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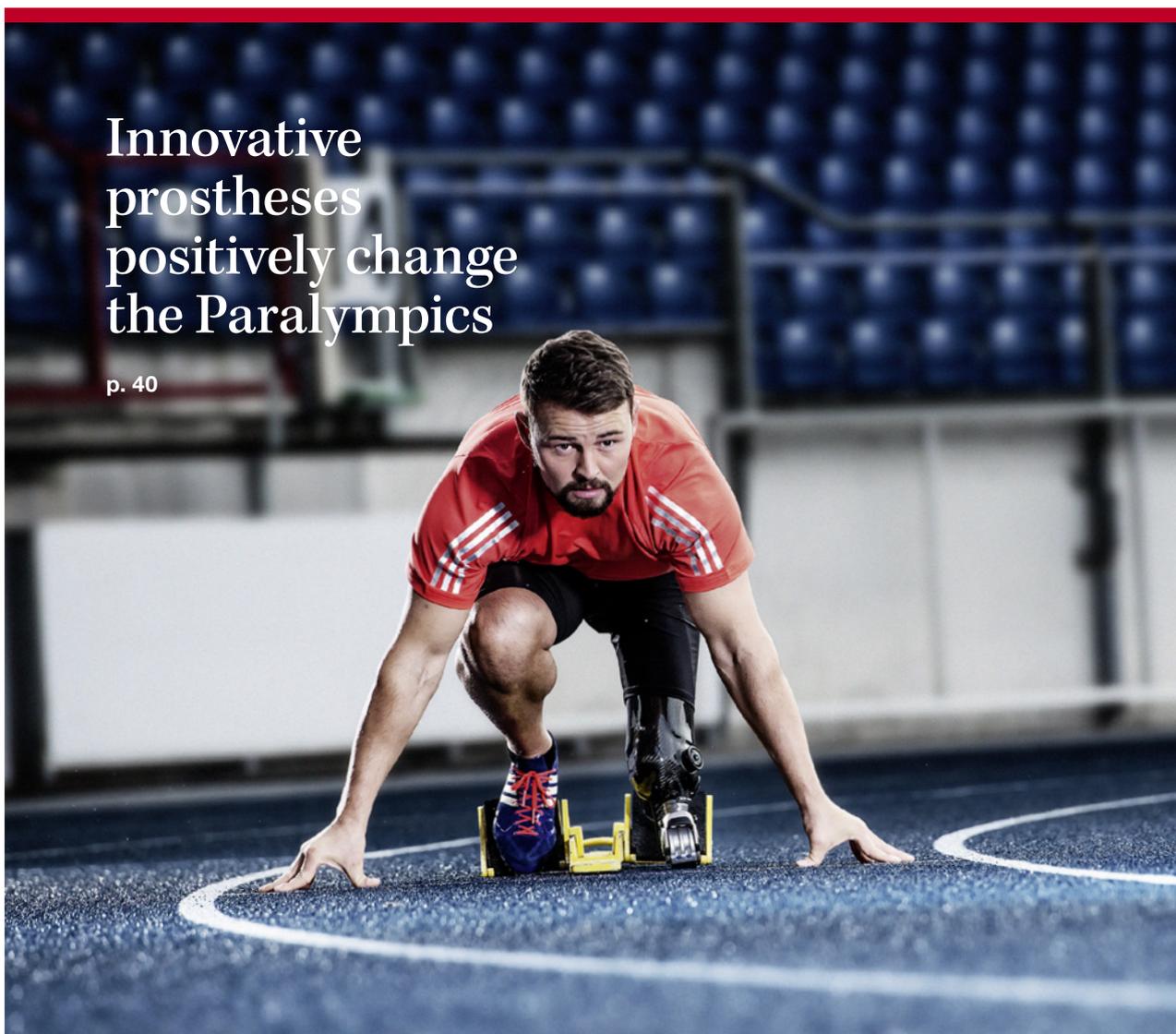


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Editor: **Catherine Jewell**

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Harnessing public research for innovation in the 21st Century

By **Catherine Jewell**, Information and Digital Outreach Division, WIPO

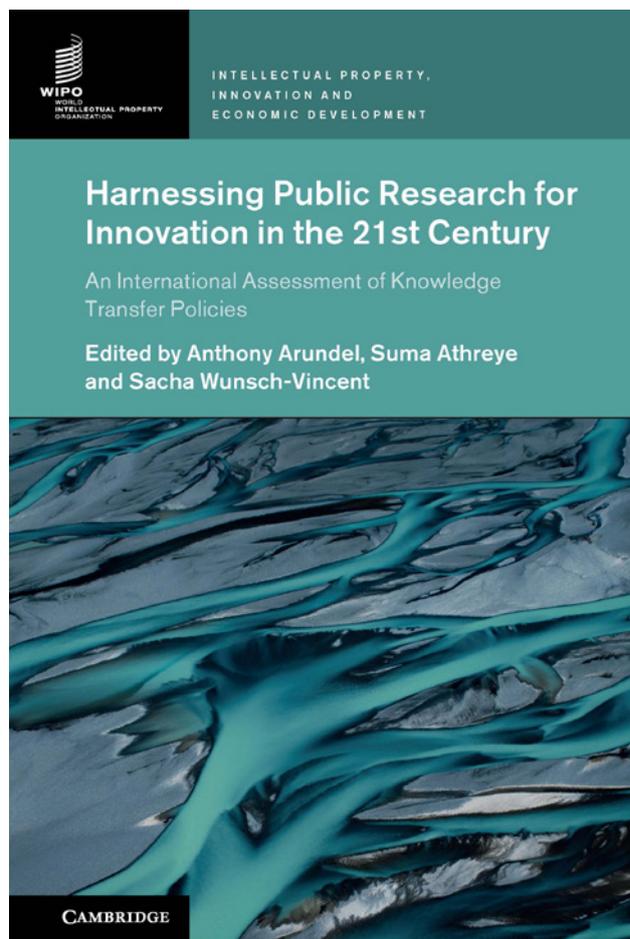
Public research systems play a huge role in generating new knowledge and enabling its real-world application. For decades, countries around the world have been implementing policies to improve the efficiency of knowledge transfer from public research to the market to boost economic growth and address real-world challenges.

Anthony Arundel, co-author of *Harnessing public research for innovation in the 21st Century: An international assessment of knowledge transfer policies*, published by Cambridge University Press, discusses the main gaps in our understanding of how knowledge transfer works and key considerations for policymakers in crafting effective knowledge transfer policies for the future.

What is the aim of your book?

Countries have implemented strategies to increase the commercialization of public research to support economic growth for years. Yet, the commercial potential of a great deal of knowledge and expertise in the public research system in many countries remains untapped.

Since the 1990s, many countries have migrated towards a so-called “IP licensing model,” where



Harnessing public research for innovation in the 21st Century: An international assessment of knowledge transfer policies, published by Cambridge University Press, examines the experiences of six countries in the area of technology transfer and sheds light on gaps in our understanding of the policy options that work and those that work less well.

“The commercial potential of a great deal of knowledge and expertise in the public research system in many countries remains untapped.”

the public research sector generates new knowledge, patents it and then licenses it to businesses or government agencies.

We examine the experiences of three high-income economies: Germany, the Republic of Korea and the UK; and three middle-income economies: Brazil, China, and South Africa.

The history and policy challenges of these countries is of real interest. They all migrated towards an IP licensing model yet came up with a variety of policies and practices for knowledge transfer to adapt to the numerous contextual conditions that influenced outcomes. They each have different industrial structures and levels of technological competence within their public research and business sectors. And they have all undergone major changes in their national policies in recent decades to improve knowledge transfer and commercialization.

Our analysis sheds light on gaps in our understanding of the policy options that work and those that work less well.

Can you say a few words about knowledge transfer and the role of public research in innovation ecosystems?

Knowledge transfer, in general, involves getting knowledge that is produced in the public research system into firms, government agencies, and even households, for them to use in socially or economically useful ways.

The public research system, which includes both universities and public research institutes, has always been essential for all countries. Historically, it has been a major producer of new knowledge, which firms have then taken up and commercialized.

The public research system has three main roles that are supported by government policy. First, to train and educate students, second to push the frontiers of knowledge through cutting-edge research, and third to support economic activity by transferring knowledge to the real world. The latter role has gained importance in recent years.

Within the public research system, universities typically focus on basic research and public research institutes focus on applied knowledge. But there are many different models globally to meet these two functions.

What are the potential benefits of knowledge transfer?

They are immense. So much of what we do in health, ICT, and mechanical engineering can be traced back to public research and is based on knowledge transfer.

Modern technological advances are increasingly science-based, and the public research system plays a central role in discovering new technology and training students about it.



Photo: Shutterstock / E+ / Getty Images

“Knowledge transfer, in general, involves getting knowledge that is produced in the public research system into firms, government agencies, and even households, for them to use in socially or economically useful ways,” explains Anthony Arundel.

“Knowledge transfer is often a two-way street. Universities and public research institutes can learn a lot from engaging in research contracts and collaborations with firms.”

Firms depend on these contributions to produce marketable innovations. That is why the interaction between the public research system and business is pivotal.

Has the COVID-19 pandemic highlighted the need for knowledge transfer?

Knowledge transfer has always been a global issue, because all countries, with the possible exception of China and the USA, are dependent on drawing knowledge from elsewhere. The pandemic has highlighted the gap between knowledge and capabilities and the need for increased sharing of both between countries. While many countries, even high-income countries like Australia, have research scientists working on mRNA, very few have applied that knowledge to produce vaccines, in part because they lack specialized knowledge and expertise to do so. It is a global imperative that knowledge and expertise are more widely available, particularly in low- and middle-income countries.

What are the main channels for knowledge transfer?

Knowledge transfer takes place through informal channels, often referred to as “open science”: reading the literature, attending conferences, hiring trained graduates and personal contacts; and through formal channels: intellectual property (IP) licensing, collaboration and research agreements and contracting-out.

Knowledge can be transferred entirely through informal or formal channels, or through a combination of both; for example, when information discussions lead to an IP license. Knowledge transfer is often a two-way street. Universities and public research institutes can learn a lot from engaging in research contracts and collaborations with firms.

What factors influence the effectiveness of knowledge transfer?

Public research is of enormous value to any firm or organization producing something of economic or social value. But a firm has to already have the capabilities to take advantage of public research. This is an important consideration for policymakers.

The R&D intensity of a firm tends to increase its willingness to engage with the public research system. And the number of universities in a given region, and their ability to respond to the needs of firms, also have a positive influence on such engagement.

The experiences of Germany, and more recently China, highlight the benefits that can flow from research collaborations and contracts in terms of improving the technical capabilities of firms to use new knowledge.

What role does IP play in facilitating knowledge transfer?

IP can play an important role. But IP is primarily an appropriation mechanism that prevents an invention from being copied. It is not a knowledge transfer mechanism, as such. IP is only required for knowledge transfer when a technology is expensive to develop and eminently copiable. When these two conditions occur, businesses will typically not invest in developing knowledge to a commercially viable state without an exclusive license (or patent) that prevents competitors from copying it. Second, companies may only agree to invest in contract or collaborative research with a university to solve a problem if they can acquire some of the resulting IP. In this case, IP can support research investment.

IP can be a good earner for a small number of universities. For example, Stanford University earned USD 254 million (90 percent came from royalties on product sales) from the Cohen-Boyer patent (1980-1997) for recombinant DNA, which started the whole biotech revolution. The patent was licensed to 468 companies and used in 2,400 products. An exclusive license was not required for this knowledge to be used.

But research shows that university revenues from contract research far outweigh those from IP licensing. For example, in 2015-16, all universities in the UK combined earned GBP 4.2 billion from all knowledge transfer activities, of which just GBP 176 million (4.2 percent) resulted from IP licensing. This suggests that IP could play a more important role in enabling knowledge transfer through encouraging contract research and collaboration than it does through IP licensing.

In some countries, IP licensing revenues generated by universities may determine access to additional funding. In the UK, for example, universities that perform well in IP licensing can attract up to 7 percent more funding than those that do not. Elsewhere, IP licensing performance doesn't affect funding but does enhance a university's ability to attract star scientists.

Isn't the patent disclosure a form of knowledge transfer?

Yes, there is a disclosure of the knowledge through the patent system and that is important, but surveys show that very few companies report this as an important source of knowledge. For example, the European Community Innovation Surveys find that less than 10 percent of firms cite patent disclosure as a source of knowledge, though firms in specific sectors, such as biotech, do track patent data. However, an important motivation for this is to monitor the state of the art for their own patent applications. The role of patent disclosures in advancing knowledge is a grey area that needs additional research.

Is a strong focus on IP licensing a positive or a negative?

It is most likely neutral. It may re-orient some types of basic research towards applied research, but that is not necessarily harmful. The bigger problem is the overriding policy focus on IP, which suggests that other forms of knowledge transfer aren't as important.

To date, research on knowledge transfer has been dominated by IP data, and understandably so, because these data are readily available. We're amazingly ignorant about the mechanics of other forms of knowledge transfer, both formal and informal.

What can be done to improve the situation?

There is no one recipe for success for effective knowledge transfer. We know that a firm's capabilities can improve when it funds contract research from a university, hires a PhD student to work on a project or engages in a research collaboration, through which it may or may not acquire patents. But we need to better understand how informal and formal knowledge transfer channels interact to create an ecosystem where knowledge is produced and commercialized. We know all the parts exist, but we don't really know what the optimal policies might be to support the process and how policies need to adapt to different contexts.

We need better metrics. Most countries do not collect consistent and comparable metrics for knowledge transfer. The development of good policies to support knowledge transfer requires a comprehensive set of metrics that cover the full range of knowledge transfer mechanisms and policies at the institutional level. A situation where we only have metrics for IP and IP licensing is insufficient.

In July 2021, ahead of the launch of *Harnessing public research for innovation in the 21st Century: An international assessment of knowledge transfer policies*, WIPO, in collaboration with AUTM, the world's leading technology licensing association, the International Chamber of Commerce (ICC) and the Licensing Executives Society International (LESI), held an international seminar to discuss how to more effectively advance technology/knowledge transfer from public research to the market.

The organizations share common goals related to the use and transfer of knowledge and IP globally. Based on this understanding, together they agreed to consider enhanced cooperation in two priority areas:

- **Metrics:** To examine ways to track technology/knowledge transfer activities in a more standardized, internationally comparable way by exploring common definitions, improved surveys, and by sharing, as appropriate, data.
- **Policy:** To contribute to the dialogue on what technology/knowledge transfer practices and policies work best (and don't work), and to propose policy actions - through publications, task forces, and/or best-practice sharing platforms - paying particular attention to the needs of small-and-medium enterprises (SMEs) as key stakeholders.



Photo: WIPO

In July 2021, WIPO, in collaboration with AUTM, the International Chamber of Commerce and the Licensing Executives Society International, held an international seminar to discuss how to more effectively advance technology/knowledge transfer from public research to the market.

We need metrics for financial and non-financial incentives that encourage and enable academics to assist firms in using new knowledge; for income earned from contract research, and for income from different types of research collaboration, particularly with firms. These metrics would help define the different roles that IP can play and where IP is not required for effective knowledge transfer.

What are some of the key barriers to effective knowledge transfer?

Under all circumstances and in all countries, knowledge transfer occurs, but effective knowledge transfer takes us back to the nexus between the capabilities of the university and the capabilities of the firms. Effective knowledge transfer hinges on capable firms and interested academics.

Too often, there is an assumption that firms are capable of absorbing and commercializing knowledge produced by universities. But that is not necessarily the case. In many low and middle-income countries, there may be no domestic firms capable of using university discoveries. Conversely, universities may not be working at a high enough level to produce value for firms.

Firms are a critically important part of the equation in all countries, but for middle-income countries, it's crucial that policy makers improve the innovation and knowledge capabilities of local firms.

What can universities do to improve knowledge transfer?

Universities can take steps to motivate and enable academics to work with firms. And their knowledge transfer offices can link academics with firms and vice versa to optimize opportunities for knowledge transfer.

Do governments need to look beyond IP-based knowledge transfer policies?

Yes. IP is the tip of the iceberg. The IP licensing model is a very small part of knowledge transfer. IP is not a silver bullet, but it can encourage firms to invest in university research and is necessary for knowledge transfer under some conditions – for instance, when an exclusive license is required.

What are your key takeaways?

First, knowledge transfer is an integral part of an innovation system. You can't divide it into its separate parts.

Second, policies for effective knowledge transfer need to ensure knowledge transfer systems simultaneously support and improve the capabilities of both universities and firms.

Third, IP can provide an incentive for both firms and academics to participate in collaborative or contract research.

Fourth, we can't rely on IP licensing as a major source of research funding. That would be a terrible mistake.

Global Innovation Index 2021: tracking innovation through the COVID-19 crisis

By **Catherine Jewell**, Information and Digital Outreach Division, WIPO

The 2021 Global Innovation Index (GII), launched in September in Geneva, Switzerland, captures the innovation performance of 132 economies and innovation trends during the COVID-19 crisis. Now in its 14th edition, the GII published by WIPO supports policymakers' understanding of how to foster innovation in support of their national social and economic development goals. **Sacha Wunsch-Vincent**, Senior Economist in WIPO's IP and Innovation Ecosystem Sector, and Co-editor of the GII 2021 at WIPO, discusses some of the report's key findings.

How has investment in innovation fared during the COVID-19 crisis?

The GII 2021 shows that investment in innovation has been resilient during the COVID-19 crisis and even reached new peaks in some sectors and regions. Before the pandemic, innovation investments were at an all-time high with R&D expenditure growing by 8.5 percent in 2019. When the pandemic hit, it was unclear what its impact would be on innovation. History suggested that innovation investments would be hard hit. However, throughout 2020, key indicators of innovation investment, namely, scientific output, R&D expenditure, IP filings and venture capital deals continued to increase. These data point to a growing acknowledgement among governments and enterprises that new ideas, products and services are critical for post-pandemic recovery and growth. However, more data are required before a full assessment is possible.

How have different sectors been impacted by the pandemic?

The impact has been highly uneven across industries. The GII's Global Innovation Tracker, a new feature of this year's report, reveals firms with outputs relating to software, information and communications technologies, hardware and electrical equipment, pharmaceuticals and biotech, increased their investments in R&D and innovation. Whereas firms with business models that rely on in-person contact, such as transport and travel, were hit hard by pandemic containment measures, and experienced significant cutbacks.

Which economies continue to deliver peak innovation performance?

High-income economies continue to dominate the rankings. Switzerland remains the world's innovation leader for the 11th consecutive year, followed by Sweden. Switzerland,

Sweden, the United States and the UK have all ranked among the top five in the past three years. And this year, for the first time, the Republic of Korea enters the top five. The majority of the top 25 most innovative economies continue to be in Europe. This year, ten European economies rise in the rankings, most notably, France (11) and Estonia (21).

Five Asian economies feature among the top 15: the Republic of Korea (5), Singapore (10), China (12), Japan (13), and Hong Kong, China (14). Since 2013, China has steadily established itself as a global innovation leader, rising in the GII rankings and getting ever closer to the top 10.

What's happening among middle-income economies?

A number of middle-income economies are starting to pull their weight and are changing the global innovation landscape. They include China, Turkey (41), Viet Nam (44), India (46) and the Philippines (51).

China remains the only middle-income economy in the top 30 most innovative economies. Nine other middle-income economies fall within the GII top 50 and are catching up. These are Bulgaria (35), Malaysia (36), Turkey (41), Thailand (43), Viet Nam (44), the Russian Federation (45), India (46), Ukraine (49) and Montenegro (50). As sizeable economies, Turkey, Viet Nam, India and the Philippines together, have the potential to re-shape the global innovation landscape.

Which economies are exceeding expectations in terms of their innovation performance?

India, Kenya (85), the Republic of Moldova (64) and Viet Nam hold the record for over performing on innovation relative to their level of development, having now done so for 11 years in a row.

In 2021, for the first time, Brazil (57), the Islamic Republic of Iran (60) and Peru (70) over performed on innovation. As in previous years, Sub-Saharan Africa is the region with the largest number of economies that are over performing on innovation. They include Cabo Verde (89), Kenya (85), Mauritius (52), South Africa (61) and the United Republic of Tanzania (90).

What changes to the global innovation landscape does GII 2021 reveal?

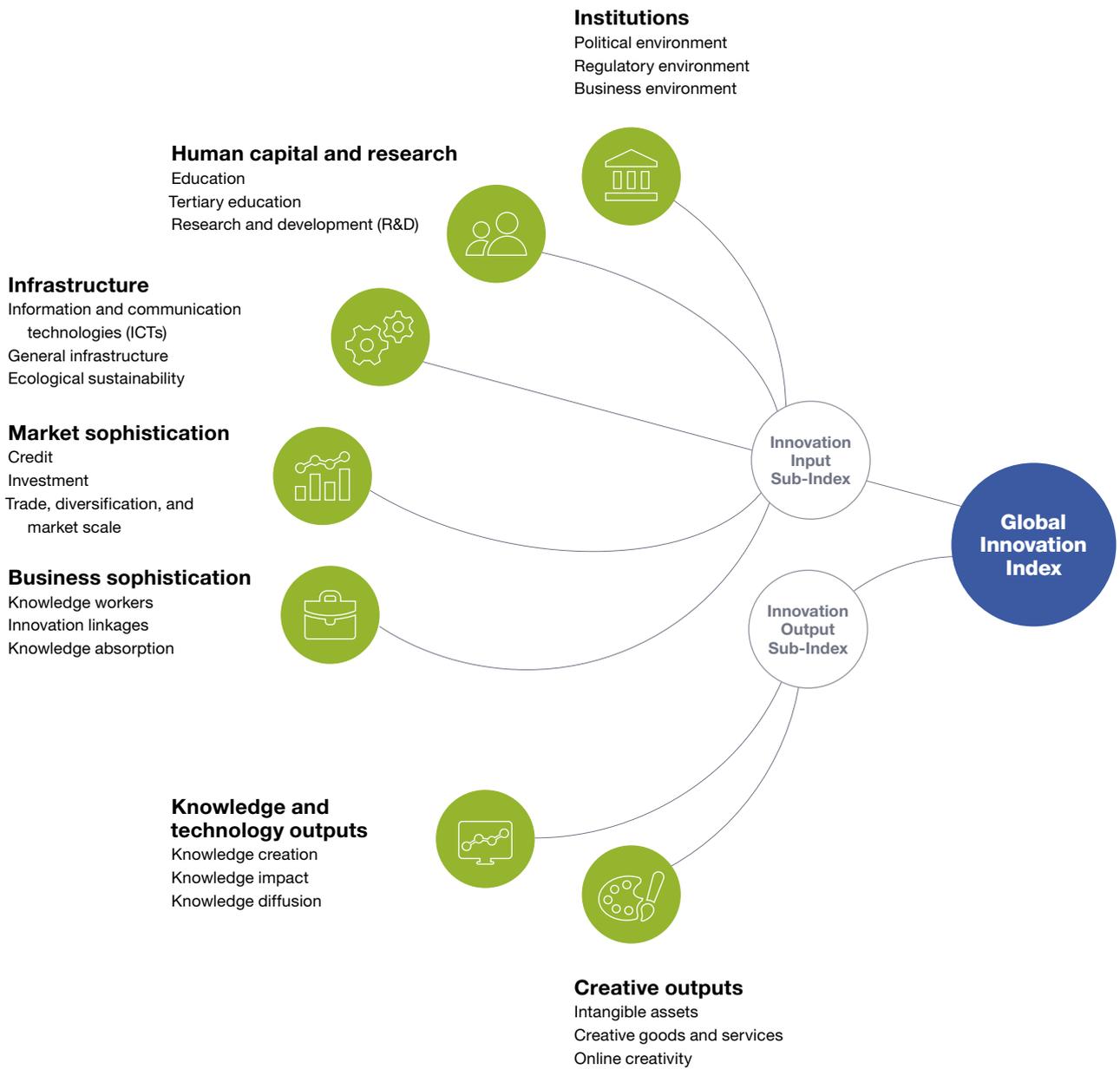
We see that the geography of global innovation is changing unevenly. Northern America and Europe are the regions that continue to stand out as global innovation leaders, well ahead of other economies.

The innovation performance of South East Asia, East Asia, and Oceania (SEAO) has been the most dynamic over the last decade and is the only region to close the gap on Northern America and Europe.

Northern Africa and Western Asia, Latin America and the Caribbean, Central and Southern Asia, and sub-Saharan Africa then follow, in that order. GII 2021 shows strong performances by the Islamic Republic of Iran, Chile (53), the United Arab Emirates (33) and South Africa (61).

In the Northern Africa and Western Asia region, Israel (15), Cyprus (28), and the United Arab Emirates (UAE) top the rankings.

Framework of the Global Innovation Index 2021



Source: Global Innovation Index 2021, WIPO.

About the Global Innovation Index

The Global Innovation Index 2021 (GII) is published by WIPO, in partnership with the Portulans Institute and with the support of the Brazilian National Confederation of Industry (CNI), Confederation of Indian Industry (CII), Ecopetrol (Colombia) and the Turkish Exporters Assembly (TIM). In 2021, an Academic Network was established to engage world-leading universities in GII research and support the dissemination of GII results within the academic community.

Published annually, the core of the GII provides performance measures and ranks 132 economies on their innovation ecosystems. The Index represents a rich dataset covering 81 indicators from international public and private sources. It goes beyond traditional measures of innovation to reflect the broadening definition of innovation. It includes a one-page profile outlining the performance of each economy in relation to all indicators relative to all other economies in the Index. The profiles also highlight an economy's relative innovation strengths and weaknesses.

The GII 2021 is calculated as the average of two sub-indices. The Innovation Input Sub-Index gauges elements of the economy that enable and facilitate innovative activities and is grouped in five pillars: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. The Innovation Output Sub-Index captures the actual result of innovative activities within the economy and is divided in two pillars: (6) Knowledge and technology outputs and (7) Creative outputs.

Since its inception in 2007, the GII has shaped the innovation measurement agenda and become a cornerstone of economic policymaking, with an increasing number of governments systematically analyzing their annual GII results and designing policy responses to improve their performance.

The GII is an integral part of WIPO's new IP and Innovation Ecosystem Sector, which is working to help member states fine-tune national innovation policies and intellectual property (IP) strategies for economic growth.

The GII has also been recognized by the UN Economic and Social Council in its 2019 resolution on Science, Technology and Innovation for Development as an authoritative benchmark for measuring innovation in relation to the Sustainable Development Goals (SDGs).

The index is submitted to an independent statistical audit by the European Commission, Joint Research Centre.

To download the full report visit: www.globalinnovationindex.org.

In Central and Southern Asia, India (46) leads the way and has consistently gone up the ranks since 2015, when it entered the top 50, followed by the Islamic Republic of Iran and Kazakhstan (79).

And in the Northern Africa and Western Asia region, Israel (15), Cyprus, and the United Arab Emirates (UAE) top the rankings. Turkey also leaps into the top 50 and continues to move up the rankings. Eight other economies in the region, including Oman (76), Egypt (94), and Algeria (120), move up the rankings.

In Latin America and the Caribbean, Chile (53) ranks first in the region, followed by Mexico (55) and Costa Rica (56). Only Chile, Mexico, Costa Rica and Brazil rank among the top 60. In 2021, 11 of the region's economies improved their ranking, with Argentina (73), Paraguay (88), and Ecuador (91) making the most progress. With the exception of Mexico, few economies in this region have consistently improved their ranking over the last decade.

And in sub-Saharan Africa, only Mauritius and South Africa rank in the top 65. In 2021, 10 economies climbed the rankings, including Cabo Verde, Namibia (100), Malawi (107), Madagascar (110), Zimbabwe (113) and Burkina Faso (115). Rwanda (102) regains the lead position among low-income economies.

Moreover, only Kenya and the United Republic of Tanzania have improved their performance over time to remain firmly in the top 100. Rwanda has regained its lead position among low-income economies.

And in terms of new science and technology clusters, what does GII 2021 show?

GII 2021 shows that new science and technology (S&T) clusters are emerging, and that the majority of them are located in a handful of countries. Tokyo–Yokohama is once again the top performing S&T cluster, followed by Shenzhen–Hong Kong–Guangzhou, Beijing, Seoul and San Jose–San Francisco.

The United States continues to host the highest number of top science and technology clusters (24), led by the San Jose–San Francisco cluster, followed by China, Germany, and Japan.

China boasts 19 of the top science and technology clusters worldwide - with Shenzhen–Hong Kong–Guangzhou and Beijing ranked 2 and 3, respectively. Clusters in China recorded the largest increases in S&T output.

S&T clusters are also found in a number of middle-income countries, including Brazil, China, India, the Islamic Republic of Iran, Turkey, and the Russian Federation, with significant growth in Delhi, Mumbai and Istanbul.

Tell us about the Global Innovation Tracker.

The GII Global Innovation Tracker looks at a variety of data points at three broad stages of the innovation journey to capture key innovation trends. These are science and innovation investments; technological progress; and socioeconomic impact.

Global leaders in innovation, 2021

Top three innovation economies by region



Top three innovation economies by income group

High-income	Upper middle-income	Lower middle-income	Low-income
1. Switzerland 2. Sweden 3. United States of America	1. China 2. Bulgaria ↑ 3. Malaysia ↓	1. Viet Nam 2. India ↑ 3. Ukraine ↓	1. Rwanda ↑ 2. Tajikistan ☆ 3. Malawi ☆

↑↓ Indicates the movement of rank within the top three, relative to 2020, and

☆ indicates a new entrant into the top three in 2021.

† Top three in Northern Africa and Western Asia (NAWA) – excluding island economies. The top four in the region, including all economies, are as follows: Israel (1st), Cyprus (2nd), United Arab Emirates (3rd) and Turkey (4th).

* Top three in sub-Saharan Africa (SSA) – excluding island economies. The top five in the region comprise Mauritius (1st), South Africa (2nd), Kenya (3rd), Cabo Verde (4th) and the United Republic of Tanzania (5th).

Source: Global Innovation Index Database, WIPO, 2021.

Notes: World Bank Income Group Classification (June 2020). Year-on-year GII rank changes are influenced by performance and methodological considerations; some economy data are incomplete (see Appendix I).

Monitoring the pulse of innovation is not easy. It can take months or years to transform an idea into a new product or service, and even longer before technological advances are widely adopted, or create new jobs, boost economic productivity and improve people's lives. No single indicator captures every aspect of innovation performance. That's why the GII relies on a broad set of indicators to measure the innovation performance of economies. Similarly, the Global Innovation Tracker looks at a variety of data points to capture key innovation trends.

What insights does the Global Innovation Tracker reveal?

As noted above, overall, we see a high level of resilience. For example, there is no evidence that the pandemic has affected scientific publishing. In 2020, the number of scientific articles published globally grew by 7.6 percent, faster than the 10-year average growth rate. Unsurprisingly, health-related scientific outputs, both pandemic-related and non-pandemic related, saw record growth. Environmental sciences also grew by 21.2 percent in 2020, overtaking electrical and electronic engineering as the second most active publication field. Artificial intelligence stands out as another field showing strong growth in 2020.

We see that government budget allocations for the top R&D spending economies continued to grow as did R&D expenditure of the top global corporate R&D spenders for which data are available. While available data indicate R&D expenditures were more resilient than historical experience would suggest, more complete data are required for a fuller assessment of the pandemic's impact on corporate R&D performance.

GII 2021 also shows that advances in frontier technologies show great promise, as powerfully demonstrated by the rapid development of COVID-19 vaccines. Advances in ICTs and renewable energy, which have the potential to improve livelihoods, human health and protect the environment, are also showing great promise.

International patent filings under WIPO's Patent Cooperation Treaty reached an all-time high in 2020, up 3.5 percent on the previous year. Medical technology, pharmaceuticals and biotechnology were key drivers of this growth. However, it's important to note that most of the inventions underlying international patent filings in 2020 predate the pandemic. As such, strong patenting of health-related technologies does not reflect an invention response to the pandemic but rather indicates that the pandemic has led innovators in the healthcare sector to upgrade the commercial potential of their recent inventions.

The Tracker also shows that venture capital (VC) deals grew by 5.8 percent, exceeding the average growth rate of 3.6 percent for the past decade. The exceptional resilience of innovation financing is all the more remarkable given the sharp decline in VC deals in Northern America and Europe amid soaring economic uncertainty in mid-2020. Strong growth in VC deals in the Asia Pacific region more than compensated for these declines. In Africa and in Latin America and the Caribbean, such deals saw double-digit growth, albeit from lower levels. And data for the first quarter of 2021 indicate a vibrant year for VC deals. In that period, the Asia Pacific region alone has already reached an all-time high of 1,260 deals.

So, overall, we see remarkable resilience in the face of the greatest economic downturn in decades, with great promise at the frontiers of technological development.

Uncanny Valley: charting a new era of musical creativity

By **Catherine Jewell**, Information and Digital Outreach Division, WIPO



Photo: Courtesy of Google Creative Lab, Sydney, Australia

In 2019, Uncanny Valley collaborated with Google's Creative Lab and emerging Australian artists on an experiment using machine learning to build progressive tools they could use in their songwriting process.

In 2010, Australian singer/songwriter Charlton Hill and music technologist Justin Shave joined ranks to set up Uncanny Valley, a Sydney-based progressive technology company at the cutting-edge of the music industry. Charlton Hill, who is also head of innovation at Uncanny Valley, discusses the company's ambitions to speed up, democratize and re-shape music production through the use of artificial intelligence (AI). In 2020, Uncanny Valley and colleague Caroline Pegram formed Team Australia and won the first-ever Eurovision AI Song Contest.



Uncanny Valley generally relates to an uneasy feeling humans have about things that aren't quite human. How did you come to call your company Uncanny Valley?

My co-founder Justin Shave came up with it. After unpacking its meaning, I embraced the fact that we were destined to be a progressive music tech company in an industry we both knew well.

Justin is a classically trained pianist and a music technologist with a computer science background and I am a songwriter and a singer. We both have a strong interest in innovation. There were shifting sands in the music industry in 2010, when we established the company, so it made sense to work with a forward-looking partner. We have always had an open approach to collaborators and have not confined them to traditional musicians and producers. I think we have grown into the name. You could say that we are trying to surpass the uncanny valley in the field of music, which is probably one of the most interesting challenges of our time.

Tell us about your business model.

We have two revenue streams. One is through commissions to create original music or re-mix music (where you take a known, licensed song and recreate it with a new vocalist) and the other is the royalties that come to us when these programs are broadcast. In Australia, we work on a range of projects, including, for example, *Australian Survivor*, which needs a lot of music to drive it along. These revenues drive the company's day-to-day operations and fund our more progressive AI and machine learning pursuits.

Tell us about your work on augmented creativity.

It's incredibly exciting. It started formally in 2019, when we collaborated with Google's Creative Lab and emerging Australian artists on an experiment using machine learning to build some progressive tools they could use in their songwriting process. Their feedback during the design phase was invaluable.

In general, they enjoyed the process but were quite vocal when they felt the tools were stepping on their toes. For example, our AD LIBBER app, which is designed to spark lyrical ideas, was welcomed by one artist who struggled with lyrics, but did not appeal to another who had a talent for phrasing. Another app called Demo Memo, allowed the artists to hum or whistle a melody and transform it into an instrument of their choice, thereby speeding up the demo process significantly. They all appreciated that.

The experiment was a great opportunity to push and pull at these concepts. We've continued to develop them through our music engine, MEMU, which is an ongoing accumulation of our research. With MEMU's architecture, we believe we can crack the quantification of music and emotion.



Photos: Courtesy of Uncanny Valley



Memu is a powerful engine for real-time mixing and mash-up of artists' work. It's really exciting. It heralds a new era in music production," says Charlton Hill.

Can you explain that further?

Our interest lies in understanding and quantifying the emotional response that music generates and the processes associated with writing melodies and songs. It's not about cracking the formula for a hit song; it's deeper than that. We are exploring the juxtaposition of particular lyrics, melodies and chord sequences and the way they make you feel, to better understand the musical fingerprint of a piece of music. It's the idea of feeling happy/sad and explaining that to a computer. It's pretty complex. It's mind-bending that we now have the computing power and smarts to analyze the lyrics and melodies of an artist's entire body of work and can generate new ideas that might turn into new songs or represent the forward movement of that person's work.

Tell us more about MEMU.

MEMU is a powerful engine for real-time mixing and mash-up of artists' work. It's really exciting. It heralds a new era in music production. We see it as an evolving ecosystem of contributors and collaborators that will allow artists to be discovered and to track and be paid for any broadcast of their work. MEMU's ability to understand and mix an endless flow of music in real time is really quite remarkable.

How are people reacting to MEMU?

Some people find it amazing but are concerned that we're going to put musicians out of work. That's not our intention. We see MEMU as a powerful engine to democratize production, by speeding up the process and making it more affordable. Just as Spotify is pursuing the best playlist ever, MEMU is pursuing the best music-scape ever.

How did you develop the software?

It was an interesting process that involved data scientists and creative technologists working with musicians, music producers and a broader team of academics.

At first, we trained MEMU with our own proprietary material. We then dabbled in using copyright-protected material, but to avoid the risk of inadvertent copyright infringement, we began drawing on the works of an extended community of users, including record labels.

This enabled us to push and pull at the notion of copyright and re-mixing. We discovered a sliding scale of reactions depending on the notoriety of the artist.

When artists enter the MEMU universe, they agree to allow it to do wonderful and extraordinary things with their art. MEMU tracks the micro-contributions of each artist and how they are used. It is a powerful way to ensure artists are remunerated.

When we needed to, we used open source material to train MEMU, but we typically developed our own proprietary solution to create MEMU's bespoke architecture, simply because the solutions we needed weren't available in the market.

Can you explain the different channels of MEMU?

MEMU is malleable and now has a variety of channels that enable us to isolate universes. For example, if we ask a record label for the forthcoming releases of two of their artists for MEMU to mix, we can create a closed universe for that collaboration.

MEMU's different channels are built into its architecture. At first, we released focused channels to teach MEMU about certain genres, emotions and the aeolian mode of music, which underpin pop music. The technology is evolving rapidly and enabling us to adapt the contributions we receive across genres. For example, MEMU may take a work that naturally sits on a chill-out channel and process it for a high-energy channel.

How does this help musicians?

MEMU offers musicians the opportunity for their music to be expressed across different modes of emotion and mediums. Artists looking to be discovered may allow us to have access to some of their work so it is heard in different ways and leads people back to their catalogue. What artist would not let their music be used in all these extraordinary platforms and ways?

MEMU also democratizes the music production process. It has the ability to take musical works and mash them in a way that we have never really seen before and to remunerate artists. There is a ridiculous hunger for music to complement content in all its forms old and new. MEMU helps meet that demand.

“We are working to speed up the mechanics of music production, improve the trackability and use of music and open up the notion of what a song is so that it can be enjoyed in all sorts of ways. AI can help build that broad landscape.”

The experiences of Twitch and other platforms show the industry is in a “don’t allow” mode. The future of music, which MEMU represents, is “to allow, attract and remunerate” so everyone wins and can go forward.

What impact do you think AI will have on musicians?

AI tools can democratize the way artists engage with the industry and enable them to generate new revenues from their work. The tools we, and others like us, are developing are designed to integrate progress and technology in an ethical and artist-centric way. AI complements the tools available to musicians and can break down entry barriers by speeding up the production process and enabling musicians to express themselves in chart-sounding ways.

We are working to speed up the mechanics of music production, improve the trackability and use of music and open up the notion of what a song is so that it can be enjoyed in all sorts of ways. AI can help build that broad landscape.

AI allows people who do not have the means to still engage with music as a form of expression. That’s probably the most exciting thing that AI can do in the music industry.

Can AI-based tools make music that really moves people?

Yes. AI can certainly help create songs that humans feel, but humans will always be involved in that process. We are not trying to

“AI tools can democratize the way artists engage with the industry and enable them to generate new revenues from their work.”

In 2020, Uncanny Valley won the first ever AI Song Contest using an AI trained on Eurovision songs to create the melody and lyrics as well as a blend of samples of Australian animals, a real producer and vocalists. The winning song, “Beautiful the World,” evokes a message of hope that nature will recover from the devastating forest fires that swept the country last year.



Photo: Courtesy of Uncanny Valley

recreate a human performance, even if what we do leans on a human performance, turns that into data and translates it into another performance. The notion of an artist avatar or performance transfer is already a reality.

I am convinced that one of things AI will do is to allow humans to be more human and to write better music.

In which fields do you think we will see early uptake and adaptation of AI music?

Experimental artists have been dabbling with AI for a long time. AI is steadily moving into the mainstream of music. For example, LifeScore, Abbey Road's AI music software, recently launched a prototype with Bentley for in-car music, which uses data points like speed and GPS location. That's very encouraging.

At the end of the day, humans are just looking for interesting, helpful and entertaining ways to engage with life. Music is a big part of that and AI speeds up the music production process. That's why we use it. AI will certainly augment human performance but it will struggle to replace it.

What's fueling the growing interest in AI in the music tech industry?

First, the fear of missing out and second, a desire to correct past wrongs. There is a sense that AI's power can get it right for us and can open the door to pro rata remuneration for artists.

How would you like to see the copyright system evolve?

At times, we have pushed and pulled at copyright, especially in the earlier stages of MEMU's development, but our current thinking is, "if it ain't broke," keep rolling with it. So, we'll keep playing by the rules until the rules change.

Is there any particular area in which you would like to see the rules change?

I think something needs to be done around the notion of using an artists' body of work to generate new art or new revenue streams, particularly when technology is so capable of taking it and using it in a valuable way.

I am quite torn on the subject because I don't think we suddenly deserve the right to take an artist's entire back catalogue and make new works with it just because we have the technology to do so. Maybe there is another way - something along the lines of allowing such use in return for contributing to a common pool of funds to support aspiring musicians.

What are your plans for the future?

We gave ourselves one year from winning the AI Song Contest to prove that we have a valid tool for musicians and songwriters. There's a lot of interest in what we're doing, and we are genuinely trying to find the right collaborators to develop something that supports the company and the broader music community. In Australia, we are helping to establish Australia's first music AI hub, which brings together academics, commercial partners, scientists and emerging artists.

And the future of MEMU is to create new and exciting music while generating new revenue streams for artists. If we succeed in that, we will have succeeded in creating a centralized hub for a community of artists to continue the AI and music conversation.

Mauricio de Sousa Productions: comic success underpinned by intellectual property

By **Ceci Almeida**, freelance writer

Mauricio de Sousa Productions (MSP) was founded in 1959 and is widely recognized as one of Brazil's most successful comic book and animation publishers. It all began when, in 1959, a leading newspaper in São Paulo began publishing its first daily comic strip about a dog named "Bidu" and its owner. The illustrious career of Brazil's best-known comic strip artist, Mauricio de Sousa, who turns 86 this year, spans more than 60 years. Creator of the country's most popular comic series, *Mônica's Friends* (*Turma da Mônica*), which was inspired by his childhood friends and his own children, Mauricio de Sousa has become a household name in Brazil.

INTELLECTUAL PROPERTY UNDERPINS MSP'S THRIVING BUSINESS

The cartoonist's company, MSP, has become a leading player in Brazil's publishing market, with a product portfolio that extends well beyond comic books and includes animated films, stage shows, theme parks, computer games and cuddly toys. Copyright and trademark licensing of the artist's cartoon characters underpin MSP's business strategy.

From the outset, Mr. de Sousa had his eye on building his business. At first, he began marketing his printed works and as his cartoon characters gained popularity, he began licensing his works to consumer goods companies. Intellectual property (IP) has been central to the cartoonist's business strategy from day one.



Photo: Courtesy of MSP

Mauricio de Sousa, creator of Brazil's most popular comic series, *Mônica's Friends*.

In 1966, the company registered its first trademark in Brazil for its much-loved canine comic character, Bidu. All of MSP's creations are now protected with the trademark, *Turma da Mônica*, which has been registered in 20 countries in Asia, Europe, North and South America.

Over the last 60 years, Mr. de Sousa has focused as much on his creative work as on his business affairs. The company's earnings have soared. Since the release of its first comic book in 1970, MSP has created over 400 new characters and sold more than 1.2 billion comics and books. Generations of children have learned to read thanks to the adventures of the cartoon character, Mônica.

With over 300 different titles, MSP sells some 2.5 million comic books every month to a loyal audience of 10 million readers. MSP's publishing business employs around 400 people, 150 of whom are artists.

During the 1980s, MSP began producing feature films and animated series, which further boosted financial returns. Its first feature film, *The Adventures of Mônica's Gang (As Aventuras da Turma da Mônica)*, has been followed by seven others. MSP's animated series are broadcast on TV channels such as Cartoon Networks and Boomerang and on all online platforms. *Mônica's Friends'* website has become the leading children's website in Brazil with 1 million-page views every day.

On YouTube, MSP has a variety of channels including *Turma da Mônica*, *Mônica y sus Amigos* and *Mônica Toy Official*, which are translated into Spanish and English. The *Turma da Mônica* channel alone has almost 17 million subscribers and reaches 450 million-page views every month. MSP also runs the *Turma da Mônica* TV app and offers a range of games. Most viewers – around 66 percent of them – live outside Brazil, in Mexico, the Russian Federation and the USA. MSP also has a strong social media following on Facebook, Instagram, LinkedIn and Twitter.

Although his talents as a cartoonist and an astute entrepreneur have earned him a reputation as the "Walt Disney of Brazil", Mr. de Sousa is strongly committed to social issues. The Mauricio de Sousa Institute, for example, has developed partnerships with non-governmental organizations, city halls and other entities to use his cartoons to promote pressing social issues and environmental causes.

“Copyright and trademark licensing of the artist’s cartoon characters underpin MSP’s business strategy.”

LEVERAGING BRAND VALUE THROUGH LICENSING

Over the years, Mr. de Sousa has built a thriving business empire by strategically leveraging the brand value of his highly popular cartoon characters.

“We have been licensing products since the 1960s. At that time, our products [cartoon characters] were licensed for use on clothing, dolls and food items. One of our greatest achievements over the last 40 years has been the licensing deal we struck with Cargill for the use of our elephant character Jotalhão on their tomato sauce packaging,” explains Mônica Sousa, the cartoonist’s eldest daughter (and inspiration for the character, Mônica), who currently serves as MSP’s Commercial Director.

Despite competition from Disney characters and Japanese superheroes, MSP’s brands, and *Mônica’s Friends*, in particular, are highly profitable when associated with a broad range of consumer goods. Today, 90 percent of the company’s profits comes from licensing.

Mr. de Sousa’s characters can be found on everything from nappies to furniture, clothing, hygiene items, toys, and foods, including apples, watermelons and broccoli. *Mônica’s Friends*-branded consumer products are top sellers in Brazil. Around 850,000 *Turma da Mônica* apples are sold each month along with *Turma da Mônica*-branded tomatoes and bananas which command sales of 20 and 35 tons, respectively, per month.

Among the companies that have licensed Mr. de Sousa’s trademarks are big corporations like Tok & Stok, Brandili, Kimberly-Clark, Nissin Food Corp., Fischer Price and Driver Toys. Mr. de Sousa’s character brands are licensed for use on some 4,000 items from 150 retailers and manufactures.

PIRACY

Despite excellent business results, piracy has been a thorn in MSP’s side for many years. The company has battled constantly with counterfeiters in Brazil and beyond.

“On February 16, 2007, during the premier of our feature film “*Mônica’s Friends – an adventure in time*,” copies of the film were already being sold on the streets of downtown São Paulo,” Mr. de Sousa recalls. “This showed huge disrespect for intellectual property.”

MSP invests heavily in protecting its intellectual property (IP) interests. Its legal department actively clamps down on counterfeit and pirated goods that bear its trademarks without authorization. “Each character from MSP is a duly registered trademark,” says Mr. de Sousa, who notes the company’s principal characters are registered in almost all classes of goods and services in 20 countries across Asia, Europe, North and South America.

“We have invested heavily to manage our intellectual property rights in multiple countries. The cost of filing for trademark protection, however, is still very high, particularly for medium-sized businesses like MSP. But such protection of cultural products not only protects the company’s interests, it also protects those of our country and our fans.”



Photo: Courtesy of MSP

“We have invested heavily to manage our intellectual property rights in multiple countries... such protection of cultural products not only protects the company’s interests, it also protects those of our country and our fans,” says Mónica Sousa, MSP’s Commercial Director.

“The Madrid Protocol is a very positive system that supports the national economy and commercial exchanges with other member countries that are part of the system.”

Mauricio de Sousa

MSP’s strategies to curb piracy and fraud have been strengthened through strategic partnerships with other companies. It also supports training programs for customs inspectors to allow them to more effectively identify and seize counterfeit goods. MSP is also collaborating with its partners to combat piracy through its participation in the Brazilian Association of Licensing of Brands and Characters.

MADRID SYSTEM FOR THE INTERNATIONAL REGISTRATION OF TRADEMARKS

MSP does not disclose details of its profits or details of spending on IP acquisition and management. However, reducing the cost of securing trademark protection for its characters, particularly in overseas markets, is a key objective in the years ahead.

Since the 1990s, Mr. de Sousa has been a vocal supporter of Brazil’s accession to the WIPO-administered Madrid System for the International Registration of Trademarks, which facilitates the process of registering trademarks in up to 125 countries. Brazil joined the Madrid System in June, 2019, and Brazil’s National Institute of Industrial Property (INPI) began processing international trademark applications under the system from October, 2019.

The fact that Brazil has joined the Madrid System has brought new hope for MSP and its ambitions to protect its trademarks internationally in a cost-effective and timely way.

“The Madrid Protocol is a very positive system that supports the national economy and commercial exchanges with other member countries that are part of the system. It will allow us to boost exports and internationalize Brazilian brands. It will also be easier for international companies to operate in Brazil, due to the reduction of filing and management costs and the simplification of the whole trademark registration procedure”, says Mr. de Sousa.

As a member of the Madrid System, INPI Brazil now examines international trademark applications within 18 months from the filing date. It also allows for trademark applications to be filed in a multi-class system (meaning that trademarks may be registered for multiple classes of goods and services), and for trademarks to be registered under co-ownership arrangements, adding flexibility to the local rules.

“We believe that we will see the benefits of joining the Madrid System in the coming years. By reducing the bureaucracy and cost, we will have easier access to member countries and this will open new business opportunities. We are very excited about the prospects,” says Ms. Sousa.



Photo: Courtesy of MSP

Mauricio de Sousa (above), creator of the comic series, *Mônica's Friends (Turma da Mônica)* and founder of Mauricio de Sousa Productions (MSP), turns 86 this year. The company founded in 1959, is as one of Brazil's most successful comic book and animation publishers.

MSP'S INTERNATIONAL VISION

MSP is focusing on a number of markets in Asian countries, including China, Indonesia and Viet Nam, where the company has been operating for the last 18 years. The company has ambitious plans for Japan where it has set up a subsidiary and where, in addition to its character licensing for local products, it is building new partnerships with other producers of cultural goods.

"We live in a global society and collaboration opens up new perspectives for brands. Production costs in animation for digital platforms are challenging, and partnerships make it feasible for us to launch new products and content that meet our audience's demands," explains Ms. Sousa.

The Asian market is central to MSP's ambitions to finally become a competitive international player.

THE FUTURE IS DIGITAL

Looking ahead, MSP is looking to further internationalize its cultural outputs and sees digital media as the vehicle to achieve that ambition.



“We see MSP becoming a more digital and international company, without neglecting or abandoning our Brazilian roots and good storytelling, which is in our DNA. In recent years, a number of our characters have gone global, bringing our cultural products to new parts of the world”, explains Ms. Sousa.

However, the company’s digital ambitions raise significant business challenges, in particular, when it comes to protecting its creations in the online world. Research estimates around 30 million views of pirated comic books every month. “The same way academic work cannot be copied without citing the source correctly, legally protected content should not be used without following certain rules,” says Ms. Sousa. “We are using the tools available on online platforms to report unauthorized use of our characters. For example, YouTube, has very efficient mechanisms to identify unauthorized use of content and prevent it from going live.”

Many countries are implementing laws and rules to protect IP rights owners’ interests, but according to Ms. Sousa “there is still a long way to go”. The power pendulum is slowly swinging towards IP owners on digital media, but many content owners still need to take legal action to enforce their rights. For Mr. de Sousa, raising public awareness about the need to respect IP rights is essential.

During the company’s 60th anniversary celebrations, Mr. de Sousa underlined the enduring importance of IP to MSP’s business. “Over the last 60 years, MSP has grown on the basis of intellectual property rights protection in Brazil and around the world. That will continue in the future.”

“Over the last 60 years, MSP has grown on the basis of intellectual property rights protection in Brazil and around the world. That will continue in the future.”

Mauricio de Sousa

Graphenel: pioneering graphene production in Viet Nam

By **Catherine Jewell**, Information and Digital Outreach Division, WIPO

Graphenel JSC, based in Ho Chi Minh City, is a technology company that specializes in the large-scale production of graphene and its applications. Jane Phung, responsible for the company's international business development, discusses the company's novel approach to graphene production, the challenges it faces in Viet Nam's nascent graphene market and the role that IP plays in supporting its ambition to become a leading industrial supplier of graphene-based materials.

What are the origins of the company?

The company was set up by Tuan Le, our CEO, and Jat Le, our Chief Project Officer, in 2011. They studied together, majoring in chemistry and nanomaterials. After graduation, they started a business, NanoLife, which focused broadly on nanomaterials. Then, when graphene and its amazing properties came into focus, they began working exclusively on it and re-branded the company as Graphenel JSC.

At the time, graphene was scarce, and its manufacture was costly. So, my colleagues decided to find a more cost-effective way to develop graphene. After around seven years of research and a lot of trial and error, they came up with a novel process for manufacturing graphene. In broad terms, we refine animal fat – such as that used to produce cosmetics – to mass produce graphene in a cost-effective way. In general, it takes around 1 kg of refined animal fat to create 1 gram of graphene, and a single production cycle, which produces 6 kilograms of graphene, takes around two days.

About graphene

In 2004, researchers at the University of Manchester in the UK, Andre Geim and Kostya Novoselov, first isolated graphene. They used sticky tape to separate graphite into individual layers of carbon. Their work won them the Nobel Prize for Physics in 2010.

Hailed as a “wonder material,” graphene is a one-atom-thick layer of carbon atoms arranged in a hexagonal lattice, with a number of interesting properties. “It’s the thinnest possible material you can imagine. It also has the largest surface-to-weight ratio: with one gram of graphene you can cover several football pitches [...] It’s also the strongest material ever measured,” noted Andre Geim in an interview with *Nature* in October 2010.

Graphene is around 200 times stronger than steel and is an excellent conductor of heat and electricity with “interesting light absorption abilities.” It can be combined with other elements to produce different materials with enhanced properties for a variety of uses, from construction to medical sensors to batteries.

According to *Graphene-info*, graphene is “truly a material that could change the world, with unlimited potential for integration in almost any industry.”



Tell us more about your business model.

Unlike other countries with established graphene markets, few people in Viet Nam are familiar with graphene and its amazing properties. So, to develop our business, we have been relying on our networks to help spread the word in the market about what we are doing. We sell our graphene products to researchers working on new materials. They have been very helpful in referring us on to other companies they work with. This has allowed us to promote broader understanding of the value that our materials can add and to expand our client list.

We also recently launched a new cooperation program, where we co-develop new materials and products using graphene with universities, research institutes and small companies. Program partners agree to use our graphene products as input materials. It's a win-win situation; they benefit from our products and expertise to advance their research, and we create an opportunity to commercialize any marketable outputs that flow from the research project. We anticipate the program will accelerate the product development process and our journey to market.

So far, we have agreements in place with two universities and one private company.

A number of products are in the pipeline, which we hope to introduce to the market by the end of 2022.

Is there a big demand for graphene in Viet Nam?

In global terms, it's not so big, but there is certainly enough demand for us to generate revenue. Of course, going forward, our aim is to increase our market share at home and in Australia and France, where we have clients, as well as in other export markets.

What types of graphene applications are you focusing on?

For now, our top priority is the work we are doing with Ton Duc Thang University on the use of graphene admixtures in cement production to increase the strength and longevity of buildings. Tests show that the compressive strength and the tensile strength of cement can increase by up to 40 percent and up to 30 percent, respectively. With graphene, it will be possible to improve the carbon footprint of the building and construction sector – cement production currently accounts for around 6 percent of global carbon dioxide emissions – and open the way for greener approaches to building and infrastructure design.

We are also working on two other projects. The first is with an American-Vietnamese business to integrate graphene into wearable medical devices to monitor the health of the person wearing it. Graphene is a highly conductive material and when embedded in other materials can conduct electric signals and act as a powerful sensor with a wide range of applications, including in bioelectronics. In general, graphene makes composite materials smart.

The other project is with Jeonbuk National University in the Republic of Korea, where we are working with researchers to find ways to improve the lifecycle and durability of batteries using graphene.

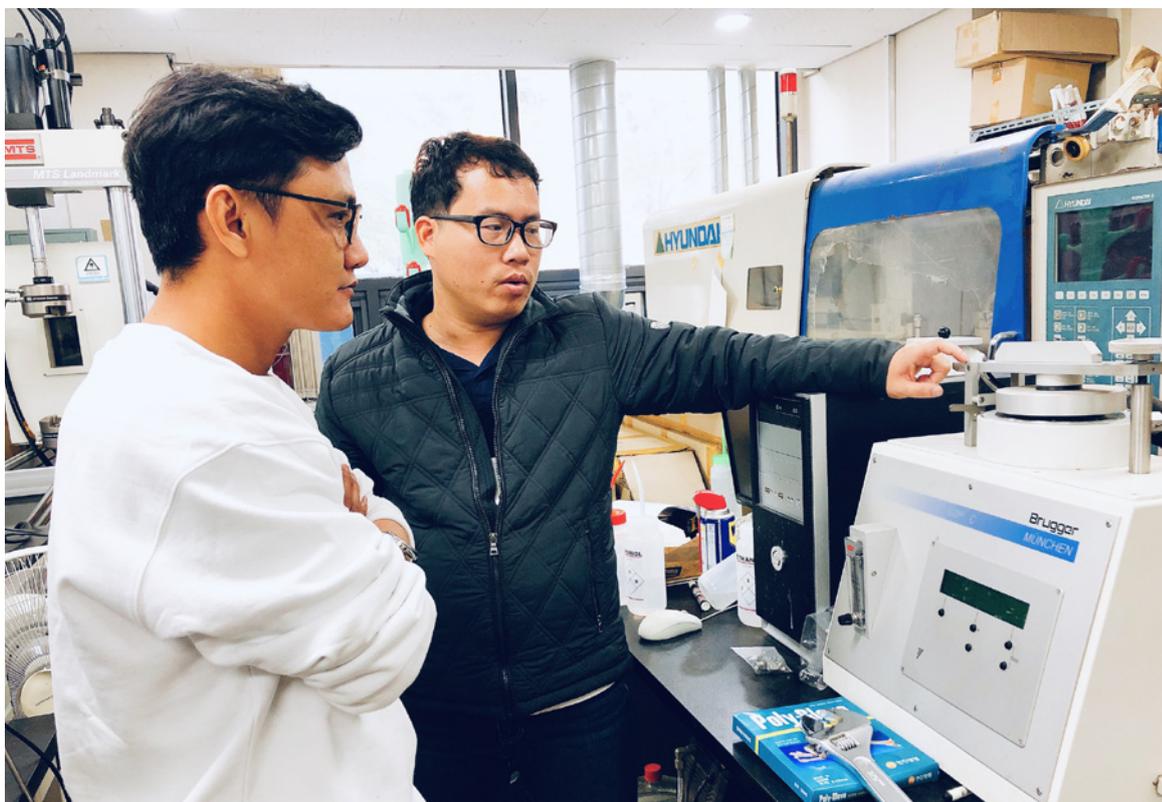
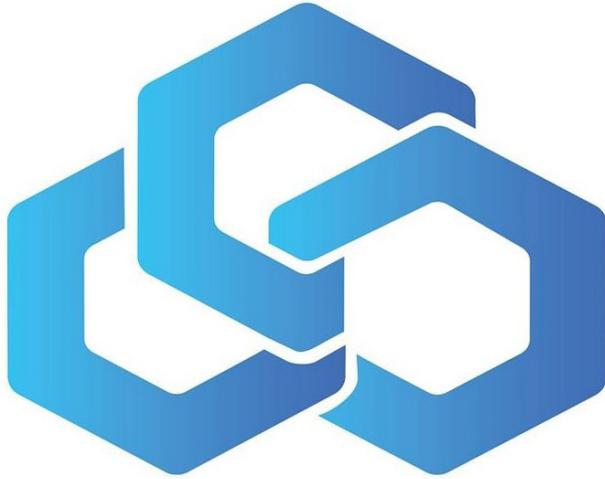


Photo: Courtesy of Graphene JSC

Graphene JSC was established in 2011 by Tuan Le (left) and Jat Le (right). Its main areas of focus are the use of graphene in bioelectronics, cement and batteries. “We are particularly excited about the battery industry and are keen to educate that market about graphene and to develop and commercialize good graphene-based batteries for a greener society,” says Jane Phung, International Business Development Manager at Graphene JSC.

“With graphene, it will be possible to improve the carbon footprint of the building and construction sector – cement production currently accounts for around 6 percent of global carbon dioxide emissions – and open the way for greener approaches to building and infrastructure design.”



“When we saw that our innovation had value, we realized we needed to protect it immediately.”

Graphenel currently produces around 100 kg of graphene layers, 1 tonne of graphene nano-platelets and 10 kg of graphene oxide per year. The company is aiming for a 10-fold increase in its production capacity by the end of the year. (Photo: Courtesy of Graphenel JSC)



Photo: Courtesy of Graphenel JSC

What has been the response from Vietnamese businesses?

We have been talking to big companies in Viet Nam and they are very excited about our research and what can be achieved with graphene. There is, however, a general concern about the cost implications of using it in their products. They also stress their need for a stable and reliable source of graphene that is capable of meeting their industrial-scale needs. If we can meet that demand, the prospects are promising. That's why we are scaling up our production capacity.

What role does intellectual property play in the company?

Intellectual property (IP) is super important to us and has been pivotal in enabling us to secure funding. As graphene was so new in our market, the only way to attract the funds we needed was to demonstrate the validity of our manufacturing process to investors. On the strength of the patent application that we had filed with the Intellectual Property Office of Viet Nam, we were able to do this. With that application, and the strong profile and experience of our co-founders, our investors began to trust our process.

When we saw that our innovation had value, we realized we needed to protect it immediately. Although the graphene market in Viet Nam is not well developed, many companies around the world make graphene, so it was clear that only by protecting our IP could we remain competitive.

We filed our application in September 2019. It is still in process, but we hope to receive confirmation that the patent has been granted by the end of 2021.

Why is it important for Graphenel to collaborate with university researchers?

Simply because university researchers are able to spread knowledge about this material to their students, who in turn, apply it to different products. University researchers understand the importance of graphene and the value it adds to products. Through their peer-reviewed articles and contacts, they will transfer knowledge about graphene and its potential applications to their peers in Viet Nam and elsewhere. In this way, people will learn about graphene and our products.

How do you protect your IP when collaborating with universities?

Through a combination of non-disclosure agreements and other agreements in which our partners agree not to reveal details of our manufacturing process. In general, when we engage with them, we give a general overview of our process, without disclosing core details; they know what is going on but not enough to copy it.

Graphene covers a family of materials, each with different properties. What types of materials do you produce?

We produce graphene in its rawest form. We have four featured products: graphene oxide, reduced graphene oxide, graphene layers and graphene

nano-platelets. They are all powder products and while they can be used for the same purposes, some forms are more suitable for specific products.

For example, our graphene nano-platelets are best suited to cement admixtures and some water treatment products, whereas graphene oxide and reduced graphene oxide are more suited for use in sensors and batteries. We sell our graphene layers to companies who process the graphene themselves without our help.

How much graphene do you produce every year?

Right now, we produce around 100 kg of graphene layers, 1 tonne of graphene nano-platelets and 10 kg of graphene oxide. But we are in an expansion phase. We currently have five full-time staff and a growing number of part-time staff who work in our factory. By year-end, we expect to increase our production capacity 10-fold.

What are the main challenges you are facing?

As I mentioned before, building awareness about graphene and its properties has been a big challenge. Then, in entering foreign markets, we confronted low levels of trust among prospective clients. Our approach to IP was an important factor in dispelling their doubts about us, and actually opened conversations with a number of companies from other countries. It encouraged them to look at our process more closely and when they did, they found it was more interesting than they first thought.

Cost also remains an issue. While the cost of graphene has dropped significantly over the last decade, it's still expensive for companies to use on a large scale. So, we need to find ways to further reduce its cost. We also need to continue working with prospective clients to demonstrate the potential benefits of using graphene in their products.

Quality control is another important issue. Viet Nam doesn't yet have a quality standards authority for graphene. We have been trying to overcome this by benchmarking our graphene products against those from other countries. When looking at new markets, we also look at their standards. For the moment, we simply work to ensure that our materials do what we say they do. It is rather difficult to talk to people about quality when we don't have any national standards in place. So, we would like to see the development and implementation of quality standards for graphene that other industries can understand and trust. Only then will customers have confidence in the quality of our products. We are working with the national authorities on this. I think we are on the right track, but we need to be faster if we want to make inroads to the market.

What needs to be done to support the commercialization of graphene materials and why is this an important issue for policymakers?

Policymakers have an extremely important role to play in developing a policy environment for the graphene market to thrive. This involves establishing

The work that Graphenel is doing with Ton Duc Thang University on the use of graphene admixtures in cement production to increase the strength and longevity of buildings is a top priority.

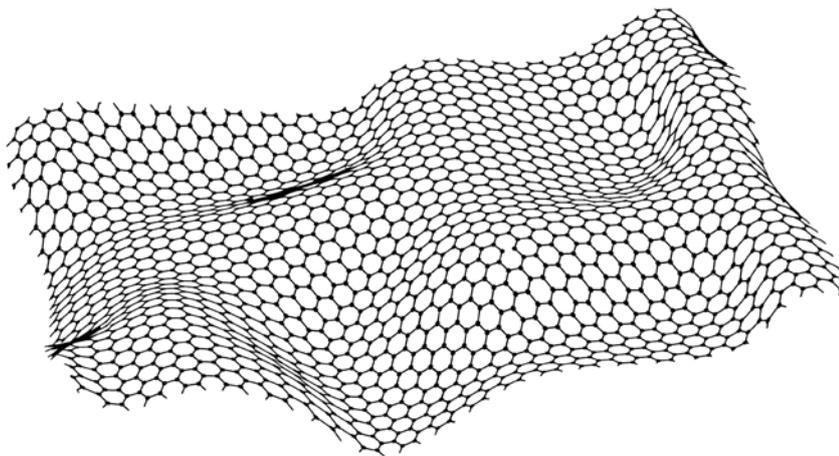


Photo: m_pavlov / iStock / Getty Images Plus

quality standards for the manufacture of graphene that the market can trust. It also means clarifying the legal boundaries governing the commercialization of graphene.

We would like to see policies, such as tax breaks, to support domestic production of graphene for both home and export markets. Such policies would enable domestic graphene producers to compete with producers from other countries. If the government could do something support local graphene production, it would be good.

Has graphene and its potential been overhyped?

No, not really. It's true, it has applications in many sectors, but so do other materials. The problem is, we don't yet fully understand how it can be best applied. I think graphene has a good future, but is it forever? I'm not sure. It's highly likely that some other amazing new material will come along to compete with it in the future.

What new uses of graphene materials are you most excited about?

Personally, I am most excited about electrical batteries. Right now, a lot of our devices rely on batteries, so if we could use graphene to improve the lifecycle of batteries so they charge more quickly and hold more power for longer, it would be amazing. It would mean we could cut the number of batteries we throw away every year and help make the world greener.

What are your plans for the future?

We will continue to develop our work in the areas of bioelectronics, cement and batteries. We are particularly excited about the battery industry and are keen to educate that market about graphene and to develop and commercialize good graphene-based batteries for a greener society.

Australian court finds AI systems can be “inventors”

By **Rebecca Currey & Jane Owen**,
Bird & Bird, Sydney, Australia

In a world first, a judge of the Federal Court of Australia has found that artificial intelligence (AI) is capable of being an “inventor” for the purposes of the Australian patent regime.

This is one more chapter in the global debate as to whether patent law and policy should adapt to recognize the changing innovation landscape. This decision is one of a series of test cases globally regarding the effect of AI “inventors” on the current state of patent law in certain jurisdictions.

The confirmation that, in Australia, AI can be “inventors” under our existing regime (subject to any appeal decision) is contrary to the position in the UK, the European Patent Office (EPO) and the USA, where an inventor must be a natural person.

BACKGROUND

An AI system, known as DABUS (or Device for the Autonomous Bootstrapping of Unified Sentience), had been named as the inventor by the Applicant, Dr. Stephen Thaler, on an international application filed under the Patent Cooperation Treaty, designating Australia. The alleged invention was the output of DABUS’ various products and methods directed at an improved fractal container, which claims to be an “improved food container for foods.”

DABUS had been named as the inventor because the *Patent Regulations* require, in relation to a PCT Application, the Applicant to name the “inventor of the invention to which the application relates”.

The Deputy Commissioner of Patents (“Commissioner”) had rejected the application because it did not name a human inventor. The Commissioner was of the view that the ordinary meaning of

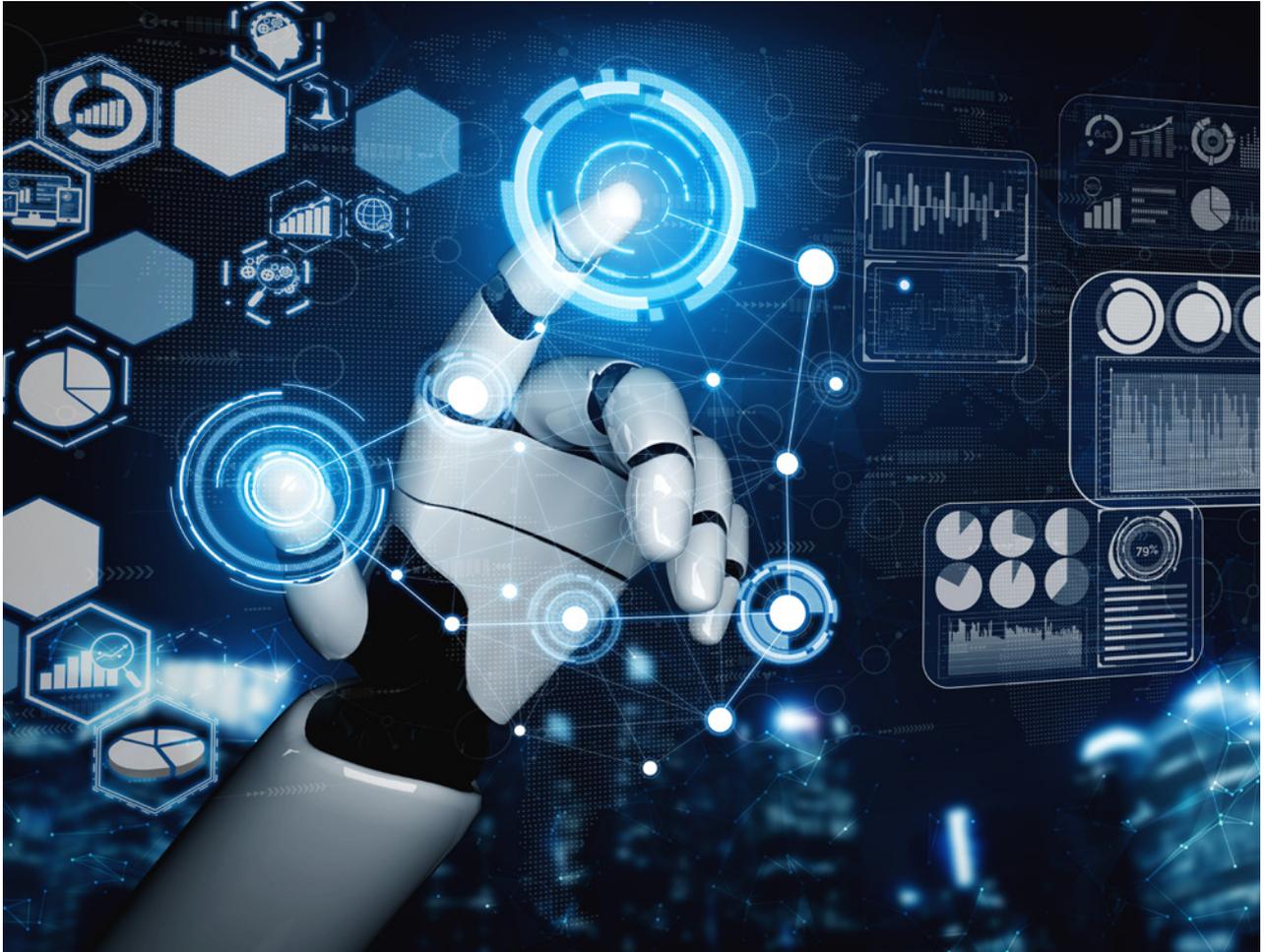


Photo: Blue Planet Studio / iStock / Getty Images Plus

In a landmark decision, Justice Beach found that there was “no specific provision [in the Australian Patents Act] that expressly refutes the proposition that an artificial intelligence system can be an inventor”, and in such circumstances, AI can be an inventor.

“In a world first, a judge of the Federal Court of Australia has found that artificial intelligence (AI) is capable of being an ‘inventor’ for the purposes of the Australian patent regime.”

“inventor” (which is not defined in the Patents Act) was “inherently human,” and that naming AI as the inventor was incompatible with section 15 of the Patents Act, which provides that a patent for an invention may only be granted to a person who:

- a. is the inventor; or
- b. would, on the grant of a patent for the invention, be entitled to have the patent assigned to the person; or
- c. derives title to the invention from the inventor or a person mentioned in paragraph (b); or
- d. is the legal representative of a deceased person mentioned in paragraph (a), (b) or (c).

In particular, the Commissioner said that in relation to:

- section 15(1)(b) “[i]t is an uncontroversial observation that the law does not presently recognise the capacity of an artificial intelligence machine to assign property”;
- section 15(1)(c), an artificial intelligence could not have any beneficial interest in property, and requires a title that moves from the inventor to another person, which on the facts, does not exist here.

Dr. Thaler sought judicial review of the Commissioner’s decision.

THE DECISION

Justice Beach found that there was “no specific provision [in the Patents Act] that expressly refutes the proposition that an artificial intelligence system can be an inventor”, and in such circumstances, AI can be an inventor.

While the Commissioner of Patents sought to emphasize the dictionary definitions of “inventor” (given that “inventor” is not defined in the Act), Justice Beach was not persuaded. He said, having regard to the evolving nature of patentable inventions and their creators that, rather than “resort to old millennium usages of that word,... [he] need[ed] to grapple with the underlying idea, recognizing the evolving nature of patentable inventions and their creators. We are both created and create. Why cannot our own creations also create?”

To this end, Justice Beach acknowledged the extensive role of AI in pharmaceutical research, as an example of its inventive and technical contribution, which indicated that a narrow view of

“This decision is one more chapter in the global debate as to whether patent law and policy should adapt to recognize the changing innovation landscape.”

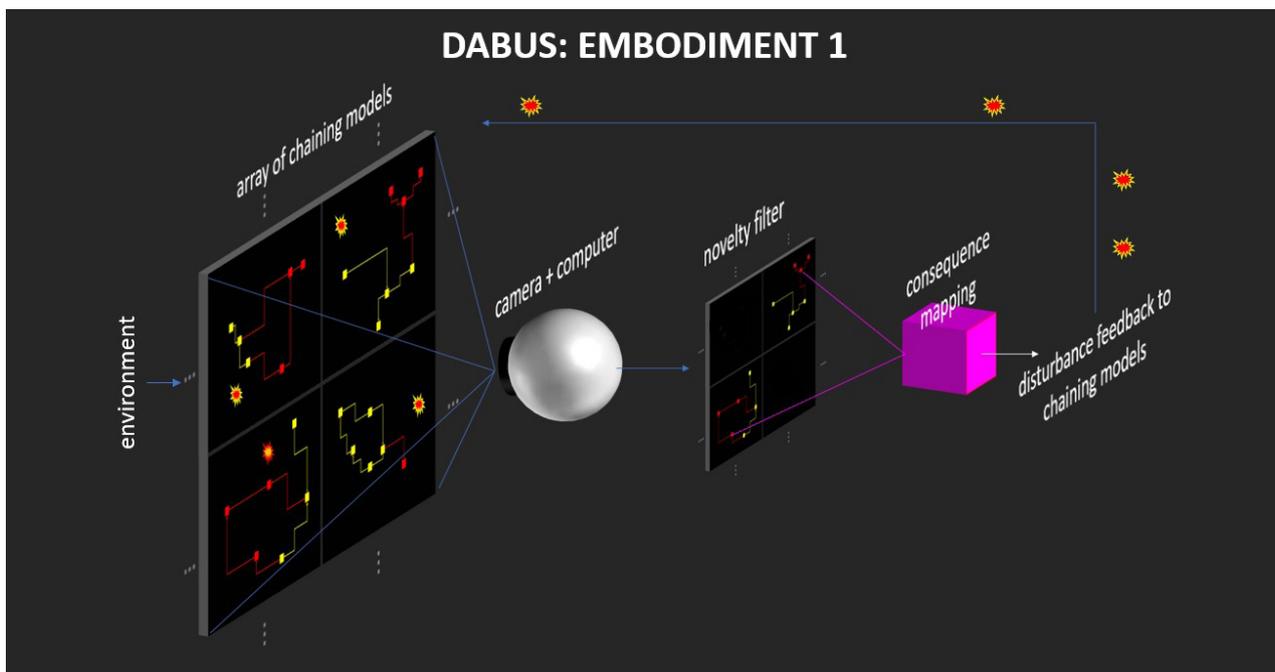


Image: Courtesy of Dr. Stephen Thaler

DABUS (or Device for the Autonomous Bootstrapping of Unified Sentience), is an AI system that was named as the inventor by the applicant, Dr. Stephen Thaler, on an international application filed under the Patent Cooperation Treaty, designating Australia. The alleged invention was the output of DABUS.

“inventor” should not be taken. While, like “computer,” an inventor, is an agent noun (and an agent can be a person or a thing) that may have originally only been used to describe humans, when only humans could make inventions, the term is now apt to describe machines that carry out the same function, he said.

In such circumstances, there is no basis to exclude AI from being an “inventor” within the meaning of the Patents Act, or to “preclude a class of otherwise patentable inventions from patentability on the basis of an exclusion that is not apparent from the express words of the Act. Indeed, that would be the antithesis of promoting innovation”.

As to the Commissioner’s arguments pertaining to section 15 of the Act, which outlines who may be granted a patent, Justice Beach said that he found the Commissioner’s reliance on this section “curious”, because the application was only at the formalities stage, which simply required that the “inventor” be named, and was nowhere near the stage of grant.

Regardless, Justice Beach considered section 15 of the Act. He said that, in principle, Dr. Thaler is capable of being entitled to be granted a patent in relation to

an invention made by AI such as DABUS under at least sections 15(1)(c) and possibly section 15(1)(b).

As to section 15(1)(b), Justice Beach said that Dr. Thaler could bring himself within section 15(1)(b). He said that this section deals with a future conditional, and that it does not require the existence of an inventor at all – all that is required is that he is entitled to have the patent assigned to him in the event there is a grant.

Turning to section 15(1)(c), he said that first impressions suggested that Dr. Thaler fell within this section, because he has derived title to the invention from DABUS. Despite the fact that DABUS is not a legal person that cannot legally assign the invention, title can still be derived from DABUS by reason of his possession of DABUS, his ownership of the copyright in the source code of DABUS, and his ownership and possession of the computer on which it resides.

Given the global significance of this issue and the contrary position of the Australian Federal Court to other courts around the world, we await with interest the outcome of the appeal submitted by the Australian Commissioner of Patents on August 30, 2021.

Innovative prostheses positively change the Paralympics

By **Maja Hoock**, IP & R&D Corporate Communications, Ottobock, Germany



Photo: Courtesy of Ottobock

Johannes Floors (26) improved his world record in the 200 meters on June 25 using sports prosthetics – and won gold at the Paralympic Games in Tokyo in August 2021.

The Tokyo 2020 Paralympic Games took place in Tokyo from August 24 to September 5, 2021. Some 4,400 athletes with disabilities competed for gold in 22 disciplines. IP protected sports prostheses were one of the key devices they used to achieve their goals. Research and development have helped athletes get the most out of their athletic ability.

Johannes Floors sprints on his track in Leverkusen for up to six hours every day. In August, he flew to Japan to compete against athletes from every corner of the world. “I’ve actually been preparing for the Paralympic Games since 2016,” says the 26-year-old. The German track and field athlete won gold at the Paralympic Games in Tokyo.

Mr. Floors is currently the world's fastest person on prostheses. He improved his world record in the 200 meter at the end of June and is also the fastest in his class (T62) in the 100 and 400 meters. But these achievements are anything but a given. Mr. Floors was born with a genetic defect affecting the fibula. He was missing both fibulas and had deformed feet. Sprinting was out of the question. "There was too much pain," he says. For this reason, he made the decision to have both lower legs amputated ten years ago. "I was still in bed at the hospital when I decided to register for the sports program at school," he recalls. His everyday prostheses allow him to walk normally now – and he can sprint with special carbon springs designed for sports. "Feeling that speed is a huge emotional experience," he says.

Not long ago, Paralympic athletes wore their everyday prostheses during competitive sports. Only in the 1980s did they begin wearing specially-designed prostheses for sprinting. Unlike the natural leg or sports prostheses today, conventional prostheses don't flex as easily and make it difficult to carry out movements required for specific sports. "All of a sudden, there were sports prostheses – and that changed everything," says Mr. Floors.

SPORTS PROSTHESES HELP PEOPLE PARTICIPATE

Ottobock is a manufacturer of widely used sports prostheses and wheelchairs and has been providing devices for Paralympic athletes for over 30 years. The German company, known for wearable human bionics, has been fabricating prostheses for over 100 years. Initially, the company produced replacement limbs made of wood for those who had been injured in the First World War. Today, its products include AI-supported prostheses, such as the bebionic hand, that have set new technological standards.

Ottobock now holds 1,886 patents issued in over 540 patent families – including numerous technical innovations for Paralympic sports.

The agile 1E95 prosthetic foot, for example, is used in sports such as basketball and volleyball. The foot has a simple structure and makes walking, jogging and sudden changes of direction easier. Ottobock developed the patented 1E91 Runner especially for sprinters and long jumpers. Many Paralympic legends wear this prosthetic foot, which can be easily adapted to suit the needs of different individuals. And its force line is closer to the body's center of gravity, making the carbon spring more efficient to use. Orthotics and prosthetics (O&P) professional Julian Napp was part of the development team. He has been overseeing the Ottobock Technical Repair Service Center at the Paralympic Games since 2012. Athletes bring their prostheses and wheelchairs to the workshop when they need to be repaired. The technician incorporated his

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practical experiences into the development process: “You have to work very precisely to ensure the foot is correctly aligned with the body,” he says.

The concept behind Ottobock’s popular 1E90 Sprinter running blade that 26-year-old Johannes Floors wears is nearly as old as he is. The Sprinter was developed in the United States in the 1990s, before Ottobock acquired the product and enhanced its design.

The carbon foot is worn with a carbon fibre vacuum socket including an outlet valve and sealing sleeve. The residual limb is enclosed and protected by a type of stocking, the polymer liner. A 1E90 adapter between the socket and prosthetic foot with a protected design ensures that the position of the prosthesis can be easily readjusted. “I can adjust the static alignment perfectly with the adapter, and this is what actually makes it possible to run without any limitations,” Mr. Napp explains.

He custom makes prostheses for various sports and athletes, including well-known sprinters and long jumpers, Heinrich Popow and Léon Schäfer: “It makes me really proud to see them chalking up one world record after the other,” Mr. Napp says. He also works closely with current world record holder, Johannes Floors. “I try to adjust the technology so it suits athletes better and better all the time – it develops along with the athlete,” Mr. Napp notes. “I couldn’t put a prosthesis that was made for Johannes Floors on a different athlete like Léon Schäfer. He probably wouldn’t be able to run very quickly with it. The static alignment is different for everyone.”

PATENT FOR FIRST MECHANICAL SPORTS KNEE JOINT

Despite the invention of the prosthetic sports foot, athletes with a transfemoral above-knee amputation still had a problem. Some of them wore the carbon foot directly on their residual limb and basically pieced together their prostheses themselves. The result can be seen in sports videos showing the characteristic swivelling movement the leg makes when extended. It helps runners who don’t wear a sports knee joint avoid an excessively long swing phase. Other athletes ran with everyday prostheses and polycentric joints, which are actually unsuitable for this purpose. The first monocentric sports prosthesis in the world offered a solution. Ottobock developed it on the basis of the 3R80 joint, for which the patent for rotational hydraulics was initially granted in Germany in 1995.*

The 3S80 has a manual lock and individually adjustable damping characteristics and is particularly compact and robust: “When jogging, the body weight acting on the prosthesis is doubled. There is as much as a fivefold increase when sprinting, with an increase of six to seven times for long jumpers,” says Julian Napp. Artificial sports knees have to be able to withstand this strain but remain flexible enough to permit acceleration. In other words, this type of sports joint is tailored to the athletes rather than the other way round, as was the case previously.

Paralympic athlete Martina Caironi wears this type of sports knee prosthesis. Ms. Caironi, a native of Italy, won a silver medal in the long jump and the 100 meters at the Tokyo 2020 Paralympic Games.

In 2007, she lost her left leg in a motorcycle accident. It was during rehabilitation that she realized she had a gift for sports. She started achieving her first records three years later. “I never actually wanted to be a professional athlete,” Ms. Caironi says.

*The patent expired in 2014.

Photos: Courtesy of Ottobock



Orthotics and prosthetics professional Julian Napp (center) adjusts Paralympic athlete Léon Schäfer's (left) everyday prosthesis with former world record holder Heinrich Popow (right) in the Ottobock Technical Repair Service Center.



Martina Caironi, former world record holder, and silver medallist at the 2020 Paralympic Games in Tokyo, uses an above-knee prosthesis with a sports knee joint and carbon foot.



“But after my accident, I realized how well I was able to run with prostheses. It would have been a waste if I hadn’t pursued my talent.”

Ms. Caironi initially participated in sports with her everyday prosthesis before being fitted with the 3S80 and the 1E91 carbon spring. “I was able to experience the technological transformation right on my own body,” says the 31 year old. “I am living the transformation.”

She says she found it difficult to control the sports prosthesis at first because the joint is more flexible and provides less stability to allow for faster acceleration. Ms. Caironi won gold with this joint at the Paralympic Games in London in 2012, finishing the 100 meter in 14.65 seconds – she was the only female athlete to complete the race in under 15 seconds.

In 2013, Ms. Caironi became a double world champion in the long jump and the 100 meter. In 2015, she ran a world record time in the 200 meter and won gold at the World Para Athletics Championships in Doha.

The new prostheses have enhanced her quality of life as well. Ms. Caironi wears the Genium X3 as her everyday prosthesis; the intelligent knee joint automatically adapts to various situations. “I’ve become much more mobile,” she says. “I can take the stairs or work out at the gym without thinking twice, which has a positive impact on my career as an athlete as well.”

SPORTS WITH PROSTHESES ISN’T TECHNOLOGY DOPING

It’s worth noting that Ms. Caironi was not allowed to use her everyday mechatronic prosthesis at the Paralympic Games. The International Paralympic Committee (IPC) has defined clear rules taking into account the degree to which the athletes’ disabilities impact their performance. For this reason, only passive prostheses without electronics are allowed. The approved length of the prostheses is determined on the basis of a complex formula that takes into account the user’s height and the length of the femur. Yet still, the media’s perception of “enhanced humans” is difficult to shift.

Johannes Floors says he would be rich if he had five euros for every time someone asked him whether he can run faster with his prostheses than professional athletes do with healthy legs. He finds the narrative about superhumans with bionic limbs difficult to swallow. “It degrades my performance and suggests I’m nothing more than my prosthesis,” he says. “It’s as if the six hours I spend training every day aren’t worth anything! And my sports prostheses aren’t even high-tech compared to my everyday prostheses – they’re the same as they have been since the 90s.”

“The International Paralympic Committee (IPC) has defined clear rules taking into account the degree to which the athletes’ disabilities impact their performance. For this reason, only passive prostheses without electronics are allowed.”

WIPO's Technology Trends Report 2021

In March 2021, WIPO released its latest Technology Trends report, which covers assistive technologies - innovations that help people living with functional limitations in relation to mobility or vision, for example, to participate in all aspects of life and fulfil their potential.

The report is part of a series that tracks technology trends through the analysis of patent and other data to provide solid, factual evidence on innovation in specific fields.

At a time when over 1 billion people need assistive technology – this figure is set to double over the next decade as populations age – the 2021 report concludes that intellectual property (IP) is enabling the growth in innovation in assistive technologies. Experts contributing to the report, however, underline the need for this innovation to become more widely available to those who rely on it. Globally, only 1 in 10 people currently has access to the assistive products they need.

The report is designed to provide the knowledge-base to support global discussions to promote greater access to assistive technology.

Key findings:

- Innovations, ranging from small improvements in existing products to cutting-edge developments in frontier technologies, can greatly enhance the lives of those with functional limitations, enabling them to live, communicate and work independently.
- Assistive technologies have enjoyed double-digit growth in recent years and are increasingly integrated in consumer goods.
- China, USA, Germany, Japan and the Republic of Korea are the five main origins of innovation in assistive technology.
- Patent filings in emerging assistive technology, including assistive robots, smart home applications, wearables for the visually impaired and smart glasses, have grown three times faster than conventional assistive technology, which include improvement and accessories for wheelchairs, environmental alarms and Braille-enabled devices.
- Two fast-growing areas of emerging assistive tech are environment (e.g. navigation aids in public spaces and assistive robots) and mobility (e.g. autonomous wheelchairs and advanced prosthetics).
- The assistive technology field is converging with consumer electronics and general medical technologies, with growth in less invasive assistive products (thanks to increasingly sophisticated sensors) and more invasive solutions like brain stem implants to recover hearing, vision, mobility. Technologies developed for those with functional limitations are increasingly applied to mainstream products. For example, bone conduction technology that can assist with hearing impairment can also be used in runners' headsets.
- Advanced and new assistive products are available thanks to developments in and use of enabling technologies like Artificial Intelligence, Internet of Things, new materials and advanced robotics.
- Corporate players are leading the development of assistive technology, including specialized assistive tech companies, such as WS Audiology, Cochlear, Sonova, Second Sight, Ottobock and Össur. Electronic consumer goods companies (e.g. Panasonic, Samsung, IBM, Google and Hitachi) and auto industry companies (e.g. Toyota and Honda) are also major players given the growing trend to integrate assistive technologies into mainstream electronic consumer goods.
- Universities and public research organizations are more prominent in the emerging assistive technology dataset and are particularly active in the field of mobility.

“Throughout the history of para track and field, only a handful of athletes have equalled the world-class levels of non-amputees.”

Despite advances in prosthetics, most Paralympic runners are also slower than Olympic athletes. While para athlete Johannes Floors can cover 200 meters in 21.04 seconds, it takes Usain Bolt, currently the fastest non-disabled athlete, just 19.19 seconds. Throughout the history of para track and field, only a handful of athletes have equalled the world-class levels of non-amputees; they include sprinter Johannes Floors and Markus Rehm in the long jump. “Blade Runner” Oscar Pistorius is controversial for various reasons.

“Athletes who wear prostheses still face disadvantages in every phase that requires acceleration,” says Dr. Thomas Schmalz, an expert in biomechanical analyses of top athletes with amputations. Para athletes have been through traumatic accidents, cancer, amputations and other difficult life events. “They are still athletes with a disability. Unilateral amputees have to compensate for asymmetries in the musculoskeletal system. There is a lack of proprioceptive feedback effects in the nervous and muscular system. Key reflex mechanisms triggered by sensors in the musculature and tendons are missing,” Dr. Schmalz explains.

Prosthetic feet don’t have any intrinsic energy during the first few steps, and what’s more, the user doesn’t perceive them as part of their body. Research in the field of prosthetics is seeking to address this drawback. “Ideally, the user should feel that the prosthesis is part of their own body – a natural extension of the body,” says Dr. Andreas Goppelt, Chief Technology Officer at Ottobock. His research and development team is conducting projects aiming to make this a reality, for example with feedback prostheses.

Johannes Floors says that feeling the prosthesis as a part of his body would be the next big step towards a normal life. “I feel a sense of identity with my prosthesis, but I would like to see it as an even more integral part of myself,” he says. “But you can’t let it get you down; you have to pursue your goals. And then the prosthesis isn’t a hindrance anymore!” In Tokyo 2020, all his hard work paid off when he brought home gold.

Intellectual property, SMEs and economic recovery in Nigeria

By **Oyinkansola Komolafe***, University of Ibadan, Ibadan, Nigeria.

*Winner of the 2021 World Intellectual Property Day Essay Competition organized by the WIPO Office in Nigeria (see box)

Now, more than ever, countries are transitioning from resource-based economies to knowledge-driven economies. Nigeria has seemingly jumped on the bandwagon, as national stakeholders are beginning to recognize the role of intellectual capital as a catalyst for sustainable economic growth. This trend has become even more prominent in light of the recent coronavirus pandemic and the continued resilience of the knowledge economy amid the drastic decline in oil prices. At the center of this renewed thirst for intellectual capital is the primary footstool of innovation – the small and medium enterprise (SME) sector.

For several years, SMEs have proven to be the lifeblood of the Nigerian economy. According to business consultants PwC's MSME Survey 2020, SMEs contribute a whopping 49 percent to Nigeria's GDP and account for about 99 percent of Nigeria's businesses.

Due to their high flexibility and innovation capacity, SMEs are well positioned to chart a new course for post-pandemic economic growth in Nigeria through employment generation and income redistribution. However, to fully optimize their potential, SMEs need to adequately protect and commercialize their intellectual creations. This is where intellectual property (IP) rights come into play.

IP: REPOSITIONING NIGERIAN SMES FOR ECONOMIC PROSPERITY

Nigeria is one of the largest hubs for innovation and creativity on the African continent. Within each invention that enters the Nigerian market, lies a distinct idea that has the potential to be transformed into a valuable business asset for its owners. IP rights provide SMEs with the opportunity to make this transformation a reality.

One of the most prominent advantages of using IP assets for SMEs is revenue generation. The exclusivity that IP rights offer enables SMEs to earn royalties and generate income from licensing their IP assets. In fact, research by the European Union has shown that SMEs that possess IP rights generate up to 68 percent more revenue than SMEs that do not.

Photo: Mlle 91/Ben Langdon / Alamy Stock Photo



Small businesses are the lifeblood of the Nigerian economy and are responsible for generating 49 percent of GDP.



Photo: Modest Franco / iStock / Getty Images Plus

The benefits of revenue generation from IP assets are set to become more significant in light of the African Continental Free Trade Area (AfCFTA) agreement.

The benefits of revenue generation from IP assets are set to become more significant in light of the African Continental Free Trade Area (AfCFTA) agreement. Upon full adoption of the AfCFTA, Nigerian SMEs will be able to acquire IP rights to build the visibility of their brands and adequately protect their assets. As a result, these businesses will be in a position to sustain a competitive advantage amid the influx of new market participants.

Similarly, the acquisition of IP rights could potentially place SMEs at the forefront of investment opportunities. Often, investor confidence is boosted when businesses are able to demonstrate that they have protected their valuable IP assets. The positive relationship between IP and a company's ability to attract investors is further reinforced by PwC's report entitled *Impact of Intellectual Property Infringement on Businesses and the Nigerian Economy*, which showed that a one percent improvement in trademark and copyright protection could increase foreign investment by 3.8 percent and 6.8 percent, respectively. The prospect of such international capital flows is crucial for Nigeria at this time, as it could potentially accelerate job creation and, in turn, reduce the scourge of the coronavirus-induced unemployment that the country is currently battling.

Despite the many benefits that IP utilization presents for SMEs, levels of IP protection among Nigerian SMEs remain abysmally low. According to the 2013 Small and Medium Enterprise Development Agency of Nigeria and the National Bureau of Statistics Collaborative Survey, of Nigeria's 41 million SMEs, a staggering 70 percent have no form of protection over their intellectual creations. This situation is due to a number of bottlenecks.

CHALLENGES HINDERING IP PROTECTION BY NIGERIAN SMES

One of the major barriers to IP utilization by SMEs is the low rate of IP awareness. SMEs often do not know how to protect their creations or which ones to protect. This is because a large number of Nigerian SMEs still operate within the informal economy, where IP literacy is particularly low and cultural motivations often shape perceptions about IP protection.

Cost is another major barrier. Even among SMEs that are fully aware of the benefits of IP rights for their business operations, high IP protection costs are a major hindrance. In Nigeria, for example, the cost of a patent application typically comes in at around USD 1,500 (approximately ₦ 619,000), with the inclusion of legal fees – a sum that accounts for the entire capital of some Nigerian SMEs. As finances are a problem for many SMEs, these high costs are a major disincentive for IP protection.

In addition, the weak enforcement of IP rights in Nigeria has put a brake on innovation and IP protection by SMEs. A case in point is the overwhelming prevalence of piracy in the country. Every year, Nigeria loses about USD 3 billion to piracy. The prevalence of piracy is seemingly affirmed by Nigeria's abysmally low share in Africa's annual royalty collections in spite of the fact that the country's creative industry is one of the largest in Africa. CISAC's *Global Collections Report 2020* shows that Algeria, Morocco, and



About the WIPO National IP Essay Competition 2020

In April 2021, the WIPO Nigeria Office launched the second WIPO National IP Essay Competition as part of its 2021 World Intellectual Property Day celebrations in Nigeria, on the theme *“IP and SMEs: Taking your ideas to market.”* With a key objective of promoting research and learning in the field of intellectual property (IP), the competition was open to all students attending tertiary institutions in Nigeria. Entrants were required to submit an essay of 1500 words addressing the theme *“Intellectual Property, SMEs and Economic Recovery in Nigeria.”* The competition attracted 143 entries from 29 tertiary institutions and 19 distinct disciplines.

An expert panel of 18 judges was appointed by the WIPO Nigeria Office to assess the entries. They identified 15 finalists and three winners, each of whom received WIPO Certificates of Achievement, scholarships for WIPO Distance Learning courses, professional IP internship or innovation fellowship opportunities, a WIPO sponsored IP Study Tour to Abuja, and WIPO resources and materials. Additionally, the overall winner, Oyinkansola Komolafe, received a WIPO scholarship to participate in the blended Advanced International Certificate Course on IP Asset Management (AICC), while the joint first runners-up received scholarships for the WIPO Summer School in South Africa.

Nigeria’s creative industry is one of the largest in Africa, but high levels of piracy mean that it only enjoys a low share of Africa’s music royalty collections.



Photo: ManuelVelasco / iStock / Getty Images Plus

South Africa accounted for more than 70 percent of the continent's royalty collections in 2020. With external pirates hijacking the bulk of the revenue that should ordinarily accrue to creators, there is little incentive for SMEs to keep innovating, creating or investing in the protection of their creations. The sustained prevalence of IP infringement has resulted in an apathetic attitude towards IP protection.

POLICY OPTIONS FOR THE WAY FORWARD

For Nigeria to be able to utilize IP to enhance the competitiveness of its SMEs, it needs to adopt a triple-pronged strategy involving IP awareness and cost reduction, stricter IP enforcement and assistance on IP commercialization.

AWARENESS AND COST REDUCTION

In order to tackle the widespread lack of knowledge among SMEs about the nature and protection of IP, there is a need to conduct on-site awareness about the importance of IP assets and how these assets make businesses more competitive. These on-site awareness programs would target specific SME clusters like the Onitsha market in Anambra, the Yaba market in Lagos, and the Kurmi market in Kano.

Subsequently, a special legal assistance initiative should be established for SMEs. The WIPO Nigeria Office could lend its weight to this strategy by establishing partnerships with law firms that would be willing to provide free advisory services to SMEs on patent or trademark filings. As legal services often constitute the bulk of the costs incurred during the process of filing for IP rights, such a strategy would lift a major financial burden from the shoulders of SMEs, thereby incentivizing IP protection. A similar strategy has proven effective in the USA, where hundreds of indigent American SMEs have benefited from such assistance in protecting their inventions.

STRICTER IP ENFORCEMENT

A special IP enforcement force could be created to clamp down on IP infringement. It would involve intensive inter-agency cooperation among relevant institutions like the Nigerian Copyright Commission (NCC), the Standards Organisation of Nigeria (SON), and the Nigeria Customs Service. Such a move would help to curtail the prevalence of IP infringement within the domestic market, while also stemming the influx of pirated products from other countries. By adopting this measure, Nigeria would be able to restore public trust in its IP enforcement system, thereby further incentivizing businesses to protect their creations.

ASSISTANCE ON IP COMMERCIALIZATION

A national strategy that supports IP commercialization is particularly important, as the ability to drive economic growth through SMEs is determined, to a large extent, by the commercialization of IP assets. A government program to encourage IP-backed financing would go a long way in supporting SMEs in commercializing their IP assets. With such a program, SMEs would be able to gain access to credit facilities by using their IP assets as collateral. This would further broaden SMEs' access to finance and subsequently boost their ability to compete effectively in the market. While Nigerian financial institutions may generally have a low appetite for IP collateralization due to valuation issues, this challenge can be bypassed through the creation of a standardized IP valuation model by the Trademarks, Patents, and Designs Registry.

Alternatively, a digital IP marketplace could be established for innovative SMEs to sell or license their IP rights. Domestic and international investors interested in investing in Nigeria's IP assets may equally apply to buy IP rights through the platform. This strategy would help SMEs significantly in gaining ready access to a market for the commercialization of their IP assets. Denmark adopted a similar strategy in 2007, and it has produced impressive results. Since the establishment of the Danish IP Marketplace, several SMEs have licensed their IP rights through the platform.

In conclusion, the outbreak of the coronavirus pandemic has dealt a huge blow to the Nigerian economy. However, with the intellectual assets of its SMEs, Nigeria will be able to carve a new path towards recovering from its current economic woes. As such, it is imperative for Nigeria to align its policies towards creating an environment that incentivizes its SMEs to continuously innovate and commercialize their innovations. This way, the country will be able to optimize the potential of its SMEs to achieve unprecedented levels of economic growth.

“A national strategy that supports IP commercialization is particularly important, as the ability to drive economic growth through SMEs is determined, to a large extent, by the commercialization of IP assets.”



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