

IP & Innovation, within the Context of Frontier Technologies; A Matter of Accessibility with “Open” Questions?

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Abstract

Through a series of duly cited, and quoted (“–”), excerpts, originating mostly from two Technology Trends reports, WIPO (2019), WIPO (2021), an attempt to establish a pseudo dialog is proposed, in order to surface a few questions accessible to a larger public of innovators, who may have an interest in the IP accessibility dimension using Frontier Technologies (such as AI, IoT, 3D...). AT, Assistive Technology, is instrumental as a uniquely faceted example. The illustrations’ section extends the consideration and integration of additional “traits” of the field of interest and related. Intuitive answers are “reachable” and further literature is provided on the relevant matters and connected. The emphasis is on educational, illustrative and demonstrative value.

Keywords

Assistive Technology, AT, Frontier Technologies, AI, Intellectual Property, IP, Emotional Intelligence, EI, Ethics, Open Innovation, Public Utility, General Interest, Bias

1. Preamble

This article is strictly for educational, illustrative and demonstrative purposes.

“How can frontier technologies make IP more accessible for users of the IP system” [1], is one of the major agenda themes of the 5th session of the WIPO Conversation on IP and Frontier Technologies, following session 4th of September 2021 with over 1300 attendees from 110 countries.

Frontier Technologies are well documented in the reference proposed in the “further reading” section, which outlines p1 that “there is no universally agreed ¹“Science Technology Ethic Intellectual Property & Related”.

definition of frontier technology. However, there is a recurring common feature across the different technological advances in that they all ‘have the potential to disrupt the status quo, alter the way people live and work, rearrange value pools, and lead to entirely new products and services’.”

These 40 frontier technologies, listed above, are “mapped (them) into four quadrants that represent broad technological areas: biotechnologies, advanced materials, digital technologies, and energy and environmental technologies”.

Advanced technologies encompass a wide range of technologies, which are interconnected as shown in **Figure 1**, with permeable interlocking boundaries and flows across them. The adapted representation in **Figure 1** further incorporates a central torus-shaped tunnel to schematize a—self-explaining—distribution via a carousel between the four quadrants; *i.e.*, allowing for a dynamic “rich and diverse” hybridization of technologies.

The practical patenting exercise in such dimensions is a rewarding Art of “mercy-go-round”.

WIPO (2021). [2] *Technology Trends 2021: Assistive Technology (AT)*. Geneva: World Intellectual Property Organization, “is part of WIPO’s dedication to creating knowledge products that support a global economic environment where individuals and enterprises of all sizes can more easily bring exciting new products to market” [2] p7.

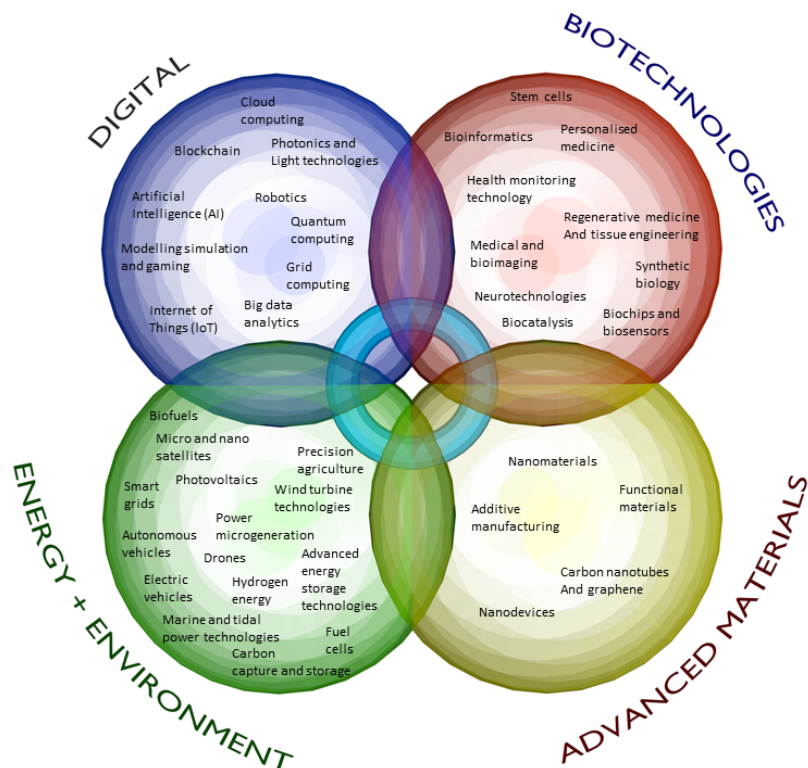


Figure 1. Adapted from the “Further Reading” reference p2 “**Figure 1.** The 40 key emerging technologies for the future” (sources OECD, 2016b, Benoit Steffenino & Serge Rebouillat© 2022).

In 2019 [3] the *WIPO Technology Trends 2019: Artificial Intelligence (AI)*, outlines on page 33 that “while it is too early to assess the impact of AI technologies on individuals and society, certain data can provide insight into business and economic activity”. AI is now part of daily activities and subjects to “Public Utility (PU) and General Interest (GI)” considerations [4] [5] within the IV industrial revolution promises.

“Frontier technologies making IP work for everyone”, [1], is further outlined here using mostly WIPO (2021) [2] as a relevant concrete base for a rather holistic set of questions. Indeed, “Assistive Technologies” IP embraces a wide range of aspects as far as “everyone” is concerned.

WIPO’s Technology Trends reports [2], of 272 pages, and [3], of 155 pages, are substantial reports with more than about 150 references, comprising a good number of reviews already covering many more references.

Four areas of patent focus [3] p143 and [6], were outlined by:

Kay Firth-Butterfield, from WEF, (World Economic Forum), as follows.

“The impact of AI on the patent system could be quite significant. Together with a WEF Centre for the Fourth Industrial Revolution Fellow, Yoon Chae, I authored a white paper on this subject. Our conclusions were that four areas should be considered:

- 1) Patent-eligible subject matter for AI, including the legal framework for patentability of “software patents”.
- 2) Patentability and inventorship issues for AI-generated inventions.
- 3) Liability issues for patent infringement by AI.
- 4) Non-obviousness standard for AI.”

The four areas of “needed improvement” suggested above are actually very relevant expert’s considerations, which generally require legal and significant time investments to implement in the field. There might also be AI intellectual property issues in the field that could have concrete answers and effects closer to the innovators; with likely faster implementation via e.g. AMC-ADR @ WIPO.

Report [2], “*WIPO Technology Trends 2021: Assistive Technology* is the first large-scale landscaping and analysis of patenting and technology trends in assistive technology”.

Combining selected excerpts, mostly from [2] and [3], in the proposed format and sequence, surfaced generic questions as well as sub-questions around our main interest of contextualized IP accessibility and availability, relevant to a larger audience than generally targeted.

Both reports being ground-breaking reports, made our investigation far easier, once these some 500 pages of relevant matter were read, assimilated, discussed... Additionally, our fairly large 50 page review [6] was further instrumental given that the AI2IP path and bias avoidance were debated [6] and multidimensionally considered to reformulate pending questions of more general interest to a broader addressees’ set.

For example a few word occurrence comparisons were performed; they un-

underscore the propensity focus on a broad range of key players in the IP domains which are considered in WIPO (2019), AI, and WIPO (2021), assistive technology (AT). In corresponding references [2] & [3] the count of keywords “Independent inventor*” and “individual*”, (*) wildcard character in Boolean searches, underlines the breadth of the IP players’ categories.

Let’s have first a closer look at some definitions and supporting numerals.

AT definitions [2]: “there is no universally accepted definition. The World Health Organization (WHO) considers assistive technology to be those products whose ‘primary purpose is to maintain or improve an individual’s functioning and independence to facilitate participation and to enhance overall well-being’ (WHO, 2020)”. The European Accessibility Act (EU, 2019), and ISO9999 (2016) provide definitions as well.

One may complement with some points [2]:

- “The recognition of access to assistive technology as a human right, as set out in the CRPD” (Convention on the Rights of Persons with Disabilities), a United Nations convention.
- “Currently, more than one billion people around the globe might benefit from assistive technology. This figure is expected to surpass two billion by 2030. (WHO)” [2] p20

Conventional AT [2]: “The term ‘conventional assistive technologies’ refers to assistive products that are well established in the market.” (& Glossary p 267)

Emerging AT [2]: “assistive products that either improve conventional assistive products or introduce novel solutions to support or recover an impaired or missing body function...” (Glossary p 267)

Specially developed taxonomies for conventional as well as emerging categories are provided on pages 28 and 29 of [2].

2. Supporting Data and Contextualized Questions

Applicant Profile

To complement the above data, [2] reports that “niche areas, such as assistive technology for sports, recreation and leisure, have the highest percentage (61%) of independent inventors”.

Additionally, “the category of Paralympics, has, (however), seen the highest number of most recent filings, primarily from Japan, and this could be attributed to the Paralympic Games to be held in Tokyo in 2021” [2].

“The development of emerging assistive products is facilitated by enabling technologies such as AI, used either alone or in combination.” [2]

Question 1: Is AI (accessibility...) a determinant factor in the applicant profile distribution listed in **Table 1**?

The Patent Office...

Figure 2 is an excerpt of Figure 2.59 of [2] p104. “Top (5 out of) 20 patent offices by number of patent applications filed for patent protection from 1998 to 2019 for conventional mobility assistive technology.”

Table 1. Data from [2] p166-167 “Where is patent protection sought? Who is filing?”

	Applicant Profile	
	Conventional AT	Emerging AT
Corporate	48%	57%
Individuals	40%	23%
Academia	11%	18%

“China is the leading patent office with 41% of patent families including an application there, followed by U.S. with 26% of the dataset’s patent families including a U.S. filing.” [2] p104

Corporate 43%, Individuals 44%, Academia 13% is the applicant profile distribution for conventional mobility assistive technology [2] p99.

“In addition, almost a quarter of filings are utility models from China.” [2] p116

Further, considering that: “a large proportion (35%) of utility models are filed in the domain of cognition. The majority were filed in China (over half of first filings in China were utility models), and the rapid increase in utility models filed after 2005 has been predominantly driven by China-based independent inventors.” [2] p35

Figure 2 and the applicant profile tend to place China as a preferred location for the filings of patent applications and utility models.

Question 2: Is the patent policy a determinant geographical factor in the application filing? Is it “influencing the entry of a product into the market and its accessibility and availability to end-users”? [2] p22. Would policy-making harmonization be holistically beneficial to support “Frontier technologies making IP work for everyone?” [1], and [6] Figure 4, EPO data 2019 “infographic”.

Question 3: Is the “utility models” right protection, as per [2] (glossary p271), globally a more suitable IP rights’ approach to facilitate IP’s accessibility at large? Reputed more accessible to individual innovators or small and medium-sized enterprises (SMEs) than patents, should utility models be globally reconsidered for harmonization? To what extent their conversion to regular patents, and reversely are happening?

Are the preceding questions applicable to provisional application patent filing (United States Patent and Trademark Office (USPTO))?

3. Commercialization Factors

“Some of these factors are particularly challenging for smaller companies and individual inventors, featuring prominently across several assistive technology areas. They need a supportive ecosystem, where the many actors in the innovation chain, from developers and academia to investors and venture capitalists, are incentivized to bring assistive technology to market.” [2] p17-18

The WIPO IAP, inventor assistance program and the EUIPO, EU Intellectual

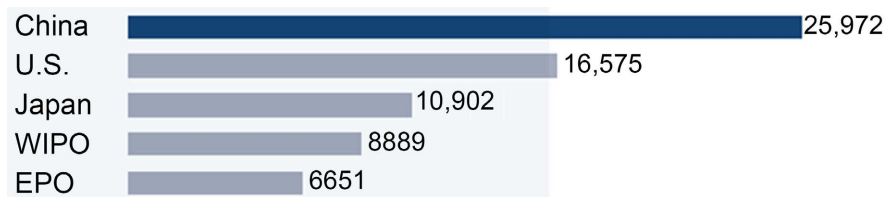


Figure 2. Excerpt of Figure 2.59 of [2] p104. “Top (5 out of) 20 patent offices by number of patent applications filed for patent protection from 1998 to 2019 for conventional mobility assistive technology.”

property office, as well as the IP5 forum initiatives (comprising the US Patent and Trademark Office, the European Patent Office, the Japan Patent Office, the Korean Intellectual Property Office, and the National Intellectual Property Administration in China), all contribute to share views on improving global harmonization, which shall directly or indirectly facilitate the above factors.

“To cover evolving user needs, in 2017, the five offices, IP5, defined their new vision of IP5 co-operation as:

Patent harmonization of practices and procedures, enhanced work-sharing, high-quality and timely search and examination results, and seamless access to patent information to promote an efficient, cost-effective and user-friendly international patent landscape.”

<https://www.fiveipoffices.org/about>

No need to underline that the above mentioned cost effectiveness is part of the commercialization equation.

Question 4: unavoidably the success metrics of concrete initiatives, from a plurality of patent offices, such as the PPH,

<https://www.uspto.gov/patents/basics/international-protection/patent-prosecution-highway-pph-fast-track>, patent prosecution highways, shall facilitate synergism; is this a consensus and how to enlarge its visibility?

4. The Opportunities and Challenges

“The recognition of access to assistive technology as a human right, as set out in the CRPD, contributing to social and economic development objectives for persons with disabilities, could be an additional impetus for policymakers in supporting the availability of assistive technology, while market-shaping approaches by different multi-stakeholder initiatives and partnerships could also contribute to increased availability.” [2] p18

Furthermore,

“The unprecedented collection and use of data and the related insights it provides are essential to enabling technology, but are not without challenges: data and privacy issues are more accentuated in the area of assistive technology, given the more vulnerable groups involved. Trends towards wearables and health diagnostic software may add to the IP-related concerns.” [2] p19

“In addition, as AI develops, some of the questions that are currently dis-

cussed only hypothetically may become real issues. These include the inventorship of AI, patent and more generally IP rights infringement by AI. Such questions may call for related regulation or a certain interpretation of existing regulations to cover possible gaps and answer related questions.” [3] p144

“Among these aspects, acceptability and ethical considerations were found to be particularly relevant to those technologies that: ...collect and use data on cloud-based services or interconnected devices (e.g., companion robots, smart nursing and health-monitoring technologies), raising privacy issues (access to, use of and analysis of individuals’ private data related to their health) and requiring connectivity.” [2] p193

Question 5: Software by design are holistic and inclusive and tend to be models relying on an “@LEAST©” type² of “motto” [5] [6] and an “implicitly adopted code of conduct” within a rather respected broader frame of software-IP rights.

(<https://www.upcounsel.com/intellectual-property-software>)
(<https://www.wipo.int/copyright/en/activities/software.html>)

Shall AI IP rights, and algorithms therewith, and generally frontier technologies making use of AI, be revisited to include a charter inspired by the software and datasets IP history, in the 1970s and 1980s, and ongoing practice in the field?

5. Closing³ [4], and Conclusions

“AI is the new electricity. I can hardly imagine an industry which is not going to be transformed by AI.” Andrew Ng, Landing AI and deeplearning.ai. [3] p13.

“Of Public Utility (PU) and General Interest (GI)”, the PU & GI banner, tends to surround the AI, within the IV industrial revolution promises, and among some of the relevant anxieties. One may have value to reflect on this aspect applicable to most panels anticipated in the proposed WIPO conversation forum. Indeed the back stage of this idea is to inflect the trend that AI & IP may be innovation barriers, black boxes within the ‘yet to define box’, sovereign new forms of intelligence governing human intelligences. Nonetheless both PU and GI sound aligned with the genesis of IP as a human right. From Public Domain to Public Utility there might be much more than a vocabulary inventiveness space? A fair and reasonable ownership for collective open use may well be here debated? Here is our question proposal: can PU & GI be integrated in the IP pillars’ main construction, such as public domain, inventorship, ownership, anteriority? And, what for?” [4]

Most of this paper proposal, is deriving from personal notes, to contextualize questions prepared as an audience member, during 2019, 20, 21, 2022 “AI2IP” events and conversations therewith, such as the 5th conversation in [1].

Combining selected excerpts, mainly from [2] and [3], in the proposed format
²Acronym @LEAST©, covers the following specific grounding attributes: • L.: Legal; • E.: Ethical, Equitable; • A.: Advanced, Accountable, Accessible; • S.: Safe, Secured; • T.: Tolerable.

³Rebouillat, S. (2019-2020-2021-2022) Personal Notes Used in the Formulation of Contextualized Questions during Events Such as the One Described in Reference [1]. Availability pending upon request to Author.

and sequence, surfaced generic questions as well as sub-questions around our main interest of contextualized IP accessibility and availability, relevant to a larger audience than generally targeted.

AT, Assistive Technology domain and related IP therewith, reveals to be very instrumental as a uniquely faceted example. Conventional AT and emerging AT, serve and enrich the present study complementarily.

The proposed set of 5 progressive, open questions shall remain the open conclusion of what may be essential to keep in mind as far as future debates keep active while progress are taking place around AI, IP and Frontier Technologies integration. The adoption of a motto, such as @LEAST©, would simplify rather down to earth resolutions.

This article is strictly for educational, illustrative and demonstrative purposes, as stated in the disclaimer.

6. Illustratively

Three illustrations implying some “traits” of the covered field and related are added below:

Illustration 1

“Method for customizing hearing aid for person, involves presenting acoustic stimulus to person and detecting neuronal activity in brain of person on basis of acoustic stimulus” (Figure 3 of patent document DE102011089661A1) (espace-net.com)

<https://worldwide.espacenet.com/publicationDetails/biblio?CC=DE&NR=102011089661A1&KC=A1&FT=D>

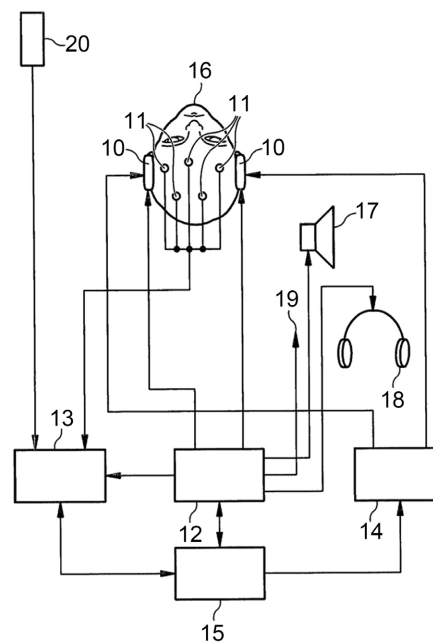
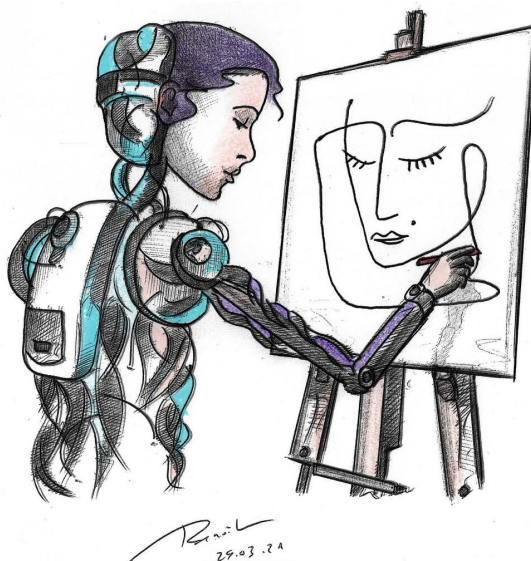


Figure 3. “Method for customizing hearing aid for person... detecting neuronal activity in brain...”

LIST OF REFERENCE NUMBERS associated with illustration 1

- | | |
|-------------------------------------|---|
| 10 <i>Hearing aid</i> | 11 <i>Electroencephalography (EEG) electrodes</i> |
| 12 <i>Stimuli generator unit</i> | 13 <i>Signal detection unit</i> |
| 14 <i>Hearing aids control unit</i> | 15 <i>Computing and control unit</i> |
| 16 <i>Person</i> | 17 <i>Speaker</i> |
| 18 <i>Headphone</i> | 19 <i>Optional stimuli</i> |
| 20 <i>Operating unit</i> | |

Patent Classification: Int Cl. H04R 25/00: Deaf-aid sets, *i.e.* electro-acoustic or electro-mechanical hearing aids; Electric tinnitus maskers providing an auditory perception. (electrical stimulation of auditory nerves to promote the auditory function A61N1/36038; optical stimulation of auditory nerves to promote the auditory function A61N5/0622).

**Illustration 2**

“A Matter of Interpretation and Emotional Intelligence, EI.” [6]—with special thanks to Benoit Steffenino® 2021.

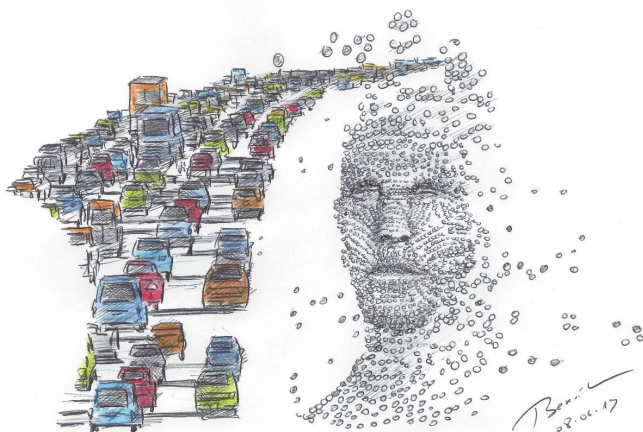


Illustration 3 [6]

AI Traffic management—with special thanks to Benoit Steffenino® 2019.

“I wish AI to be more than just the ‘new electricity’ [3] p13: it ought to also be the new electronics operating with components that control and direct electric currents as well as new gates’ design as per the state of the art mechatronic, an interdisciplinary branch that focuses on the integration of electronics and mechanical and electrical systems! Well, my companion robot, “Séribel”, seems to disagree, ‘you missing the human factor, they all leave same time’, he says. ‘Look at the traffic jam! A real connected blackout. By far not a no-brainer issue!’, he adds.”

Acknowledgements

Thanks, to WIPO dedicated teams vs. [1] [2] [3] studies.

Recognition to my co-authors, Benoit Steffenino, Mirosława Lapray, Antoine Rebouillat, of the AI-IP-EI’s trilogy [6].

More about the Author

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Intellectual Property Organization.

<https://www.wipo.int/publications/en/details.jsp?id=4386>

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Further Reading

Frontier Technologies for sustainable development in Asia and the Pacific.

<https://www.unescap.org/publications/frontier-technologies-sustainable-development-asia-and-pacific>