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WIPO CONVERSATION ON INTELLECTUAL PROPERTY (IP) AND ARTIFICIAL INTELLIGENCE (AI)

Organized by
the World Intellectual Property Organization (WIPO)

Geneva, September 27, 2019

SUMMARY OF CONVERSATION

Prepared by the International Bureau

Introduction

1. The present document contains a brief summary of WIPO Conversation on IP and AI, which the Secretariat prepared. WIPO webcasted the meeting and the complete conversation may be found at Video on Demand site of WIPO meetings (<https://www.wipo.int/webcasting/en/>). A copy of presentations and the program are also available at https://www.wipo.int/meetings/en/details.jsp?meeting_id=51767.

Opening Remarks made by the Director General

2. Opening the WIPO Conversation on Intellectual Property (IP) and Artificial Intelligence (AI) on September 27, the Director General remarked on the growing importance of AI and the necessary recognition of factors, such as the impact of AI on the economy and society, the technology gap, and the deeper inclusion of AI in governments' strategies, and their considerations for regulation.

3. The Director General listed seven aspects, which the Organization recognizes with respect to AI.

4. The first one is that a "relatively new" general-purpose technology (AI) is unfolding across the economy and society, and it has and will have an extraordinarily profound impact.

5. The second is that commercial applications deploying AI are increasing, matched by a rise in investment in AI on the part of major corporations.

6. As a third aspect, the Director General stressed that as the interest in AI and AI applications is growing, WIPO, being an international organization, needs to take cognizance of the "very uneven capacity" in the field of AI. "There are clear leaders and there are trailers." There needs to be awareness of a major technological gap in the world and AI risks exacerbating that gap.

7. AI is also generating widespread media and public attention, both as an object of wonder, and of deep anxiety and concern, and this needs to be acknowledged, the Director General enounced as a fourth aspect.

8. The fifth aspect regards governments' engagement. It is growing around the world, in three different directions, said the Director General. The first is the engagement of strategic thinkers within governments, as they are including AI in the establishment of industrial or post-industrial economic strategies. The second is the efforts by governments to develop policies and strategies to support AI, such as opening up government's data for commercial applications. The last one is the beginning of "regulatory" initiatives.

9. As a sixth aspect, the Director General remarked that policy questions raised by AI are broad and multidisciplinary, and one of those is property, and in particular intellectual property. Beyond the national dimension, AI questions really have an international dimension, such as the flows of data, different regulatory initiatives and the value chain, the Director General pointed out as the final aspect. Technical interoperability is going to depend on regulatory interoperability and if regulatory initiatives are going in "all sorts of directions, we are going to find ourselves in a difficult position technically," he said to conclude his list.

10. WIPO has been trying to engage in the field of AI in different ways. The organization published a major report earlier this year landscaping scientific publications and patent applications in the field of AI since the beginning of AI in the 1950s, providing empirical data as a basis for policy discussion (WIPO Technology Trends (WITT)).
11. In addition, WIPO has been developing its own AI-assisted tools for the purpose of the administration of IP (WIPO AI Tools).
12. WIPO has also joined efforts with Member States, for example by co-organizing the conference “AI: Decoding IP” with the United Kingdom IP Office, participating in various events on AI in Dubai and Israel and planning for an event next year with the United States Copyright Office. WIPO also participated in the “AI for Good Summit” held by the International Telecommunication Union.
13. This conversation on IP and AI is hopefully a step moving toward a more determined engagement on the part of WIPO in the field of AI, responding to a growing demand on the part of WIPO member states.

Panel Discussions

14. WIPO Conversation on IP and AI convened six panels: Opening, patent, governance and development, copyright, data, and intellectual property offices (IPO) administration, and gathered 24 panelists. The following paragraphs contain highlights of the conversation at the six panels.

What impact does AI have on the IP system and IP policy?

15. The opening panel focused on the extent of AI’s impact on innovation, commercial markets and industry, the potential need for change in IP concepts, and the current use and effect of AI on IP offices and IT systems.
16. All four panelists of the opening panel agreed that AI is a game changer. One of the panelists said AI has the potential to be the most disruptive technology yet, echoed by others, predicting that AI will still gain in strength, will become even more disruptive in the next two years, and sits at the core of the fourth Industrial Revolution.
17. One of the reasons why AI technology has so much potential is because it covers a very large spectrum of areas, from autonomous vehicles to personalized medicine, from cyber security, to imaging, and diagnostics.
18. However, the definition of AI itself can be challenging. AI is a discipline of computer science, whose objective is to build non-biological intelligent systems. Historically, from when AI was first coined in the 1950s, two philosophies emerged. One was grounded in symbolic logic and is based on the assumption that if a machine is given human knowledge, combined with laws of logic and some rules, it will derive new knowledge. The second one is a bottom-up, or data-driven philosophy built on the fact that an AI system can learn from data, such as in neural networks. This second approach was not very popular and did not get recognition until very recently.

19. Three phenomenon contributed to the success of the data-driven approach. The first is the availability of large-scale non-structured data, such as video, text, big data and data coming from different sources like sensors. Humans are unable to make sense of those data without the help of AI. The second reason is the availability of large-scale computing power at low cost, and the third is the development of highly complex models inspired by the original neural network, now including several hundred millions parameters, which are able to sift through vast volumes of non-structured data, and find patterns.

20. The capabilities of statistical machine learning and deep learning are revolutionizing many areas, such as computer vision, analysis of video, audio, text, and voice recognition.

21. The past 10 years have seen exponential growth in AI applications and an impressive increase in the number of papers published, patents, and venture capital investment. In Israel, for instance, over 1,000 AI start-ups open each year.

22. Beyond all the achievements and impacts of AI applications, one panelist gave a word of caution. AI has always captured the imagination and it is important to be careful about some of the claims, creating expectations that might not be met. The current impact of AI is already remarkable and there is no need to extrapolate into the realm of science fiction. A lot of the hype surrounding AI is good but the world should be realistic about the competences of the system.

23. AI is not only proving to be disruptive in most areas, and becoming omnipresent in our everyday life; it also brings into question traditional concepts of intellectual property.

24. The protection of AI inventions poses a number of challenges to the current IP system. One of the biggest issues surrounding AI innovation is its potential to reshape the nature of innovation itself. Innovators use machine-learning tools, setting a faster pace for innovation, and machine learning tools are developing innovations on their own.

25. Panelists raised some questions specifically related to the current patent system as examples of AI's impact and challenges on IP (see more on patent-related questions in the next Section)

26. The IP system has an increasing role in incentivizing innovation, and the question is how to solve the particular challenges brought by AI to the IP system. AI poses policy, legal, and examination-based questions, and policy-makers should listen to practitioners from the sector and seek to improve examination criteria. In this regard, one panelist referred to a recent request for comments on patenting AI inventions (US Federal Register, Vol.84, and No.166, filed on August 26, 2019).

27. The definition of intellectual property cannot be limited to the human intellect, according to one of the panelists. AI can use data to generate content, video, image, a piece of art, or a novel. The network will use the training to generate content that is similar to the material used for its training. One of the challenges of IP is the heavy dependency on data and the difficulty to interpret and to explain deep neural networks.

28. The same architecture, the same type of network, the same nodes and the same connections can produce different creations according to the input data. The network could generate a painting worth €200,000, a cartoon, or something else, like a novel. In that case

where does the IP lie? An additional question is how to manage IP when there is a collaboration between a researcher and an AI tool.

29. One of the panelists also mentioned the difficulty and the cost for young start-ups active in AI innovation to enforce their IP rights against big companies, underlining the growing frustration on the part of those start-ups.

30. In addition to policy matters surrounding AI, one panelist remarked that another important issue for IP Offices is how to use AI tools to process patent applications. The other panelist echoed that observation, and shared recent developments with regard to the use of AI tools (see more in the last Section regarding IPO Administration).

AI and patents: are the current patent law and patentability guidelines appropriate for protecting and using AI-related Inventions?

31. Bringing together panelists from the private sector, users of the patent system, the second panel focused on whether the current patent law and patentability guidelines are appropriate for protecting and using AI-related inventions. In particular, the panelists shared their views on topics such as ownership of patents, their enforcement, challenges linked to the speed of innovation, and the global management of patents.

32. Intellectual property laws were written at a time when only human inventors were contemplated and that poses a series of questions and challenges in the context of a rapidly rising reliance on artificial intelligence systems, whether they contribute to an invention, or they actually create one.

33. As one panelist remarked, the technology is moving incredibly fast, but creating legislation takes time, and it is difficult for legislators to keep track. AI systems are also now able to invent new devices, and panelists shared the view that such new devices should be patentable, and cannot be dismissed just because there is no human inventor.

34. Earlier this year two patent applications were filed at the United States Patent and Trademark Office (USPTO), the European Patent Office (EPO), and the United Kingdom Intellectual Property Office for inventions created by an AI system (DABUS), one for a food container and the other one for a flashing light. The system was created by Dr. Stephen Thaler, an AI expert based in the US, himself listed as applicant in those applications. Those applications play the role of test case. If a machine develops an invention, who is the inventor? If a patent were to be granted to a machine, then who would own the IP? The machine, its owner, the developer of the machine, the data supplier, the people who trained the machine?

35. Different jurisdictions define inventorship differently. In the United States, for example, an inventor has to be a natural person. Some jurisdictions refer to the Paris Convention for the Protection of Industrial Property, for requiring that an inventor be human, but the Paris Convention actually only mentions the right for an inventor to be named as such in the patent. So could an AI system be given that right and be mentioned?

36. Rather than looking at what the existing laws say on the subject, it might be useful to see if they are fit for purpose now and in the future. The first principle of patent law is to encourage the disclosure of ideas, to broaden the common general knowledge base. Not being able to patent an AI invention is a step into the unknown: will that encourage innovation, collaboration, or rather discourage the publication of a large number of inventions?

37. Several solutions could be contemplated to address this issue, such as nominating the machine as an inventor, but machines have no rights, duties or responsibilities, or list as inventors the humans who trained, coded or controlled the AI systems. One panelist suggested that expanding the terms of inventor to a natural or legal person, who controls and has responsibility of the AI process that created the invention, is considered a better option.

38. In the US, it can be considered fraud not to correctly name the inventor in a patent application. Such alleged fraud would make the patent unenforceable, which might call for urgent revision of patentability criteria.

39. Examination guidelines also differ from country to country which makes it even more challenging when it comes to AI patent applications. The field is so new that there is even little coherence between patent offices and their national courts. In the US, for example, since a Supreme Court ruling (*Alice v. CLS Bank* – involving a business method implemented by a computer, considered as abstract ideas, not eligible for patent protection), inventive step in the area of AI patents have been problematic. Even if the USPTO has published examination guidelines, those are not new law. There is uncertainty about how the US courts will consider AI-related applications, which makes a patentability analysis in the US rather uncertain for the moment.

40. The EPO has released new guidelines on examination of AI inventions but a pending referral at the EPO Enlarged Board of Appeal on the patentability of computer generated simulation (case number T 0489/14) is threatening to move the bar in terms of patentability on computer programs in Europe, where it has been somewhat higher than in other jurisdictions. This case also has direct implications on the patentability of AI, since some might argue that AI is merely a simulation of the human brain.

41. In Japan, new examination guidelines institute machine learning as a technical field in itself, and the patentability analysis is closer to standard inventive step requirements applied to all types of inventions. This approach is in line with the International Association for the Protection of Intellectual Property's (AIPPI) position that computer programs should be patentable, so long that they meet the traditional criteria of novelty, inventive step, and industrial applicability.

42. The validity of a patent is assessed against a set of criteria, one of which is to evaluate inventive step in the light of the knowledge of one of ordinary skill in the art. If the machine is an inventor, who is the one with ordinary skill in the art?

43. Another issue is disclosure requirements. Many times AI innovations are the result of black box operations by the machine, which makes it impossible to disclose the innovations in sufficient levels of details to satisfy existing laws. Patents, copyright and trademarks may not be enough to protect an AI-related invention, so companies are tempted to jealously guard training data used for machine learning. The reversion to secrecy runs against one of the principles of the IP system, where public disclosure is a condition for limited protection. The world might need other forms of protection that do not currently exist.

44. In response to a question from one of the participants concerning measures to address the issue of insufficient disclosure and in a reference to the past response to the need for disclosure of microorganism by introducing the Budapest Treaty, one panelist indicated that the disclosure requirement in patenting may be part of a bigger issue of the accountability of AI-

enabled machines and their operators, and referred to a recent initiative called “explainable AI” (more on the accountability, see the next Section).

45. All panelists agreed that international convergence and more coordination among regions would be useful, and should ultimately lead to greater legal certainty.

46. Questions around infringement have no more answers than those about ownership of patents. If an AI system infringes a patent, who is then liable? Is it the people who trained the AI system? Would everybody be involved, including the owner of the system and the people whose data was used to train the system?

47. On the other side of the coin, there is no experience of someone or a system infringing on a patent awarded to an AI system, however, the detectability of infringement in computer systems can be hard to prove and the help of AI might be required to find potential infringement in the future.

48. Ethical issues were also mentioned by panelists, in particular the issue of data privacy, and the necessity for AI to serve social goods (more on ethics in the next Section). One panelist observed that in the future AI systems would communicate with each other by data, and underlined that if AI is sometimes considered as a super power, it is matched by enhanced responsibilities for companies. AI should remain controlled by humans, to benefit society, respect safety, data privacy, and ultimately protect world peace and development. There cannot be discrimination against a technology, which will be able in the future to create inventions by itself, but it must remain controlled by human beings and legal persons.

Socio-economic and ethical impacts of AI on the IP system: public policy interpretations

49. Artificial Intelligence systems praised for their capacity to provide solutions to human issues also have the potential to widen the technological gaps existing between countries. Beyond worries about data privacy, transparency of algorithms, concerns are also rising about possible biases in AI systems. Panelists presented their view about policy considerations in the regulation of AI.

50. The development of AI-assisted systems, and in particular decision-making systems, is raising ethical issues and a number of initiatives and research are seeking to provide ethical guidelines to the development of AI systems.

51. For example, one of the panelists developed a framework, called FATEN, listing essential ethical dimensions of any AI-enabled system. In this framework, the F stands for fairness and non-discrimination. AI-enabled data-driven algorithmic decisions-making systems can be discriminatory if the data used to train the systems are biased, or if some of the algorithms are misused.

52. The A stands for three different principles: human autonomy, accountability, and human augmentation. When algorithms can understand our tastes, our needs, our activities but also our weaknesses, they can use that to subliminally direct our actions and decisions. So human autonomy should be preserved. Accountability relates to the inventor of a new creation that has been algorithmically created, and the consequences for the use of those algorithms. Finally, most experts' opinions and most national strategies published to date call for the augmentation of human abilities, not for the replacement of human abilities.

53. The T stands both for trust and for transparency. Trust is needed in the institutions, in the systems, and in other humans. This trust needs competence, reliability, honesty and transparency. Multiple factors might provide for a lack of transparency. One of them is illiterate opacity, which means something might not be transparent because if its functioning is disclosed to a non-expert individual, this person will not be able to understand the explanation. Another reason is intrinsic opacity, in which the model is so complex that even experts cannot explain it because they do not understand it themselves. In many cases intrinsic opacity is unacceptable because one should be able to demonstrate that no variables were used that might break the law.

54. The E has a triple meaning: beneficence, education and equality. Beneficence relates to the need to maximize the societal beneficial impact from the development of AI. This includes more diversity in terms of algorithmic, gender, and geographical diversity.

55. N stands for non-maleficent and includes four dimensions: reliability, security, robustness, and privacy. Personal data are not the only ones, which can provide personal attributes; non-personal data can disclose a person's sexual or political orientation, a mental condition, or the state of their marriage.

56. Other socio-economic issues include sustainability. It is estimated that 20 percent of the world's energy consumption is due to technology and largely AI. The promises of AI should not translate into a threat to the planet, as pointed out by a panelist. Vigilance is also required on the veracity of content generated by AI, and on the global education challenge. Most children and young people are being educated based on the second industrial revolution while we are now in the fourth one. Education should also address the needs of professionals who will have to work together with AI systems, of politicians, citizens, and decision-makers.

57. The technological gap will widen, as developed countries are AI leaders and are likely to increase that lead in the adoption and deployment of AI one panelist mentioned. It is estimated that by 2030, 20 to 25 percent of the net economic benefit of developed countries will be coming from AI systems, compared to five to 15 percent for developing countries. Developed countries not only have strong technological foundations for AI but also strong incentives to invest in that area. They also have better digital infrastructure, better internet penetration, broadband speed and affordability, adequate human capital able to absorb new knowledge, a more flexible labor market structure, and are more innovative.

58. Internet penetration in Africa is about 32 percent, compared to the 90 percent and above in developed countries.

59. Beyond the development of AI-based solution, the issue of job creation is critical in Africa. Policy makers are facing a dilemma trying to balance automation and job creation. Confronted with an expanding young population, the continent needs to create employment opportunities.

60. However, robust policies could address that issue, in particular the move to embrace the digital economy. Some 62 percent of employment opportunities in Africa are found in the informal sector, and it is predicted that this sector as it moves toward digitalization will hasten its formalization through the creation of new platforms and new jobs. It is also believed that the agricultural sector in Africa will benefit from automation, increasing productivity and providing new services, thus creating additional job opportunities.

61. On accountability, panelists agreed on the importance to define who would be accountable for a decision based on resources developed by AI. For example, as one panelist explained, intentional or unintentional biases in the development and structuring of an algorithm, such as face recognition could result in racist bias in a regulation. Who would then be accountable for this bias, the regulator, policy-makers, the developer, the algorithm, or the machine itself?

62. Developing countries do not have the capacity to develop their own AI technology for decision-making processes and are at the mercy of algorithms derived from a limited scope of original parameters, or a multiplicity of algorithms. Consequences for faulty algorithms in decision-making processes could be detrimental for individuals when they might become the recipients of inaccurate decisions or treated unfairly, detrimental to the group, when algorithms produce different results according to different groups, like demographic groups, and detrimental to society if the result of the algorithmic processes cannot be relied on to be accurate.

63. Artificial intelligence has been developed early on by Singapore as a way to find solutions to the country's aging population and the diminishing work force.

64. However, the country has chosen trust-building dialogue and consultations over regulations, estimating that premature legislative steps might stifle innovation. Another panelist found that rules should evolve as well as the IP framework, and it might be an opportunity to look for new IP protection rules for AI.

65. A proposed model of AI governance framework was announced earlier this year in Singapore, with a set of consistent definitions and principles relating to the responsible use of AI to provide greater certainty to industry players and to promote the adoption of AI and trust.

66. The framework, based on two high-level guiding principles, asks that the algorithm decision-making process is explainable in non-technical terms, transparent and fair. Designers and operators are also accountable for their systems and algorithms, and should make sure those systems operate in a transparent and fair manner.

67. The panelist mentioned Huawei's recent release of a white paper on shared responsibility model for AI security and privacy (Thinking Ahead About AI Security and Privacy Protection), which calls on governments, standard organizations, users and industry to reach a consensus and work together to develop a new code of conducts. Google has also called for governments to work with civil society and stakeholders on AI governance, while Microsoft issued six ethical principles.

Will AI change human creativity and its protection as copyright and related rights?

68. AI is evolving fast, and AI systems are producing content that could pass for human creation. Copyright laws are different across the world in the way they protect authors. For many countries copyright can only apply to a human author, for others with a more flexible approach, the leap to awarding authorship to an AI system seems feasible. Panelists explained their view on the conditions of such protection, but also what AI-produced content means for human creators, and how to deal with data.

69. The position taken by Indian courts has been that creativity must be respected wherever it comes from, and India's courts have opted for a modicum of creativity test. Holy Scriptures,

rivers and even animals have been considered by courts as legal entities for owning property. In a number of areas, Indian courts have interpreted cases in a broad manner as to include new concepts on the internet, such as phishing, spamming, Meta tagging, hyperlinking, and the protection of domain names. Those courts have used old thoughts and stretched them to meet the circumstances and needs of today.

70. In the case of machine learning programs, first datasets are acquired, then the AI system is trained with them, and a model is subsequently built. In a second phase, an input is given to the model, which produces an output in the form of a solution.

71. Several questions arise around the data (more on data in the next Section). One of them is to know if the acquired data are protected, as Indian law consider raw data and structured databases in a different way. Other questions relate to whether the data were in the public domain, or if the data represent only some normal facts, or something beyond normal facts. Another factor for court consideration is whether the data found in the model output are in recognizable format, and if the technology used was supervised machine learning, or unsupervised machine learning.

72. If the court finds that somebody has provided the creative input, and another person has taken advantage of that, it would be considered as an infringement, and the database would be protected under copyright law.

73. On authorship, the deeming provisions in the Indian copyright law provide that the author is the person who took the initiative and was responsible for the work, so people who take the initiative and are responsible for machine learning program could be considered the authors.

74. Three broad different approaches to authorship for AI creations can be found in jurisdictions across the world. The majority of countries, including continental Europe, Australia, and the United States require human creativity in their copyright law. Others, such as the United Kingdom, Ireland, South Africa, New Zealand, and India, adopted the wording of the UK Copyright Designs and Patents Act (CDPA), and award authorship to the person who arranged for the created work. It was originally based on the concept of “skill and labor” or “sweat of the brow.” Separately, Japan seems to be exploring a system, which would reward the investment put into the creation of a work.

75. According to a panelist, the CDPA language is best suited to answer questions of authorship for an AI-produced work. This because of article 9(3) of the CDPA which states that “In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.” That definition leaves originality out of the question.

76. However, protecting an AI-produced work seems to meet inescapable obstacles in many jurisdictions, as explained by another panelist. The first one is whether the AI-produced work can be considered as intellectual work in the sense of copyright, as many consider that an intellectual work is an original form created by a physical person.

77. A definition of what is intellectual work could be that it is an original form created by a physical person who was aware of the result to be achieved, which rules out AI. A reasoning based on the novel nature of the work could not be considered since novelty is not a criterion for copyright law, which bases its evaluation on originality.

78. That criterion would hardly be satisfied by an AI-system in jurisdictions, which consider that originality is the expression of the author's personality, and the result of subjective choices, none of which apply to AI.
79. In other jurisdictions, such as in the UK, where the sweat of the brow is a criterion, it would also be difficult to demonstrate the effort on the part of the AI system, when the best of the effort was made by human managing and training the system.
80. Finally, most copyright laws require the awareness of the creation. A machine does not have that conscience.
81. Since copyright conditions do not allow for granting copyright protection to an AI-generated work, a special *sui generis* system could be designed. If protection were to be granted to an AI-generated work under most current copyright conditions, the link to the physical person would have to be removed or weakened, completely transforming the copyright system.
82. Legislation takes a long time, and one panelist explained, that law changes could only come about through judicial pronouncement. Courts will solve the issues on a case-by-case basis through an iterative process until the international community agrees on a treaty.
83. Panelists agreed that AI is getting very sophisticated and it is getting increasingly difficult to tell if a human has created a work, such as music or a painting, or not. A recurrent neural network dubbed "Bot Dylan", trained with over 20,000 pieces of Celtic music (engineered by scientists from Kingston and Queen Mary Universities in London) is producing "very passable" folk music.
84. The copyright status of those 20,000 pieces of music is impossible to discern, there are no authors, nobody knows who owns the music, and the project, which created that neural network, is almost a copyright-free area. The program generated codes, which are under open source license, as explained by a panelist.
85. Nevertheless, keeping work in the public domain is worrisome as it can create unfair competition with creators. When AI systems are so advanced that nobody can tell if the work is coming from a human or a machine, it is going to be in favor of the machine.
86. For researchers, copyright sometimes can contribute to algorithms biases said one of the panelist. If there is a risk that the data used to feed the AI systems are infringing copyright, researchers will try to minimize that risk. One natural way of doing this is to use data, which are in the public domain when the copyright has expired. For literary work, this means relying on data that might be representing society as it was in past centuries, leading to possible gender or racial biases.
87. Another problem arises when researchers have to demonstrate the safety or reliability of their machine learning models. If the models have to be audited and/or edited, it is useful to go back to the original database. If a copyright exception allows the researchers to process and reproduce material for the purposes of machine learning but that material has to be immediately destroyed afterwards, those records are gone.
88. A common misunderstanding is about the quantity of data needed for machine learning when in reality the quality of data is really the key so a considerable amount of efforts that goes

into machine learning is the search for valuable datasets and reducing biases. The impossibility to go back to the original database because of copyright rules might prevent the need for continual improvement of datasets.

89. Licensing could be a way out of the dilemma, as a number of datasets have been relying on works under creative common licenses.

Data Policy and AI: Data Protection and Free Flow of Data for Developing and Utilizing Technologies, and its Implication on the IP System

90. Data have been dubbed the oil of the 21st century since it is the necessary raw material to feed AI systems. Panelists in this session looked at the current legal framework for data sharing, and its possible improvement, and how to establish strong safeguards for privacy.

91. Panelists agreed on the need to define data in more precise terms, in particular when discussing data policies. A clear delineation of AI-related data is needed, one said, as well as guidance on how current laws do or do not apply to each category.

92. There are multiple policy aspects to the data issue, including privacy, liability, and IP. On input data, which are used for the purpose of machine learning, they may be protected by copyright, or be confidential information protected by trade secrets. However, it appears that the majority of datasets, the raw data used by machine learning, might not fall within the scope of IP rights. It is important to specify the type of data considered in policy discussions.

93. One panelist pointed out to three areas in which solutions are needed. One is improving the legal framework on data sharing, including the legal structure around copyright, which provides exceptions for text and data mining for research purposes, but also data standards, which would improve interoperability, and data use agreements. The others are the need to build modern software tools, and pursue further work on privacy preserving technologies.

94. A public-private multipronged approach to the overall data policy issue, which would focus on innovation and social benefits, was also suggested.

95. Microsoft recently released three data sharing model agreements, under creative commons license, with annotations on legal consequences of each of the provisions.

96. In Germany, intense discussions have been taking place about the protection of non-personal data, and whether new rights are necessary, in the context of emerging data markets. Platforms are emerging for the trading of data and competition law has a very important role to play. For the moment, the trade of data takes place in win/win situations, through contracts.

97. IP is about innovation, and positive argumentation can be made about a new IP right for the protection of data, based on the need for allocation noted one panelist. However, opinions are split 50/50 among IP laws practitioners of the AIPPI on the need for such new IP right, as a new right might cause a paradigm shift in IP protection.

98. At the European Level, the Data Protection Directive provides a good basis and the current IP legal framework can adapt since it has room for flexibility according to one panelist. They are moreover other ways to get the right balance than to tweak IP laws. For example, in the context of the European legislation on open data and the re-use of public sector information,

some public administrations claimed that they had some IP rights on this information, but the European Union clarified that the disclosure obligation of the data prevailed over IP rights.

99. Data sharing has multiple dimensions and it is best not to rush into legislation. The market could be left to lead the way or soft law or guidelines could be issued. The compulsory sharing of data is an extreme option, but it has been used in particular circumstances, such as in the banking sector. It is best to foster voluntary sharing for the moment and when and if needed to serve the public interest, legislative solutions can be found.

100. One panelist remarked on the importance to differentiate between data and information. Information can be conceptualized in three levels: syntactical level, semantic, and pragmatic level. In the existing IP schemes, protection covers the semantic level, which concerns works, designs, and knowhow, and the pragmatic level, with inventions and trademarks. If data were to be protected as such, that would mean extending the protection to the syntactic level, where the whole of the information, unqualified, would be protected. That would provide for a very broad protection that does not exist so far.

101. The balance achieved by the IP system, providing rights, and exceptions, protecting the creators and at the same time providing benefits to society should not be tipped, according to a panelist. Although it is true that data can have value, it is also true that data is the fuel of innovation. Some insights and innovation come from data and it is important for society that researchers have access to those data to train AI programs to advance society. If the balance is tipped in the wrong direction towards a data property right, those opportunities will be lost.

102. As a mirror image to data sharing, there is an issue of access to data said one panelist. In the current situation, data are being held under the control of companies and kept in secrecy. This impedes access to data and threatens the free flow of information, and competition law, although useful, might not be sufficient because of its high threshold.

103. Another panelist remarked on the fact that a lot of data do not implicate privacy as many academics rely on public data, which do not involve privacy. There is a vast amount of research done to tackle the privacy issue and how to use data that may involve private information in way that does not compromise the privacy of the individual but allows the researcher to be able to do conduct research.

104. Confidential computing in which data are transmitted from one entity to another through encrypted communication is an example of technology which secures data transmission. Another one, launched in September by Microsoft, called differential privacy, injects white noise into the database so to create an abstraction layer for private information, preventing someone from extracting that private information but preserving the part that can be used by researchers.

105. The private sector and the academic sector ought to work with governments to present AI-based technologies achievements and ask governments to create some level of safe harbors suggested one panelist.

106. On national and regional best practices, one panelist described the strategies adopted by Japan, based on five main principles. The first one is the establishment of a comprehensive data policy. The second is the recognition that data rights are not currently strong enough to encourage sharing as the country introduced a new protected data system under its unfair competition law. The third principle is the publication of comprehensive contract guidelines to

help companies, and the fourth is tweaking the existing system to fit the purpose, such as setting up an anonymization system for medical data. The last one is the creation of a new article of the copyright act allowing the exploitation of certain copyrighted work for data analysis.

AI and IPO Administration: What is the impact of AI on examination of IP applications?

107. AI is increasingly used within IPOs to facilitate the work of both applicants and examiners, in particular, in addressing the growing volume of applications. Speakers explained how AI-assisted tools have been created and implemented, the benefits the offices have derived from those tools, and the mid- to long-term possible effects of this technological revolution on their offices and on the IP system in general.

108. A number of the activities of IPOs have the potential to benefit from AI-assisted tools, including classification of patent documents, document searches, translation of applications, prior art searches, with text and image recognition, and virtual assistants. AI has changed the state of play for offices and examiners and how to administer IP rights in the future, as IPOs become more efficient in using that technology. In China, for example, tools have been developed to help with prior art searches and categorization. Although some promising results have been achieved, it seems there is still quite a long way before users' requirements are satisfied.

109. One of the pre-requisites to conceive an efficient AI-assisted tool, panelists agreed, is the careful selection of criteria for searches and close collaboration with their information technology team. Rospatent recently created a distributive thesaurus to match their database lexical volume. The first three operations of a patent search: the query, the extension of the search query with the distributive thesaurus, and the extraction of the ranked list of results are carried out through an algorithm, the last phase of the search, which is the intelligent rearrangement of the list is using an AI-assisted tool. In a further development, the office is hoping to create a multilingual distributive thesaurus.

110. Although the AI-assisted patent prior art search tool is not providing complete results for the moment, it still alleviates the work of examiners, saving them the task of going through huge databases and giving them the opportunity to focus on the essence of the inventions. It reduces examination time and expedites the examination process.

111. The European Union Intellectual Property Office (EUIPO), which deals with trademarks and designs, uses AI-assisted tools widely, in particular, to address translation needs. They also use AI in prior art searches, letter analysis, and workload distribution. Further implementation of AI-assisted tools are part of the EUIPO's strategic plan for the next five years, including virtual assistants with multi-lingual chat-bots, further machine translation capabilities, validation of content, image recognition for design registration, and enforcement.

112. Trade Mark Assist is an AI-assisted tool, which walks applicants through the trademark application process at IP Australia, as many of those applicants do not have legal representation. The machine-learning tool executes a search and gives the applicant information on already registered trademarks, or signs they are not allowed to use, such as the Olympic rings. A twenty per cent increase in successful trademark applications was noted among applicants using Trade Mark Assist.

113. The use of a virtual assistant, with an eighty per cent query resolution rate, lead to a massive decrease in the number of calls taken by the call center, reducing costs for the office.

114. IP Australia also deployed a goods and services assistant for the trademark examiners, and an automatic patent classification tool. Neither have proved to be completely accurate, but are expected to improve as they are fed new data.

115. A recent addition to Australia's IP laws was the use of a computer to make a decision. The addition of these provisions was accompanied by a robust governance framework setting out how those computer-assisted decisions are governed, and how algorithms are applied. It requires that checks and balances are in place, and determines how records should be kept.

116. One panelist remarked that there is currently no common understanding of AI, first coined in in the 1950s by John McCarthy. The concept of AI has changed over time, but can be classified in four levels: the first is simple control programs, such the ones used in a washing machine, the second are more advanced controlled programs, such as in traditional puzzle games, the third level is AI with machine learning, and the fourth, deep learning.

117. In talking about AI tools, there is a need to understand at what level those tools are being developed and how to ensure the maximum quality possible to avoid biases.

118. Asked about whether AI could have an impact on examination criteria, panelists agreed that it would not. AI-assisted tools are designed to increase efficiency and streamline the examination process through automation.

119. The usual examination criteria, for example patentability criteria are not meant to change. The goal of the IP system to provide a balance between the interest of the community and the reward of the inventor will remain unchanged.

120. The advent of AI-assisted tools in IPOs has raised concerns on the part of examiners, fearing that the use of AI would translate into job losses. However, this scenario seems unlikely to happen.

121. Although one panelist said, humans still have a crucial role to play, this situation could quickly change and another countered that there is no reason to panic. AI is like any other technology, it will imply a displacement of work, and this displacement can happen very quickly. Repetitive tasks will be carried out by machine, while more complex operations will continue to be done by humans. The role of examiners will still be key in the future. IPOs, however, will have to manage the change; in particular, they should recruit good data scientists who will be able to help with identifying valuable data.

122. The use of AI-assisted tools in IPOs is not a new issue, beginning with search engines which have changed the offices' working environments as one panelist remarked. Over the last decade, deep learning technologies have advanced dramatically and have started to improve the quality of speech or image recognition, and machine translation.

123. AI technology can increase the efficiency in the quality of IPOs administration and in the long run it can replace humans in certain areas, such as call centers, or prior art searches, but it will not replace the examiners.

124. One panelist called for IPOs to work together to improve their AI-assisted tools. The data being used in individual national systems are insufficient. Exchanging data across IPOs and pooling them would provide for better training of machine learning systems.

Closing Remarks made by the Director General

125. Observing considerable interest from Member States and other important stakeholders in the organization's discussion of AI questions, and no resistance so far, the Director General offered some thoughts on the way forward.

126. Reminding the audience that everything in WIPO is subject to the control and guidance of Member States, the Director General proposed that WIPO moves from general to more structured discussions. In order to do that, process is going to be very important. At this stage, the process will slightly depart from WIPO's classical approach. The Director General proposed that, "we should aim for an open and inclusive process, in which we can take advantage of the considerable expertise that is in the hands and minds of the scientific, research, and commercial sectors, as well as governments."

127. To form the basis of a future more structured discussion, the Director General proposed that WIPO formulate an issues paper with a list of questions. That paper would be available in November. Comments on those questions would be invited from Member States and any interested party to help guide the formulation of a list of topics or questions for further discussion. The purpose is not to discuss rule making, which seems a long way from now and is the prerogative of governments.

128. All submissions would be available for everyone to consult, and posted on the WIPO website. The timeline envisioned for the submissions, assuming that the issue paper is available in November, is the end of January 2020. The initial draft list of questions could be complemented to include comments received.

129. WIPO would hope to convene an open discussion on substance and process on the set of topics or questions of the revised issues paper in May 2020. Time is of the essence as the world is going very quickly, the Director General remarked.

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