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ABOUT US

The **International Journal of Digital and Data Law / Revue Internationale de droit des données et du numérique (RIDDN)** is an academic journal created and edited by Irène Bouhadana and William Gilles at IMODEV, the Institut du monde et du développement pour la bonne gouvernance publique.

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REGULATING NEW TECHNOLOGIES IN THE DIGITAL ECONOMY: WHEN AND HOW?

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According to Klaus Schwab, the transformation of the analog to digital world is what constitutes the 4th Industrial Revolution. For the author, the main characteristics of this social transformation are its speed, breadth and depth and systemic impact - which, after all, changes not only what and how we do things, but also who we are[1]. The advancement of technologies will increasingly demand that the State be aware of the changes that occur in society: the 4th Industrial Revolution is underway and that means a transition towards new systems built under the influence of the digital revolution[2]. In view of this constant technological progress, how will the State adapt to this new reality?

The Law, as a regulatory instrument for different sorts of relations in society, is obliged to act in this environment. However, new technologies require a new perspective from regulators and from the legal doctrine, as they do not fit into the traditional categories of Law[3]. It is necessary to rethink the economic regulation that is linked to the territorial aspect, since globalization has already evidenced the crisis of the state model[4]. In this perspective, the regulatory aspects that link the cross-border flow of information and trade in services require a thorough review to establish a more convenient and responsible format to face the disruptive impact of the development of new technologies, both in guaranteeing the fundamental rights of citizens, see the provision of public services,

[1] K. SCHWAB, *A quarta revolução industrial*, Trad. Daniel Moreira, São Paulo, Edipro, 2016. p. 13.

[2] About the 4th Industrial Revolution, also see: T. PIAIA, B. COSTA, M. WILLERS, "Quarta revolução industrial e a proteção do indivíduo na sociedade digital: desafios para o direito", *Revista Paradigma*, Ribeirão Preto, Vol. 28, No. 1, p. 122-140, jan./april 2019.

[3] P. BAPTISTA, C. KELLER. "Por que, como e quando regular as novas tecnologias? Os desafios trazidos pelas inovações disruptivas", *RDA – Revista de Direito Administrativo*, Rio de Janeiro, Vol. 273, pp. 123-163, sept./dec. 2016.

[4] E. BITENCOURT NETO. "Transformações do Estado e a Administração Pública no século XXI", *Revista de Investigações Constitucionais*, Curitiba, Vol. 4, No. 1, pp. 207- 225, jan./april 2017.

such as the stability of trade and diplomatic relations between nations[5].

Therefore, it is necessary that the Law evolve symbiotically with technology, so that it does not only modify the behavior of society, but so that it can also modernize the existent legal structure[6]. This is, therefore, the rationale that must guide the legal perspective - and, in this case, in particular, that of the regulator – to the current technological environment.

This paper intends to discuss the matter of the 4th Industrial Revolution in regard of the effects of digital economy in today's society. The biggest problem the study seeks to address is how regulators must face the continuous process of technological advance. To do that, its proposed to discuss to main questions: when to regulate new technologies and when to regulate them. The conclusion has a positive takeout. If planned, the gathering of data and information in different sectors of the economy affected by the revolution of technology could help facilitating the regulators' work.

§ 1 – THE DISRUPTIVENESS OF DIGITAL ECONOMY

Law, as a tool that reinvents itself from time to time, whether by the political or economic model of a nation, has as one of its roles that of operationalizing social changes and guaranteeing, in a democratic State, legal security (or legal certainty). In view of the bureaucratic scenario of Western societies, Law can be understood as a decision-making and power instrument[7]. Leonardo Coelho Ribeiro defends the assimilation of Law as a social technology that organizes means to achieve socially desired ends, which demands an instrumentalizing relation[8]. Therefore, the legal science (that studies the Law) must, within a scenario of advancing technology and asymmetry between practical and legal mechanisms, reinvent itself.

Currently, this technological advance has been "appropriating" different sectors of the economy and imposing a constant digitalization in people's lives. It is a process defined as the business transition through the use of digital technologies, products and

[5] R. Castellanos, "Ejercicio del poder regulatorio en materia de inversiones relacionadas com la economía digital", *Con-texto – Revista de Derecho y Economía*, n. 51, jan./jun. 2019, pp. 115-126.

[6] D. TOFFOLI. "Prefácio", in R. Fernandes, A. Carvalho (dir.), "*Tecnologia jurídica & direito digital: II Congresso Internacional de Direito, Governo e Tecnologia*". Belo Horizonte, Fórum, 2018.

[7] T. FERRAZ JUNIOR, *Introdução ao estudo do direito: técnica, decisão, dominação*, São Paulo, Atlas, 2010. p. 2.

[8] L. RIBEIRO, "A instrumentalidade do direito administrativo e a regulação de novas tecnologias disruptivas", in R. Freitas, L. Ribeiro, B. Feilgelson (dir.), *Regulação e novas tecnologias*, Belo Horizonte, Fórum, 2017. pp. 62-64. According to the author, legal instrumentalism, therefore, leads to the perception of Law as a social institution, being, in short, a method of analysis of legal architecture that can help to build the most capable strategies to affect the desired purposes, because it is from an instrumental view of law that it becomes possible to assess whether a strategy will be successful, and what can be done to improve it in this regard.

services, which increasingly explore new trends in intersectoral digitization, including influencing several traditional economic actors[9]. The digital economy - which is continuously evolving, due to constant technological development - can be associated with a greater use of advanced robotics, artificial intelligence, Internet of Things, cloud computing, big data analysis and three-dimensional printing[10].

The digital economy is becoming increasingly inseparable from the functioning of the economy as a whole. According to the United Nations, the different technologies and economic aspects of the digital economy can be divided into three major components that characterize it: (i) its fundamental aspects, such as fundamental innovations (such as processors), its core technologies (computers and telecommunications devices, for example) and their enabling infrastructure (the case of the Internet, for example[11].

As it is a digital revolution in constant change, the doctrine differs in relation to its concept. Knichrehm, Berthon and Daugherty define the fundamentals of the digital economy in broader terms, suggesting that this is the share of total economic output derived from a series of digital investments. These investments include digital techniques, digital equipment (hardware, software and communication equipment) and intermediate digital goods and services used in the production of goods and the provision of services[12]. By their turn, Erik Brynjolfsson and Brian Kahin, from a broad approach to the concept, understand that the digital economy encompasses all the ways in which digital technologies are spreading across the economy[13]. Nonetheless, Rumana Bukht and Richard Heeks understand it as the part of economic production derived solely or mainly from digital technologies with a business model based on digital goods or services[14].

In this context of technological development and digitalization of the world, the idea of "disruptive innovation" arises. There are the ones which open the market for the participation of new agents using relatively simple solutions and allow new companies to gain economic strength to the point of competing with traditional

[9] S. BRENNEN, D. KREISS. *Digitalization and digitization*. 2014 [http://culturedigitally.org/2014/09/digitalization-and-digitization/]. (accessed 11 september 2020).

[10] UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT, *Digital Economy Report 2019*, september 2019 [https://unctad.org/en/PublicationsLibrary/der2019_en.pdf]. (accessed 26 september 2020).

[11] *Ibidem*.

[12] M. KNICKREHM, B. BERTHON, P. DAUGHERTY, *Digital disruption: the growth multiplier* [https://www.accenture.com/_acnmedia/pdf-14/accenture-strategy-digital-disruption-growth-multiplier-brazil.pdf]. (accessed 25 september 2020).

[13] E. BRYNJOLFSSON, B. KAHIN, *Understanding the Digital Economy*, Cambridge, Massachusetts Institute of Technology, 2002.p. 33-35.

[14] R. BUKHT, R. HEEKS. "Defining, conceptualising and measuring the digital economy", *Manchester Centre for Development Informatics Working Paper* No 68, 2017 [https://diodeweb.files.wordpress.com/2017/08/diwkppr68-diode.pdf]. (accessed 16 june 2020).

companies.[15] This means that disruptive technologies change economic processes and present a new market scenario, that is, they revolutionize the standard format of products for a specific sector of economic activity[16]. These "disruptive situations" promote changes in the market by moving away from the old logic of the sector, consolidating in the medium and long term[17]. And this is the scenario that is currently experienced, in which new business models challenge those already established.

According to the Organization for Economic Cooperation and Development, disruptive innovations have two possible characteristics (that can both coexist or not). First, they must present something beyond an incremental change, such as a drastic change in the market, with serious consequences for the agents hitherto established (which is the case of the impact of the iPhone, produced by Apple, in relation to the devices produced by Nokia in the past decade). Second, they must offer new business models and not just new products (as is the case with Airbnb, a new architecture for renting accommodation, compared to traditional real estate)[18].

The transformation of markets (between creating new ones and changing old ones) is carried out extremely quickly. New economic agents, the "disruptors", appear to promote changes overnight. According to Larry Downes and Paul F. Nunes, disruptive agents are able to achieve the three values of business discipline: low cost, constant innovation and offering product customization to users[19]. This happens, as the authors state, due to three characteristics: (i) free development, reflected in the fact that these services often use a third party structure to make their products available; (ii) unrestricted growth, as the creation of new platforms and ways to offer the same product are faster; and (iii) undisciplined strategy, based on the argument that "disruptors" achieve, as soon as they enter the market, a better performance at a lower cost and with greater customization of the service - which, according to the authors, allows them to compete, right when they enter the market, with the traditional economic agents in the sector[20].

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[15] C. CHRISTENSEN, M. RAYNOR, *Innovator's solution: creating and sustaining successful*, Boston, Harvard Business School Press, 2003. pp. 32-40.

[16] K. ZHU. "Internet-based distribution of digital videos: the impact of the motion picture industry". *Electronic Markets*, Vol. 11, No. 4, pp. 273-280 [https://ssrn.com/abstract=526582]. (accessed 31 august 2020).

[17] E. MOREIRA, "Situações disruptivas, negócios jurídico-administrativos e equilíbrio econômico-financeiro", in R. FREITAS, L. RIBEIRO, B. FEILGELSON (dir.), *Regulação e novas tecnologias*, Belo Horizonte, Fórum, 2017. p. 223. According to the author, this is the case with laptops, desktop publishing, cameras and compact discs (CDs).

[18] ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. *Hearing on disruptive innovation*. 2015 [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP(2015)3&docLanguage=En]. (accessed 25 may 2020). According to the organization, it is not necessary that the economic agents are new, that is, a company already established in the market may present a disruptive innovation.

[19] L. DOWNES, P. NUNES, "Big Bang Disruption", *Harvard Business Review*, mars 2013, pp. 44-56. [https://ssrn.com/abstract=2709801]. (accessed 02 september 2020).

[20] *Ibidem*.

The scientific advance of the 21st century allowed society to create new products and goods that, over time, started to transform people's daily lives and allowed a series of services to be used with greater agility and fluidity[21]. As a consequence of the digital context of production, storage and consumption, there is a new ecosystem in every sector of economy, characterized by the emergence of actors that offer disruptive business models, enabling the existence of a competitive environment and difficult regulation by the responsible agencies.[22]

§ 3 – THE COLLINGRIDGE DILEMMA: WHEN TO REGULATE?

One aspect of technological innovation that is important from a regulatory point of view is the so-called Collingridge dilemma. It teaches us that, at an early stage of technology development, regulation is problematic due to a lack of information about the likely impact of the technology. On the other hand, at a later stage, regulation is also problematic, because technology would become more diffuse in society, making the implementation of any changes required by regulators costly and less effective[23]. Faced with this dilemma, the question is: when to regulate? Although not all new technology results in a Collingridge dilemma[24], this "uncertainty paradox" forces regulators to make decisions in the absence of reliable information or prior knowledge of technological developments.

There is no doubt that technological development has an impact on Law. In view of the existence of new scenarios and new possibilities, there is an increase in uncertainty in the application of previous laws and in their ability to deal with the new technological reality - this process may even make legislation obsolete. While changes in what people do, as well as changes in their capabilities, that is, social changes, have the potential to raise questions about the applicability of the law, most social changes have less impact on the law than changes technological.[25]

However, the question remains: when to regulate something that does not exist? In principle, there is no reason (unless the future can be predicted) to worry about whether this hypothetical product

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[21] A. VIANA, L. KREUZ. "Admirável mundo novo: a Administração Pública do século XXI e as tecnologias disruptivas", *Interesse Público – IP*, Belo Horizonte, a. 20, No. 110, pp. 51-68, jul./ago. 2018.

[22] B. BACCARNE, T. EVENS, D. SCHUURMAN. "The television struggle: an assessment of Over-The-Top television evolutions in a cable dominant market", *Communications & Strategies*, No. 92, pp. 43-61, december 2013 [https://ssrn.com/abstract=2473955]. (accessed 21 september 2020).

[23] For a deeper understading ot the Colligridge Dillema, see: D. COLLINGRIDGE. *The social control of technology*., New York, St. Martin´s Press, 1980.

[24] In analyzing David Collingridge's doctrine, Lyria Bennett Moses argues that only where there are regulatory gaps, associated with new damage or potential risks, Collingridge's dilemma explains the difficulties of regulatory timing. See: L. MOSES, "How to think about law, regulation and technology: problems with 'technology' as a regulatory target", *Law, Innovation and Technology*, Vol. 5, No. 1, pp. 1-20, 2013.

[25] L. MOSES, "Why have theory of Law and Technological Change?", *Minnesota Journal of Law, Science & Technology*, Vol. 8, No. 2, pp. 589-606, 2007.

or service should be allowed, prohibited, required or encouraged, since it does not exist. These issues arise when technological innovation is conceived, developed and disseminated in society. The problem is that (and therein lies the heart of the matter) when a certain technology is already propagated in society before any legal provision, it calls for more urgent action by regulators.

It seems to be a human tendency to increasing technological dependence, which grows as fast as technology advances. The nature of social or technological paradigms is so unstable, since it is in a constant process of renewal, that it is difficult to reflect on its changes, unless it is seen in retrospect[26]. In this scenario, it is necessary that the legislation be updated as soon as possible to cover the new realities, which can also lead to a series of regulatory difficulties, legal adaptation to innovation and compliance with the rules by society, which gets more difficult given the level of diffusion of technology.

There may be partial solutions to this problem. On the one hand, there is no way to predict the future of a technological enterprise, much less how society will behave and deal with innovation in their daily lives. On the other hand, the perspectives of a given technological change can be studied through: (i) analysis of specialists (in technology and the market and sectors involved); and (ii) comparing with other countries, thus improving the regulators' know-how to manage different types of uncertainties. Still, a measure that can be fruitful is the holding of consultations and public hearings that debate the theme of regulation of a given innovation with civil society - those who will effectively use the new technologies.

Thus, having information and data, it is possible for regulators, initially, to express legal obligations and determinations in broad terms to aim at the gradual adaptation of innovation. In this way, they can then, when the technology is already widespread in society, adopt a particular approach to deal with the problems arising from the use of the new technology[27].

Therefore, assessing the feasibility of carrying out these measures, alone or in combination, and analyzing their results, can help guide public policy-making processes in new technological contexts. No theory about Law and Technology will answer all legal questions about all technologies. This is impossible, as innovation has different characteristics in different sectors of the economy and result in different applications in society (such as nanotechnology and Information and Communication Technology). In any case, it seems correct to argue that the existence of general rules, although with a certain specificity for each technology, may offer, at first,

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[26] A. UL HAQ, *Technology Regulation: Pre-Emptive or Symptomatic?*, July 2017 [https://ssrn.com/abstract=3065407]. (accessed 25 august 2020).

[27] L. MOSES, "How to think about law, regulation and technology: problems with 'technology' as a regulatory target", *Law, Innovation and Technology*, Vol. 5, No. 1, pp. 1-20, 2013.

some insights for interested economic agents and perhaps give them legal certainty to operate in the sector.

§4 – THE TEN DIMENSIONS OF STUDYING REGULATORY POLICIES FOR TECHNOLOGY: HOW TO REGULATE?

According to Bert-Jaap Koops, to research technology regulation, it is necessary to determine the coordinates of regulatory policy from ten different dimensions, related to: (i) the type of technology; (ii) the type of innovation; (iii) the place; (iv) time; (v) the type of regulation; (vi) the normative perspective; (vii) knowledge about the technology; (viii) the scientific discipline of interest; (ix) the problem; and (x) framing the problem[28].

The first and most obvious dimension is the type of technology to be regulated. Since the term "technology" refers to the wide range of tools, different technologies can be the focus of the research and, obviously, the questions raised by a particular development in technology depend a lot on the character and the level of abstraction of the technology in question.

The degree of innovation is also a relevant dimension in technology regulation research. The most well-known technology applications, which do not present great news to the sector, will normally fall within the scope of existing legislation and regulatory instruments, in contrast to disruptive innovation. This dimension differs from the first since the type of technology is, in principle, independent of how innovative it is.

An obvious dimension to the regulation of technology, even because it is the most associated with our understanding of space, is place. Where a technology is developed or used, in what environment, in what type of organization - all of these are relevant factors for assessing the implications of a given technology. Even though globalization and the increasingly international organization of science and technology imply that technological innovations are accessible around the planet, this does not mean that technologies evolve in a global 'techno-space' without local, national or regional geographic components.

According to Koops, time is the fourth dimension in the technology regulation research space - both for technology and for regulation. To a large extent, this dimension corresponds to the time cycle of technology development: from fundamental science to applied science, and from research and development, through product development, marketing and product use. The various stages of technology development involve different regulatory issues.

The fifth dimension is the type of regulation. At this point in the research, it is understood that the different types of regulation can

[28] The complete analysis of Koops can be accessed on: B. KOOPS, "Ten dimensions of technology regulation. Finding your bearings in the research space of an emerging discipline", *Tilburg University Legal Studies Working Paper Series*, No. 15, 2020 [http://ssrn.com/abstract=1633985]. (accessed 30 july 2020).

change the focus given to the study. For Koops, this dimension is important because it is relevant for research involving technological regulation to be interdisciplinary - discussing themes of legal theory, political science, public policies, law and economics and administration, among others.

The next dimension refers to the normative perspective, since the regulation of technology does not occur in a neutral vacuum. On the contrary, since efforts are concentrated to influence people's behavior, the normative elements come into play as something natural. In this sense, the central objective of regulation - which will always be of a normative nature to a greater or lesser degree - falls within the previous dimension, since it is an integral part of the type of regulation. Although the purpose of regulation goes far beyond established norms, it is the normative perspective that implicitly underlies or fuels technology regulation.

The knowledge dimension is the seventh in the Bert-Jaap Koops doctrine - understood separately from the dimension of normative perspectives. The latter focuses on knowledge at a meta-level, while the dimension of knowledge deals with its substance. This means that it understands what we know and how much (or how little) about a technology and its effects, on certain regulatory aspects or on some instance of technology regulation.

The discipline or field of research itself is the eighth dimension of technology regulation. As it is a vast area of research and it absorbs a variety of themes, the disciplines of academic research are spread out. That being said, the author understands that the regulation of technology can be researched from all types of disciplinary perspectives, such as governance studies, ethics, policy studies, public administration, political science, economics, media studies, communication theory, psychology, sociology of technology, philosophy of technology, cybernetics, information theory, systems theory, robotics, genetics, neuroscience and so on.

Research on technology regulation is not random, always seeking to address a particular issue - a theoretical or practical problem. In this sense, a crucial dimension of the research space is, therefore, the definition of the problem. The definitions of the problems when researching this matter vary, therefore, from the understanding of a phenomenon to the solution of a technological difficulty. Likewise, the resulting research involves approaches that range from the purely descriptive, through the analytical, to the normative.

The last dimension to research in the sphere of technology regulation, according to Koops, is the framing of this problem. The way the problem is going to be addressed is influenced by a wide range of factors that will influence the researcher to open or restrict the research "window" on technology regulation.

These dimensions are certainly helpful to scholars and to regulators that face the problem of how to regulate new technologies. It is certainly not the only measure that should be put into display to deal with the disruption of innovations, but, with the right

approach, if all these ten dimensions could be appropriately discussed, the informational asymmetry would be minor, what would facilitate positive and effective regulations.

Therefore, the Public Administration must monitor market fluctuations and changes in technological components so that, thus, it can carry out periodic regulatory reforms, in a planned manner and considering the interests involved[29]. When it comes to technological advancement, the future is uncertain. Technologies tend to break out constantly, drawing new models and creating different ways to offer a product. However, if on the one hand, it is up to the Public Authorities to create the bases for the promotion of research and technological development at business levels[30], on the other hand, it is up to the Law to provide security, predictability and certainty for economic activity in the face of state intervention[31].

CONCLUSION

The present article discussed the impacts of the digital economy on the regulation of technological innovations. The definition of digital economy was analyzed in order to conclude what are the effects of technological disruption in the different sectors of the economy with regard to the paradigm break caused by traditional regulation. Thus, it is possible to conclude that the Law - and especially Public Law - must be remodeled so it could act as an efficient tool to deal with new technologies and its consequences regulatory-wise.

The logical consequence of technological evolution and the emergence of more constant disruptive innovations is that public regulatory policies become obsolete, which implies a necessary revision of the regulatory approach in the face of technological development.

In the scenario, the problem of technological regulation was investigated from two simple questions: when to regulate and how to regulate? The first question was analyzed using the Collingridge Dilemma to demonstrate that regardless of when regulation is implemented, there may be difficulties in complying with it. To answer his question, we commented on the ten dimensions for the development of regulatory policies for technologies.

What can be concluded in this research is that these two questions – when and how to regulate – are essential for any regulatory action that aims to establish standards for the use of disruptive technologies. The establishment of pros and cons to determine the opportune moment for regulation and the collection of data to

[29] S. GUERRA. *Discricionariedade, regulação e reflexividade: uma nova teoria sobre as escolhas administrativa*s, 4th edition, Belo Horizonte, Fórum, 2017. p. 141.

[30] M. SILVA, *Inovação, transferência de tecnologia e concorrência: estudo comparado do direito da concorrência dos Estados Unidos e da União Europeia*, Coimbra, Almedina, 2003. p. 52.

[31] B. TAMANAHA, *The Primacy of Society and the Failures of Law and Development: Decades of Stubborn Refusal to Learn* [http://www.lawschool.cornell.edu/research/ilj/upload/tamanaha-final.pdf]. (accessed 13 april 2020).

support public policies are critical to reduce informational asymmetry. This would make the task of regulators more predictable, which could guarantee greater legal security for economic agents.

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