic activity and a significant portion of all world trade.[66] We have dealt with the first aspect of the relationship between interoperability and trade – the impact of interoperability on innovation that in turn fosters trade – in an earlier part of this chapter by discussing the relevance of and approaches towards increased ICT interoperability from a public policy perspective. The approaches outlined there also apply to ICT-based services and are readily available to national policy makers. Similarly, we have addressed the ways in which both technical and legal interoperability can be used to lower transaction costs for businesses engaged in cross-border trade. In order to ensure economic growth, governments can be expected to consider interoperability both as a policy mechanism and as a design feature of the legal system itself, especially in the face of increased regulatory competition.[67] Viewed from that angle, even unilateral strategies aimed at increasing legal interoperability in the context of ICTs, as we proposed above, have the potential at least to mitigate the much-discussed tension between local laws and the global Internet.[68]

Further, policy-makers in democratic societies and possibly elsewhere may have an incentive to seek international coordination in cases where it is difficult to find national solutions to global problems and in situations where self-regulatory approaches driven by globally operating ICT companies do not succeed. In this regard, trade 2.0 follows a pattern that has already emerged with regard to the trade in goods, where extensive efforts to harmonise national standards such as the WTO's Agreement on Technical Barriers to Trade have been made.[69] One particularly important set of harmonised standards that require collective action among nations and connect the concepts of interoperability, innovation, and trade are

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[64] A. Chander, 'Trade 2.0', *The Yale Journal of International Law* 34 (2009), 284.
[65] Asian Development Bank, Asian Development Outlook 2006 (2006).
[66] The definition of services remains unclear and contested. For a pragmatic definitional approach, shared in the context of this paper, see Chander, supra note 64, 282, with further references.
[67] Ibid., 326.
[68] M. J. Schallop, 'The IPR Paradox: Leveraging Intellectual Property Rights to Encourage Interoperability in the Network Computing Age', *AIPLA Quarterly Journal* 28 (2000), 195–207.
[69] Chander, supra note 64, 300.

international IPR frameworks.

III. Example: International IPR frameworks

Until the late nineteenth century, countries had unilaterally set up IPR systems according to their local preferences and desired outputs. National IPR regimes up to this time had largely ignored the rights of foreign creators and inventors and led some countries to engage in free riding.[70] Important international treaties such as the Paris Convention of 1883 for patents and the Berne Convention of 1886 for copyright started to change this situation by introducing the principle of national treatment of foreigners. Several international IP agreements followed over the decades, cumulating in the TRIPS Agreement of 1996, which established minimum standards for various forms of IP protection and introduced IP law into the international trading system. These IPR frameworks can be understood as attempts to create legal interoperability by means of international harmonisation. The effects of such harmonised IPR systems on trade flows are difficult to model and measure given the number and complexity of the forces at play, but various studies suggest a positive correlation between IPR protection and trade.[71]

In the context of the service-based trade 2.0 environment, the WIPO Internet Treaties are an interesting case study connecting the themes of legal interoperability, innovation, and trade. A series of important technological innovations in the 1970s and 1980s – ranging from video technology to cable TV and the increased importance of computer-generated works – forced national legislators to deal with the disruptive effects of these technologies and address related IPR, in particular copyright challenges.[72] The international copyright community initially followed an approach of 'guided development', under which recommendations, guiding principles, and model provisions were worked out by bodies such as WIPO and UNESCO in order to offer guidance to governments on how to respond to the new technological challenges.[73] Around the time the text of the TRIPS was finalised, the non-binding standards of the 'guided development' approach became insufficient, especially in the light of the rapid expansion of digital technologies in general and the Internet in particular. The new technological environment and associated challenges, including concerns about piracy, led to the emergence of a 'digital agenda' in the aftermath of the adoption of TRIPS and ultimately resulted in the enactment of the WIPO Internet Treaties in 1996, which provide for high levels of legal interoperability among the signatories with regard to copyright (WIPO Copyright Treaty, WCT) and related rights (WIPO Performances and Phonograms Treaty, WPPT).

The WIPO Internet Treaties are not only an interesting case study that illustrates how higher levels of legal interoperability may emerge over time. As mentioned before, some of the key provisions of the treaties also highlight the ways in which an interoperable legal framework may in turn shape ICT interoperability. Specifically, the WIPO anti-circumvention provisions serve as an example of how interoperable IPR frameworks may negatively affect ICT interoperability. As noted earlier, these provisions, in essence, forbid the 'hacking' of DRM-systems as well as the trafficking in 'circumvention devices' and back-up copy and access

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[70] C. Greenhalgh and M. Rogers, *Innovation, Intellectual Property, and Economic Growth* (Princeton, NJ: Princeton University Press, 2010), 260.

[71] Ibid., 335 and K. E. Maskus, *Intellectual Property Rights in the Global Economy* (Washington, DC: Peterson Institute for International Economics, 2000).

[72] For the underlying patterns, see D. L. Spar, *Ruling the Waves: Cycles of Discovery, Chaos, and Wealth from the Compass to the Internet* (New York, NY: Harcourt, 2001).

[73] See for a detailed discussion, M. Ficsor, *The Law of Copyright and the Internet: The WIPO 1996 Treaties, their Interpretation and Implementation* (Oxford: Oxford University Press, 2002), N 1.01–1.18.

control technologies that are currently used, in tandem with restrictive terms of services which ban reverse engineering, to design closed, non-interoperable devices and applications.[74]

E. Tying it together: The case of cloud computing

Cloud computing – a technical innovation – illustrates many of the working hypotheses put forward in this chapter. In particular, the cloud computing narrative shows the importance of interoperable technical and legal frameworks. It also shows how such frameworks, in turn, can foster innovation, trade, and as a result economic growth. The section starts with a brief background and definition of cloud computing. It then discusses the relevance of technical interoperability and illustrates the concept of legal interoperability in context. It concludes with a brief discussion of the relation between cloud computing and trade.

I. Background and definition

Cloud computing is Internet-based computing.[75] Shared resources, software, and information are provided to computers and other devices on demand. It includes activities such as Web 2.0, web services, the Grid, and Software as a Service (SaaS), all of which enable users 'to tap data and software residing on the Internet rather than on a personal computer or local server'.[76] A key characteristic of cloud computing is the manner in which cloud services can provide the aforementioned services promptly – whenever and wherever. In this sense, a supplementary definition for cloud computing would be that it is a 'model for enabling convenient, on demand network access to a shared pool of configurable computing systems (e.g. networks, servers, storage, …) that can be rapidly provisioned and released with minimal management effort or service provider interaction'.[77]

More specifically, three types of cloud services can be distinguished:[78] (1) SaaS, where consumers can use the provider's applications from various client devices through a 'thin' interface; (2) Cloud Platform as a Service (PaaS), based on which consumer–producers can create and/or acquire applications developed through programming languages and tools supported by the provider; and (3) Cloud Infrastructure as a Service (IaaS), where consumers can rely on the provider for processing, storage, networks, and other fundamental computing resources off-site, 'in the cloud.'

Cloud computing arguably provides a number of benefits, including access to millions of different pieces of software and databases and the ability to combine them and create customised services; increase reliability and security (e.g. no crashing hard-drives and stolen or lost laptops); in-built possibilities for online sharing of information and applications; the ability to gain access to information and tools from anywhere where the user can connect to the Internet; and no need for end-device computing power, since data and applications are in the cloud.[79]

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[74] Gasser and.Palfrey, supra note 16.

[75] For a helpful overview, see K. Stanoevska-Slabeva and T. Wozniak, 'Cloud Basics – An Introduction to Cloud Computing', in K. Stanoevska-Slabeva, T. Wozniak and S. Ristol (eds.), *Grid and Cloud Computing: A Business Perspective on Technology and Applications* (Berlin: Springer, 2010), 47–61.

[76] OECD Briefing Paper for the ICCP Technology Foresight Forum: Cloud Computing and Public Policy, DSTI/ICCP(2009)17, 29 September 2009.

[77] Computer Security and Division of the US National Institute of Standards and Technology (NIST).

[78] J. Viega, 'Cloud Computing and the Common Man', *Computer* 42 (2009), 106.

[79] M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica and M. Zaharia, 'A View of Cloud Computing', *Communications of the ACM* 53 (2010), 50–58.

II. Technical interoperability

Given the high investment costs, cloud-based services, infrastructures, and platforms arguably require significant economies of scale and network externalities in order to be economically sustainable and successful.[80] Against this backdrop, governments, users and businesses have expressed concerns about insufficient levels of interoperability among clouds, which in turn would hamper innovation, competition, and economic growth in the ICT sector.[81] In contrast, the cloud industry is concerned that high levels of interoperability conflict with their aim for independence and service differentiation.[82]

The balancing of this tension among different stakeholders is further complicated by the lack of clarity as to what interoperability means across different cloud models and what their respective priorities are.[83] At the same time, at least some consensus has emerged that certain standards, for instance in the context of identity management systems, are desirable and that interoperability can be particularly valuable with regard to SaaS and PaaS.[84] Against this backdrop, various industry initiatives have emerged that address cloud interoperability in general and cloud standards in particular.[85] Furthermore, the current discussion about cloud computing interoperability illustrates the relevance of the different layers of interoperability as introduced in the first part of this chapter and emphasises the need to look beyond technical interoperability and consider, for instance, accountability and security policy issues.

The current debate about cloud computing interoperability is not only illustrative of the benefits and challenges mentioned above, but also highlights some of the general findings regarding governments' role in creating an interoperable ICT ecosystem. Given the relatively nascent nature of the technology and market, respectively, it seems premature for governments to step in by what we have described elsewhere as 'unilateral' approaches such as mandating standards or requiring the disclosure of interoperability information. Rather, governments in the US and the EU currently seek to provide guidance on interoperability by providing frameworks for cooperation, using procurement power, and working with other incentive-based approaches.[86] At the same time and in the context of foresight analysis, ex post legal mechanisms such as existing antitrust regulations and their potential applicability to the cloud environment are currently examined in order to potentially increase the levels of interoperability.[87]

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[80] D. Kondo, B. Javadi, P. Malecot, F. Cappello and D. P. Anderson, 'Cost-benefit Analysis of Cloud Computing versus Desktop Grids', *IPDPS 2009: Proceedings of the 2009 IEEE International Symposium on Parallel & Distributed Processing* (2009), 4–6.

[81] A. E. Alter, Y. Peng, L. Runhua and J. G. Harris, 'China's Pragmatic Path to Cloud Computing', *Accenture*, 4 May°2010, 6–7.

[82] .Armbrust et al., supra note 79, 54–55.

[83] G. Lawton, 'Addressing the Challenge of Cloud-Computing Interoperability', *Computing Now*, September 2009, http://www.computer.org/portal/web/computingnow/archive/news031 (discussing the proliferation of differing interoperability standards, such as those of Distributed Management Task Force and Open Cloud Consortium).

[84] R. Yasin, 'Identity, data management crucial to cloud success', *Government Computer News*, 21 May 2010, http://gcn.com/articles/2010/05/21/nist-identity-management.aspx

[85] http://cloud-standards.org/wiki/index.php?title=Main_Page

[86] D. C. Wyld, 'The Cloudy Future of Government IT: Cloud Computing and the Public Sector around the World', *International Journal of Web and Semantic Technology* 1 (2010), 1–20; S. Fraser, R. Biddle, S. Jordan, K. Keahey, B. Marcus, E. M. Maximilien and D. Thomas, 'Cloud Computing Beyond Objects: Seeding the Cloud', *Proceeding of the 24th ACM SIGPLAN conference companion on Object oriented programming systems languages and application* (2009), 848–849. See also NSF open cloud manifesto as example of incentive-based 'regulation'.

[87] J. D. Feinstein, Transcending the Cloud: A Legal Guide to the Risks and Rewards of Cloud Computing, 17 June 2010, http://www.reedsmith.com/_db/_documents/Cloud_Computing_white_paper_090810.pdf

III. Legal interoperability

In order to be successful, cloud computing requires a well-developed legal ecosystem, both from the perspective of cloud providers and that of the consumers.[88] Such a legal and regulatory framework needs to be designed to address a series of key issues associated with cloud computing. Core issues that may require both industry action and government intervention include among others:[89]

- *Transparency and clarity*: Transparency and clarity are central elements of both contractual and regulatory approaches in complex technological, organisational, and economic settings such as cloud computing.
- *Responsibility*: Closely linked to transparency and an inherent element for providing an appropriate safeguard framework for cloud computing is the clarification of areas of responsibility for all parties involved in such processes. Instruments range from more traditional approaches (criminal law, civil liability and risk insurance) to concepts such as social responsibility.
- *Data privacy*: Privacy is among the most pressing issues in the cloud. Cloud architecture and the sensitive nature of the data stored in it may support the need for a regulatory framework that addresses individual rights and related issues, such as data quality, processing transparency, and international transfers.
- *Data security*: Closely linked to privacy issues are concerns regarding data security, standards, contractual rules, and legal obligations. Such issues may suggest the need to guarantee and supervise data security measures that are preventive and operational.
- *Data retention*: Economic regulation as well as national security obligations increasingly require the development, implementation, and operation of retention practices which have to be balanced against other legitimate concerns.
- *Compliance*: Cloud computing providers need to comply with existing sector-specific laws (e.g. financial or health information), while such laws need also to be revisited in order to keep them open to technological evolution.
- *Innovation and competition policy*: Policy decisions in the cloud (e.g. regarding standards) are likely to have an impact on innovation and competition policy and need to be assessed with regard to their macro-impact.

In cloud computing environments, data typically flows across jurisdictions. Often, cloud providers themselves do not have knowledge as to where data is stored or processed because of the dynamic allocation of processing resources in the cloud.[90] While the location-based fragmentation of data storage and processing is technically possible and currently also practiced in the context of sensitive data such as government clouds,[91] it is in tension with the

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[88] Senior Vice President and General Counsel of Microsoft, B. Smith, 'Cloud Computing for Business and Society', Panel Discussion at The Brookings Institution, 20 January 2010, http://www.microsoft.com/presspass/presskits/cloudpolicy/docs/20100120_transcript.pdf

[89] D. M. Parrilli, 'Legal Issues in Grid and Cloud Computing', in: Stanoevska-Slabeva and Wozniak, supra note 75, 97–118; M. Armbrust et al., supra note 79; R. L. Grossman, 'The Case for Cloud Computing', *IT* Professional 11 (2009), 25–27; N. Leavitt, 'Is Cloud Computing Really Ready for Prime Time?', *Computer* 42 (2009), 15–20.

[90] Commission of the European Communities, 'The Future of Cloud Computing: Opportunities for European Cloud Computing Beyond 2010', Expert Group Report (2010), 29−30http://cordis.europa.eu/fp7/ict/ssai/docs/cloud-report-final.pdf

[91] J. Beardwood, D. Fabiano, and F. Martineau DuMoulin 'New Canadian Restrictions on Extra-Jurisdictional

guiding design principles of cloud computing and limits its potential benefits in terms of efficiency gains and cost savings. Against this background, cloud providers have begun to urge national legislators to create legal frameworks to respond to this concern. For example, Brad Smith, General Counsel for Microsoft, has spearheaded an initiative to create more awareness among US legislators of key issues arising from cloud computing. He has proposed what he calls the 'Cloud Computing Advancement Act' to get law-makers to think about potential privacy and security concerns that may hamper cloud computing.[92]

In addition to national initiatives, the need for an interoperable regional legal framework aimed at regulating cloud computing has been discussed among stakeholders. Asian governments in particular seem to be responsive to these calls from industry,[93] while others emphasise the role of industry self-regulation.[94] Through various forums such as the Asia-Pacific Economic Cooperation (APEC) and the Association of Southeast Asian Nations (ASEAN), several Asian governments led by Japann and in cooperation with other stakeholders, have discussed interoperable cloud frameworks.[95] Through these initiatives, governments reportedly hope to foster innovation and trade across Asia and, last but not least, create a counterbalance to the economic heavyweight, China, which recently launched its own national cloud computing initiative.[96]

Taking a genuinely global perspective, the idea of a 'TRIPS for data' has recently been introduced in US think tanks in order to harness the full benefits of cloud computing in terms of innovation and growth.[97] This approach – the creation of international law – certainly marks the extreme end of the spectrum of the possible approaches that can be used to create higher levels of legal interoperability.

IV. Cloud computing and trade

How does an interoperable cloud computing environment matter from a trade perspective? Based on the framework offered in the previous section, we can identify a series of connections between cloud computing, interoperability, and trade.

An interoperable cloud ecosystem enables various types of innovation. Many more providers can deploy online services without big upfront investments. Start-ups can access on-demand resources. Small companies can incur shorter-term costs to fund their activities. Underpinning and facilitating this new industrial structure is the cloud. It can incubate and inspire

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Data°Processing'°Canadian°Bar°Association°National°Newsletter,°August°2006,www.cba.org/cba/newsletters/pdf/priv-patriot.pdf 'The amendments to FOIPPA [the Freedom of Information and Protection of Privacy Act] require that all British Columbia public sector entities (and their service providers) ensure that any personal information is stored and accessed *only in Canada*, subject to some narrow exceptions'.

92 http://itmanagement.earthweb.com/netsys/article.php/3859626/Microsoft-Urges-Feds-to-Get-Behind-the-Cloud.htm

93 W. Arnold, 'Regulations and Security Concerns Hinder Asia's Move to Cloud Computing', *New York Times*, 10 October 2010.

94 J. Kim, 'Asian Cloud Manifesto', November 2010 (on file with authors).

95 Asian SMEs most keen on cloud adoption: study, Enterprise Innovation, 23 April 2010, http://www.enterpriseinnovation.net/content/asian-smes-most-keen-cloud-adoption-study

96 National Development and Reform Commission (NDRC) and Ministry of Industry and Information Technology (MIIT), Joint Notice on Cloud Computing Pilot Projects, NDRC Hi Tech Dept Notice 2480,18 October 2010.

97 See e.g. B. Smith, supra note 88, 30: 'Ultimately cloud computing will benefit the most if governments can establish a multilateral framework that provides legal clarity in the form of a new treaty or similar international agreement. We need a free trade agreement for data and information. While a multilateral framework would require substantial diplomatic, leadership, and resources, it is definitely a cause worth embracing.' Also, see Kim, supra note 94.

innovation across the economy, but it is especially relevant for small and medium-sized enterprises (SMEs). Large-scale, commodity-computer data centres in low-cost locations comprise the basis for these innovative cloud-computing centres.

In addition to its expected positive impact on innovation, recent surveys among ICT leaders suggest that cloud computing could help organisations to recover from the current global economic downturn by providing more flexibility and significantly lowering IT costs,[98] which in turn decrease transaction costs of IT-based services in cross-border business transactions.

Lastly, an interoperable cloud computing legal ecosystem can be a driver of trade and economic growth by creating a level playing field for companies operating internationally and reducing legal uncertainties that are impediments to trade. Moreover, the vision of an interoperable legal system that supports the adoption of cloud computing has been recognised by some regions in the world as a potential core element while working towards a more integrated economic market space as noted above.[99]

F. Conclusion

In this chapter, we have examined the different facets and roles of interoperability as a driver of innovation and trade in the ICT space. In the first section, we have defined ICT interoperability as the ability to transfer and render useful data and other information across systems (including organisations), applications, and components and discussed its multi-layered character ('cake' model). Based on previous studies and anecdotal evidence, we conclude that ICT interoperability is an important means to promote innovation, competition, and economic growth, which makers of public policy should consider and use systematically and strategically.

The analysis suggests that makers of public policy have different tools available with which to work towards higher levels of ICT interoperability, and that the appropriate approach needs to be determined based on a careful evaluation of contextual variables such as time, maturity of the relevant technologies and market, the specific user practices and norms. The toolbox includes, among other instruments, frameworks for cooperation and public procurement, as well as various legal and regulatory interventions.

The core hypothesis presented in this contribution is that makers of public and private policy would not only be well-advised to work towards higher levels of ICT interoperability, but should also aim for interoperability among legal norms and policies as applicable to information society phenomena. Such an approach requires a deeper understanding of the multifaceted interplay between law and interoperability, from which the notion of legal interoperability emerges. In this context, we have explored the characteristics of legal interoperability in greater detail and discussed why it is promising for innovation, trade and economic growth. We have also noted that, as in the case of ICT interoperability, legal interoperability is not a silver-bullet solution to challenges that makers of public policy face in today's global, digitally networked environment. And legal interoperability is not necessarily desirable for its own sake, nor must it extend to the greatest possible degree. Rather, interoperability should be used as an important design principle of legal norms aimed at regulating increasingly global information society phenomena.

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[98] J. Burt, 'Sun CTO: Recession Fueling Interest in Cloud Computing, Virtualization', *eWeek*, 5 March 2009; J. Scott, 'Has the recession accelerated cloud computing?', ITPro, 24 March 2010, http://www.itpro.co.uk/621745/has-the-recession-accelerated-cloud-computing

[99] R. Byrne and J. Timbuong, 'Mukhriz: Malaysian businesses must capitalise on cloud computing', *The Star*, 25 May 2010; J. Galligan, 'Public Policy for Cloud Computing', *Malaysian Business*, 16 September 2010.

Legal interoperability in the trade context and beyond can be achieved top-down, for instance by enacting international law, or in bottom-up processes in which various institutions in multilayered governance situations work together over time. Which approach should be pursued depends on a rather granular, factor-specific analysis of a given governance issue, its regulatory context, and the underlying objectives.

Finally, we used the example of cloud computing to weave the core threads of this contribution – interoperability, innovation, and trade – together. Cloud computing is illustrative of the importance of both technical and legal interoperability for innovation, demonstrates how both types of interoperability relate to trade, and puts some of the theoretical concepts addressed in this chapter into a practical context.

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