I

SECTION

Legislative Support for the Development of the World Economy in the 21st Century. Directions, Technologies, Resources

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Legislative Support for the Development of the World Economy in the 21st Century. Directions, Technologies, Resources

The report draws on a wide range of case studies dealing with technological development and legal regulation in different states against the backdrop of new technology-driven challenges*.

The report aims to reveal the role of the proactive approach to legislation in order to ensure sustainable economic development, to use specific examples in order to demonstrate a variety of approaches to regulation, to highlight specific challenges to deal with while responding to thechanging technological environment, and to discuss possible principles and instruments of new regulation.

The report includes a brief analysis of the world economic situation with emphasis on global technology trends and an account of their influence on various aspects of socio-economic processes.

The report shows the controversial nature of new technologies and highlights the need for proactive law.

Important technology trends in various economic sectors are identified to evaluate possible scenarios and challenges to developing regulation, with cases from different states contrasted and merits and demerits of different approaches to regulation highlighted. Some of the trends under consideration are those essential for breakthroughs in various economic sectors ("cross-sectoral"). Consider the regulation of artificial intelligence. In the other cases considered markets have been dynamically evolving. They include the regulation of the cryptocurrency market, the unmanned vehicles market, and the agtech market.

The regulation in education is also studied since it is the development of human resources which lays the basis for progress and emerging responsible technology.

The analysed cases and challenges to regulation allow working out the necessary common framework for new regulation, which is vital amid rapid change, highly unpredictable implications, and the close overlap between economic aspects and social and ethical ones.

It is proposed to learn from international experience of soft regulation, which involves horizontal policies and consensus documents, and to develop the common framework to regulation.

It is suggested to draw on the experience of setting up regulatory sandboxes to swiftly and conveniently try bringing in new rules, adjust them to the changing situation, and attract potential investors to new technology sectors.

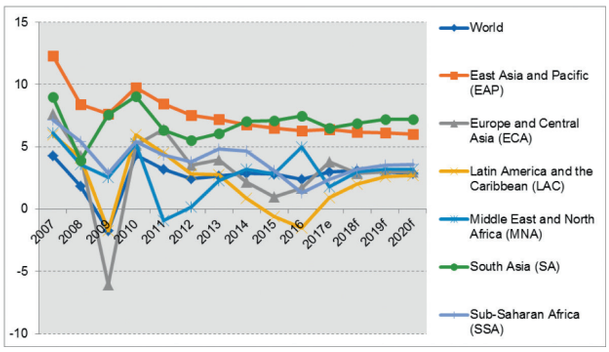
The final proposal is to use the legislative foresight mechanism to systemically change the regulation, make it pro-active and secure a consensus among the parties involved.

* The report is compiled by leading experts from a range of departments of National Research University Higher School of Economics, including the Center of Development Institute, the Institute for Statistical Studies and Economics of Knowledge, the Skolkovo— HSE Institute for Law and Development, Institute of Legal Regulation, the Institute for Transport Economics and Transport Policy Studies, and the Institute of Education and the Institute of Education of National Research University Higher School of Economics. Authors: V.Mironov, A.Sokolov, J.Radomirova, T.Meshkova, I.Moiseichev, M.Karlyuk, A.Dupan, Y.Bikbulatova, K.Molodyko, M.Bashkatov, E.Galkova, M.Blinkin, A. Ryzhkov, A. Ivanov, D. Katalevsky, S. Yankevich, N. Knyaginina, Y. Simachev.

World economic development amid technological challenges: New demand for legal regulation and individual practices

1. Peculiarities of Global Economic Development and Role of Technology

The global GDP growth in 2017 was 0.3 to 0.4 percentage points above the projections made early this year. It is estimated by the World Bank to have picked up from 2.4 percent in 2016 to 3[1] percent in 2017. The global economy is expected to grow by about 3 percent over the next three years, while growth in EMDEs is expected to reach 4.5 to 4.7 percent (Fig. 1.1).



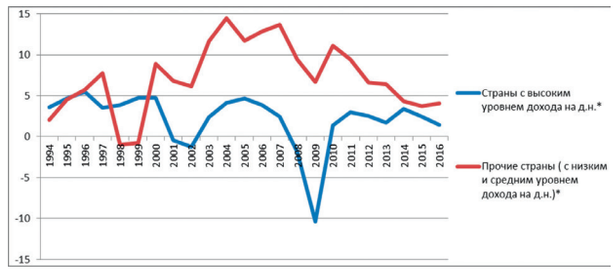
Source: *World Bank (WDI Database; Global Economic Prospects, 2018)*

Figure 1.1. Real GDP growth by region and in the world, % (based on the World Bank data)

Despite the upturn of the economy in 2017-2018, a decade after the global financial crisis, *GDP growth rates have not returned to the pre-crisis level and are unsustainable in most states*. There are concerns that the global economy may be stuck in the low-growth trap for a while as growth rates will slow down in developed countries due to aging populations, as well as the steadily modest growth in investment in fixed assets and slow productivity in recent years (at least according to official data).

The post-crisis period and the past three decades in general have been characterized by the *long-term slowdown in productivity growth*[2] in both advances economies and EMDEs despite the boom in new technologies, evolving global value chains, and increased investment in human capital (through education and healthcare). The slowdown is accompanied by lower investment rates, which is particularly apparent in EMDEs (Fig. 1.2).

The lower production levels caused by outdated production facilities and *the ever-less favourable impact of previous technological innovations on the world economy*. The slowdown in knowledge-based capital accumulation, the reduced number of new enterprises, and the smaller contribution of ICT and total-factor productivity to GDP growth have also caused some concern over the last decades.



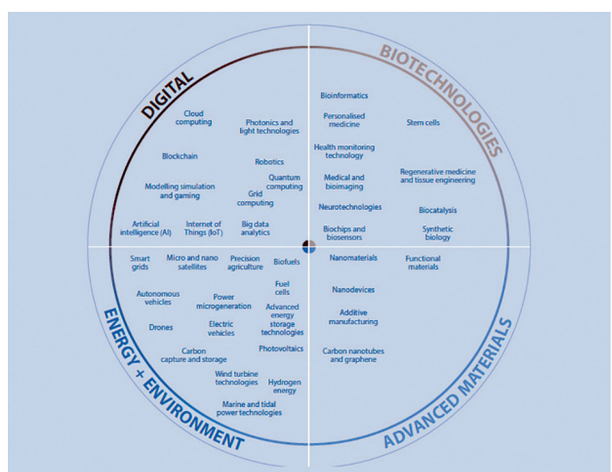
*) The WB classification of states in accordance with their income per capita is used.

Source: *World Bank*

Figure 1.2. Growth rate of investment in fixed assets in advanced economies and EMDEs (%)

Amid the existing challenges (or maybe due to them), *new trends have been emerging in the global economic - first and foremost, technological - development*. Many experts attribute large-scale technological shifts to the fourth industrial revolution, which results in dramatically changing economic sectors[3].

Key technologies (Fig. 1.3), including ICT, artificial intelligence, advanced manufacturing technologies, and biotechnologies, are cross-sectoral and provide the basis for developing numerous technologies and sectors.



Source: *OECD Science, Technology and Innovation Outlook 2016.*

Figure 1.3. Key and emerging technologies

Dealing with key technologies, which will shape the digital economy and the transition to the fourth industrial revolution, experts point to the following trends:

[1] The IMF estimated that global GDP growth reached 3.8 percent in 2017. The discrepancy stems from the difference in methods. The World Bank uses constant 2010 U.S. dollars for computing aggregate growth rates while the IMF uses purchasing power parity, which gives more weight to emerging economies excluded from the developed states category. The report cites the World Bank data.

[2] See more about the negative global trend, its causes, and possible solutions at OECD Compendium of Productivity Indicators 2017//OECD, 2017; The Future of Productivity//OECD, 2015.

[3] Strukturnaya politika v Rossii: novyye usloviya i vozmozhnaya povestka [Structural Policy in Russia: New Conditions and a Possible Agenda] [Text]: Reports from XIX April International Academic Conference on Economic and Social Development, Moscow, 10-13 April 2018 /Yu.Simachev, N.Akindinova, A.Yakovlev et al.; Scientific adviser E. Yasin; Higher School of Economics. - M.: HSE Publishing House, 2018.

- further development of artificial intelligence (AI) and robotization will lead to the boom in advanced manufacturing technologies, which will allow customizing manufacturing processes and production capacities to the brisk pace of change, and thereby secure mass customization;

- the progress in developing advanced manufacturing technologies will be measured by advances in additive manufacturing and the emergence of new materials as well the breakthroughs in robotization and improvements in AI. The Internet of Things, which allows machines to share data and perform various industrial, commercial and banking operations on their own, will affect many areas, including trade and finance. Additive manufacturing optimizes manufacturing processes in different ways and minimizes reject goods and waste. It has allowed producing most sophisticated things not only in aerospace engineering, the automotive industry, and shipbuilding, but also in the healthcare industry (for example, exoskeletons);

- the advances in robotization and AI will apparently eliminate numerous jobs by automating routine tasks in a number of traditional sectors (operators, cashiers, security guards, vendors, junior analysts and lawyers, etc.). However, the whole range of entirely new jobs will be created. The ubiquitous use of AI will transform the education system root and branch. It will require a radical revision of the fundamental principles of curriculums, including the shift to training people for art careers or high-level analysts;

- Distributed ledger (blockchain) technology has already provided the basis for creating cryptocurrencies, whose regulation extends far beyond the borders of a state and raises questions about direct regulation (prohibition or authorization), as well as changes in taxation and the registration of property rights and results of intellectual activity. Blockchain facilitates the introduction of smart contracts; digital platforms transform the institution of intermediaries;

- biotechnologies increase active life expectancy while simultaneously enhancing the quality of life. They significantly contribute to food security, preserve natural resources and conserve biodiversity. On the whole, they ensure sustainable development. A landmark breakthrough in healthcare will be achieved due to the safe use of gene editing technology in human embryos, which will help to cure many diseases, and due to new neurotechnologies which will explain many processes in the human brain[4].

In general, *technological change* is a most important driver of economic growth nowadays which increases labour productivity. However, it also *presents new challenges*, which include new trends in the labour market leading to multiple job cuts in a number of sectors, growing income inequality, and rampant urban sprawl, which exacerbates environmental and transport problems. Moreover, technological change causes uneven economic development within states and growing regionalization and protectionism amid increasing monopolization of main platform owners. Both developed states and Asian and African states are confronted with new problems. Developed countries face an increase in aging population due to the progress in healthcare. Developing states will be hit even harder as the declining demand for cheap labour (provoked by robotization), reshoring and reindustrialization of developed countries lead to tectonic shifts in the structure and the need for a new economic policy, primarily new structural economics.

The impressive scientific and technological progress sets one thinking about the *anticipatory development of institutions*, since technological change presents a grave economic and social threat as well as affects traditional lifestyle. *The use of new technologies often breaks the established ethical norms* and requires their revision both in terms of changing social values and legal regulations. It predominantly concerns the use of artificial intelligence for decision-making and medical technologies[5].

All these factors necessitate *by far more stringent requirements for rule-making*, standard-setting and regulation nowadays and create *the need for new global frameworks for the legal regulation of emerging technologies and markets*.

2. Individual Cases and Practices for New Regulation

2.1. Digitalization of Economy and Science

Market Features and Demand for Regulation

Digitalization as a global phenomenon is characterized by a number of features. In particular, digitalization dramatically changes business models and social organization, as well as the way scientific research is conducted, government departments operate and society is structured.

[4] Tekhnologicheskoye budushcheye rossiyskoy ekonomiki [Technological future of the Russian economy] [Text]: Report from XIX April International Academic Conference on Economic and Social Development, Moscow, 10-13 April 2018 /Chief Editor: Gohberg L.; Higher School of Economics. - M.: HSE Publishing House, 2018.

[5] SCOTT A. (2018) A CRISPR path to drug discovery // Nature. 8 March 2018 / Vol 555 / Issue No 7695. Retrieved from https://www.nature.com/magazine-assets/d41586-018-02477-1/d41586-018-02477-1.pdf, 24.04.2018.
Madhusoodanan J. (2015) Bioethics accused of doing more harm than good // Nature. Vol. 524. No. 7564. August 5, 2015. Retrieved from http://www.nature.com/news/bioethics-accused-of-doing-more-harm-than-good-1.18128, access date: 24.04.2018.
Butler D. A world where everyone has a robot: why 2040 can blow your mind // Nature. Vol. 530. No. 7591. February 24, 2016. Retrieved from http://www.nature.com/news/a-world-where-everyone-has-a-robot-why-2040-could-blow-your-mind-1.19431, access date: access date: 24.04.2018.
AI (2015) Research Priorities for Robust and Beneficial Artificial Intelligence. Open Letter. Retrieved from http://futureoflife.org/ai-open-letter/, access date: 24.04.2018.

Experts estimate that the digital share of GDP may grow by about three percentage points between 2015 and 2020 in most developed countries. The US digital economy is worth $6 trillion, or accounts for about a *third* of the country's *gross domestic product*[6].

Digitalization is a double-edged sword. Its positive effects are associated with the increasing productivity in various sectors and new sources of growth. Negative effects can lead to growing inequality of citizens, the emergence of monopolies, etc.

In some industries, the advance of digital technologies lowers barriers to entering new industrial markets and expands the client base, which opens up opportunities for new enterprises. In the meantime, digitalization may end up with large companies monopolizing the market, thereby hindering the growth of small and medium-sized enterprises[7].

Individual Practices

The share of total economic output derived from "digital" inputs varies considerably, with some economies generally seen as advanced, lagging behind some developing states in terms of digitalization. Thus, *Germany*, the European economic powerhouse, ranks quite low when it comes to digitization[8]. Its relevant strategy regards digital technologies as an instrument to sustain its leading positions in the world economy[9].

China sees digitalization as a way to stimulate industrial modernization and enhance competitiveness[10]. Despite the rise of new Chinese companies ranking high in the ICT market (Tencent, Alibaba and others), lack of qualified personnel, underdeveloped infrastructure, and undeveloped organizational culture in enterprises constrain the digitalization of the economy.

Many countries have launched programs to prop up economic digitalization, including National Network for Manufacturing Innovation (USA), Plattform Industrie 4.0 (Germany), and Made in China 2025 (PRC). The programs emphasize the role of small and medium-sized enterprises in digitalization.

Digitalization has become a focal point for the OECD. The Going Digital (GD) Horizontal Project[11] was formally launched in early 2017. It seeks to devise guidelines which take into consideration the benefits and challenges of digitalization. In 2017, OECD secured *the G20 Roadmap to boost the digital economy*[12]. The document envisages increased investments in broadband networks, new international standards for the digital economy, the creation of the prerequisites for another industrial revolution, a regulatory and legal framework that meets the requirements of the new digital environment.

New standards which will secure convergence, cost savings and network effects, are instrumental in developing digital technologies, with ICT standardization issues actively tackled worldwide. Thus, the EU has been developing a range of initiatives, including a framework for Monitoring the Digital Economy and Society 2016-2021 and the Digital Single Market (DSM) Strategy for Europe. The DSM Strategy provides for a number of steps to set up strong and harmonized regulatory framework for the EU digital economy. As a result, over 50 documents of different legal effect, ranging from EU directives to roadmaps (plans), will be adopted[13]. It envisages the change of standards in 32 subject areas[14].

Digitalization of Science

Digital data becomes increasingly important in science, as it often replaces full-scale live experiments and testing. The ICT impact is particularly noticeable in some realms, for example, in health care. Statistical and digital skills become ever more valuable for scholars, which necessitates the revision of both state and corporate policy in the field of research, education, and administrative management in research centres and universities.

A range of states have been trying to *create digital research information systems to evaluate research funding and assess the socio-economic impact of scientific research* (like CRIStin in *Norway* and Arloesiadur in *the UK*). It will foster the development of a new model and newly-shaped scientific, technical and innovation policies in the future.

Prospects for Regulation

1. Fast technology-driven socio-economic change provoked by the emergence of new economic activities and business models, stands in the way of establishing a new regulatory framework due to avert the detrimental effect of digitalization (to mitigate digital risks).

2. Digitalization requires swifter legislative decision-making and a deeper understanding of socio-economic and technological trends.

3. Vast common economic spaces with uniform regulations are needed for the discernible effect of digital technologies, which makes steps towards harmonizing regulatory frameworks important.

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[6] Accenture Strategy (2016) Digital disruption: The growth multiplier.

[7] Brynjolfsson, E. et al. (2008). Scale without Mass: Business Process Replication and Industry Dynamics (http://ebusiness.mit.edu/research/papers/2008.09_Brynjolfsson_McAfee_Sorell_Zhu_Scale%20Wit hout%20Mass_285.pdf; last accessed 01.05.2017).

[8] KfW (2017). Unternehmensbefragung. Digitalisierung der Wirtschaft: breite Basis, vielfaltige Hemmnisse (https://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-Unternehmensbefragung/Unternehmensbefragung-2017-%E2%80%93-Digitalisierung.pdf; last accessed 15.06.2017).

[9] BMWi (2016). Digitale Strategie 2025. (http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm; last accessed 15.06.2017).

[10] Gossovet KNR (2015). Sdelano v Kitaye 2025. [State Council of the People's Republic of China (2015). Made in China 2025] (中国制造2025) (http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm; last accessed 15.06.2017).

[11] Going Digital - Organisation for Economic Co-operation and Development Retrieved from: https://www.oecd.org/going-digital/ (access date: 28.04.2018).

[12] G20 Digital Ministerial – Remarks (https://www.oecd.org/g20/g20-digital-ministerial-april-2017-remarks.htm; last accessed 14.05.2017).MIC (2013) Information and communications in Japan White Paper, Ministry of Internal Affairs and Communications, Japan.

[13] https://ec.europa.eu/digital-single-market/

[14] http://ec.europa.eu/information_society/newsroom/image/document/2017-13/grow_rolling_plan_ict_2017_web_170302_C7EC62EB-0196-6C12-45229D71D00B0D6B_43894.pdf

4. Well-coordinated activities of government agencies, the engagement of research centres, companies and civil society in elaborating steps to promote digital technologies as well as a refined regulatory framework are needed to reduce the risks posed by digitalization.

5. Qualified specialists with digital skills are in high demand. Many states need to reform their educational systems to have a new school of digital experts.

2.2. Regulatory Oversight over Artificial Intelligence (AI)

Market Features and Demand for Regulation

AI technologies have been developing dynamically. While in 2011 the total of $282 million was invested in start-ups in 67 deals, in 2015 the number of deals reached almost 400 and AI start-ups received nearly $ 2.4 billion[15].

The widespread transition to smart infrastructures and intelligent transport management systems (unmanned vehicles, smart roads)[16], medicine management systems (surgical robots, diagnostic robots) and the proliferation of hands-off manufacturing require *a thorough revision of many regulations* in place since Roman law.

AI systems are becoming increasingly autonomous in terms of the complexity of tasks they can perform, their potential impact on the world and man's diminishing ability to understand, predict and control their operations. Such self-study systems can act in a way which was not designed by their creators[17]. These characteristics raise issues related to, first, the systems' predictability and, second, to their ability to act independently without bearing any legal responsibility[18].

Algorithms collect information about various aspects of private life and are even used to predict possible crimes and assess a person's predisposition to a crime. At the same time, most algorithms are patented and constitute commercially sensitive information which prevents both users and competent authorities from learning what algorithms do and how they make decisions.

Moreover, self-study algorithms erode the concept of an actor. Studies show that even without market dominance or a level playing field, *artificial intelligence can independently generate new anticompetitive practices*[19], which will require the complete revision of competition law.

Models of Regulation

The AI-based technologies can be regulated as:

- intellectual property subject to copyright;
- a special type of property;
- a legal entity;
- a new legal category.

The standard regulation involves *the protection of copyright, property or ultrahazardous activity liability*, for instance, in cases when financial algorithms were used for deals or accidents involve unmanned vehicles. Such trials are not numerous as of now[20], but their number will grow, and the ability of algorithms to act autonomously irrespective of the will of its creator, owner or proprietor will complicate their application.

Regulations treating animals as a kind of property[21] can offer a solution since animals are also capable of autonomous actions. In most states animals are legally categorised as property and are treated accordingly, with the owner held responsible. First, the application of legislation by analogy is unacceptable within the framework of criminal law. Moreover, these laws have been created primarily for household pets, which, we can reasonably expect, cannot normally cause harm. In certain cases, it is possible to apply more stringent laws regulating private possession of wild animals[22], but it can impede innovation as a creator or inventor is held liable in unpredictable ways.

In this regard, it is frequently suggested that *norms similar to those that regulate the activities of legal entities should be applied*. Since a legal entity is an artificially constructed subject of the law[23], for example, robots can be ascribed a similar status. Legal systems make legal entities liable under civil and, in some states, criminal law. However, such analogy can also pose difficulties since the actions of legal entities are always traced back to those of a person or group of people[24], which may be impossible in AI-based systems.

Finally, it is possible to create a *new legal category* according the most advanced AI technologies legal per-

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[15] World Economic Forum (2017) The Global Risks Report 2017 12th Edition. Retrieved from http://www3.weforum.org/docs/GRR17_Report_web.pdf

[16] Vivek Wadhwa. Laws and Ethics Can't Keep Pace with Technology. MIT Technology Review. April 15, 2014. Retrieved from https://www.technologyreview.com/s/526401/laws-and-ethics-cant-keep-pace-with-technology/

[17] Asaro P., "From Mehcanisms of Adaptation to Intelligence Amplifiers: The Philosophy of W. Ross Ahby", in Wheeler M., Husbands P., and Holland O. (eds.) The Mechanical Mind in History, Cambridge, MA: MIT Press: 149-184.

[18] Asaro P. The Liability Problem for Autonomous Artificial Agents // AAAI Symposium on Ethical and Moral Considerations in Non-Human. Agents, Stanford University, Stanford, CA. – March 21-23, 2016. – P. 191.

[19] Ezrachi A., Stucke M. E. Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy, Harvard University Press, 2017.

[20] Such cases often end up in pre-trial settlement. See the recent case - Bradshaw T. "Uber settles self-driving car crash case with victim's family" // Financial Times, 29 March 2018, https://www.ft.com/content/1d7f174a-3362-11e8-b5bf-23cb17fd1498

[21] Arkhipov V., Naumov V., O nekotorykh voprosakh teoreticheskikh osnovaniy razvitiya zakonodatel'stva o robototekhnike: aspekty voli i pravosubyektnosti [On some theoretical issues of developing legislation on robotics: will and legal standing] // Zakon. — 2017. — № 5. — C. 167; Kellye R., Schaerer E., Gomez M. and Nicolescu M. Liability in robotics: an international perspective on robots as animals // Advanced Robotics. — 2010. — № 24(13). — P. 1861-1871.

[22] Asaro P. The Liability Problem for Autonomous Artificial Agents. P. 193.

[23] See Winkler A. We the Corporations: How American Business Won Their Civil Rights. — Liverlight, 2018. See the description at https://www.nytimes.com/2018/03/05/books/review/adam-winkler-we-the-corporations.html

[24] Brozek B., Jakubiec M. On the legal responsibility of autonomous machines // Artificial Intelligence Law. – 2017. – № 25(3). – P. 293–304; Khanna V.S. Corporate criminal liability: what purpose does it serve? // Harvard Law Review. – 1996 – № 109. – 1477–1534.

sonality, which is proposed both by legal experts[25] and lawmakers.

Regulating Smart Robots

The European Parliament has proposed a *prospective regulatory* framework for robots which is based on the definition of a robot as a new legal category. The resolution on the Civil Law Rules on Robotics resolution was adopted in 2017. EU authorities also suggested establishing the European Agency for Robotics and Artificial Intelligence and introducing a *system* of *registration* for '*smart robots*'[26]. There are two possible types of liability for damage caused by robots:

1. strict liability (*no requirement* to prove *fault*),

2. a risk management approach (liability of a person who was able to minimize the risks).

Liability should be proportionate to the actual level of instructions given to the robot and to its degree of autonomy. Rules on liability is complemented by a compulsory insurance scheme for robot users, and a compensation fund.

It is suggested that the most advanced robots would be granted a special legal status of an e-person. It implies liability for the damage caused when robots make decisions autonomously or otherwise interact independently with third parties.

Individual Practices

Nowadays states are vigorously establishing legal frameworks for developing AI-based technologies. *South Korea* adopted Intelligent Robots Development and Distribution Promotion Act[27] back in 2008 while the *UAE* has devised the Artificial Intelligence Strategy[28] and has even appointed the world's first Minister of Artificial Intelligence[29].

In late March 2018, *France* presented its national Strategy for Artificial Intelligence[30]. The French government plans *to invest* €1.5 billion in *artificial intelligence* research over five years. The strategy is based on expert advice[31]. There are seven key proposals, one of which is particularly important. *It concerns the transparent nature of AI.*

The self-study process can make algorithms biased. They can, for example, absorb social stereotypes or adopt biases from their developers, and rely on them while making decisions. There has already been legal precedent. A defendant in the United States received a lengthy prison sentence on the basis of information obtained from an algorithm predicting the likelihood of recidivism[32]. The defendant's appeal against the use of an algorithm at the trial was rejected because the criteria used to evaluate the possibility of repeat offences constituted a trade secret and therefore were not presented.

Ethical Issues

Ethics and law are inextricably linked in modern society, with AI adding a new dimension. This year, Microsoft has released a report on the impact of artificial intelligence on humanity, highlighting the need for strict ethical principles (in particular, it suggested a Hippocratic oath for coders) and new regulation[33]. The Ethics Advisory Group under the *European Data Protection* Supervisor has published a report which called AI a technology that brings about significant socio-cultural shifts, predicted *a shift from individual to distributed responsibility*, and highlighted regulatory inadequacy and the need for digital ethics[34].

The above mentioned resolution proposes codes of conduct for dealing with ethical issues, which enshrine four ethical principles in robotics engineering: 1) beneficence (robots should act in the best interests of humans); 2) nonmalfeasance (robots should not harm humans); 3) autonomy (human interaction with robots should be voluntary); and 4) justice (the benefits gained from robotics should be distributed fairly).

Prospects for Regulation

1. AI presents new challenges to various domains of law, ranging from patent law to criminal law, from the protection of privacy to antitrust law.

2. Liability for using the algorithm is the main issue. In the long term, a transition from individual responsibility to distributed responsibility may occur.

3. What remains unclear is the necessity or desirability of new regulations, in particular the direct responsibility of AI-based systems. Making coders or users of autonomous systems responsible for the actions of such technologies may be more effective. However, it can stand in the way of innovation.

(4) It is necessary to increase the transparency of algorithms and expand the possibilities for their verification.

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[25] See. Chopra S., White L.F. A Legal Theory for Autonomous Artificial Agents, University of Michigan Press, 2011; Hage J. Theoretical foundations for the responsibility of autonomous agents // Artificial Intelligence Law. — 2017. — № 25(3). — P. 255-271.

[26] Civil Law Rules on Robotics, European Parliament resolution of 16 February 2017, http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2017-0051+0+DOC+XML+V0//EN.

[27] Act No 9014, 28 March 2008 on Intelligent Robots Development and Distribution Promotion Act (IRDDPA) with amendments and additions, http://robopravo.ru/zakon_iuzhnoi_koriei_2008

[28] UAE 2031: UAE Artificial Intelligence Strategy, http://www.uaeai.ae/en/

[29] His Excellence Omar bin Sultan Al Olama, The Cabinet, United Arab Emirates, https://uaecabinet.ae/en/details/cabinet-members/his-excellency-omar-bin-sultan-al-olama

[30] French Strategy for Artificial Intelligence, https://www.aiforhumanity.fr/

[31] Villani C. For a Meaningful Artificial Intelligence: Towards a French and European Strategy, 2018 https://www.aiforhumanity.fr/pdfs/MissionVillani_Report_ENG-VF.pdf

[32] Smith M. "In Wisconsin, a Backlash Against Using Data to Foretell Defendants' Futures" // The New York Times, June 22, 2016, https://www.nytimes.com/2016/06/23/us/backlash-in-wisconsin-against-using-data-to-foretell-defendants-futures.html

[33] Shum H., Smith B. The Future Computed: Artificial Intelligence and its role in society, Microsoft, 2018, https://blogs.microsoft.com/uploads/2018/02/The-Future-Computed_2.8.18.pdf

[34] Burgess J. P. et al., Ethics Advisory Group Report 2018, https://edps.europa.eu/sites/edp/files/publication/18-01-25_eag_report_en.pdf

5. Public values affect the attitude to AI and its legal status. New digital ethics and codes of conduct are required.

2.3. "Fake News" Circulation

Market Features and Demand for Regulation

Internet platforms and other Internet services have opened up unparalleled opportunities for processing data. *Information-transfer rates* have soared, which has transformed society along with other cutting-edge technologies. *Web 2.0,* which presupposes active and potentially positive user participation, including blogs, wikis, social networks and other features, has changed the usual approach to disseminating information and receiving news drastically as it has deprived the traditional media of their role of gatekeepers.

Social networks and other large-scale digital platforms are the major instruments for circulating fake news today since they tend to have neither an editor-in-chief nor contracted professional journalists. News appears in the news feed in the order determined by automatic algorithms, which are dependent on the number of "clicks", "likes", and reposting. Studies by Edelman Trust Barometer[35] show that *63% of the respondents fail to tell good journalism from rumor or falsehoods when they get information via the Internet.* Recipients of information – in fact, almost everyone - are overwhelmed with data flows and often fail to properly process them. Thus, former markers of deception have disappeared, which facilitates the manipulation of social groups' views.

Even though disinformation is not a recent phenomenon, modern technological advances have added new features to the process of disseminating information, which can be deliberately misleading. In turn, it must be taken into account when regulations for new legal relations are designed. *The dissemination of fake news* does not only affect politics and ethics, but it also *damages the economy by paving the way for poor investment decisions (market manipulation).*

Models of Regulation

The definition of «fake news» boils down to the "online publication of the intentionally or knowingly false statements of a fact"[36]. Another feature of post-truths and fake news is also of importance. In a range of cases, publications are not legally actionable as they do not possess all the necessary features. Only false defamatory statements are actionable. Information is often used as a tool for fine manipulation based - among other things - on big data analytics. It complicates state regulation in cases associated with the circulation of fake news.

Regulation of the dissemination of intentionally distorted information can be divided into two categories:

1. state regulation (which can be subdivided into legal regulation and other types, including organizational regulation, information regulation, economic regulation, etc.);
2. non-state regulation (sectoral self-regulation, public initiatives).

Individual Practices

Nowadays every state is actively drafting bills to regulate the dissemination of false or misleading information in three main areas:

1. regulating online advertising (advertising regulations apply to political propaganda in most states);
2. regulating online platforms (social networks);
3. regulating the activities of people disseminating false information.

In particular, the United Kingdom is about to adopt the Digital Charter[37] and the Internet Safety Strategy, part of the Charter[38]. The Charter is aimed at making the internet work for everyone – for citizens, businesses and society as a whole. It is based on liberal values that cherish freedom. To develop Internet safety regulations, the British government will engage public organizations and volunteers, as well as high-tech companies, schools and the public[39].

Israel is mulling the «Facebook Bill», the Removal of Criminally Offensive Content from the Internet bill. It will allow the state to seek court orders to force the social media site to remove incitement and hate content based on police recommendations. The Knesset passed the bill in the first reading in March 2017[40].

In Germany, the fake news regulation is linked to the activities of online platforms and, especially, social networks. In October 2017, the Network Enforcement Act came into force in Germany[41]. This is the first European state to lay down clear rules.

In Ireland, James Lawless, a TD for Fianna Fáil party, submitted the Online Advertising and Social Media (Transparency) Bill 2017 on November 6, 2017.

The draft of the US Honest Ads Act[42] was put to the vote in the US Senate on October 19, 2017.

Prospects for Regulation

Lawmakers have not yet answered some key questions:

1. whether new regulations are needed to combat fake news online circulation or the existing mechanisms are effective enough;

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[35] Edelman Trust Barometer Special Flash Poll. Research. 2017 // https://www.edelman.com/trust2017/trust-barometer-media-fake-news-flash-poll/.

[36] Klein D., Wueller J. Fake News: A Legal Perspective // Journal of Internet Law. Apr. 2017. Available at SSRN: https://ssrn.com/abstract=2958790.

[37] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/676715/2018-01-25_Digital_Charter_final.pdf; https://www.meetup.com/ru-RU/ORG-Birmingham/events/247971623/?eventId=247971623.

[38] Internet Safety Strategy. October 2017 // https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/650949/Internet_Safety_Strategy_green_paper.pdf.

[39] http://www.theweek.co.uk/90730/should-uk-adopt-european-style-fake-news-law.

[40] https://www.timesofisrael.com/israel-getting-better-grip-on-online-incitement-justice-minister-says/.

[41] The Network Enforcement Act) // http://www.bmjv.de/SharedDocs/Gesetzgebungsverfahren/Dokumente/NetzDG_engl.pdf?__blob=publicationFile&v=2

[42] Honest Ads Act // https://www.congress.gov/bill/115th-congress/senate-bill/1989; https://www.epic.org/democracy/Honest-Ads-Act.pdf.

2. in which cases false or misleading information should be subject to regulation;

3. who should be authorized to classify any information as false or misleading;

4. who should be charged with removing / limiting access to fake news

5. on which realms new regulations should be imposed: politics, economics, public safety, etc.

Legal regulation cannot fully meet the challenges of the digital era caused by the information dissemination and *must necessarily be combined with other regulatory mechanisms*:

- cooperation with the high-tech sector, journalists, non-profit organizations and commercial enterprises;

- urgent measures, including a fast-track plan to address the crisis of online interaction (including fact-checking initiatives);

- long-term measures aimed at enhancing social sustainability through media literacy, new social responsibility standards, including the cases of sharing and reposting and determining the degree of responsibility of a high-tech company in adopting such measures[43].

This multifaceted strategy, a combination of legal regulation and other measures, will allow effectively influencing statements as they take shape amid the dissemination of knowingly false statements.

2.4. Cryptocurrency and Token Market

Market Features and Demand for Regulation

Prices.org, a cryptocurrency prices and news aggregating website giving live information about economic indicators for over 1000 largest cryptocurrencies, says that the market capitalization of all cryptocurrencies reached $421.28 billion as of April 27, 2013. Bitcoin's share amounted to $158.42 billion (37.6% of the total). Ethereum's share was $67.35 billion (16%). Ripple accounted for 8% ($33.42 billion), while Bitcoin Cash secured 5.7% ($24.08 billion)[44]. Bitcoin Cash has recently split from Bitcoin because cryptocurrency miners processed 17 million coins, and there are only 4 million left to mine, with 21 million being the total number of bitcoins allowed under the current codebase.

State authorities are wary that crypto-currencies may affect regulation in a number of ways, which crudely boil down to the following:

- the state may lose control over inflation and lending through the banking system;

- the interests of third parties which invest in cryptocurrencies must be safeguarded;

- state seeks to control budget revenues from cryptocurrency trading and effectively ward off the shadow market[45].

An argument against cryptocurrencies goes that they are not backed by any tangible asset and, therefore, are fraught with the risk of default increasing in parallel to expanding trade in cryptocurrencies. Bitcoin is subject to sever criticism because of its high volatility and inconvenience when it is regarded as a store of value, which is the key function of money[46].

Models of Regulation

Opting for proactive regulation lawmakers can choose between

1) creating one legal framework for cryptocurrencies and tokens;

2) setting different regulatory frameworks, which will depend on a particular asset.

Major financial regulators (the US, the EU, Switzerland, Singapore, etc.) still prefer the second approach as they stress that the emission of tokens should be regulated as securities issuance given the former's investment component. First of all, it concerns the obligation to disclose information about the issuer and the planned emission. The major drawback is the need to clearly differentiate between tokens and the need for traders to accept liability for unintentional mistakes. The main advantage is the application of the relevant legislation. If goods are sold, then consumer protection is used. If tokens look profitable, they are treated as securities.

Economies with developed legal systems do not try to label cryptocurrencies as a money surrogate or ban the trade. However, it does not imply that regulatory frameworks are rejected. For example, the German Federal Financial Supervisory Authority classified cryptocurrency as a unit of account equating it with a foreign currency in a way. Therefore, intermediaries in the cryptocurrency market, primarily cryptocurrency exchange platforms, are to obtain a permission prior to launching their operations.

Money Laundering and Terrorist Financing Prevention

On December 15, 2017, the European Union announced the strengthening of EU rules to prevent money laundering and terrorist financing. Specifically, the new regulations, among others, obliged cryptocurrency trading platforms and custodian wallet providers to target anonymity among users[47].

On April 19, 2018, the European Parliament adopted amended Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing. The new changes stipulate that cryptocurrency trading platforms and custodian wallet providers will be obliged to introduce customer due diligence controls, including bank-style identity verification procedures. More specifically, to reduce anonymity for both crypto-traders and crypto-related transactions,

[43] Haciyakupoglu G., Yang Hui J., V. S. Countering Fake News a Survey of Recent Global Initiatives. March 2018. Nanyang Technological University. P.3.

[44] https://prices.org/

[45] Bulgakov I. Pravovyye voprosy ispol'zovaniya tekhnologii blokcheyn [Legal Aspects of Using Blockchain Technology]// Zakon. 2016. № 12

[46] Bitcoin is Evil by Paul Krugman December 28, 2013 http://krugman.blogs.nytimes.com/2013/12/28/bitcoin-is-evil/?_r=0 Also see his speech at The Genius of Economics in summer 2015 https://www.youtube.com/watch?v=B-H8LRHG1hc&feature=youtu.be

[47] https://www.reuters.com/article/us-global-markets/world-shares-hemmed-in-by-dollar-and-fed-rate-expectations-idUSKBN1I306B

national Financial Intelligence Units (FIUs) should be able to obtain information allowing them to associate virtual currency addresses to the identity of the owner of virtual currency. EU member-states will have 18 months to transpose the provisions of the directive into their national regulatory frameworks[48].

From our perspective, one can find itself at "a regulatory crossroads or fork" when every cryptocurrency transaction beyond the prescribed amount is subjected to rigorous financial scrutiny, which, among others, demands that investors get certified as a qualified investor.

Cryptocurrency Taxation

Although the world does not have a common approach to the issue, the 2015 Skatteverket-versus- David Hedqvist disputed, which was resolved by the European Court of Justice (ECJ)[49], can be considered a momentous case. The judgement at the highest court ruled that that when virtual bitcoin exchanges were used as a way of issuing a payment it would be exempt from VAT.

Against this background, the German Federal Ministry of Finance, Bundesministerium der Finanzen, jumped on the bandwagon and released a message to clarify when it would not tax cryptocurrencies. Specifically, when used for purchases, cryptocurrencies will receive the same tax treatment as legal tender. For purchases, taxes will be calculated (in accordance with the EU's VAT Directive) based on the converted value of the cryptocurrency's fiat pair value at the point of sale, which is reported by the vendor. Taxes will not be applied to block rewards sent to miners. Likewise, intermediaries who facilitate cryptocurrency conversions to or from fiat currency would not be considered liable for taxes.

As for the Republic of Belarus, it signed Decree No. 8 "On the Development of Digital Economy" setting out a 5-year tax holiday (until 2023) for crypto-business activities, like exchange services, initial coin offerings, mining operations, smart contracts[50]. It is noteworthy that individual entrepreneurs and corporate entities from the crypto-industry are free to do business anywhere, as long as they register as residents of the Belarus High Technologies Park (HTP).

Regulatory Aspects of Islamic Banking

Influential Islamic financiers claim that cryptocurrencies may be more "halal" than fiat money because the former has nothing to do with fractional reserve banking (FRB) and usury or loan sharking[51]. The counter-argument is that fiat money is created by banks through the multiplier mechanism, which allows scope for fractional reserve banking. In terms of economic security, this is quite similar to cryptocurrency creation. Moreover, fiat money printing – at least to some extent - is backed by reserves of commercial banks and central banks, which is not usually the case when issuing cryptocurrencies.

The question of cryptocurrencies has not been incorporated into the current set of AAOIFI standards yet. However, the situation might change in two or three years' time. In terms of Sharia law, anything that becomes widely accepted as currency by society or government mandate can be regarded as money. As for such a cryptocurrency as Bitcoin, it can hardly be viewed as a real asset. In addition, Bitcoin is highly volatile[52].

Prospects for Regulation

On March 20, 2018, G20 financial leaders examined cryptoassets at the First G20 Meeting of Finance Ministers and Central Bank Governors, which was made in preparation for the November G20 summit. The forum's final communiqué highlights the necessity to monitor the situation around cryptoassets, which, in their turn, do not yet pose a "significant risk" to global financial stability.

Meanwhile, many G20 countries supported the need to develop common regulatory principles. At the same time, it was pointed out that cryptoassets are not currencies in the traditional sense of the word. As an unreliable asset in terms of value preservation qualities, they do not perform the standard functions of currencies.

The document also notes that it is necessary to implement FATF standards, when it comes to cryptoassets.

2.5. Unmanned Vehicles Market

Market Features and Demand for Regulation

The development of unmanned and autonomous vehicles is part of global trends. Numerous automobile manufacturers, above all in the United States, Germany, Great Britain and Japan, tend to test vehicles on closed landfills and public roads. The list of prospective areas encompasses self-driving trucks, short-term lease cars characterized by unmanned delivery services (the so-called Shared Electric Autonomous Vehicle, SEAV), and unmanned personal cars with different levels of autonomy.

Today's regulation is assumed to be evolving gradually, which depends on the levels of autonomy. For instance, partially autonomous cars, that is from level 1 to level 3, equipped with driver support devices (for example, emergency braking systems and cruise control and lane-centering) will not require drastic changes in the control systems.

The main changes will be needed as fully autonomous cars referred to as level 4 and level 5 vehicles, start entering the mass market. The key regulation aspects are related to artificial intelligence, information security, insurance, responsibility for road accidents[53], and access to the public infrastructure.

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[48] https://forklog.com/evrosoyuz-vvodit-verifikatsiyu-vladeltsev-kriptovalyut-dlya-deanonimizatsii-tranzaktsij/

[49] http://curia.europa.eu/juris/document/document.jsf?docid=170305&doclang=EN

[50] https://bits.media/news/belarus-legalizuet-mayning-i-kriptovalyuty-i-predostavit-nalogovye-lgoty/

[51] www.muslimeco.ru/onews/2143

[52] Madina Kalimullina. Mozhno li Musulmanam potupat' bitkoiny (Kryptovalyuta). [Can Muslims buy Bitcoin (Cryptocurrency)]http://www.islam.kz/ru/articles/ekonomika/mojno-li-musulmanam-pokupat-bitkoiny-kriptovalyuta-1085/#gsc.tab=0

[53] Krawiec, R. J., White, V. (2017) Governing the future of mobility: Opportunities for the US government to shape the new mobility ecosystem, Deloite University Press.

Individual Practices

As an initial stage of regulation of unmanned vehicles, it is possible to recognize *the approval of special reports (White Papers) outlining governmental policies* rather than the passage of relevant legislation. This is illustrated by "Federal Automated Vehicles Policy: Accelerating the Next Revolution in Road Safety" issued by the US Department of Transportation (DoT). It is noteworthy that the report was primarily aimed at emphasizing safety measures[54].

Innovations have an impact on the regulation of artificial intelligence. This is exemplified by a *set of ethical standards for developers of automated and connected cars* embraced by Germany in 2017[55]. The paper centers around the value of human life.

The world witnesses the emergence of legal acts giving *unmanned vehicles potential access to the public road network.* In 2017, the German federal government approved a bill changing the country's Road Traffic Act to allow the use of automated vehicles on public roads[56]. The system must, amongst other things, be able to comply with traffic rules, recognize situations that require human input, and allow override by the driver at any time.

The US House of Representatives has recently approved the SELF DRIVE Act (Safely Ensuring Lives Future Deployment and Research in the Vehicle Evolution Act), which makes it easier

to ensure the safe and innovative development, testing, and deployment of self-driving cars. In March 2018, Russia endorsed an action plan (road map) to improve legislation in the field[57].

Special requirements are gradually prepared *to address the infrastructure designed to accept unmanned vehicles*. In the United States, such an initiative was launched by the National League of Cities (NCL) serving the interests of 19,000 cities. The document recommends changing the urban infrastructure. A similar initiative is being developed by Russia's Federal Road Agency in extra-urban conditions. Under the Caravan project, it is planned to provide a federal road network, included in international transport corridors, with the infrastructure for unmanned traffic by 2035[58].

Prospects for Regulation

1) Individual practices in the sphere have started to emerge since the second half of the 2010s.

2) Driverless cars typified by high levels of autonomy are expected to be sold after 2025.

3) In countries, which are supposed to see unmanned vehicles, a comprehensive review of the legal framework will be required, primarily with regard to the regulation of artificial intelligence and responsibility for road accidents.

2.6. Agtech Market

Market Features and Demand for Regulation

The list of modern agrotechnologies includes new methods of genome editing, robotization, the Internet of Things, big data, artificial intelligence and others. Technologies find their way into the agricultural sphere and they will be able to overhaul the decades-old landscape of the industry in the near future.

As of now, there is an active development and application of new technologies in agriculture. For instance, in 2017, the world investment in agro-industrial start-ups was two times higher than in 2014[59]. In 2017, the number of venture transactions in the agricultural sector reached its peak, compared to 2012, with the volume of transactions increasing threefold[60]. In addition, at present, genetically modified plants occupy a significant part of the market. According to *the International Service for the Acquisition of Agri-Biotech Applications (ISAAA),* the genetic modification of agricultural products has both positive and negative aspects[61] that need to be evaluated and studied.

Over the recent decades, the focus of research and development has changed significantly. While the main investments were funneled into the development of mechanical engineering and the improvement of chemical plant protection products and synthetic fertilizers in 1994, by 2010 priority was given to biotechnology in crop production and livestock, as well as technologies related to the maintenance of the health of farm animals[62]. Modern technologies, including cellular and molecular genetics, allow shortening the terms for the removal of plants and animals with the required characteristics by an order of magnitude, selecting and fixing the necessary genes[63].

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[54] Hanaghan, J. (2018) Preparing communities for autonomous vehicles, An American Planning Association Report.

[55] URL: http://www.bmvi.de/SharedDocs/EN/publications/report-ethics-commission.html?nn=187598

[56] Deutscher Bundestag Website. URL: http://dipbt.bundestag.de/extrakt/ba/WP18/795/79579.html

[57] Russian Government Order No. 335-r of 29 March 2018. URL: http://government.ru/docs/31810/

[58] Federal Road Agency website. URL: http://www.rosavtodor.ru/press-center/news/archive-news/45501

[59] AgFunder AgriFood Tech. Investing Report: mid-year review – 2017. < https://research.agfunder.com/2017/AgFunder-Agrifood-Tech-Investing-Report-Midyear-2017.pdf >.

[60] Finistere Investures LLC, 2017 Agtech Investment Review – 2017. <http://finistere.com/wp-content/uploads/2018/03/Finistere_Ventures_PitchBook_2017_Agtech_Investment_Review.pdf>.

[61] International Service for the Acquisition of Agri-Biotech Applications, Pocket K No. 4: GM Crops and the Environment, 2017. <http://www.isaaa.org/resources/publications/pocketk/4/default.asp>.

[62] Global private-sector agricultural research increasing for crop seeds & bio- technology. <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=77510>

[63] For example, these technologies make it possible to create plants with incorporated protectors - substances that the plant produces independently in the process of vital activity from the genetic material introduced into it - and to produce "smart" varieties of agricultural plants that yield more crops when a less number of consumed resources. In the most general form, the gene technologies used in modern selection of agricultural plants and animals are divided into four main categories: 1) hybridization (combining the genetic material of different cells in one cell within one species or between different systematic groups); 2) genetic engineering (a set of techniques, techniques and technologies for the production of recombinant RNA and DNA, the isolation of genes from the body (cells), manipulation of genes and their introduction into other organisms); 3) cloning (natural occurrence or generation of several genetically identical organisms by asexual reproduction) and 4) replication of the DNA sequences of the genome and selection by markers. See: Ivanov A.., Katalevsky D.. Modern Agrotechnologies: Economic, Legal and Regulatory Aspects. M.: The Publishing House of the Higher School of Economics, 2018.

The spread of agricultural technologies and the growing number of agricultural transactions in the agricultural sector lead to structural changes in the market. Thus, preventing negative consequences (for example, the monopolization of the industry when changing value chains[64]) is a priority.

Models of Regulation

Given the natural complexity of the global food chains of production and supply, any failure in the supply of seed or animal resources can cause a global food system shock. Significant changes taking place in the upper level of the food chain have strengthened the influence of global seed market players in most aspects[65].

The development of new technologies leads to the emergence of various groups of players, including companies for the protection of culture and seed companies, equipment and fertilizer companies, retail distributors and digital start-ups. Companies are developing strategies in search of new opportunities and using different sources of income to acquire a greater market share, which is achieved through large mergers and acquisitions leading to high concentration levels in some markets[66]. Market players should, therefore, choose between positioning themselves as fully universal suppliers, or network conductors, or partners of industry leaders[67].

At the moment, the antimonopoly authorities of the United States and Europe basically support the trend of economic concentration. This approach is primarily based on the theory that such a concentration will boost innovation[68]. However, little attention is paid to its consequences for the functioning of the global food chain as a whole, the correlation of forces between market players in the agricultural sector of the economy.

In this light, *the regulation of the intellectual rights of technology developers* deserves close attention, along with the need to protect the rights of farmers and consumers. International and national regulation is aimed at resolving these issues. An important international treaty in this area was the TRIPS Agreement, adopted within the WTO[69]. Of particular importance is the International Union for the Protection of New Varieties of Plants (UPOV), the provisions of which apply to all kinds and types of plants (Article 3)[70]. This Convention was adopted as part of the activities of the International Union for the Protection of New Varieties of Plants and is aimed at protecting the so-called *breeders' rights*.

The current international legal regulation defines a model for the protection of breeders' rights[71]. Their specification is implemented at the level of national legislation[72]. The existing international legal approach recognizes the need to protect the rights to the products of intellectual activity in the field of crop production. At the same time, the need to limit such protection to ensure food security is proclaimed[73].

Prospects for Regulation

1) Based on the practice of regulation and current trends in the development of agro-technologies, the following conclusions can be drawn:

- patent activity in the field of crop protection and animal husbandry protection by default does not guarantee the interests of the food industry and the agricultural sector of the economy;

- the patent protection of genetic resources used in one branch of the economy can potentially harm another industry, which raises the issue of development priorities.

[64] The global market for GMO seeds alone is estimated at about $ 24 billion, which is about 45% of the world seed market (the cost of the latter, according to various estimates, is about 55-65 billion dollars). The market is characterized by a high degree of concentration, as more than half of the world sales (53%) are accounted for by only three international producers: Monsanto (26%), DuPont (18%) and Syngenta (9%). See: Seed Market by Type (Cereals & Grains, Oilseeds, and Fruit & Vegetables), Seed Trait (Herbicide Tolerant, Insect Resistant, and Other Stacked Traits) & Region: Global Trends & Forecast to 2020. Markets and Markets, 2015.

[65] Seed chain "consists of three basic components: plant research and selection; seed production; marketing and distribution. See: .: Louwaars N.P., Tripp R., Eaton D., Henson-Apollonio V., Hu R., Mendoza M., Muhhuku F., Pal S., Wekundah J. Impacts of Strengthened Intellectual Property Rights Regimes on the Plant Breeding Industry in Developing Countries: A Synthesis of Five Case Studies. February 2005. P. 28. <http://www.iprsonline.org/resources/ docs/ LouwaarsCGN_Plants_05.pdf>.
It is necessary to take into account the differences between developed and developing countries in how different components of the industry are structured: in developed countries, seed production, marketing, and distribution are in fact considered commercial operations, and plant research and breeding is carried out by commercial enterprises, in particular in quality seed crops. See: Ivanov A.., Katalevsky D.. Modern Agrotechnologies: Economic, Legal and Regulatory Aspects. M.: The Publishing House of the Higher School of Economics, 2018.

[66] See: Corsini L., Wagner K., Gocke A., Kurth T. Crop Farming 2030 — The Reinven- tion of the Sector. April 2015. P. 10.; Aghion Ph., Bloom N., Blundell R., Griffith R., Howitt P. Competition and Innovation: An Inverted U Relationship // The Quarterly Journal of Economics. 2005. Vol. 120. Iss. 2. P. 701–728.; Moss D.L. Transgenic Seed Platforms: Competition between a Rock and a Hard Place? October 23, 2009.

[67] See: Ivanov A.., Katalevsky D.. Modern Agrotechnologies: Economic, Legal and Regulatory Aspects. M.: The Publishing House of the Higher School of Economics, 2018.

[68] See: Gereffi G., Humphrey J., Sturgeon T. The Governance of Global Value Chains // Review of International Political Economy. 2005. Vol. 12. Iss. 1. P. 78–104.

[69] The TRIPS Agreement establishes minimum standards for the protection of intellectual property rights and the procedure for their application. In accordance with paragraph 1 of Art. 1 (1) TRIPS, States Parties to the Agreement may not provide more protection for the results of intellectual activity and independently determine the mechanisms for implementing its provisions in their legal system. See: Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Marrakech, April 15, 1994 <http://www.wipo.int/wipolex/en/ treaties / text.jsp? File_id = 329636>.

[70] World Intellectual Property Organization, International Convention for the Protection of New Varieties of Plants (UPOV), 1991. <http://www.wipo.int/wipolex/en/ details.jsp?id=12733>.

[71] International legal regulation in the field of animal husbandry deserves special consideration. See: Oldham P., Hall St., Barnes C. Patent Landscape Report on Animal Genetic Resources: WIPO. 2014. P. 35. <http://www.wipo.int/edocs/pubdocs/en/wipo_pub_947_3.pdf>.

[72] For example, in the United States, plant varieties propagating asexually can be protected by a special patent under the Plant Patent Act (PPA) of 1930; Sexually reproduced or tuber plants are protected by a plant variety protection certificate (PVP certificate) issued under the Plant Variety Protection Act (PVPA) of 1970 and, since 1985, patents for an invention. Since patent protection has become too expensive and the patent is limited in duration, the effectiveness of protection will depend on enforcement practices - for example, the possibility of awarding judgments. See: Howard Ph.H. Visualizing Consolidation in the Global Seed Industry: 1996-2008. P. 1268.

[73] The issue of the scope of patent protection in Europe for the first time acquired relevance in 2010 in the case of Monsanto Technology v. Cafetra BV. The EU Court pointed out that the patent protection of DNA sequencing is limited to the functionality specified in the patent documents. See: C-428/08, Monsanto Technology LLC v. Cefetra BV and Others, [2010] ECR I-6765.

2) The focus on preserving the diversity of species of animals and plants acts as a certain deterrent, which rationalizes the provision of intellectual protection. This implies the use of legal protection but in the context of external factors, which is necessary amid global warming.

3) The shift from patent protection of genetic resources to patenting of technologies, crop and livestock farming practices can reduce the risks of both structural distortions (for example, excessive protection of breeding achievements in the medical field) and "overheating" of the economy.

2.7. Education in Digital Economy

Digital Ecosystem

Against the background of digital technologies, the education system is becoming more sophisticated. The world is witnessing the introduction of numerous educational technologies such as distance and online courses, computerized adaptive testing, blended learning, gamification, flipped classroom, machine learning, artificial intelligence, and learning management systems (LMS)[74]

Schools and universities are not able to independently develop and ensure the use of new technologies at a proper level. To that end, one needs *a viable digital ecosystem including a large number of participants, namely online platforms, developers and suppliers of hardware and software, classroom and room designers, and IT companies. This will allow for diversity in new educational technologies.*

China[75],[76] represents a large high-tech giant, with the country's 13th Five-Year Plan seeking the complete modernization of the education system[77]. By incorporating AI-enabled education into a national strategy, the government intends to make China a global centre of AI innovation by 2030[78].

New Skills for All

Acquiring new digital skills is recognized as an essential task all over the world, *with such training covering even primary education*. For instance, Malaysia announced in 2016 that primary schools would start teaching coding. Such programs are also implemented in Estonia and the United Kingdom[79].

Training is not limited to the introduction of special subjects, such as programming. In general, it implies the creation of a digital environment in the educational system.

Digital training goes well beyond the younger generation. The 2017 digital strategy, approved by the British government, enables the population to learn digital skill until 2020. Both students and adults, including managers and rank-and-file employees, will be trained[80]. The digital strategy involves the participation of large companies in the training of four million people. As a result, the digital economy sector should be developed, which will require new staff[81].

In the context of the new education system, *training of new teachers* is also a must. In China, there is a "two teacher" system at all levels of education. One of the teachers is the lecturer of an online course, with the second being his or her assistant. Dealing with students, the second teacher does not have such high qualifications as lecturers. At the same time, he or she is able to organize the independent work of students and give the necessary recommendations[82]. Besides, Chinese teachers incorporate digital infrastructure resources into their daily routine, using a social network (WeChat) and a platform (Slack) to conduct lessons and review tasks[83].

Flexibility and Personalization

Amid new technologies, new organizational models of education are created. Specifically, we observe the emergence of *more flexible educational routes* and the introduction of short-term and modular courses are introduced, which allows for greater personalization of education. To that end, not only electronic systems for the formation of such routes are introduced, but also solutions for their implementation, namely systems for transferring and re-crediting educational loans, with the possibility of their separation or indexing. This is exemplified by the Scandinavian countries and the UK. Flexibility of the educational system is strengthened by personalized informing students about their possible educational trajectories at any moment of their education. Similar systems are already used in Australia and US leading universities[84].

Personalized education requires a balanced legal regulation. One of the solutions is the formation of a legislative framework for individual profiles of the competencies of university graduates and the trajectories of their development. Actually, it is necessary to guarantee the protection of such information and to ensure employers' access to competency profiles. In addition, it is necessary to provide for the regulation of more flexible labor relations, including distance ones, and the regulation of the use of a personal trajectory for the development of university graduates.

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[74] Ila Mishra (2018) EdTech Trends and Challenges in 2018. URL: https://blog.wiziq.com/edtech-trends-challenges-2018/ (access date: 27.04.2018).

[75] Jeriel Tan (2018) A look into China's future: Unravelling China's edtech landscape. URL: https://technode.com/2018/01/10/china-edtech/ (access date: 27.04.2018).

[76] Emmanuel Nataf (2018) Education technology is a global opportunity. URL: https://techcrunch.com/2018/01/19/education-technology-is-a-global-opportunity/ (access date: 27.04.2018).

[77] The 13th Five-year Plan for Economic and Social Development of the People's Republic of China (2016–2020). URL: http://en.ndrc.gov.cn/newsrelease/201612/P020161207645765233498.pdf (access date: 27.04.2018).

[78] Meng Jing (2017) China wants to bring artificial intelligence to its classrooms to boost its education system. URL: http://www.scmp.com/tech/science-research/article/2115271/china-wants-bring-artificial-intelligence-its-classrooms-boost (access date: 27.04.2018).

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3. Common Framework and Individual Tools for Developing Legal Regulation

3.1. Regulating Economy amid Dynamically Changing Technologies

While regulating digital relations, today's lawmakers face the following challenges:

- new relations are often so special that they cannot be effectively managed through the existing regulatory mechanisms at the state's disposal (incentive, coercion, and calling to account);

- notwithstanding rapid technological advancement, legal regulation is quite inert due to sophisticated mechanisms of adopting regulatory acts. At the same time, non-governmental regulation, including self-regulation, cannot provide proper enforcement of the rules of the game;

- the fact that lawmakers are aware of the "overregulation" risk slows down the passage of new regulatory acts because it requires preliminary discussions and arriving at a consensus with business and society;

- the cross-border nature of digital relations requires the development of cross-border mechanisms or common approaches to their regulation.

Against this background, a possible response to emerging challenges in the face of rapid changes, high uncertainties, and a close interconnection between economic aspects and social and ethical ones is *the transition to "new regulation"* based on the following approaches:

1) given the complexity of governmental and non-governmental regulation, the state is forced to shift from detailed regulation of the rights and obligations of participants in economic relations to the regulation of principles and transfer regulatory functions to non-state institutions such as self-regulating organizations, professional associations, industry associations, etc.;

2) one should ensure the maximum possible independence of regulation from the nature of technologies, which will allow approaches and norms to be used by the parties, irrespective of technological changes. This will also allow scope for technological neutrality of the legislation:

3) one should develop "soft regulation" mechanisms and guarantee cross-border harmonization of approaches, the exchange of best practices and the development of shared framework rules, including through the formation of "horizontal" strategies, as well as the development of consensus documents for individual technological areas;

4) one should establish a legal regulation regime (regulatory "sandboxes") to lay the basis for formulating new rules and attracting investors to new technological areas;

5) one should use pro-active regulation (legal foresight) aimed at implementing systemic changes in the sphere and ensuring the consensus of interests of various parties, which, in its turn, will take into consideration the peculiarities of new generations and limit the risks of increasing age-related technological inequality.

3.2. Horizontal Policies as a Tool for Global Soft Regulation

Demand for Soft Regulation and its Peculiarities

In recent years, the OECD has been active in accumulating and analyzing the new approaches being developed in the countries in regard to regulating areas of economic relations, which are connected to the challenges of the 21st century, such as the development of advanced production technology, global climate change, as well as the processes of digitalization, affecting all countries.

The work of OECD is aimed at structuring country approaches and identifying best management practices. Accumulated information is analyzed by OECD experts and is proposed in the format of strategic documents, which refers to the type of soft law: *the recommendations are not strictly binding*. The development of such documents allows countries to move in a unified manner, implementing coordinated management approaches, which ultimately not only contributes to the achievement of sustainable development goals, but also creates an understandable and favorable business climate for the business sector. Among the strategic documents aimed at "soft" regulation, we can include the Innovation Strategy, the Green Growth Strategy, and the project on the digital transformation of the economy and society "Going Digital".

Selected practices and examples of horizontal strategies

The OECD Innovation Strategy (OECD Innovation Strategy) is kind of guide for the formation of an integrated, flexible process management model, which, in one way or another, affects a variety of innovative activities. The Strategy examines conceptual changes in the views on the nature of innovation and the methods of their dissemination, analyzes relevant decisions and mechanisms recommended by the OECD, including methodology and methods of statistical recording, a system of specific statistical indicators, etc.

OECD green growth strategy

"Green" growth means stimulating economic growth and development, while ensuring the safety of natural assets and the smooth provision of resources and ecosystem services on which the well-being of countries depends. Developed and adopted in 2009 The the OECD "green" growth strategy has identified a set of policy measures for the transposition of the "green" growth goals into practice.

The strategy means:

- more efficient use of resources to minimize environmental loads;

- application of special fiscal and regulatory measures;

- obtaining an economic effect from some purely environmental measures in a relatively short-term perspective (rising emissions).

The most important point for the OECD in terms of work in the field of "green" growth is the integration of environmental considerations into countries economic policies.

Horizontal project «Going Digital»

Going Digital project was officially launched on January 12, 2017 and is a multidisciplinary, integrated initiative of the OECD countries, whose goal is to help politicians to better understand digital changes occurring in different sectors of the economy and society as a whole[85].

The result of the project is the formulation of recommendations for proactive policies.

The project combines the experience and practice of OECD countries in the digital economy and supports the

[85] Going Digital - Organisation for Economic Co-operation and Development [Electronic Resource]. URL: https://www.oecd.org/going-digital/ (access date: 03.05.2018).

discussion at the international level related to the resolution of problems caused by digital transformation.

3.3 Consensus Documents as a Tool for Developing Common Regulatory Framework

Demand for Universal Regulation and its Peculiarities

The development of biotechnologies expands the use of living organisms, their systems or products of their vital functions to solve technological problems, including the possibility of creating organisms with specified features by genetic engineering. Developments in the field of biotechnology are conducted in many countries of the world. However, given the novelty of biotechnology, research organizations in different countries have to act in the absence of a single legal field, which not only creates barriers to international trade in new biotechnology products, but also presents significant business risks from the point of view of strategic development.

The OECD is working to create a single international regulatory framework that would create a reliable legal framework for the implementation of relevant biotechnological developments in the countries open to dialogue in this area. Countries cooperate in order to develop common approaches to improve the safety of biotechnology products and the exchange of relevant information. The result of this work are the so called consensus documents[86].

Consensus documents (CD) contain science-based information used during the inspection of new products derived from biotechnology, and are intended to be mutually recognized by OECD countries. CDs are taken in relation to plants, trees and microorganisms, as well as individual features of different organisms. In addition, there are CDs of a technical nature, regulating the processes of harmonization between countries.

Individual practices and examples of consensus documents

The first accepted CDs were the documents on potatoes (1997), rice (1999), wheat (1999) and soybeans (2000), as the most important foodstuffs in the world. Currently, active work is under way to reach agreements on trees, mushrooms and various types of plants, including fruits. Evaluation of the safety of new food and feed, as well as their derivatives is based on scientific methods, implying a comparison of the characteristics of new products with traditional ones, with the involvement of the maximum number of stakeholders.

To date 64 CDs have been adopted[87]. CDs are periodically updated to contain the latest knowledge on relevant animal organisms. For this purpose, comments from countries are collected in preparation for the meetings of the above-mentioned working groups.

3.4 Regulatory Sandboxes as a Mechanism for Introducing New Effective Regulation

Demand for Regulatory Sandboxes

The consequences of implementing a particular technology in business turnover are difficult to assess, especially when venture financing of projects in the early stages (pre-seed)[88].

In addition, it is at these stages that funding is attracted through the emerging mechanisms of crowd-funding[89] and the initial deployment of tokens (ICO)[90], and the relevance of regulatory calls is increasing.

The financing process in this case is accompanied by high costs of investors and start-ups for research and development, business modeling, testing of new products or services. At the same time, the effectiveness of market research is reduced, since the channels for marketing and consumption of innovative products or services can sometimes not be determined in advance. In cases where the target market is difficult to estimate, the costs of uncertainty are distributed between investors and developers of innovative technologies.

Due to the scale of investment, the systemic risks of using new business models increase.[91] The economic failure of one project undermines the reputation of the entire digital platform used to attract funding.[92]

At the same time, it is characteristic that the characteristics of the digital economy can constantly change. In this regard, analytical modeling of business models and legislative initiatives de lege ferenda may not be effective due to the unpredictability of the market and the inability to guess the expectations of its players.

Administrative and regulatory barriers should not hamper the attraction of investment in innovative clusters of the national economy. Legal regulation, focused on the regulation of specific physical infrastructure objects and their legal regime, may threaten the investment attractiveness of national business[93]. For example, the requirements of intellectual property law or land legislation may limit business opportunities when testing and spreading innovations.

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[86] See.: Safety of novel foods and feeds and on the harmonisation of regulatory oversight in biotechnology - OECD [Electronic resource]. URL: https://www.oecd.org/chemicalsafety/biotrack/oecdandrisksafetyassessmentinmodernbiotechnology.htm (access date: 28.04.2018).

[87] Consensus documents: work on harmonisation of regulatory oversight in biotechnology - OECD [Electronic resource]. URL: https://www.oecd.org/science/biotrack/consensusdocumentsfortheworkonharmonisationofregulatoryoversightinbiotechnology.htm (access date: 28.04.2018).

[88] See: Feld B., Mendelson J. Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist, 3rd Edition, Wiley, 2012.

[89] Amsden, Ryan and Schweizer, Denis, Are Blockchain Crowdsales the New 'Gold Rush'? Success Determinants of Initial Coin Offerings (April 16, 2018); Heminway, Joan MacLeod, Business Lawyering in the Crowdfunding Era (2014). American University Business Law Review, Vol. 3, No. 1, 2014. Available at SSRN: https://ssrn.com/abstract=3156005.

[90] See: Kuo Chuen, David Lee, Decentralization and Distributed Innovation: Fintech, Bitcoin and ICO's (October 25, 2017). Available at SSRN: https://ssrn.com/abstract=3107659; Boreiko, Dmitri, SMEs and Start-Ups Financing: From Governmental Support to ICOs and Token Sales (December 2017). Available at SSRN: https://ssrn.com/abstract=3108677; Düdder, Boris and Ross, Omri, Timber Tracking: Reducing Complexity of Due Diligence by Using Blockchain Technology (August 8, 2017). Available at SSRN: https://ssrn.com/abstract=3015219; Planet Compliance // Cryptocurrencies, ICOs and Financial Regulation. 2017. URL: http://www.planetcompliance.com/2017/04/06/icos-financial-regulation/.

[91] Smitcoin B. Ether Price Analysis: Here's What Just Went Down // Bitcoin Magazine. 2017. URL: https://bitcoinmagazine.com/articles/ether-price-analysis-heres-what-just-went-down/.

[92] Shier, Charlie and Mehar, Muhammad Izhar and Giambattista, Alana and Gong, Elgar and Fletcher, Gabrielle and Sanayhie, Ryan and Laskowski, Marek and Kim, Henry M., Understanding a Revolutionary and Flawed Grand Experiment in Blockchain: The DAO Attack (August 7, 2017).

[93] Shankland S. Google to government: Let us build a faster Net // CNET. 2011. URL: https://www.cnet.com/news/google-to-government-let-us-build-a-faster-net/.

Approach features

Response to regulatory challenges might be the development of a balanced legal regime for regulatory sandboxes, that offers the possibility to test innovative technologies in transparent regulatory environment[94].

The costs of testing and mastering innovative technologies in this case are distributed between the business and the state providing infrastructure for the pilot projects. Regulatory sandboxes are a flexible tool for stimulating innovation in a digital economy. *First,* simplified (alternative) legal regulation can reduce the costs for market players, coupled with formal uncertainty in the development of innovative products. The introduction of simplified regulation for pilot projects makes it possible to reduce the costs associated with compliance with the requirements of the current legislation [95].

In addition, participation in regulatory sandboxes helps market players to more fully predict the results of innovation after the "release" from the sandbox [96].

Secondly, the possibility of researching innovative products under controlled conditions helps prevent potential violations of consumer protection legislation. Developers of innovative products can test and improve new products in the absence of a threat to consumers.

At the same time, the regulator administering the sandbox forms an idea of the innovative products features and the risks associated with the introduction of it into the turnover [97]. *Thirdly,* the introduction of pilot regulation can reduce the formal uncertainty in the testing of qualitatively new types of products and technologies [98].

Individual practices

Nowadays, the most complete approaches to the development of regulatory sandboxes are presented in the field of financial technologies. In particular, the latter is due to the proliferation of mobile and p2p-networks, which make it possible to assert that every financial system is literally involved [99].

Since 2015, regulatory sandboxes have been successfully implemented in the US, Australia, Singapore, UAE, Hong Kong, Malaysia, Thailand, Indonesia, Russia, Bahrain, Switzerland and Canada. Regulatory sandbox mode is being developed in Brunei, China, India, Kenya[100], Mexico, Mozambique, Nigeria, Pakistan[101]. Based on the study of the world practice of creating regulatory sandboxes, six factors are identified that potentially affect the success of FinTech ecosystems: 1) government support the availability; 2) legal opportunities provision; 3) the presence of feedback from the consumers; 4) feedback from the expert community; 5) development of an innovation culture; 6) increasing the attractiveness of the regulatory sandbox for foreign start-ups[102].

Prospects of the regulation development

The experience of introducing regulatory sandboxes in the FinTech field attests the effectiveness of experimental (alternative) regulation. Such regulation can be developed to support pilot projects in other sectors of the economy, including the approbation of innovative technologies by non-profit organizations[103].

3.5. Legal Foresight for Proactive Regulation

Accelerating the rate of change in the economy and society, associated with the rapid development of science and technology, leads to the fact that the existing systems of legislative regulation become obsolete and cease to reflect the objective state of affairs, and often hamper the development. One of the most effective tools to determine the prospects of the science, technology, society and economy development are foresight studies, which are based on the global challenges analysis, their refraction with respect to the problems of the country's development (groups of countries), identification of key areas that require a significant advance change in the regulatory system.

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[94] This way in 2001, the Philippine telecommunications company SMART first launched a mobile payment service with the assistance of Banco de Oro. As of 2018, mobile operators handle about 43 million transactions per day. In connection with the reduction in costs of doing business, including transaction costs for attracting intermediaries, innovative technologies become available to a wide range of consumers. See: Castri di S. Is Regulation Holding Back Financial Inclusion? A Look at the Evidence // GSMA Blog.2015. URL: https://www.gsma.com/mobilefordevelopment/programme/mobile-money/is-regulation-holding-back-financial-inclusion- a-look-at-the-evidence; Castri di S. Mobile Money: Enabling Regulatory Solutions // GSMA. 2013. URL: https://www.gsma.com/publicpolicy/wp-content/uploads/2013/02/GSMA2013_Report_Mobile-Money- EnablingRegulatorySolutions.pdf.

[95] Pratt A. The benefits of a regulatory sandbox // VET RECORD. 2017. URL: http://veterinaryrecord.bmj.com/ on December 31, 2017.

[96] Castri di S., Plaitakis A. Going beyond regulatory sandboxes to enable FinTech innovation in emerging markets // BFA. 2018.

[97] Ibid.

[98] Formal uncertainty can lead to increased barriers to entry, limit the availability of financing for innovative projects, and reduce the potential revenue of innovative technology developers. For example, formal difficulties can arise if new insurance instruments are used (travel insurance from departure point A to destination B), when using mobile payments to collect administrative fines or when assessing the applicability of general provisions of the contract law to smart contracts. The introduction of the regulatory sandbox mode allows you to test the technology from the standpoint of security and practical compliance with current legislation. См.: Stern A.D. Innovation under regulatory uncertainty: Evidence from medical technology // Harvard University. 2014. URL: http://www.rotman.utoronto.ca/-/media/Files/Programs-and- Areas/Strategy/papers/JMP_Stern_Jan_2014.pdf.; In the face of uncertainty: A challenging future for biopharmaceutical innovation // Deloitte. 2014. URL: http://www2.deloitte.com/content/dam/Deloitte/lu/Documents/life-sciences- health-care/us_consulting_Inthefaceofuncertainty_040614.pdf; Financial Conduct Authority, Regulatory Sandbox, November 2015, https://www.fca.org.uk/publication/research/regulatory-sandbox.pdf.

[99] GSMA, State of the Industry Report on Mobile Money, 2016, at 17, https://www.gsma.com/mobilefordevelopment/wp- content/uploads/2017/03/GSMA_State-of-the-Industry-Report-on-Mobile-Money_2016.pdf; Accion, How Financial Technology is Changing Financial Inclusion, https://www.accion.org/fintech.

[100] The introduction of the regulatory sandbox regime aims to stimulate innovative projects while maintaining system stability. The implementation of projects in the pilot mode will allow to assess and reduce the risks of negative consequences in cases when the project has failed. См.: Castri di S., Plaitakis A. Going beyond regulatory sandboxes to enable FinTech innovation in emerging markets // BFA. 2018.

[101] Financial Conduct Authority, Regulatory Sandbox Lessons Learned Report, October 2017, https://www.fca.org.uk/publication/research-and-data/regulatory-sandbox-lessons-learned-report.pdf.

[102] Deloitte, Connecting Global FinTech: Hub Review 2016, September 2016, http://thegfhf.org/wp- content/uploads/2016/10/Connecting-Global-FinTech-Hub-Review-2016-.pdf.

[103] For example, the pilot regim was introduced for projects in the field of veterinary care:Pratt A. The benefits of a regulatory sandbox // VET RECORD. 2017. URL: http://veterinaryrecord.bmj.com/ on December 31, 2017.

Foresight research in the field of legislation (Figure 3.1) should analyze the "big challenges" that can affect the global development of the economy and society as much as possible, identify possible answers to these challenges, including from science and technology, identify key barriers, windows of opportunities and risks that require changes in the regulatory system, while the best world practice of preparing responses of the legislative system to individual challenges must be analyzed.

Foresight provides a systematic discussion of the legislative regulation problems with all stakeholders, thus playing the role of a communication mechanism and platform for coordinating the positions of key stakeholders and, ultimately, the formation of more effective institutions. Particular attention should be paid to the processes of national legislation harmonization with the international norms based on the assessment of prospective trends, proactive participation in the discussion and the formation of new norms of international law, including standards.

Conclusions: Political Implications, Agenda for Parliamentarians

I. Harmonizing Legal Regulation

- The emergence of a new technological order and the digitalization of all spheres of life constitute most important trends which determine political and socio-economic processes at the global, regional and national levels. The issue is bound to top the political agenda of both developed and developing countries for years to come.
- The prominent role of parliaments in developing the regulatory and legal framework of the digital economy and preparing society for the requirements of the fourth industrial revolution is a major factor strengthening the authority and clout of the legislative power in the emerging new world.
- Active and proactive development of legal regulation enhancing digital development and simultaneously safeguarding citizens' rights in the ICT environment brings parliaments to the forefront of public life and adds considerable political weight to their activities.
- Close interparliamentary interaction, the systematic exchange of best legislative practices and joint efforts to develop model legislation are essential for effective law-making in this field with due regard to rapidly changing technologies.
- It is important to secure the compatibility of national legislation and emerging international norms in this field and jointly formulate such norms.
- Large-scale reforms, including legislative innovations, designed to stimulate accelerated digital development, the formation of a data-centric economy and digital ecosystems, will have political implications both at the domestic and international levels.
- Stimulating reforms will affect socially sensitive spheres, including taxation, education and health.
- The investment process in the digital economy is to be accelerated by the system of financial and non-financial incentives for the creation and development of business companies, including preferential tax regimes for R&D investment, sale of start-ups, disposal of intellectual property, residence of highly qualified specialists.
- In order to provide the digital economy with human resources, to form the necessary digital skills, the educational system should be deeply reengineered. The learning process will be individualized on a life-long basis with the use of modern flexible digital educational technologies.
- Digitalization of medicine will allow to dramatically improve the effectiveness of health care, the quality of life and, thereby, significantly reduce social and political tensions.

II. Lifting Barriers

- The digital economy is inherently open, with open architecture, and functions with an aim to ultimately enter the global market. An attempt to build a "closed" digital economy or an autarchic digital economy will inhibit its development, preventing breakthroughs and the emergence of game-changers.
- Therefore, along with harmonized national regulatory systems, a non-confrontational political environment, which is conducive to deeper economic cooperation, will be an important prerequisite for promoting digital development.
- Stable international trade regimes, as well as the renouncement of attempts to politicize international economic relations, to wage trade wars, to exert pressure through sanctions and to impose other artificial barriers are necessary prerequisites for dynamic and synchronized digital development, whose unification multiplier effect benefits the whole international community.
- Interparliamentary dialogue is able to contribute to a common and uniting agenda concerning international economic cooperation in the interests of digital development.

III. Risk Management

- As various elements make uncoordinated and multi-speed progress towards the new technological order, the complex world of interconnected global economies runs a potential risk of destabilization.
- Against the background of the fourth industrial revolution, potential revolutionary changes will bring about profound socio-economic transformations in most states, which can reconfigure the current system of global labor division and technological chains and ultimately have an impact on the distribution of world economic power.
- Apart from the different depth levels and dynamics of the new technological order in numerous countries, the speed of digital development can cause an explosive growth of global inequality, which, in its turn, can destabilize socio-political systems of the entire regions. This will prepare the ground for new migration waves, the spread of extremist ideologies, and the growth of international terrorism and organized crime.
- It is of crucial importance to prevent the emergence of such destabilizing gaps, to ensure equal access to potential benefits of the new technological order, and to effectively use antimonopoly legislation to avoid the monopolization of markets and the establishment of technological superiority.
- The agenda can be advanced only through close interparliamentary dialogue, political interaction within multilateral parliamentary structures, and concerted legislation efforts aimed at regulating the economy of the future.