



IP TrendMonitor
ANNUAL
STUDY
2023

IP FRONTIERS

Navigating innovation in eight key industries

Industry snapshots

Across automotive, biotech, energy, media, ICT, medtech, pharma and space sectors

1,803 answers & opinions

Collated from the most active panel members and social media followers

Emerging trends

Direction of research, successful entities and how deliverables reach consumers



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Exciting times for those in IP development, commercialization and protection

ABOUT THIS EDITION

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Technologies and challenges

IP Trend Monitor is an annual survey established by the Dennemeyer Group in cooperation with CTC Legal Media to investigate current and emerging topics in Intellectual Property (IP). There are more than 500 members of the IP Trend Monitor panel, representing the full range of IP practitioners – lawyers, attorneys, consultants, counselors, inventors and scientists, working in all areas of the industry – large corporations, small and medium-sized enterprises (SMEs), law firms, IP service providers and IP offices.

This year's questionnaire focuses on eight pivotal industries, all of which are undergoing significant change thanks to disruptive technologies, including artificial intelligence (AI), new business methodologies and external commitments such as meeting the United Nations' Sustainable Development Goals.

The 2023 edition of the survey is a companion piece to Dennemeyer's recent report, [Technology in the 21st Century: Innovation trends since 2000](#), which analyzes 20-year patenting trends in the same eight sectors.

For this report, IP Trend Monitor panelists were asked about their projections and expectations for the near future. While it is impossible to cover all the relevant topics in this format, the questions were designed to address IP-specific issues in general business forecasts and economic developments. The main findings for each industry are described below, along with key data, reflecting on differences between respondent groups where appropriate.

START YOUR JOURNEY

Insights from our diverse IP panel,
representing companies big and small

This year's edition collates 1,803 answers and opinions from the most active panel members. These represent all aspects of IP practice, with patent / trademark firms and law firms particularly well represented.

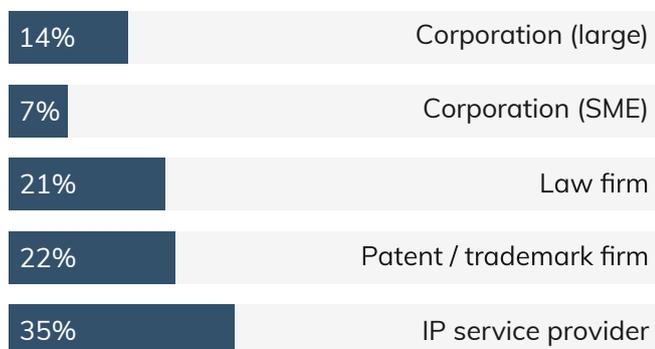
Additionally, 14% are in large corporations, 7% in SMEs and 35% work for IP service providers.

Participants were asked about their primary responsibility: 27% said management level, 34% answered legal experts, 11% administration of IPRs, 6% C-suite and 22% other.

The "other" responses included professionals working in sales, marketing, compliance and IP management consulting.

What type of organization

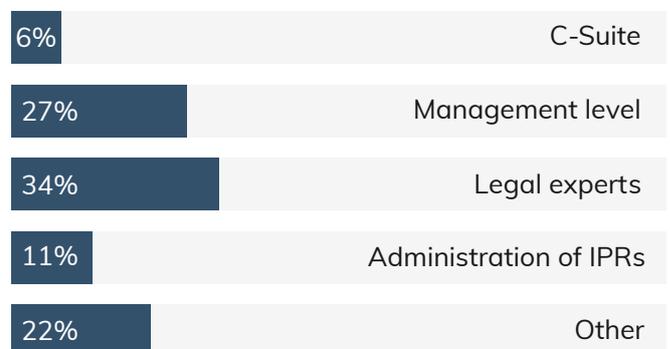
do you work for?



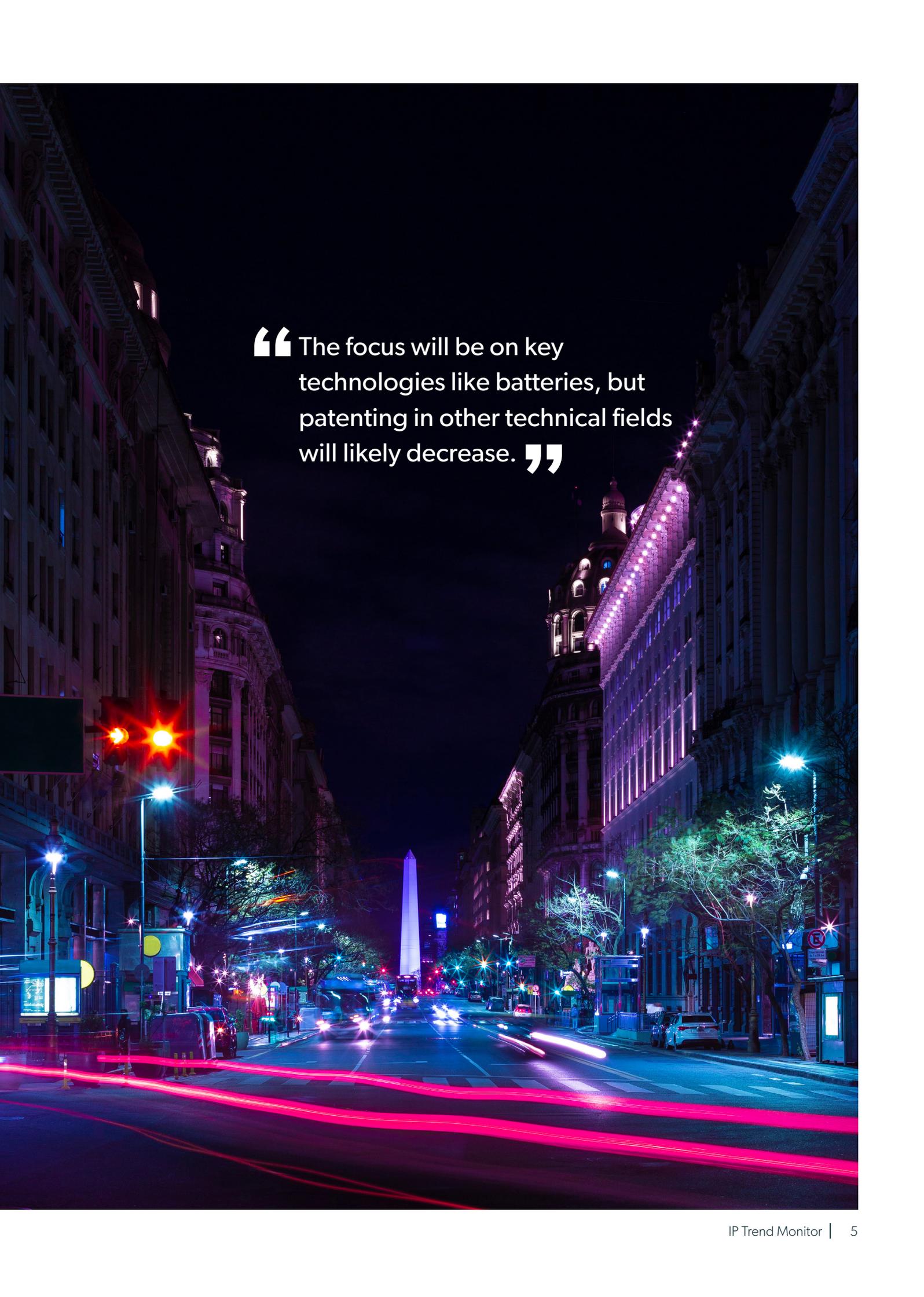
SINGLE CHOICE
 QUESTION

Your primary responsibility

lies with:



SINGLE CHOICE
 QUESTION

A long-exposure photograph of a city street at night. The street is illuminated by various lights, including streetlights and building lights. The buildings are multi-story and have a classical architectural style. The street is filled with cars, and their lights create long, horizontal trails across the frame. The overall scene is vibrant and dynamic, capturing the energy of a city at night.

“ The focus will be on key technologies like batteries, but patenting in other technical fields will likely decrease. ”

A VISTA OF CHANGE

Navigating transformative
trends across industries

The eight industries explored in this year's IP Trend Monitor are automotive, biotechnology, energy, digital media, information and communications technology (ICT), medical devices, pharmaceuticals and space. For all of them, an advanced level of innovation is essential to the development of new products, services and business models. Thus, each industry also raises intriguing points about the influence of IP strategies and how different kinds of exclusive rights will shape the future of research and commerce.

To start with, respondents were asked to rate the importance of IP in driving innovation in each sector. It is striking that the three industries where most respondents said that IP is "extremely important"

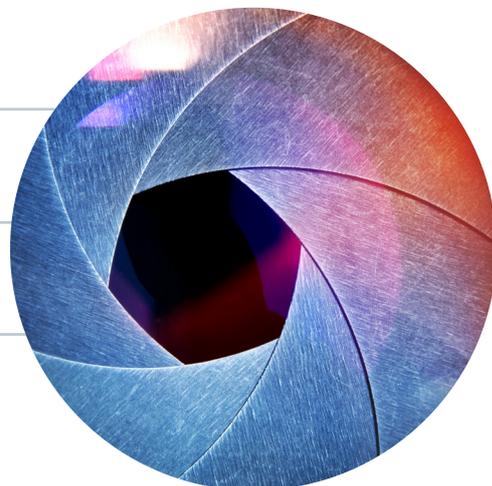
are all in healthcare, namely, pharmaceuticals (77%), biotechnology (60%) and medical devices (51%).

Perhaps surprisingly, just 17% of respondents said that IP is "extremely important" in the digital media industry, while 1% chose "not at all important" and 19% "not so important." Although IP rights, particularly copyrights, are a foundation of the entertainment business, this result may indicate that other factors are viewed as impelling its development.

Alternatively, the prominence of copyrights in this sector may be interpreted as a correlative de-emphasis on patents, which are typically the drivers of technological innovation.

Findings at a glance

- 77% of respondents rated IP protection as extremely important in pharmaceuticals
- Innovation in the digital media industry was seen as less dependent upon IP rights
- IP is not seen as a priority in space exploration by the expert panel



Another industry where IP rights are viewed as less impactful is, curiously, space exploration, where more than 40% of respondents said IP is only “somewhat important” at best. This may be because space exploration is still a relatively young industry that has been dominated by public entities rather than private companies. As this changes, with the emergence of private-sector projects and partnerships, the significance attached to IP may increase.

Some of these trends are even more pronounced among patent specialists. Of this group, 83% said IP is “extremely important” in pharmaceuticals, and 66% said the same for biotechnology. Continuing this pattern of more strongly aligned opinions, just 18% of patent specialists viewed IP as “extremely important” to space exploration compared to 30% of the whole panel.

Trademark specialists, meanwhile, were less likely than the general respondent population to view IP as “extremely important” for medical devices (42% compared to 51%) and energy (40% compared

to 48%), with a correspondingly larger proportion ranking IP as “not at all important” or “somewhat important” in these industries.

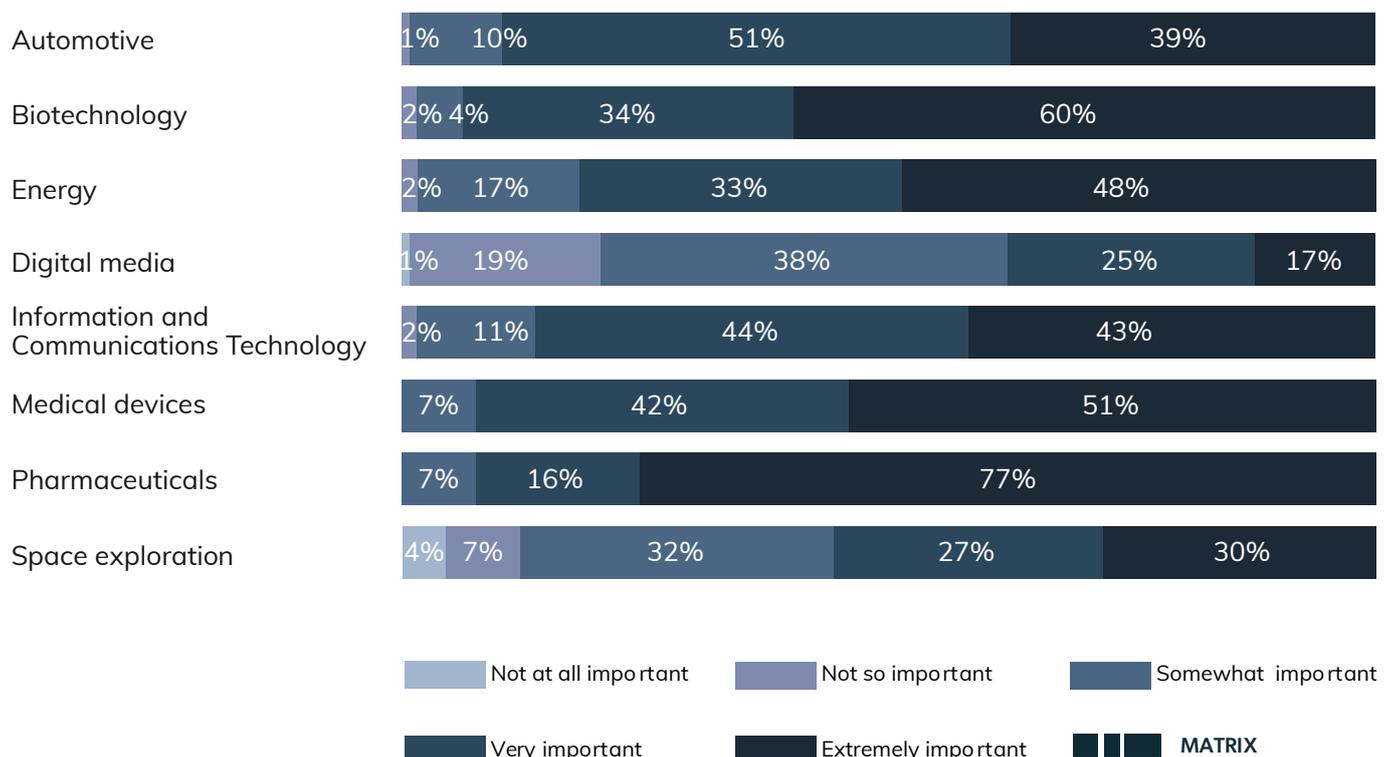
Combining answers from large corporations and SMEs, responses were more moderate overall, with fewer people selecting the weightiest options for every industry. Most notably, only 41% selected “extremely important” for medical devices and just 29% for ICT.

By contrast, respondents from law firms generally tended more to the extremes. For example, 47% selected “extremely important” for automotive, 72% for biotechnology, 41% for space exploration and 83% for pharmaceuticals.

In general, respondents from C-suite / management were more likely than the average to rate IP as “extremely important,” including for pharmaceuticals (86%), biotechnology (71%), automotive (48%) and space exploration (37%). Nevertheless, the opposite was true for energy (39%) and digital media (11%), where the primacy of IP was slightly downplayed.

Please rate the importance of IP in driving innovation

in the following sectors:



01 AUTOMOTIVE INDUSTRY

Batteries at full charge

The automotive industry is being revolutionized with new engines, electronic systems, autonomous or semi-autonomous driving and a wide variety of sensors and real-time analytics. The IP Trend Monitor panel was asked to rank four emerging technologies according to their effect on the sector in the next five years from 1 (most impact) to 4 (least impact).

Advanced / solid-state batteries came out on top, with 85% of respondents ranking the field as either 1 or 2. This indicates a clear recognition of the efficacy of electric vehicles (EVs) and the need for further research into developing batteries that store more energy, are lighter and can charge quickly. EV sales are growing each year: They [represented 14% of global car sales in 2022](#) and are predicted to reach 18% in 2023. With many countries aiming to end sales of new internal combustion engine (ICE) cars [within the next 15 years](#), the development of better batteries is vital to meeting this ambition. Recently, there has been [increased speculation](#) about the affordable mass production of solid-state batteries by leading companies such as Toyota, meaning this will surely be an area to watch.

It is perhaps surprising that 71% of all respondents ranked autonomous driving as either 1 or 2 (though this proportion fell to 56% among law firms) despite the fact neither full nor partial systems have become widespread yet. That being so, there has been

Ranking score

3.33 Advanced / solid-state batteries

2.91 Autonomous driving

2.15 Vehicle-to-everything (V2X) communication

1.61 Subscription-based features

huge investment in this area by companies such as Waymo, Tesla and Uber, and autonomous cars are already on the road in the U.S. cities of Phoenix and San Francisco. With many patent applications also having been filed in this field, it is likely that autonomous driving vehicles will become more prevalent and visible over the next five years.

Findings at a glance

- Patents will be essential to the industry's growth
- Despite slow uptake, self-driving technologies are still eagerly awaited
- The rise of electric cars will drive patenting of battery technologies



“ We will see a shift in priority-patenting in other jurisdictions than those we are familiar with from the past. ”

Though the concept of paying to access factory-built features has not gained traction among consumers, 14% of patent specialist respondents and 10% of trademark specialists gave this option a ranking of 1, suggesting a hidden bearing on manufacturers' portfolios. The impact of vehicle-to-everything communication is less decisive, with almost a third of the panel ranking it as either 1 or 2 compared to just over two thirds ranking it as 3 or 4.

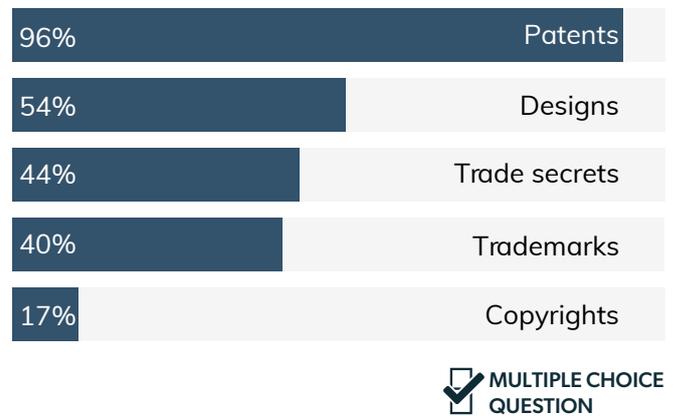
The rapid changeover from ICEs to electric motors will inevitably have a powerful knock-on effect on IP strategies, from the direction of inventive activity to patent portfolio development and licensing. More than half of all respondents predicted increased patenting of battery technologies and more collaboration between automakers and technology companies, with 46% foreseeing a greater focus on software and AI-related IP. Notably, however, this last portion grew to 58% among patent specialists and 61% among trademark practitioners.

Open answers from all specialisms included a shift in priority patenting to new jurisdictions, a decrease in patenting in technical fields other than power storage and an increase in energy-saving air conditioning.

Given the technology-heavy nature of the automotive sector, it is to be expected that nearly all of the panel, including 100% of legal experts, said that patents will be essential to the industry's growth. Trade secrets and designs were each selected by around half of respondents, reflecting the fact that some of the innovations fueling the industry's growth are non-patentable or highly confidential. Among law firm respondents, a much larger percentage than average – 61% – selected trade secrets.

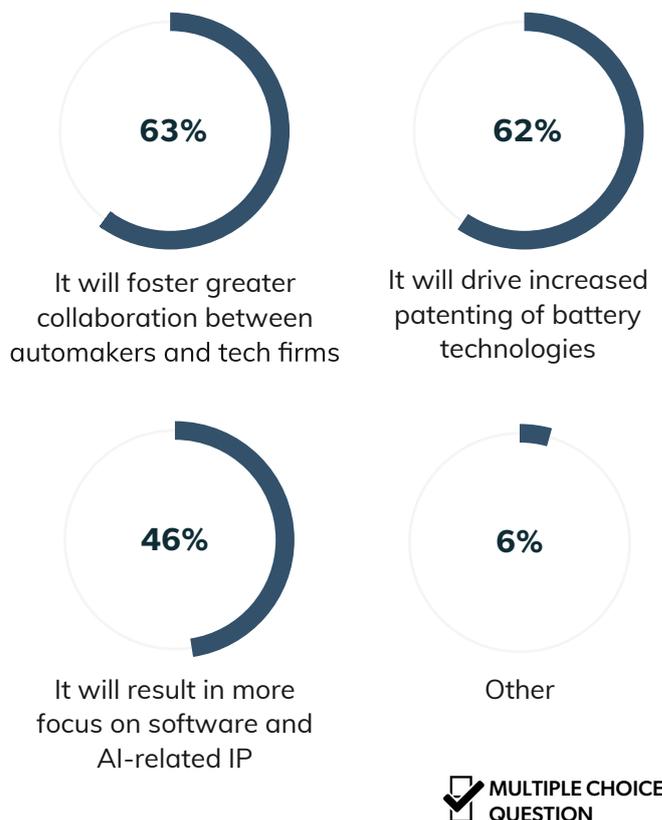
Fewer participants overall selected trademarks or copyrights, though the former are of particular interest for bringing fresh products and services to market, while the latter remain relevant given the expected increase in the role of software in controlling vehicles. Among trademark specialists, however, there was greater recognition of non-patent rights: 65% selected designs, 52% checked trademarks and 32% copyrights.

Which IP protections will be essential for the automotive industry's future growth?



Perhaps unexpectedly, patent specialists were more likely than average to think trade secrets and copyrights will be vital, selected by 56% and 28%, respectively. This suggests that those who work with patents recognize their limitations and the complementary role that other IP rights have to play.

How will the rise of electric vehicles affect IP strategies in the automotive industry?



INDUSTRY SNAPSHOT

The global automotive industry is evolving, with rising electric vehicle adoption, autonomous technology advancements and increased demand across the board.

Below are the numbers of passenger cars and similar light vehicles sold regionally in 2022.

Europe



11.8 million cars sold

Besting-selling car model in Europe in 2022 – Peugeot 208 (206,816 units).

North America



16.4 million cars sold

The U.S. automotive industry invests approximately \$18 billion USD annually in research and development.

South America



3.2 million cars sold

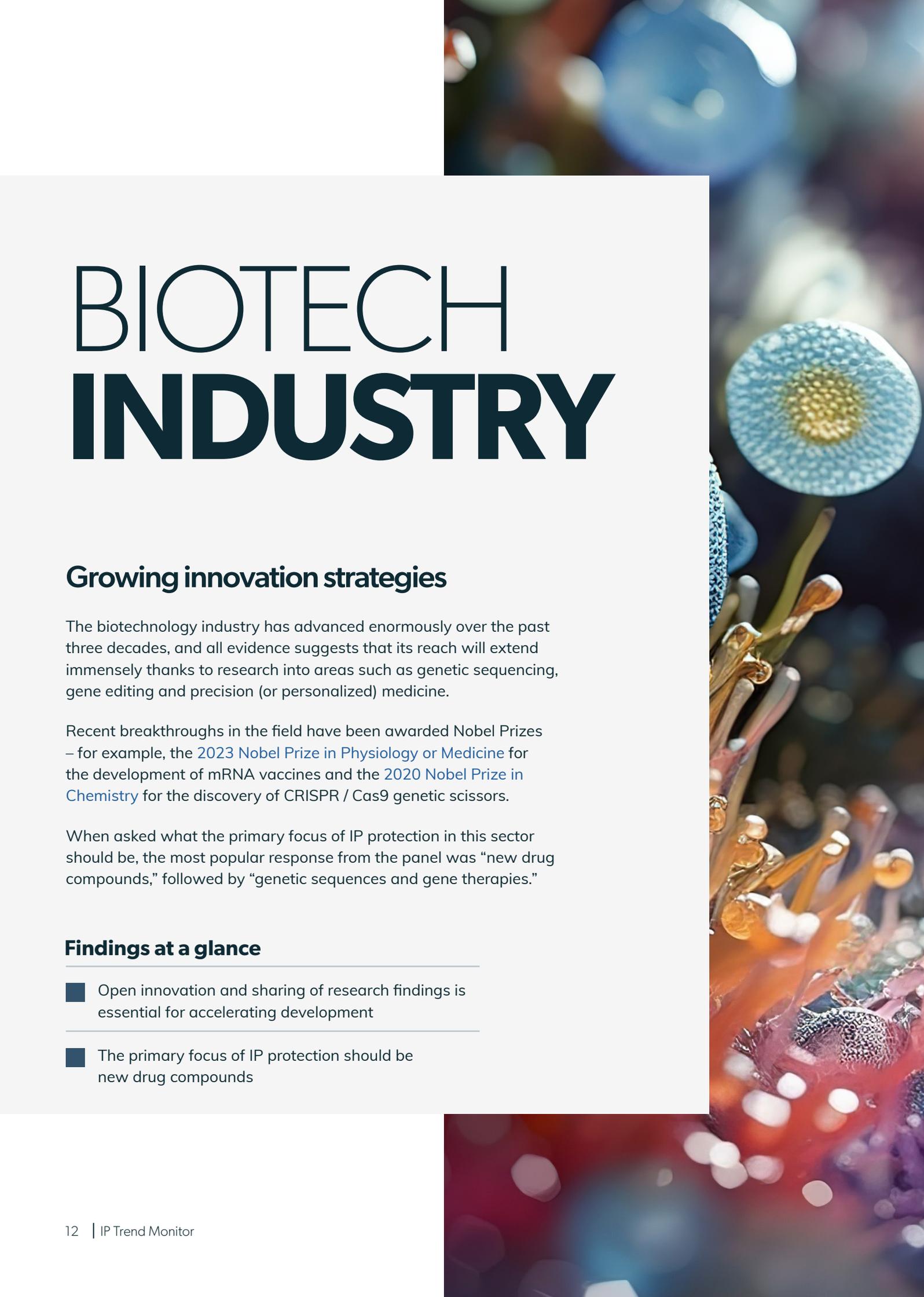
In 2022, the car manufacturing industry in South America generated \$40.9 billion USD in total revenue.

Asia



35.9 million cars sold

Leading car producer in 2022 by sales – Toyota Motor Corporation (\$281.75 billion USD).



BIOTECH INDUSTRY

Growing innovation strategies

The biotechnology industry has advanced enormously over the past three decades, and all evidence suggests that its reach will extend immensely thanks to research into areas such as genetic sequencing, gene editing and precision (or personalized) medicine.

Recent breakthroughs in the field have been awarded Nobel Prizes – for example, the [2023 Nobel Prize in Physiology or Medicine](#) for the development of mRNA vaccines and the [2020 Nobel Prize in Chemistry](#) for the discovery of CRISPR / Cas9 genetic scissors.

When asked what the primary focus of IP protection in this sector should be, the most popular response from the panel was “new drug compounds,” followed by “genetic sequences and gene therapies.”

Findings at a glance

- Open innovation and sharing of research findings is essential for accelerating development
- The primary focus of IP protection should be new drug compounds



02

By contrast, just 14% said “bioinformatics and data analytics” (though this increased to 20% among patent specialists and 25% among corporate respondents), and around 1 in 10 said “laboratory processes and techniques.”

While a restrained interpretation of survey answers is needed in the case of highly specialized industries, these responses indicate that conventional IP strategies based on blockbuster drugs and therapies are expected to continue to dominate emerging alternatives, such as data monetization or the licensing of platform technologies.

However, the panel also recognized the potential that “open innovation and the sharing of research findings” has to redefine IP in the biotech industry.

An impressive 80% either agreed or strongly agreed with the contention that it is essential for accelerating innovation, while just 16% agreed or strongly agreed that it is not a priority for biotech IP strategies.

At the same time, a significant distribution saw potential difficulties, with about two thirds either agreeing or strongly agreeing that research sharing “can lead to IP challenges and should be approached cautiously.”

That being so, the implication is that open innovation is likely to rise in prominence, uplifted by the greater participation of non-profit institutions and publicly funded bodies and the increased pressure to spread costs in early-stage research.

How important is open innovation and sharing of research findings for the future of biotech IP?

It is essential for accelerating innovation



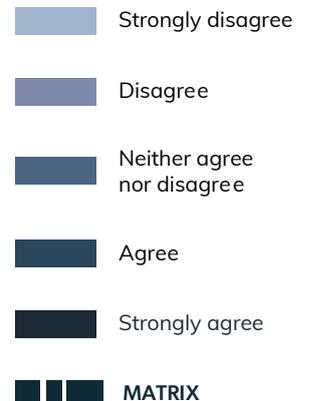
It should be limited to pre-competitive research



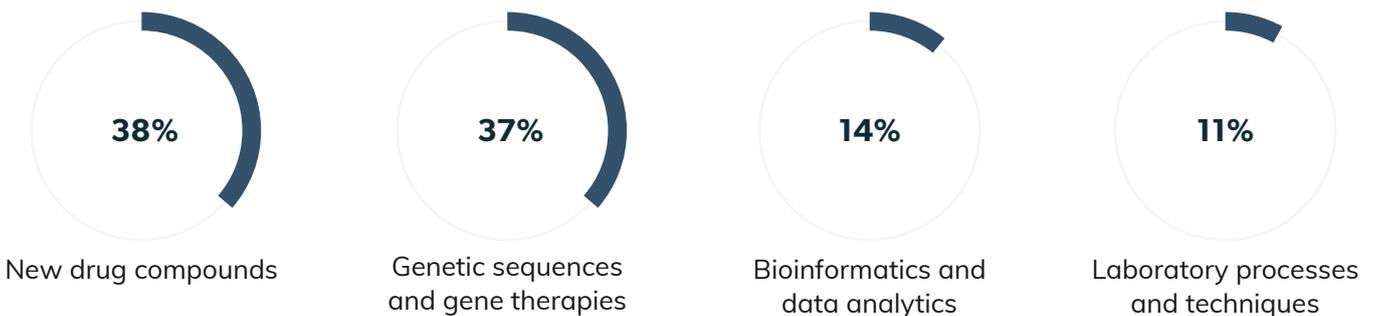
It can lead to IP challenges and should be approached cautiously



It is not a priority for biotech IP strategies



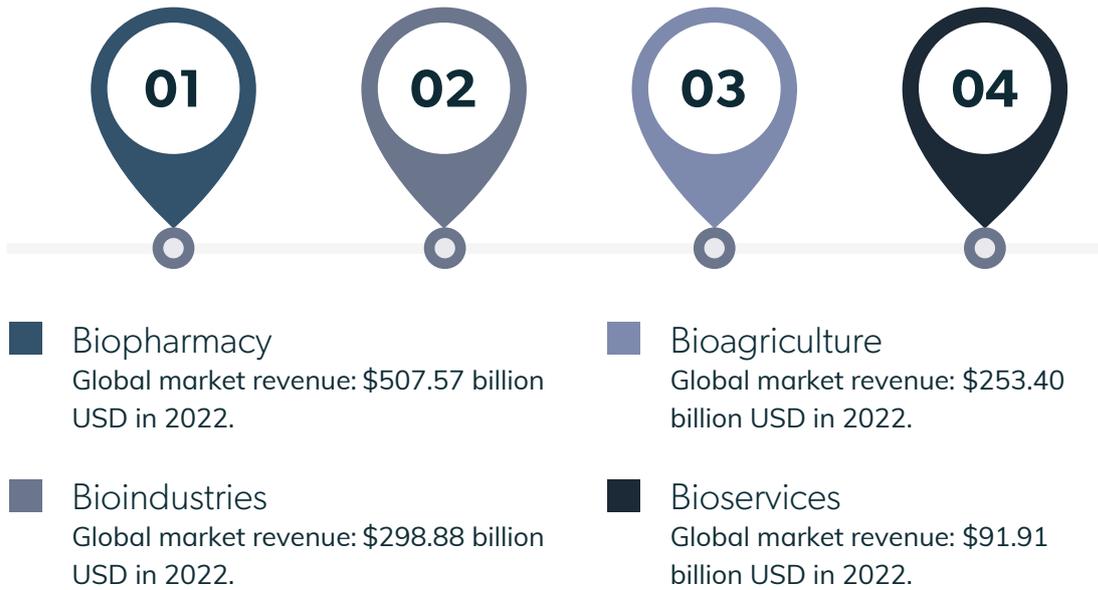
In the biotech industry, what should be the primary focus of IP protection?



INDUSTRY SNAPSHOT

Top 4 subsectors worldwide

by revenue (source: [Precedence Research](#))



866.3 million people

In 2021, there were approximately **866.3 million people** employed worldwide in agriculture, which includes bioagriculture, a significant division within the biotech industry.

Global market value

The [global biotechnology market](#) was estimated at \$1.22 trillion USD in 2022.

Biotech companies

The [collected revenue](#) of public biotech companies in the United States and Europe reached \$215 billion USD in 2022.

Annual growth rate

The market size of the global biotechnology industry has [grown 0.8% per year](#) on average between 2018 and 2023.

U.S. dominance

The United States contained nearly 59% of [global biotech value](#) in 2021.

03 ENERGY SECTOR

Electrifying change

If there is one sector that will look very different in the future, it is energy production. Over the coming decades, the way we power most aspects of our lives will change substantially, from everyday appliances to transportation to domestic and industrial heating.

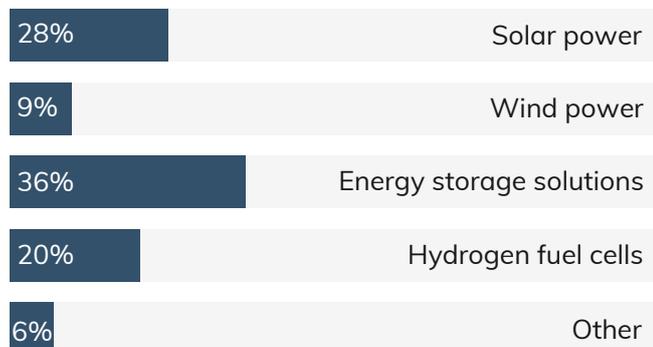
Asked which renewable energy technology will dominate over the next five years, contributors were split, with “energy storage solutions” the most popular choice, ahead of “solar power,” “hydrogen fuel cells” and “wind power.” Among corporate respondents, 44% selected “energy storage solutions,” compared to 17% for both

“solar power” and “wind power” and just 11% for “hydrogen fuel cells.”

On the other hand, 44% of law firm respondents chose “solar power,” followed by “energy storage solutions” at 39% and “hydrogen fuel cells” at 17%. None selected “wind power.” Meanwhile, patent specialists selected “solar power” at a slightly higher rate than average (33% to 28%), with this rising to 39% among trademark specialists. And yet, no trademark respondents selected “wind power.” Other energy technologies mentioned in replies included hydroelectric and next-generation nuclear methods and smart grids.

Which renewable energy technology

will dominate over the next five years?



SINGLE CHOICE
 QUESTION

Findings at a glance

- Balancing collaboration with IP exclusivity will be the key challenge in transitioning to a more sustainable energy mix
- There is a significant degree of practical uncertainty surrounding a switchover to renewable energy sources



“ Wind and hydrological sources will be major producers of energy in the immediate future (the next five years). In the mid term, hydrogen fuel cells will become more prominent in the aviation and maritime industries. Further down the line, nuclear fusion will generate most electrical energy. ”

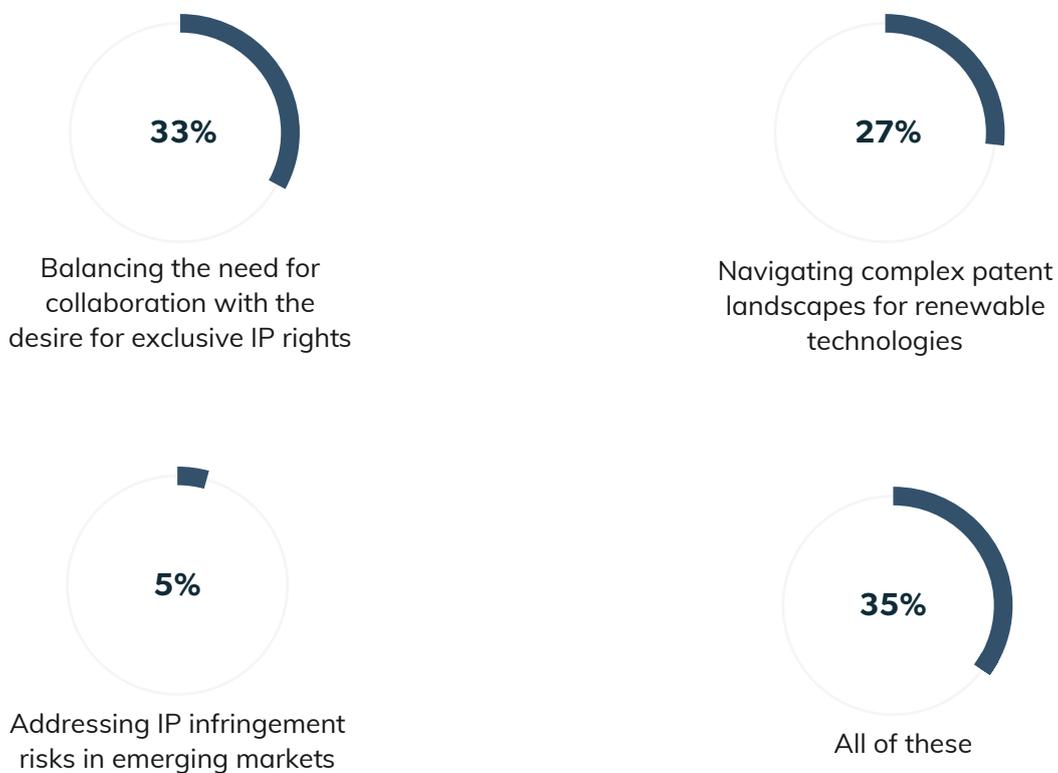
These varying numbers underscore the findings from the automotive industry that ascribe priority to batteries. That is, electrical energy is notoriously difficult to store on a city scale, which means that in order to be fully viable, renewable sources will need to be able to handle surges in demand at all hours. No single solution is yet feasible, as manifested in the more diverse survey answers.

Seeing the exigency of further investment in this sector, there is already considerable research into patenting trends. For example, the European Patent Office and International Energy Agency have recently published joint studies on both [battery](#) and [hydrogen](#) patents, and the World Intellectual Property Organization included a section on green technology in the [World Intellectual Property Report 2022: The Direction of Innovation](#).

Such a fundamental shift poses a number of IP hurdles, particularly around how to incentivize original research and encourage broad take-up. The single biggest hindrance identified by the IP Trend Monitor panel (33%) was “balancing the need for collaboration with the desire for exclusive IP rights.” In other words, ensuring that different entities work together to advance research without jeopardizing their entitlement to compensation. Next came “navigating complex patent landscapes,” selected by just over a quarter of respondents and only 5% elected for “IP infringement risks in emerging markets.” Among legal experts, the top response was “navigating complex patent landscapes” (45%).

However, 35% of total respondents (and 46% of C-suite / management) answered that all three complications will appear in the future.

What IP challenges do you foresee in transitioning to a more sustainable energy mix?



SINGLE CHOICE
 QUESTION

INDUSTRY SNAPSHOT

Top 5 countries

by total energy supply in 2019 (source: iea.org)



2.3 billion people

Rely on coal and traditional, often inefficient, forms of biomass (wood, charcoal, animal dung and crop waste) for cooking.

In 2020, the World Health Organization (WHO) *estimated* that household air pollution from cooking with traditional fuels contributed to 3.8 million premature deaths annually.



Energy consumption *continues to grow* at an average rate of 1% to 2% per year.



Nearly 675 million people worldwide still live *without electricity*.

DIGITAL MEDIA

Defending against deepfakes

The digital media industry faces unusual dilemmas compared to most of the other sectors covered in this report. It has already been shaken up by digitization and streaming, along with the emergence of platforms and technologies that make it as easy to upload user-generated content as to share IP-infringing material.

“Defending against deepfake technology” was the issue selected by most respondents. In addition to threatening individuals’ privacy and personality rights, computer-generated likenesses can negatively affect IP in various ways, such as by facilitating highly convincing trademark and copyright infringement, producing fake endorsements and spreading misinformation.

Findings at a glance

- The advancement of AI is already having an impact on the creation and consumption of media
- It is crucial that the entertainment industry embrace innovative licensing models

04



The other three concerns presented to the panel – “protecting original characters and storylines,” “safeguarding digital distribution platforms” and “securing copyrights for interactive media” – were each selected by between a fifth and a quarter of overall contributors.

The advancement of AI is also already having an impact on the creation and consumption of media and is one of the factors cited in the [recent strikes](#) by writers and performers in Hollywood. It is interesting that several respondents added their own AI-related issues in answer to this question, including protecting actors against AI use, protecting authors’ input in AI-generated content and the copyright eligibility of AI-generated works. One respondent mentioned geofencing in content distribution as a key obstacle.

AI was the clear frontrunner when the panel was asked to rank various technologies according to their effect on digital media. Nearly three quarters of respondents ranked AI as either 1 or 2 on a scale of 1-4, putting it some way ahead of the “metaverse and digital commodities” and “VR / AR” [virtual

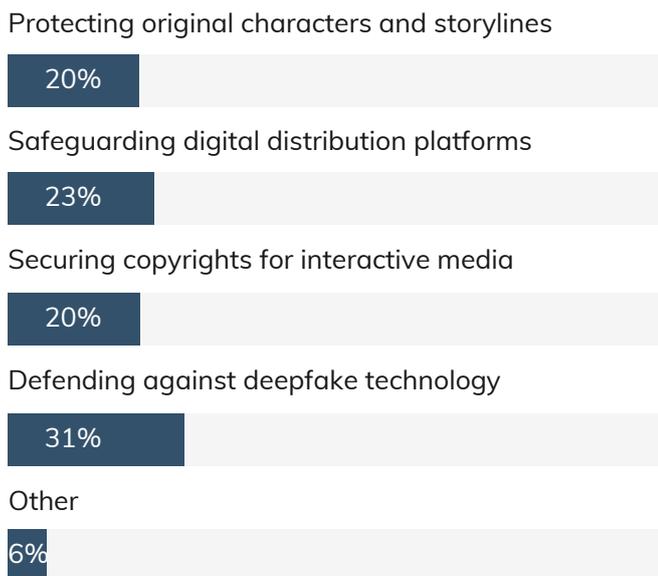
reality / augmented reality]. At the other end of the spectrum, 79% of respondents (including 86% of trademark specialists and 93% of corporate respondents) ranked “video on demand” as 3 or 4 out of 4.

Ranking score

- 3.23** Artificial intelligence
- 2.54** Metaverse and digital commodities
- 2.50** VR / AR
- 1.74** Video on demand

In the context of this upheaval, it is not surprising that two thirds of the panel said it is crucial that entertainment embrace innovative licensing models, while just 1 in 10 said that existing licensing frameworks are still effective.

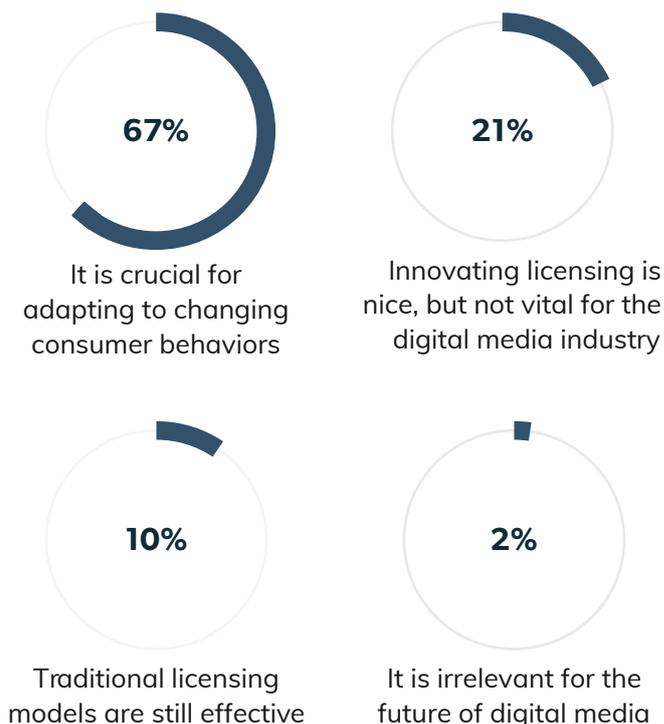
What is the key aspect of IP protection for the digital media industry’s future success?



SINGLE CHOICE QUESTION

How important is it to embrace innovative licensing models?

SINGLE CHOICE QUESTION



INDUSTRY SNAPSHOT

North
America



\$1.8 trillion USD

In 2021, [core copyright industries](#) contributed \$1.8 trillion USD (7.76%) to the U.S. economy.

Europe



\$911.6 million USD

In 2022, European [location-based](#) (out-of-home) entertainment was worth \$911.6 million USD.

Asia



\$3.1 billion USD box office

In 2020, China overtook the United States as the world's largest film market, with box office revenues reaching \$3.1 billion USD.

South
America



286.49 million users

In 2022, there were around 286.49 million Facebook users in South America.



62% of consumers

agree with the use of AI to achieve better business experiences ([Salesforce, 2019](#)).

05 MEDICAL DEVICES

Data protection is paramount

The medical device industry is expansive and well-established, but wearable medical devices such as smartwatches and remote monitoring tools are still relatively new and raise several interesting business and IP complications.

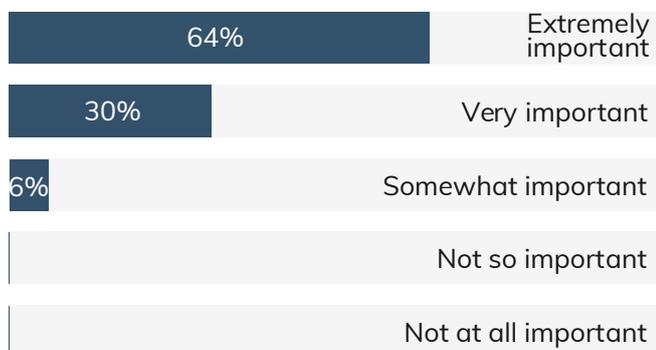
One of the most pressing is data security, which almost all respondents said was either “extremely important” or “very important.” Given the quantity of information wearables are able to collect, its sensitive nature and the need to process it for

research purposes, airtight privacy standards and ethical usage are essential. These hazards are compounded by the fact many companies – including healthcare specialists and IT hardware and software providers – are divergently innovating in this field.

One determinant of commercial success in this industry is likely to be whether users trust companies with their data – and that trust can easily be lost.

How important is data security

in the context of wearable medical devices?



Findings at a glance

- Data security is a top priority for the medical devices industry
- Virtual care platforms, implantable devices and robotics in surgery have yet to enter the wider public consciousness



SINGLE CHOICE
QUESTION



“ With technology advancing at a rapid pace, robust patent protection will be key to staying competitive. ”

The sensitivities around wearable health devices and remote monitoring are clear from the survey. Nearly half of all respondents (including 52% of patent specialists, 55% of trademark specialists and 63% of legal experts) ranked this field as the top priority for robust IP protection among medical devices. That put it ahead of “surgical and diagnostic tools” and “nanotechnology” and well in front of “3D printing.” The majority of respondents gave this last technology a ranking of 4, though it was more popular among large corporation and SME respondents, 28% of whom ranked it as 1 or 2.

Slightly fewer answers identified the main reason for IP protection as encouraging research and development (37%), dropping further among law firm respondents (22%). This reduced focus on research persisted among trademark specialists: 32% said the main reason for IP protection is to guard against infringement, while just 23% said it is to promote research and development.

Ranking score

- 6.13** Wearable health devices and remote monitoring
- 5.63** Nanotechnology
- 5.62** Surgical and diagnostic tools
- 4.62** 3D printing

Other potentially disruptive technologies in this field include virtual care platforms, implantable devices and robotics in surgery. In the near future, these may become mainstays of therapeutics.

The dynamic and complex nature of the medical device industry is on display in responses to the question about the main reason for IP protection. Taking a closer look, a fifth of respondents said it is to protect against infringement (possibly because high technical and regulatory barriers make such breaches difficult), while twice that proportion (and an impressive 46% of patent specialists and 50% of C-suite / management) said that it allows for commercialization. This highlights the role that IP rights can play in helping organizations obtain finance, monetize technology and negotiate deals.

What is the main reason for IP protection in medical devices?



INDUSTRY SNAPSHOT

Classification of medical devices

according to Annex IX of EU Council Directive 93/42/EEC



Class 1: Low-risk (non-invasive) devices like bandages, examination gloves and hand-held surgical instruments.



Class 2b: Medium- to high-risk devices such as incubators, blood bags and ventilators.



Class 2a: Low- to medium-risk devices such as syringes, hearing aids or short-term contact lenses.



Class 3: High-risk devices that sustain or support life such as pacemakers, heart valves and implanted cerebral stimulators.



Over 1 million jobs globally

In the United States, the medtech industry accounts for [nearly 519,000 jobs \(2021\)](#), while in Europe, it employs more than [800,000 people \(2022\)](#).

Though Germany has the highest total number of people working in the medical technology sector, Ireland and Switzerland come out on top among European countries on a per capita basis.

Global market value

The [medical device market in 2022](#) was valued at \$512.29 billion USD.

Growth rate

[Revenue](#) is projected to grow annually by 5.26% (2023-2028), resulting in a market volume of \$609.7 billion USD in 2028.

Product range

Approximately 2 million types of medical devices exist globally, grouped into [over 7,000 generic](#) categories.

Future projections

The global medical device market [could reach](#) \$996.93 billion USD in value by 2032.



ICT INDUSTRY

Keeping software safe

ICT operators have been among those most affected by the aggressive assertion of patents in court disputes over the past two decades, yet only a relative handful of the panel members identified “defending against patent trolls and IP litigation” as the primary goal of IP protection here.

Findings at a glance

- Most respondents identified challenges arising from ambiguous, unharmonized or complex areas of law

- AI and machine learning will have the most influence on IP strategies

- The rate of evolution in this sector is rapid and its permeation into other areas will only increase as time goes on



06

Instead, most respondents identified challenges arising from ambiguous, unharmonized or complex areas of law, such as protecting software and upholding data security. Among responses from law firms, “ensuring the protection of user data and privacy” was the most popular, with 47%, while just 12% (half of the average) indicated using standard-essential patents (SEPs) and “traditional” patents to generate income.

As with the digital media industry, “artificial intelligence and machine learning” topped the list for many respondents when they were asked to rank the trends that will most influence IP strategies in the ICT sector. Around three quarters ranked it as 1 on a scale of 1 to 4, and almost a fifth ranked it as 2. This put the trend well ahead of the other options available (“5G and beyond,” “blockchain and distributed ledger technology” and “quantum computing”), for each of which, the responses tended toward the middle two weightings (numbers 2 and 3).

Among patent respondents, there was slightly more enthusiasm surrounding “blockchain and distributed ledger technology,” with 37% giving it a ranking of either 1 or 2. Among trademark specialists, 33% ranked “blockchain and distributed ledger

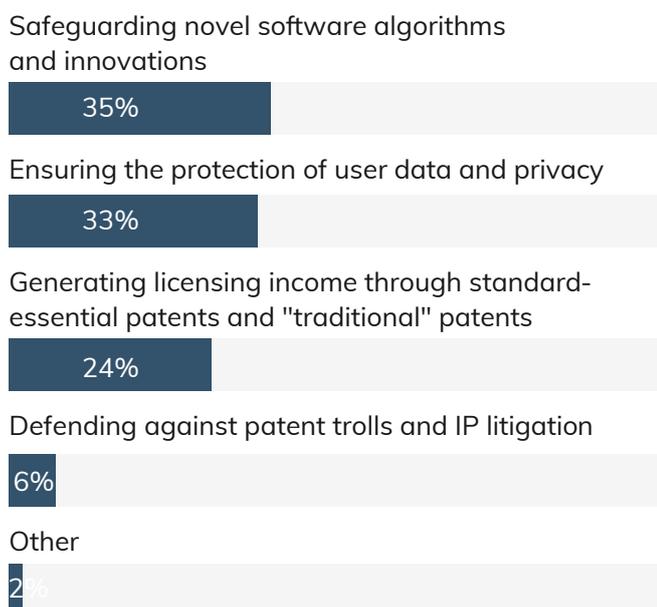
technology” as 1 or 2, but there were generally lower expectations for “quantum computing” – with 75% of trademark respondents ranking it either 3 or 4, as did 82% of C-suite / management panelists. This meager ranking may indicate that the still-quite-young technology and its potential are poorly understood.

Ranking score

3.64	Artificial intelligence and machine learning
2.34	5G and beyond
2.05	Quantum computing
1.96	Blockchain and distributed ledger technology

The rate of evolution in this sector is rapid, with the expansion of digital technologies sometimes described as the [Fourth Industrial Revolution](#). Such is their compass that these developments are influencing all the industries covered in this report in some way, and that permeation will only increase.

What is the primary goal of IP protection in the future of this industry?



INDUSTRY SNAPSHOT

Impact of AI

on current and future business



Some 77% of respondents to a 2023 [Forbes Advisor survey](#) were concerned that AI will cause job losses within a year.



Generative AI could contribute up to **\$4.4 trillion USD** to the global economy annually.



Companies in China have the **highest AI uptake** globally, with 58% deploying the technology and another 30% considering it.



The worldwide AI market is **predicted to expand** from \$428 billion USD in 2022 to \$2.03 trillion USD by the start of the next decade.



5.3 billion internet users

In October 2023, the [global internet user count](#) reached 5.3 billion, constituting 65.7% of the world's population. That means around 34%, or 2.8 billion people, still lack access.

The [main deficiencies](#) behind this uneven distribution include infrastructure, digital literacy, government policies and resources.

Global market value

The global ICT market is expected to **reach almost \$6 trillion USD** in 2023.

Employees

An estimated **62 million people** will be employed full-time in this sector in 2023.

Future projections

More **technological progress** will be made in the 10 years of 2020-2030 than in all of the preceding century.

Annual zettabytes

By 2025, the **estimated 50 billion devices** in the Industrial Internet of Things will generate around 79.4 zettabytes annually.

07 PHARMA INDUSTRY

Synthesis and distribution

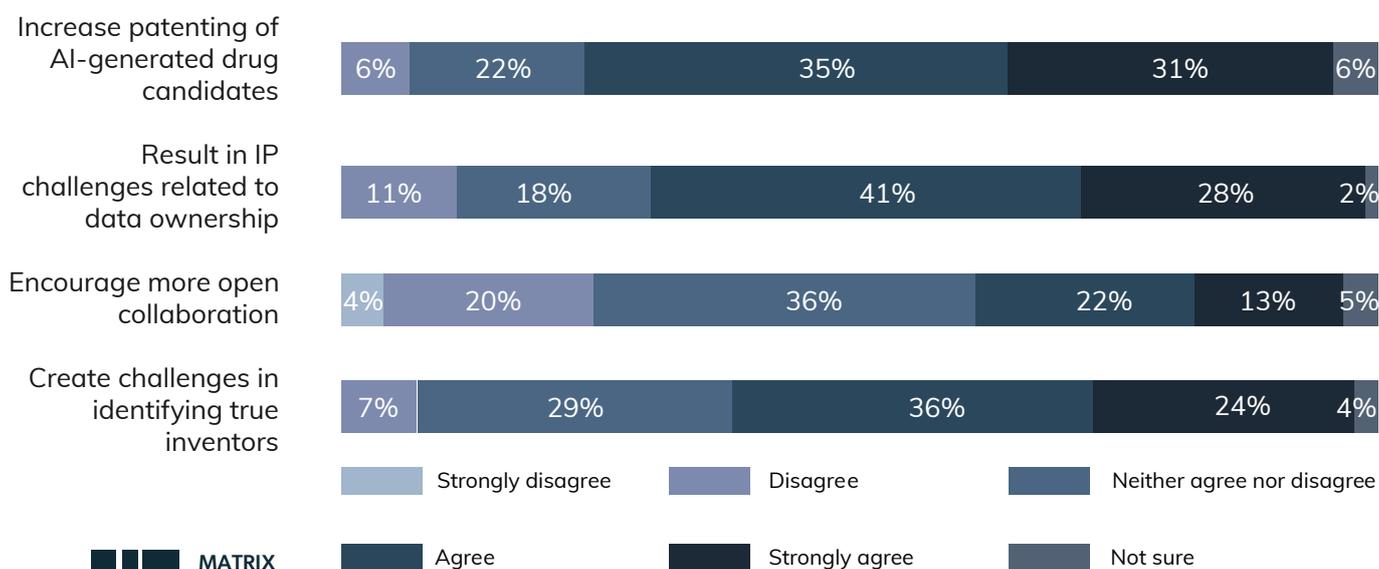
The pharmaceutical industry has matured to a point where the role of IP – particularly patents and trademarks – is massively valued. However, as in other fields, it is being disrupted by new technologies and business models. For example, recent research has demonstrated the power of AI to improve the understanding, diagnosis and treatment of complex diseases.

Findings at a glance

- The use of AI in drug discovery will lead to difficulties related to data ownership
- Traditional patent exclusivity is not seen as sufficient to ensure affordable access to life-saving medications

The use of artificial intelligence

in drug discovery will:





“ IP protection secures an authentic source for products of critical-health impact. ”

In one [example](#), a study found that AI was almost twice as accurate as a biopsy in assessing how aggressive sarcomas (connective-tissue tumors) are.

A clear majority of IP Trend Monitor panelists agree or strongly agree that the use of AI in drug discovery will “increase patenting of AI-generated drug candidates” (66%), “result in IP challenges related to data ownership” (69%) and “create challenges in identifying true inventors” (60%). This emphasizes the extent to which the use of machine learning will cloud issues that were previously considered transparent (such as who is an inventor) and increase uncertainty for researchers (if many more drug candidates are patented).

However, only 35% of panelists agreed or strongly agreed that the use of AI will encourage more open collaboration, with more than half either disagreeing with the statement or being neutral. Among trademark specialists, though, 45% either agreed or strongly agreed that it would foster more cooperation.

A perennial balancing act for the pharmaceutical industry, and one that has been highlighted by the development of vaccines in response to the COVID-19 pandemic, is the struggle between promoting research through strong IP protection and facilitating access to medicines. Asked how companies should achieve this balance, nearly half of respondents (and 65% of corporate panelists) indicated “investing in open innovation and public-private partnerships.”

Slightly fewer said “leveraging compulsory licensing in certain cases” (though this option was selected by 61% from law firms), and fewer still chose “implementing tiered pricing models based on income levels.” One panelist offered “income-based costs and country-based pricing” as an option. But it is striking that only 8% said “relying on traditional patent exclusivity” was the preferred solution – a recognition that business models need to adapt in some way to address these conflicting interests.

Among patent specialists, there was marginally greater support than the average for both “investing in open innovation and public-private partnerships” and “leveraging compulsory licensing,” with 51% checking each answer. Compulsory licensing was also the top answer among C-suite / management respondents (57%) and trademark specialists (52%), with just 26% of the latter favoring tiered pricing models.

How should pharmaceutical companies balance the need for IP protection with ensuring affordable access to life-saving medications?

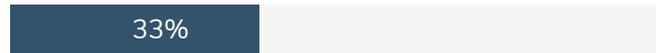
By investing in open innovation and public-private partnerships



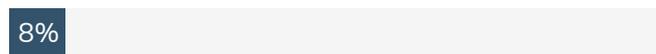
By leveraging compulsory licensing in certain cases



By implementing tiered pricing models based on income levels



By relying on traditional patent exclusivity



MULTIPLE CHOICE QUESTION

INDUSTRY SNAPSHOT

Geographical breakdown (by main markets) of sales of new medicines 2016-2021 (source: EFPIA and IQVIA)



5,000-10,000 substances

For every new compound that passes all research and control stages to become a marketable medicine, 5,000-10,000 substances will have been screened.

R&D

In 2020, the biopharmaceutical industry spent an estimated **\$198 billion USD** on R&D.

Global GDP

In total, the biopharmaceutical industry contributes about **\$1.84 trillion USD** to global GDP.

Marketable drugs

It takes an average of **12-13 years** to go from a laboratory-synthesized substance to a marketable drug.

Prescription medicine

The global market for **prescription medicines** was estimated to be approximately **\$1.26 trillion USD** in 2021.

SPACE TECH

Still on the launchpad

As noted, space is one area where the effect of IP protection is yet to become evident; nevertheless, respondents identified certain topics as likely to pose IP challenges. Top among these were “telecommunications and satellite services” followed by “advanced materials and manufacturing.” On the other hand, issues relating to renewable energy and the environment generally received far less attention.

Findings at a glance

- 10% of respondents do not foresee any major IP problems for space-focused industries
- Telecommunications and satellites will present the most significant IP challenges
- Space tourism could offer lucrative branding opportunities in this field





08

Two outliers were patent and trademark specialists, who selected advanced materials at lower rates (23% and 16%, respectively) and leaned more toward “environmental monitoring and climate research” (26% for both).

Surprisingly, 1 in 10 respondents did not foresee any major IP problems for space-focused industries – perhaps because such matters have not yet developed or are of a lower priority. At this time, questions around jurisdiction are still uncertain, and the size of the sector remains hard to predict.

When it comes to which technologies will have implications for IP, more than two thirds of all respondents, and 80% of corporate respondents, ranked “satellites” as either 1 or 2 out of 4. The proportion was slightly smaller among patent specialists (63%). This put it well ahead of other options: “space tourism and commercial rockets,” “asteroid mining and resource harvesting” and

“lunar and planetary exploration.” Perhaps these technologies just seem too distant (both physically and in terms of timing) to be of great interest.

Ranking score

- 3.14** Satellites
- 2.33** Lunar and planetary exploration
- 2.31** Space tourism and commercial rockets
- 2.22** Asteroid mining and resource harvesting

Having said that, space tourism was ranked more highly by trademark specialists (36% ranking it as 1 and 25% as 2), possibly hinting at lucrative branding opportunities in this field.

Where will the most significant IP challenges arise due to space-derived technologies?

Telecommunications and satellite services

31%

Renewable energy and solar power

13%

Advanced materials and manufacturing

28%

Environmental monitoring and climate research

18%

I do not foresee major IP challenges in this industry

10%



INDUSTRY SNAPSHOT

Charting the cosmos:

selected missions in our solar system

The latest mission to Mercury is BepiColombo, a joint European-Japanese craft launched in 2018.

The Europa Clipper craft is set to depart for Jupiter's frozen moon, Europa, in October 2024.

Voyager 2 seized a 175-year alignment opportunity to become the only spacecraft to reach Uranus.

On January 1, 2023, there were 6,718 operating satellites orbiting the Earth. Of these, 4,529 originated from the United States.

Uranus

Pluto

Earth

Jupiter

Neptune

Mars

Saturn

Venus

The first-ever private mission to Venus could launch as early as December 2024.

As of late 2023, there are nine active missions on or orbiting the Red Planet.

In the next few years, NASA plans to launch its Dragonfly "quadcopter" explorer to the gas giant's largest moon, Titan.

Three years after arriving at Uranus and 12 years after leaving Earth, Voyager 2 became Neptune's only terrestrial visitor.

THE FUTURE ROLE OF IP

Exciting times for those in IP development,
commercialization and protection

The IP Trend Monitor report has touched on patterns in just eight industries, but the findings support some broader conclusions. In particular, it is likely that AI tools based on machine- and deep learning will have a significant impact across the entire economy.

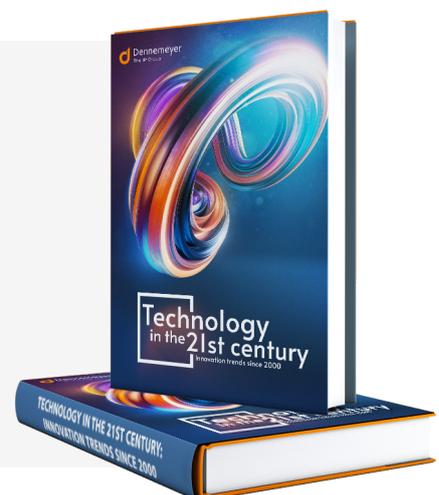
In addition, the transition to net-zero carbon emissions will lead to fundamental changes in the automotive and energy industries, among others. Meanwhile, the pressures of aging populations in advanced economies, combined with new technologies and techniques, will transform healthcare.

Innovative products, services and business models, as well as disruption from new entrants, will reshape previously stable markets, as already seen in electric vehicles and media consumption. In all these aspects, IP rights will have a critical role to play in determining the direction of research, which entities are successful and how deliverables reach consumers.

The next few years promise to be very exciting for all those involved in the development, commercialization and protection of IP rights.

Find out how we got here

Download the companion piece, “[Technology in the 21st century](#),” to discover how 20-year patenting trends have shaped the eight industries covered in this report. Explore geographical shifts, research priorities, major players and much more in this in-depth study.





Legend

RANKING SCORE

 MATRIX

SINGLE CHOICE QUESTION

MULTIPLE CHOICE QUESTION

Ranking questions find the favorite by averaging rankings for each choice.

Asks respondents to rate row items using identical column choices.

Asks people to choose one answer from a list of answer choices.

Lets people select multiple answers from a list of answer choices.

The sum of the individual numbers does not always add up to 100% or exceeds 100% due to rounding.

For multiple-choice questions, the total number of answer choices selected for a question can be greater than the number of respondents that answered the question.



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