

# The Benefits and Challenges of Technology Neutral Regulation – A Scoping Review

Completed Research Paper

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## Abstract

*The principle of technology neutrality (PTN) is being used as a starting point for regulation by regulators around the world. While technology neutral ICT regulation is seen as an answer to regulators' struggles to keep up with fast-paced changes of ICT, also critique towards this principle has been voiced. Here, we report on the results of a scoping review we conducted on literature in three research databases to summarize the current understanding of the benefits and challenges in the context of technology neutral regulation. We contribute to IS research by introducing to the IS community four benefits of and seven challenges related to technology neutral regulation – which has been foremost addressed in legal research so far – and by suggesting three research themes and questions for future IS research on, e.g., technology innovation, the development, adoption and use of technology, and a better theorization of the PTN.*

**Keywords:** literature review, technology-neutral regulation, principle of technology neutrality, ICT regulation, regulation of IT

## Introduction

Information and communication technology (ICT) regulation affects the development, adoption and use of technology (e.g., Bernardi et al. 2017; Klecun-Dabrowska and Cornford 2000; Väyrynen and Lanamäki 2020). One prominent characteristic for legislation is that it usually follows what is happening in the world, and legislators try to keep up with the development and changes that occur. ICT is often changing at a fast and increasing pace, which makes keeping ICT legislation up-to-date challenging. Law often lags behind the development of technology (Reidenberg 1997). One practical example of this are drones. When drones started to be more common in civil use in the 2000's and 2010's, there was a growing number of instances where drones caused harm to people or property. In addition to concrete harm, some of them also caused disturbance when they were flown in certain areas. The European Union, for example, has reacted to this and adopted a regulation that, e.g., requires operators of unmanned aircraft to register themselves in certain cases.<sup>1</sup> Regulation is often much slower to change than the technology it seeks to regulate, which poses certain challenges for regulators.

One approach taken to respond to this challenge is to design regulation based on the principle of technology neutrality (PTN) (Moses 2007). Legislation can be drafted in a technology-specific or

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<sup>1</sup> Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft C/2019/3824 article 14 section 5.a.

technology neutral way. Technology-specific legislation means that the legislator refers to specific types or classes of technology (Ohm 2010), e.g., in defining the tools that make a larceny (i.e., the theft of personal property of another person or business) into a grand larceny. For example, in Finland one of the reasons that a larceny can be considered grand larceny is that the perpetrator has used a firearm, explosive or similar dangerous equipment (The Criminal Code of Finland 39/1889, 28:1.1.4 §). Technology-specific legislation pays more attention to *how* something happens. Technology neutral legislation, on the other hand, focuses on regulating behavior and *what* happens instead of how it happens (Greenberg 2015). This means that the law is drafted in terms that are general and vague, with emphasis on general characteristics such as purpose and functions (Koops et al. 2006; Ohm 2010).

According to Harasta (2018) the term “technology neutrality” is used to describe how emerging technologies should be regulated, mainly in the field of ICT. The principle of technology neutral regulation has been accepted and implemented by regulators around the globe (e.g., European Commission 2019; Kim 2019; Koulu 2016). In Europe, this principle has been defined in the Framework Directive 2002/21/EC on a common regulatory framework for electronic communication networks and services<sup>2</sup>. It states that all member states should ensure that regulation is technology neutral, so that it “neither imposes or discriminates in favour of the use of a particular type of technology”. The PTN is commonly used as the starting point for ICT regulation (Koops et al. 2006; Koulu 2016). Some of the reasons for creating technology neutral regulation are to ensure that regulation does not prevent technological innovation (Kamecke and Körber 2008) and that it is flexible, time-proof and open to change (Ali 2009; Koops et al. 2006). However, also critique has been presented regarding the usefulness or applicability of the PTN. Problems that have been emphasized especially in legal research are the difficulty of regulating technology that does not yet exist, the danger of over- or under-inclusion of technologies in the law, and the question of whether technology neutral law really can be neutral (Greenberg 2015; Koops et al. 2006; Moses 2007).

Information systems (IS) research, among others, is interested in studying the development, adoption and use of technology. However, the regulation of information technology (IT) has been scarcely studied in IS research (see Gozman et al. 2020), and the PTN has not been addressed at all in the main IS outlets. Given the practical relevance of the PTN for ICT regulation, as well as the research gap on regulation of IT, we conducted a scoping literature review to answer the following **research question**:

*“What are the benefits and the challenges related to a technology neutral regulation of ICT?”*

With our paper, we make two contributions to IS research. First, we introduce some of the benefits and challenges of technology neutral regulation to the IS community, and second, we provide some directions for future IS research based on our scoping review.

We next describe the research methodology we applied. Then, we present the findings of our literature review. Finally, we discuss our findings and present potential research themes and questions that future IS research could address. We conclude our paper with practical implications and research limitations.

## **Methodology**

This research was conducted as a scoping literature review (Arksey and O’Malley 2005; Munn et al. 2018). Scoping reviews are a suitable approach to identifying the key characteristics or factors related to a concept (Munn et al. 2018), i.e., to summarize and disseminate research findings in the context of a particular area (Arksey and O’Malley 2005). In addition, scoping reviews can act as a precursor to a systematic literature review and to identify gaps that exist in the literature (Arksey and O’Malley 2005;

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<sup>2</sup> European Parliament and the Council (2002). Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive). The principle of technology neutrality is mentioned in Section (18).

Munn et al. 2018). The main goal of our scoping review is to summarize and disseminate for the IS research community research findings regarding the benefits and challenges related to technology neutral regulation, and to also identify potential directions for future IS research. For our scoping review, we followed the five stages described by Arksey and O'Malley (2005).

In **Step 1 (“identifying the research question”)**, we identified our research question based on the observation that the PTN is being applied in practice by regulators as a way to create flexible regulation that would allow for future technological development, while at the same time some research has voiced doubts about whether the application of the PTN is really as beneficial as regulators seem to perceive it. In **Step 2 (“identifying relevant studies”)**, we first conducted a Google search on technology neutral regulation to familiarize ourselves with the terminology used (e.g., technology neutral regulation, technologically neutral regulation/legislation, etc.). We then conducted a search in three databases with the following search string: (“tech\* neutr\*”) AND (policy OR regulat\* OR legal OR legis\*) in May 2020. We did not set any restrictions to the publication date of articles. ABI/INFORM (Abstract search) returned 10 results, Ebscohost (Abstract search) 193 results, and Scopus (all fields) 215 results, in sum 418 results. We then removed the 61 articles that were returned in both Ebscohost and Scopus, resulting in 357 articles. In **Step 3 (“study selection”)**, we excluded 31 articles that were not written in English. We also excluded results that were not academic papers (e.g., books and book chapters, newspaper articles) and papers that – based on the abstract – clearly were not addressing ICT-related technology neutral regulation. By ICT we mean all electronic information and communication technologies, such as the devices, software, and (telecommunication) networks that are “defined by their use (communication) or area (information)” (Koops et al. 2006, p. 3). For example, when reviewing the 50 first search results, we noticed that no papers on climate policy and energy policy were relevant to our research question as those papers addressed other than ICT-related technology regulation. Therefore, we decided to exclude all results that were about those themes. We then went through the full text of the remaining papers to identify those papers that in one way or another addressed benefits or challenges of ICT-related technology neutral regulation. In papers where text search was possible, relevant content was mainly found by searching for the term “neutral”, other papers were browsed through. Only papers that gave some original insight were included in the review, resulting in 38 articles. In addition, the article by Koops et al. (2006), which we identified through snowballing (Koops et al. 2006), is also included due to its relevance and because of being referred to in many of the papers that are included in our review. As a result of this study selection process, 39 articles are included in this review (see Table 1). In **Step 4 (“charting the data”)**, we extracted from these 39 articles information on the study context (what ICT was the study about), what the main findings of the study were, and any benefits and challenges that were mentioned related to technology neutral regulation or the PTN. In **Step 5 (“collating, summarizing, and reporting the results”)**, we conducted thematic analysis (Vaismoradi et al. 2013) on the extracted benefits and challenges to identify common “themes”. This resulted in the identification of four categories of benefits and seven categories of challenges. We want to emphasize that even though we identified these different groups of benefits and challenges, the reader will notice that these are overlapping to some extent and interrelated.

## **Results**

Based on our literature review, we identified four categories of benefits, and seven categories of challenges. The benefits are Future-proof regulation (B1), Non-discriminating regulation and resulting benefits to competition (B2), Tackling regulators’ limited understanding of the regulated technology (B3), and Allowing for innovation and future development through flexibility and freedom to choose (B4). The challenges we identified are Difficulties in applying technology neutral regulation due to uncertainty and ambiguity (C1), The PTN is undertheorized (C2), Evaluation of when the application of the PTN is suitable is challenging (C3), Doubts whether regulation even *can* be neutral (C4), Negative effects on competition (C5), Providing both technologically neutral and standardized options can increase enforcement costs (C6), and The PTN might be applied by regulators for the wrong reasons

(C7). Table 1 summarizes the literature we reviewed in form of a simple concept matrix (see Webster and Watson 2002). The table is split into 3 sections – research that recognized only benefits of technology neutral regulation, research that recognized only challenges related to technology neutral regulation, and research that recognized both benefits and challenges of technology neutral regulation.

**Table 1. Summary of the analyzed articles**

	Authors	Context	Benefits				Challenges									
			B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7			
[1]	Cave (2008)	Spectrums		x												
[2]	Chochliouros and Spiliopoulou- Chochliourou (2003)	Telecommunication, Spectrums		x												
[3]	Cramton (2013)	Spectrums		x	x	x										
[4]	El-Moghazi et al. (2019)	Spectrums, International mobile telecommunication			x											
[5]	Falch et al. (2009)	Spectrums		x	x	x										
[6]	Jordan (2009)	Telecommunications	x	x												
[7]	Julia-Barcelo and Vinje (1998)	Electronic signatures		x		x										
[8]	Kim (2019)	Electronic signatures		x		x										
[9]	Kruys et al. (2016)	Spectrums	x	x												
[10]	Lipinski (2003)	Copyright law in cyberspace		x												
[11]	Miller and Hoffman (2011)	Digital infrastructure policy		x		x										
[12]	Pritchard-Kelly (2018)	Satellites, Broadband				x										
[13]	Vittet-Philippe (1998)	Digital convergence	x													
[14]	Briglaue et al. (2020)	Broadband policy					x						x			
[15]	Bygrave (2015)	Information + data concepts in regulation					(x)									
[16]	Clarke and Bennett Moses (2014)	Drones									(x)					
[17]	Craig (2016)	Copyright law in information age						x	x	(x)						
[18]	de Lanerolle (2011)	Broadcasting + telecommunication regulation					x									
[19]	Escudero-Pascual & Hosein (2004)	Regulation of access to traffic data														x
[20]	Goodman (2006)	Sponsorship disclosure law					x									
[21]	Greenberg (2015)	Copyright law, technology neutrality theory					x	(x)	x	(x)					(x)	
[22]	Harasta (2018)	Artificial Intelligence					(x)					x			(x)	
[23]	Hildebrandt (2011)	Theoretical, legal protection by design							(x)	(x)						
[24]	Hildén (2017)	Information privacy regulation					x		x		x					
[25]	Hofman et al. (2019)	Blockchain, GDPR					(x)									
[26]	Hojnik (2016)	Digital goods regulation							x							
[27]	Irnich et al. (2013)	Spectrums												x		
[28]	Mangano (2018)	Blockchain (insolvency law)						x								
[29]	Marcinauskaitė et al. (2020)	Electronic payments					(x)									
[30]	Shah and Srivastava (2014)	e-commerce, e-governance					x					x				
[31]	Veerpalu (2019)	Distributed ledger technology					(x)									
[32]	Whitley (2013)	E-identity					x		x	x						x
[33]	Chandra (2009)	Spectrums		x			x									
[34]	Cohen and Koosed (2019)	Public notice regulation (digital information)	x			x				x					x	
[35]	Ercole (2005)	Spectrums				x	x						x			
[36]	Hildebrandt and Tielemans (2013)	Theoretical, data protection by design		(x)						(x)	(x)					
[37]	Koops et al. (2006)	Theory		(x)				(x)		(x)						
[38]	Ohm (2010)	Surveillance laws	x					(x)	x	(x)						
[39]	Veerpalu (2018)	Blockchain, payment technology		(x)		x		x								

Within each section, the articles are alphabetically ordered. For each article, the table shows the “reference number” we use due to space limitations and for brevity to refer to the respective article in the remainder of the Results section, the author information, the (technology) context in which the study was conducted, and the identification of what benefits and challenges the article contributed to. If an “x” in the table is presented in brackets “(x)”, it means that the respective benefit/challenge has not been

mentioned in relation to the specific (technology) context the article addresses, but in relation to technology neutral regulation more generally.

Research interest in technology neutral regulation and the PTN seems to have increased over the past 3 decades. While only three of the articles in our review have been published before the year 2000, ten articles have been published between 2000-2009, and 26 articles have been published between 2010-2020. Considering the types of technology regulations and technologies addressed in these articles, this also makes sense. Over the past 20 years, technology and technological possibilities have considerably changed, which has increased the need to take the rapid changes in technology into account also on the level of laws/regulations. An interesting observation that can be made from Table 1 is that the ‘tone’ of how technology neutral regulation is considered in research has changed. Of the 19 articles that only address challenges related to technology neutral regulation, 17 have been published after 2010. In contrast, all three articles published before 2000 only address benefits of technology neutral regulation. Thus, without claiming any statistical significance, it appears that research has become more critical towards the PTN. Of the 39 articles in our literature review, 26 have been published in forums that focus on law and/or policy research – thus, our study is quite heavily informed by legal research.

Next, we describe the benefits and challenges we identified in more detail.

### ***Benefits of Technology Neutral Regulation***

#### ***B1 – Future-Proof Regulation***

Future-proofness is one of the most prominent characteristics that the supporters of the PTN discuss. A technology neutral approach tries to reduce or remove the need of revising regulation whenever a new technology has been developed [9], as technology neutrality allows methods to evolve with the society [34]. Technology neutral regulation can survive development and innovations in technology [6], and it has a better statutory longevity than technology-specific regulation [38]. Especially in areas and environments where rules are short-lived, technology neutral regulation may be required to ensure the longevity of the regulation [13].

#### ***B2 – Non-Discriminating Regulation and Resulting Benefits to Competition***

Numerous scholars have discussed the positive aspects of the PTN for a non-discriminating regulation and healthy competition: technology neutral legislation promotes innovation in technology and competition (see, e.g., [8, 39]). One aim of the PTN is the attempt to prevent unfair competitive advantage for existing technologies [36] and to avoid discriminating or favoring different methods or technologies [5, 36, 6, 9] to ensure equal treatment of the same services, regardless of the way of delivery [2, 10]. New possibilities of competition can be created by technology neutral regulation, as they could, e.g., reduce the risk of underutilization of spectrums [33], and technology-neutral spectrum auctions would promote competition between potential technologies on an equal basis [3]. By technology neutral regulation the technology could be used for other services, too, in addition to the already regulated purposes [33]. In addition, also the need of revising technology-specific regulation can be seen as an anti-competitive feature [9].

Competition can be encouraged, for example, by leaving room for future development, because then it is easier to develop new technologies and business opportunities [7] or to avoid regulation that is both country-specific and technology-specific, because country/technology-specific regulation hinders or even prevents international competition by being confusing and conflicting with each other [11]. Technology neutral rules can also combat market problems, such as environments where former monopoly operators continue benefiting from the market power they gained earlier [2], and they can provide predictability and consistency in the treatment of different technologies [10]. Together with flexibility (see B4), technology neutral rules can create higher investment security and lower transaction costs [1]. According to Koops et al. [37], “what holds off-line should also hold on-line” (p. 7).

### *B3 – Tackling Regulators’ Limited Understanding of the Regulated Technology*

In a spectrums context, failed policy decision on technological choices might cause lock-in of technology development and limit competition to that particular service area [5] or cause locking into an inferior standard that hinders development of new tools and technologies [4]. The PTN helps to tackle the problem that often, legislators do not possess the best knowledge on the most suitable and applicable technologies and the challenges related to forcing the markets to use a certain standard [35]. As the technologies develop fast, legislators need the market test to identify the best technologies [3].

### *B4 – Allowing for Innovation and Future Development through Flexibility and Freedom to Choose*

Technology neutral regulation provides significant flexibility as the legislator can let the governments, actors in the market and other private entities decide how they want to carry out a particular task in a way that is suitable for their needs [34, 5, 8] or which standard is the best option for them [35]. Since the legislator cannot or should not predict emerging technologies and what technologies will be in use in the future, providing flexible regulation would allow the actors to find the best options [34] to, for example, implement the most cost-effective services, irrespective of the technology that is used [12]. Technology-neutral spectrum auctions, for example, would allow flexibility by allowing the spectrum to be organized in different ways for different technologies [3].

Technology neutral legislation can allow methods/technology to evolve with society [34] and leaves room for future development. This encourages innovations and development of new business opportunities [7]. Technology neutral regulation also speeds up adoption of innovative services [12]. Technology neutral goals and principles can also make worldwide collaboration with innovations easier [11].

## ***Challenges Related to Technology Neutral Regulation***

### *C1 – Difficulties in Applying Technology Neutral Regulation Due to Uncertainty and Ambiguity*

The challenge that was addressed most often in the context of the PTN is the wording of it. Numerous scholars describe technology neutral provisions as too broad, vague or ambiguous (see, e.g., [24, 25, 39]). This vagueness/ambiguity causes challenges for both regulators and those that have to adhere to the regulation (= the subjects of the law). It leads to the law being obscure and difficult to interpret [30] or causes a low level of adoption of the new technological possibilities [32]. Vague or broad language can result in difficulties to interpret what objects/technologies are in the range of the regulation [20, 29]. Too neutral provisions and language can also cause the regulation to be meaningless [37].

Sometimes the broad language causes unsureness of how a certain technology neutral law will regulate a particular technology [25] or leaves in other ways the meaning and intent of the law unclear to the subjects of the law, causing non-transparency in the rule [39]. When rules are defined too broadly, they might need to be complemented or replaced by stricter norms, leaving unnecessary ambiguity in the legislation for a while [15]. It is also argued that to create a fundamentally technology neutral regulation, it must be specific about the technologies to which it will be neutrally applied [21].

Applying the PTN to a certain regulation requires that the legislature understands the context – and to understand that there *is* some context in the first place. However, policy makers often fail to study the context of technology at hand when enacting laws [38]. Not providing this context can lead to confusion in the creation, application and interpretation of the legal framework [22]. If there is a default of applying the PTN, this can result in very narrow and quickly outdated conflict-specific results [21]. As technology neutrality allows various uses and utilizations for particular contexts, such as spectrums, and it is not clear which technologies will be used, regulators should develop strong mechanisms to avoid harmful interference between the technologies and to ensure compatibility between them [33].

However, the fast pace of technological innovation causes difficulties for the legislators, as new innovations can challenge the neutrality of the regulation time and again. Sometimes, amendments must be made to the existing regulation to ensure that new uses of technology or business models get the same treatment as the former technology [31]. Sometimes, the legislators do not know in advance whether they want to apply certain technology neutral regulation to some new technology or not, or whether the application of such regulation to a new technology will promote or hinder the new law's policy goals [21]. If a technology definition that the PTN should be applied to is broad to begin with, it can give an unstable basis for technology neutral regulation, as it could lead to an unclear or unwanted result regarding what technology is regulated [18].

The role of the PTN is limited as long as the EU and national politicians continue talking about specific technologies, as this promotes certain technological solutions to achieve policy goals and hampers implementation of the PTN [14]. Depending on the approach the legislator has chosen, the end result can vary a lot. Craig [17], for example, has formulated three approaches to the PTN: restrictive, intermediate and expansive. Restrictive and intermediate approaches can produce very different, sometimes even contradictory conclusions about how to apply the PTN to some technology case [17].

### *C2 – The PTN is Undertheorized*

The PTN has been argued to be undertheorized, and that therefore scholars, legislators and others often are not aware enough of all the relevant aspects, possibilities and restrictions of the principle [21]. It is, for example, unclear whether PTN is a rule of law or rather a rule of thumb [28]. Ohm [38] argues that the PTN lacks theoretical definitions, and that the PTN is considered as a general principle. Lacking understanding and undertheorization leads to a situation where scholars and legislators are often too optimistic about the possibilities of PTN: they may simply assume that utilizing the PTN will lead to statutory longevity and equal treatment of old and new technologies, even though the matter is not that simple, and factors exist that weaken the possibility to achieve said goals [21]. In the context of copyright, the PTN has been criticized for being applied in a too restrictive manner in which foremost the rights of a copyright owner are protected and extended, but where changes in how technology can exploit these rights have received too little regard [17].

### *C3 – Evaluation of when the Application of the PTN is Suitable is Challenging*

Some critics of the PTN see it as a starting point or a guiding principle for regulation rather than as the end goal or as something to be treated as a main principle or default choice for technology regulation (see, e.g., [17, 38, 32]). Legislation should not always be technology-proof [34, 36]. Technology neutral regulations are not appropriate in all legal aspects, and it should be examined whether they fit the modern society and its values that are protected by the EU [26], for example. Some fields, such as information privacy, are seen to require clear and concrete technical mandates instead of just guiding principles such as the PTN, as technology neutral regulation has the risk of being “too vague or all-encompassing” [24, p. 159]. The legislators should first gain an understanding of how the technologies at hand work, are used and deployed, to be able to make an educated decision of applying the PTN to the respective technology regulation [38]. It should also be noted that over the years, a sustainable law can also lead to a situation where the interpretation of the rules has diverged for different technologies, leading to technology specificity [37].

Sometimes, technology specific regulation is necessary to ensure the effectiveness of legal norms [36, 37], and interestingly, sometimes sustaining technology neutrality might require the embedding of legal protection into innovative technological infrastructures [23]. It is even argued that discriminating different technologies is necessary to achieve the benefits of technology neutral regulation [21].

#### *C4 – Doubts whether Regulation Really can be Neutral*

Some criticism against the general idea of neutral laws and regulation has been voiced. According to some scholars, regulation and laws cannot be neutral, and technology neutral regulation should be considered as being rather an aspiration [16, 17]. Generally speaking, regulation is not meant to be neutral, and the technological ICT infrastructure that enables the law takes away the neutrality [36]. The possibility of “neutral” regulation has also been challenged by the argument that the law is already embodied by technology [23], as well as by political and social choices [32]. As each technology has its own force since it allows or inhibits certain behavior, it means also that technology is never neutral [23]. It has even been argued that neutrality itself is not neutral, and that neutrality is not only suboptimal, but also often self-defeating due to its elusive neutrality and fading normativity [21].

#### *C5 – The PTN Might Hinder Competition*

Technology neutral provisions do not provide enough guidance to the actors in the markets [24] or describe how to achieve the objectives of the PTN [14]. This reduces competition by causing uncertainty in the actors that operate in the markets, because they are not sure how certain different technologies will be treated by the law [24]. In addition, the obscureness and ambiguousness of some technology neutral terminology choices in legislation [30] can hinder competition. In the context of spectrums, it has been argued that competition can also be reduced by technology neutral regulation, e.g., by creating environments where technology neutral regulation would allow competing technologies to operate in the same area in such a way that they interfere with each other and make each other’s operations less effective. Interference reduces, e.g., the value of spectrums and makes their use less efficient. [27]

Even if a guiding and prescriptive technology neutral regulation was enacted, it is not certain that it would lead to changes in actual practices. The changes in operations/technologies that *would* be possible under a new, technology neutral regulation are not automatically suitable in practice. [35] New technology neutral regulation can also be seen as a regulatory burden for the new technology [22].

#### *C6 – Providing Technologically Neutral AND Standardized Options can Increase Enforcement Costs*

Technology neutral regulation can increase the costs of enforcing a regulation. Cohen and Koosed [34] identified this aspect in the context of public notice<sup>3</sup> regulation. The authors proposed that regulations that specify where/how public notices can be published (e.g., print newspaper, online newspaper repository) should be formulated in a technology neutral way. However, they also argued that at the same time, safe harbors<sup>4</sup> should be specified that would take into account, e.g., the demographic and socio-economic characteristics of those whom a public notice should reach. The safe harbor would present a way of acting in compliance with the technology neutral standard, while the actors could also choose their own method which would have to be in accordance with the standard. However, Cohen and Koosed [34] also argue that the implementation costs of such a technology neutral regulation could be higher than otherwise, as not all actors would decide to use the safe harbors forms of notice. The wide range of options could then cause extra costs for the reason that the notice receivers might bring suits over public notices they mistake to be inadequate. [34]

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<sup>3</sup> Public notice is a notice given to the public by a government office or legislative body regarding some legal procedures, e.g. about the possibility to comment on a law proposal.

<sup>4</sup> Safe harbor means that the regulator makes a provision in connection to a law or regulation that specifies that a certain conduct will be bestowed compliance with the applicable standard (Cohen and Koosed 2019), in other words it is stated that certain conduct will not be against the law.

### *C7 – The PTN Might be Applied by Regulators for the Wrong Reasons*

Some critique against the PTN – or against those who apply it – addresses the motivations of applying the PTN. It is claimed that often, the PTN is applied to avoid the work that would be required to address emerging technologies and how to regulate them. In other words, sometimes legislators shift the burden to the courts and administrative agencies, and those then end up with the responsibility to decide whether a law applies to a new technology. [19, 21] For example, in the UK, this delegating leaves technology-specific decisions to secondary legislation, where they do not receive as thorough examination as they would require, and this can lead to unintended or poor legislation [32]. Harasta [22] pointed out that sometimes, legislators seem to approach the PTN or the regulation of technology from the viewpoint that *avoiding* the regulation of technology is one way to keep up with countries that have less strict regulation for technology or non-existing regulation.

### **Summary of Results**

The PTN, and the benefits and challenges related to the PTN, have been addressed in a number of technological contexts (see Table 1), with the most common ones being spectrums (e.g., for 3G or DySPAN technologies), blockchain and distributed ledgers, electronic signatures and e-identity, and copyright. In addition, several articles [see 15, 17, 21, 23, 36, 37, 38] were focused more generally on a discussion of benefits and/or challenges of technology neutral regulation.

Based on our scoping review, technology neutral regulation is seen to be potentially beneficial in the context of electronic signatures [7, 8], copyright law in cyberspace [10], digital infrastructure policy [11], and digital convergence [13]. Most prominent were the benefits identified in relation to spectrums regulation: B1 - Future proof regulation [9], B2 - Non-discriminating regulation and resulting benefits to competition [1, 2, 3, 5, 9, 33], B3 – Tackling regulator’s limited understanding of the regulated technology [3, 4, 5, 35] and B4 – Allowing for innovation and future development through flexibility and freedom to choose [3, 5, 35]. Only C1 – Difficulties in applying technology neutral regulation due to uncertainty and ambiguity [33] and C5 – Negative effects on competition [27, 35] have been identified as challenges in the context of spectrums regulation. Also in the context of telecommunication regulation and broadband policy the same benefits (except B3) and challenges have been identified [14, 18].

In contrast, technology neutral regulation has been identified to be potentially challenging in the context of e-identity [32], e-commerce [30], information privacy regulation [24], regulation of access to traffic data [19], sponsorship disclosure law [20], artificial intelligence [22], and digital goods regulation [26].

### **Discussion**

Regulation has an impact on IS phenomena and on the development, adoption and use of information technology (Bernardi et al. 2017; Klecun-Dabrowska and Cornford 2000; Väyrynen and Lanamäki 2020). Nevertheless, research on the regulation of IT/ICT has been scarce in the IS field (e.g., Gozman et al. 2020). While the principle of technology neutrality (PTN) in regulation is being widely applied by regulators in Europe and elsewhere (e.g., European Commission 2019; Kim 2019; Koulu 2016), the IS community has not yet addressed this important topic (with the notable exception of Escudero-Pascual and Hosein 2004), and the benefits and challenges of technology neutral regulation have been discussed foremost in legal research outlets, as our scoping review indicates. Our contribution with this review is twofold: first, we introduce some of the benefits and challenges of technology neutral regulation to the IS community. The regulation of IT is an emerging and important topic in IS research, and we believe that also the PTN is becoming more and more important, especially considering attempts to create flexible regulation to allow for future technological innovation (e.g., Kamecke and Körber 2008). Second, we identify three themes and related research questions (this is not an exhaustive list) that provide directions for future IS research on the regulation of IT/ICT, see Table 2.

**Research Theme 1** (see Table 2) is the technology neutral regulation of specific ICT. We found that while technology neutral regulation has been seen beneficial for the regulation of some technologies, for other contexts there has been a focus on the challenges (see Section “Summary of Results”). This points towards the importance of the context in which technology neutral regulation is being applied, which also has been pointed out by previous research (e.g., Hojnik 2017; Ohm 2010). However, there is also division regarding whether technology neutral regulation is seen as beneficial or not in a *specific* technological context: research on spectrums and on blockchain, for example, have emphasized both benefits and challenges of technology neutral regulation (see Table 1). This warrants further investigation of the circumstances under which technology neutral regulation should be considered in the context of a specific technology or group of technologies. However, with the exception of papers addressing spectrums, our review only included one or two research papers for each different technology regulation contexts. Therefore, while our review gives a good general overview of the different benefits and challenges of applying the PTN to ICT regulation, it does not allow us to make strong claims regarding whether or not the benefits of applying the PTN for regulation of a *certain* ICT would outweigh the drawbacks. This opens possibilities for future IS research to contribute to our understanding of technology neutral regulation in different ICT contexts. For example, the PTN has – on a hypothetical level – been proposed as a potential approach to address challenges of Artificial Intelligence (AI) regulation (see Kerkimäe and Pärn-Lee 2020). However, how to regulate AI technology neutrally, and what the effects of such a regulation would be, has not yet been studied. The same is true for other ICT contexts.

**Research Theme 2** concerns the effects of technology neutral regulation on innovation, development, adoption and use of technology (see Table 2). The benefits of technology neutral regulation for innovation and future development through flexibility and freedom to choose has been proposed for numerous different ICTs (see B4 in Table 1). However, legal uncertainty might follow from a technology neutral regulation (Marcinauskaitė et al. 2020). Legal uncertainty, in turn, can negatively affect organization’s adoption of technological innovation (e.g., Demlehner and Laumer 2020). Future IS research should investigate this contradiction in depth.

**Research Theme 3** concerns the theorization of the PTN. Our review directly pointed towards an undertheorization of the PTN (e.g., Craig 2016; Greenberg 2015; Mangano 2018; Ohm 2010). We believe that by addressing Research Themes 1 and 2, IS research also can eventually make a valuable contribution to the theorization of the PTN by stepping up from investigation of specific technology neutral ICT regulation to identifying more generally parameters and conditions that affect the outcomes (e.g., innovation; development, adoption and use of technology) of technology neutral regulation. Also, when comparing the benefits and the challenges we identified, we found contradictory indications of whether the PTN supports or hinders fair and healthy competition. Through our scoping review, we also found that benefits/challenges refer to different actors: the regulator, and the “regulatory subjects” who have to abide by a regulation/law (e.g., technology organizations developing and organizations adopting new technology). For the regulator perspective, future research could study the benefits of the PTN (i.e., to overcome the problem that regulators often have only a limited understanding of the technologies they seek to regulate) versus the problem arising if regulators apply the PTN “too easily” to avoid the need to dive deep into technical details. For the “regulatory subject” perspective, future research could focus on the benefits of technology neutral regulation for those who want to develop, bring to the market or adopt new technological innovations versus a potentially resulting sub-optimal market situation from the perspective of consumers. The vagueness and ambiguity of technology neutral regulation (see C1) and resulting challenges are relevant for both regulators and regulatory subjects.

In regard to many of the questions presented in Table 2, one possible approach would be a comparison of the regulations of a certain ICT in different countries (e.g., technology neutral vs. technology specific regulation) coupled with an evaluation of the effects of these regulations on technology innovation activities, or on adoption and use of technology.

**Table 2. Possible Research Themes and Exemplary Questions for Future IS Research**

<p><b>Theme 1: Technology neutral regulation of specific ICT (e.g., AI, blockchain, ...)</b></p> <p><b>1a:</b> Under which conditions should a technology neutral (technology-specific) regulation formulation be considered in the context of a specific ICT?</p> <p><b>1b:</b> What are the benefits and drawbacks of technology neutrality in the regulation of a specific ICT?</p> <p><b>1c:</b> For what types of technologies is a technology neutral regulation more (less) beneficial than technology specific regulation, and why?</p> <p><b>1d:</b> What are the factors that determine whether technology neutral or technology specific regulation is more beneficial in the context of a specific technology (type)?</p> <p><b>1e:</b> What are the challenges involved in the formulation of future-proof regulation for a specific ICT?</p>
<p><b>Theme 2: Effects of technology neutral ICT regulation on innovation, and on development, adoption and use of technology</b></p> <p><b>2a:</b> What are the impacts of technology neutral regulation vs. technology-specific regulation on technological innovation (potentially in a specific industry)?</p> <p><b>2b:</b> What factors influence whether a technology neutral regulation is beneficial for future technological innovation or not?</p> <p><b>2c:</b> What are the impacts of technology neutral regulation vs. technology specific regulation on the development, adoption and use of technology?</p>
<p><b>Theme 3: Theorization of the principle of technology neutrality</b></p> <p><b>3a:</b> What are the parameters that should be considered when evaluating the suitability and effects of a technology neutral ICT regulation formulation?</p> <p><b>3b:</b> Under what conditions is technology-neutral ICT regulation beneficial for market competition?</p> <p><b>3c:</b> What are the challenges related to developing “future-proof” regulation and how to overcome them?</p> <p><b>3d:</b> Under what circumstances (e.g., regulated technology, intended outcome of the regulation) does the PTN provide benefits merely to the regulator (or the regulatory subjects), and why?</p>

## Conclusion

With this scoping review, we identified several benefits and challenges that are related to technology neutral regulation and the PTN. With this, we hope to provide the IS research community with a first basis for taking up this important and current topic related to the regulation of ICT.

In addition to implications for research in form of the directions for future IS research we have identified in the discussion above, our research also has practical implications. For regulators, it is clear that applying the PTN to regulation in an overoptimistic manner without comprehensive enough understanding of the technological context or the features of the PTN can lead to an unwanted situation, where the PTN is expected to solve technological challenges the regulator would otherwise have to solve themselves when drafting the regulation. However, the PTN is not a miracle solution and applying it requires careful planning and research, just as “the normal”, technology-specific regulation does. It is also necessary to examine what exactly is the beneficial impact of the PTN that the regulator aims to achieve.

Our research has several limitations, which also open possibilities for future research. First, this review was not conducted as a systematic literature review, and thus not all relevant literature that might provide information on the benefits and challenges related to the PTN and technology neutral regulation has been identified. In addition, even though we have identified the general context of ICT regulation that the articles referred to, we did not conduct a systematic analysis of whether certain benefits or challenges are specifically relevant in certain technological contexts. We limited our review to academic articles, and the inclusion of other types of sources (such as book chapters) might have revealed additional insights. However, our scoping review gives some indication that a systematic literature review would be beneficial and called for. This would then also allow a systematic analysis of regulator vs. regulatory subject point-of-view, of the benefits vs. challenges of the PTN in the context of different,

specific technologies, and the provision of more detailed directions for future research (for also other than research fields than IS, e.g., legal research).

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