World Intellectual Property Report

Executive Summary

Technology on the Move

WIPO

Executive summary

Introduction

The *World Intellectual Property Report 2026: Technology on the Move* reveals striking patterns in how technologies spread globally, with profound implications for economic development.

Since the Industrial Revolution, humanity has experienced unprecedented growth: global per capita income has increased more than tenfold and life expectancy has nearly doubled in developed nations. This reflects the power of creative destruction – successive waves of innovation replacing older technologies, enabling economies to produce vastly more with the same resources.

Creating innovative solutions does not automatically translate into economic growth or societal benefits. For new technologies to fulfill their potential, they must be adopted and effectively used by firms and households. This process, called technology diffusion, represents a crucial bridge between invention and impactful innovation, yet it is neither automatic nor guaranteed.

The *World Intellectual Property Report 2026* aims to provide policymakers, business leaders, and researchers with a comprehensive understanding of technology diffusion. This knowledge can inform decisions about innovation policy, IP systems, and strategies for harnessing technological progress to improve economic outcomes and address global challenges.

Do new technologies diffuse faster?

The report draws on historical data spanning 250 years and cutting-edge analysis of recent digital innovations. It uncovers several transformative trends reshaping our understanding of technology diffusion. The report also provides a deep dive on how technologies diffuse within specific contexts by looking into three case studies: agricultural technologies, clean technologies, and digital technologies.

There is a striking acceleration of global technology adoption

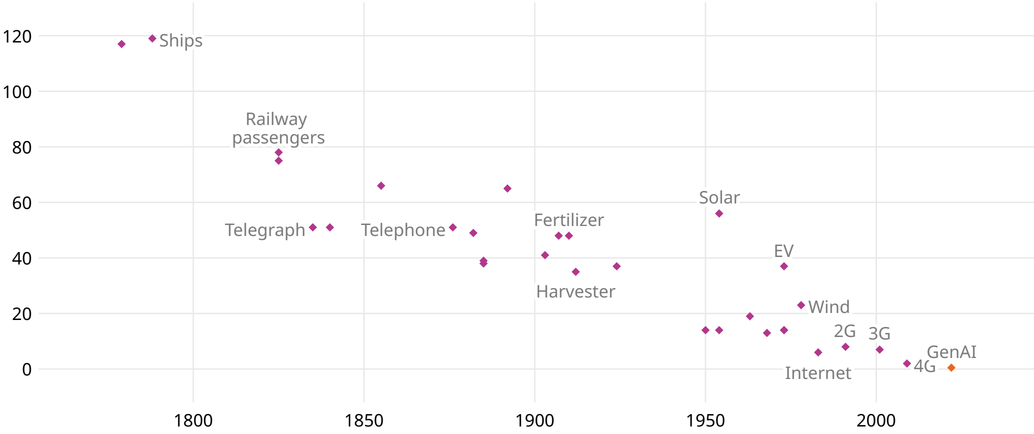
Using a historical technology database, the report reveals an unprecedented acceleration in how quickly new technologies reach global markets. There has been a remarkable compression in the time between the invention of new technologies and their first use worldwide.

Historical technologies took decades to adopt, while new digital technologies are adopted within days

The telegraph and the automobile, invented in the 19th century, took around four decades to reach countries around the world. By contrast, generative AI – exemplified by ChatGPT's release in November 2022 – had users in virtually every country within days of becoming available online (see Figure 1). This unprecedented speed of diffusion reflects a ready-made global digital infrastructure enabling immediate worldwide access.

Average technological adoption lags around the world have fallen

Figure 1 Average number of years to adopt selected technologies by year of invention, 1750–2025



Note: The sample includes 139 countries, 17 of which are advanced economies. A small average adoption lag indicates that adoption is rapid across all countries in the sample, regardless of income level.

Source: Fink, C. *et al*. (2026). How do new technologies diffuse? *WIPO Economic Research Working Paper Series No. 91*. Geneva: WIPO.

Developing economies show encouraging signs of convergence in their speed of adoption

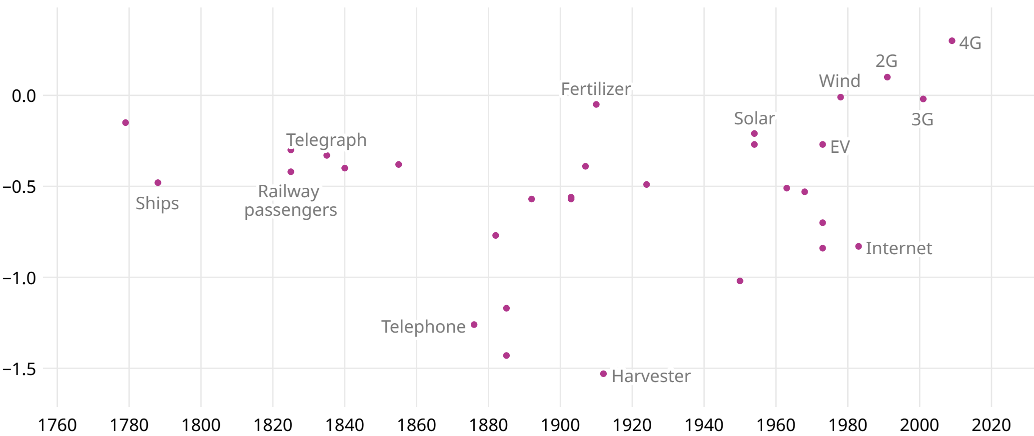
Advanced economies consistently emerge as early adopters. Historically, these economies embraced new technologies 20–80 years in advance of the global average. However, this historical advantage has diminished over time. Virtually all newer technologies demonstrate converging adoption lags between advanced and developing economies.

The gap in intensity of use was first widening, now it is narrowing

Beyond adoption time lag, the report examines how intensively technologies spread within countries after initial introduction. Studying the intensity of technology use across countries reveals a fascinating historical reversal: from the 19th through much of the 20th century, the gap in the intensity of use between advanced and developing economies generally widened, with newer technologies showing larger differences in how intensively they were used, as illustrated in Figure 2.

The gaps in usage are larger for earlier technologies

Figure 2 Gap in use intensity between advanced economies and developing economies



Notes: The intensity of use calculates relative to advanced economies (normalized to zero). Negative values indicate below-average intensity among non-advanced economies adopters. Sample includes 139 countries, of which 17 are advanced economies.

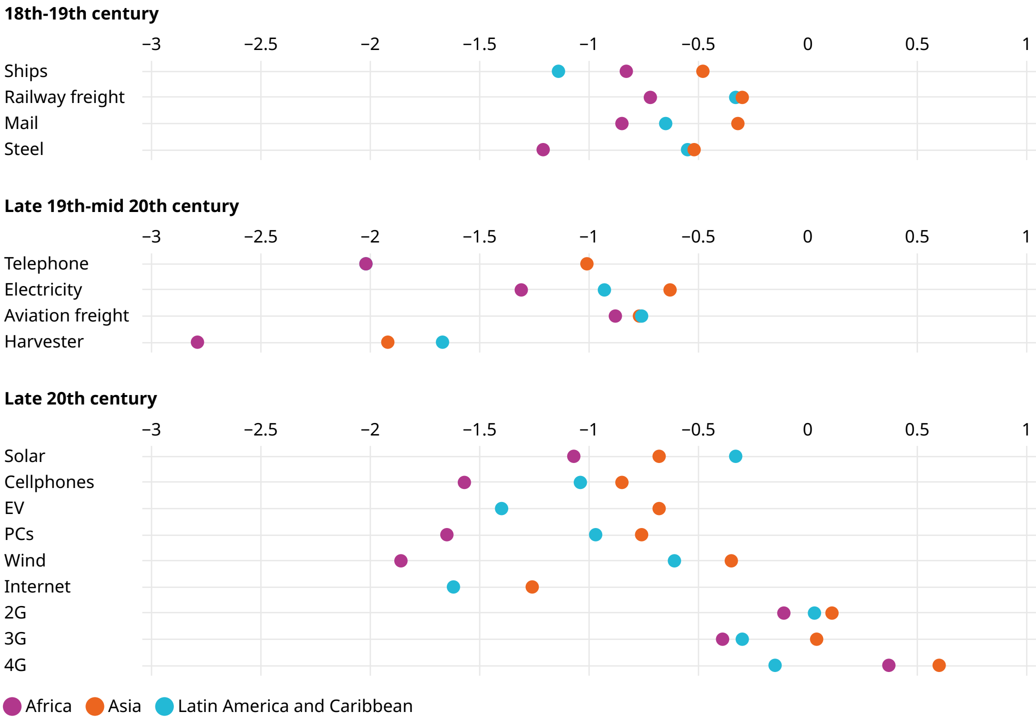
Source: Fink, C. *et al*. (2026). How Do New Technologies diffuse? *WIPO Economic Research Working Paper Series No. 91*. Geneva: WIPO.

The dramatic reversal relates to recent digital technologies revolution

Digital innovations like 3G and 4G show a converging usage intensity across countries, suggesting that today's digital technologies offer greater opportunities for developing economies to narrow historical gaps. Regional analysis reveals that while Africa exhibits the widest technology gaps, followed by Latin America and then Asia, all three regions show such gaps narrowing for recent technologies. Figure 3 shows how Asia stands out not only in having narrowed technology gaps substantially, but in some cases even exceeding advanced economy usage levels.

Asia reduces the usage gap with advanced economies

Figure 3 Intensity of use in the African, Asian and Latin American and Caribbean regions compared to advanced economies, by time period



Notes: Adoption lags are listed in deviation from the mean adoption lag for each technology. A smaller number indicates an earlier the adoption year. Advanced economies include: Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Kingdom of the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, Australia, New Zealand, Canada, the United States and Japan.

Source: Fink, C. *et al*. (2026). How Do New Technologies Diffuse?*WIPO Economic Research Working Paper Series No. 91* . Geneva: WIPO.

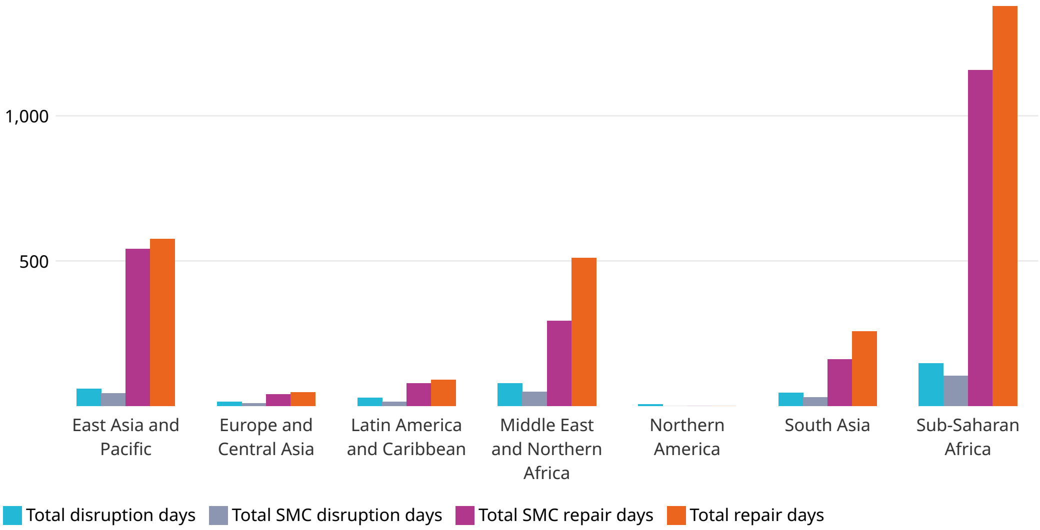
The case study on digital technologies shows that Africa managed to surf this digital wave to catalyze unique local innovations, even overcoming economic and infrastructure constraints. African innovations like mobile money services (e.g., M-Pesa in Kenya) and off-grid energy solutions have benefited global markets. The adoption of digital technologies can also improve the local socioeconomic conditions. In rural Africa, mobile connectivity has reduced gender wage gaps, narrowing when in closer proximity to 2G+ networks.

While the aggregate picture tells a positive story, especially about newer digital technologies, there are still many challenges in making technology diffusion work in developing economies. Digital inequality in developing economies operates across many dimensions: infrastructure gaps, technology quality differences, usage gaps arising from limited digital literacy, and affordability barriers. These divides create a dual digital landscape where advanced economies leverage high-value innovation while others depend on simpler solutions.

Infrastructure vulnerability and limited access to the best mobile network technology constrain Africa. High-capacity submarine cables carry over 99 percent of international data traffic connecting countries worldwide, where cable damage represents a top common cause of internet shutdowns with substantial economic losses. Africa, especially Sub-Saharan Africa, faces an infrastructure vulnerability that disproportionally disrupts the continent's connectivity (see Figure 4). Moreover, Africa still has limited access to the atest generation mobile networks, with only 12 percent of Africans having 5G access in 2023 against 74 percent of Europeans.

Submarine cable (SMC) damage causes a disproportionate level of disruption to connectivity in Sub-Saharan Africa

Figure 4 Distribution of internet shutdowns, SMC disruptions, and associated repair days by region, 2008–2020



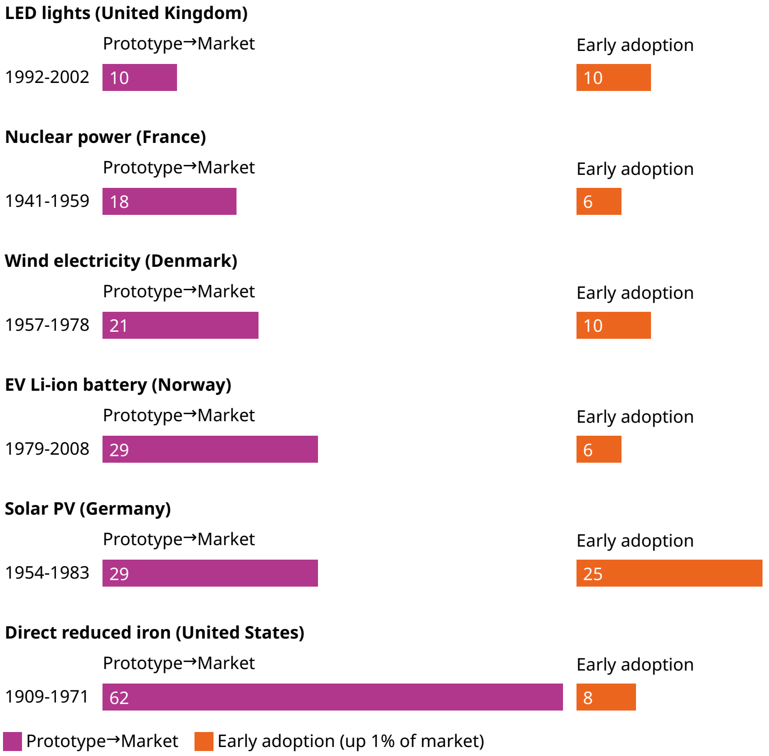
Note: Raw data drawn from the Subtel forum http://subtelforum.com/category/cable-faults-maintenance/, Akamai's reports on the "State of Internet Connectivity", and completed by manual Internet searches. The dataset is not exhaustive of all cable faults but records documented disruptions that effectively impaired Internet connectivity. SMC = Submarine cable.

Source: Cariolle, J. (2026). Digital Transformations in Developing Economies: From the First-mile Infrastructure to the End-user Fingertips. *WIPO Economic Research Working Paper Series No. 96*. Geneva: WIPO; data and calculation.

Beyond the digital revolution: technology characteristics still shape adoption timelines. Different technologies display distinct adoption patterns. Even nowadays, genetically modified crops require long development periods and must be adapted to local soil, climate and pests. On average, it takes about 16.5 years from discovery to regulatory approval. Similarly, historical evidence shows clean energy technologies typically require decades before reaching just one percent of market share. Figures 5a and 5b show how nuclear power achieved this within 20 years in France, while direct reduced iron took a full six decades. Even solar photovoltaic (PV) needed more than half a century to reach a material market share. These differences reflect variations in modularity, capital intensity, infrastructure requirements, and regulatory frameworks, and provide caution against one-size-fits all policy approaches.

Sectoral variations in technology scaling: industrial applications demonstrate prolonged market adoption timelines

Figure 5 Time required for prototype-to-market introduction and early adoption of energy technologies, by years



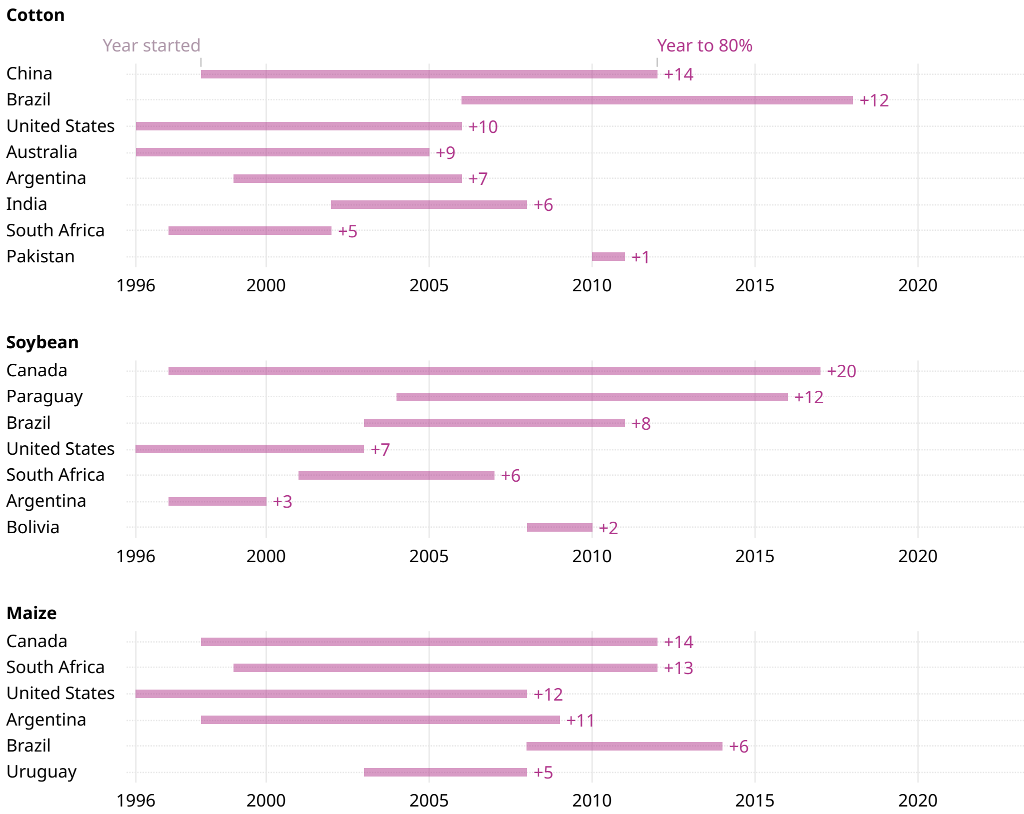
Note: Country designation applies to the early adoption phase and refers to the first countries reaching materiality for each technology.

Source: IEA (2020). Energy Technology Perspectives 2020: Special Report on Clean Energy Innovation. Paris: International Energy Agency, Figure 3.5, 76.

Regulatory frameworks are a crucial factor in the speed of technological adoption. Regulatory frameworks play a decisive role in genetically modified crop adoption. For example, genetically modified cotton reached 80 percent cropland coverage in the United States in roughly 10 years, while South Africa achieved this milestone in five years partly due to streamlined approval processes (see Figure 6).

Speed of GM crop technology adoption varies across countries and crop types

Figure 6 Time to widespread adoption (80 percent cropland) of GM crop technology for selected countries and crop types, 1996–2023



Notes: Argentina and Pakistan informally adopted GM crops earlier than recorded here

Source: WIPO based on de Grazia, C., Rada, N. and Graff, G. (2026). Diffusion of Genetically Modified Crop Technology. *WIPO Economic Research Working Paper Series No. 93*. Geneva: WIPO.

Is the technological knowledge behind new inventions spreading more internationally?

Technological knowledge is the set of problem-solving principles, techniques, and capabilities that enable the creation, improvement, and application of products, processes, or services. Innovation ecosystems with more diverse technological knowledge can produce more advanced and breakthrough inventions.

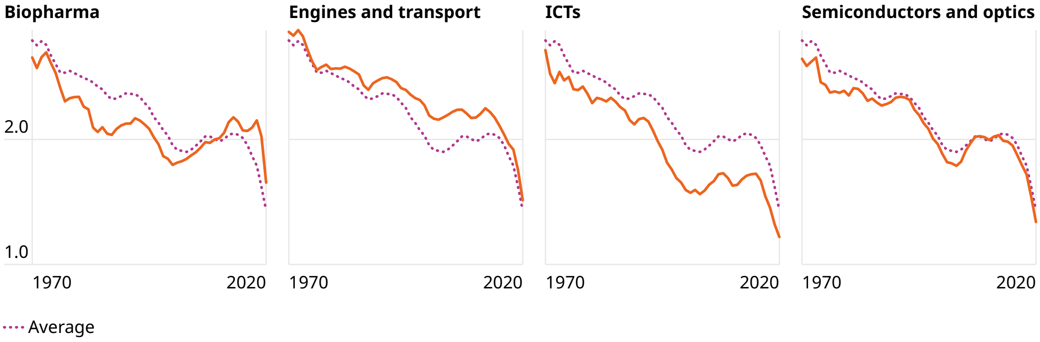
Technological knowledge flows have economic impact. Evidence shows a clear link between international knowledge spillovers – measured through indicators like patent-to-patent citations – and improvements in worker productivity, industry performance, and national income. Developing economies particularly benefit by adopting and adapting knowledge from more advanced countries, which helps narrow productivity gaps and accelerate economic development.

The report uses comprehensive analysis of patent citations, scientific references, and reuse of breakthrough inventions – novel combinations of existing technical knowledge. The report's analysis spans five decades and reveals a fundamental transformation in the diffusion of technological knowledge within the global innovation landscape.

International flows of technological knowledge have doubled in speed. The time needed for technological knowledge to spread internationally has reduced dramatically, according to every measure. Over the past 50 years, the time needed to observe the first international patent citation has halved. This systematic acceleration has occurred across all technological fields (see Figure 7).

For the past half century, the technological knowledge adoption lag has systematically decreased

Figure 7 Average adoption lag of international patent family citations, lag years, 1970–2020



Notes: Adoption lag refers to the average lag to observe a first international citation within a 5-year window from the priority application year of the cited patent family. Patent families without citations are excluded. Recent years have been omitted due to citation data truncation. For more details see the Technical annex in the full report.

Source: WIPO based on EPO Patstat, 2025, Autumn edition.

Are geographical barriers to knowledge flows at an end?

The gap between the speed of knowledge flows within countries and across countries has all but vanished. In 1988, international patent citations took on average 12 percent longer than domestic citations. By 2020, the difference between the two had essentially disappeared, suggesting that geography is no longer a meaningful barrier to knowledge flows speed.

There is a persistent dominance of innovation leaders

Despite faster global diffusion of technological knowledge, analysis reveals a striking concentration in a handful of economies. Primarily, the United States, Western Europe and Japan dominate both as contributors to and beneficiaries of international flows of technological knowledge.

Deep tech revolution takes time

There are fascinating patterns in how scientific knowledge is sourced for deep tech innovations, such as biotechnology, artificial intelligence (AI), quantum computing, and advanced materials inventions that are built upon advanced basic science. Yet, scientific articles take an average of 10 years to receive a first patent citation – much longer than patent-to-patent citations. This extended timeline reflects the complex process of transforming fundamental scientific discoveries into industrially viable deep tech applications.

Deep tech champions source globally

Scientific knowledge sourcing is even more concentrated than general patent citations, in just a handful of economies. The United States, Western Europe and Japan absorb scientific knowledge from virtually every global source available. Technologies with higher scientific content travel longer distances and are more likely to generate new inventor clusters worldwide.

The United States, Western Europe, Japan and China dominate global science sourcing for deep tech

Figure 8 Share of scientific articles with international and national patent citations, selected corridors, 2016–2022

	To Africa	To China	To Japan	To LAC	To United States	To Western Europe
From Africa	2%	10%	8%	1%	24%	36%
From China	0%	20%	9%	0%	25%	30%
From Japan	0%	8%	39%	0%	21%	23%
From LAC	0%	7%	6%	5%	26%	39%
From United States	0%	9%	7%	1%	45%	31%
From Western Europe	0%	8%	7%	1%	26%	48%

Notes: LAC = Latin America and the Caribbean, Western Europe excludes Germany. Figure data points refer to the share of scientific papers in the origin that are cited by patents from the destination. Only scientific papers with at least one patent citation are considered in the calculations. For more details see the Technical annex in the full report and Miguelez, E., Pezzoni, M., Visentin, F. *et al*. (2025). The Changing Geography of International Knowledge Diffusion. *WIPO Economic Research Working Paper Series No. 92*. Geneva: WIPO.

Source: WIPO based on EPO Patstat, 2025 Autumn edition and Marx and Fuegi, 2020 and 2022.

China joins the exclusive group of deep tech leaders

China emerges as the most dynamic player in this space, dramatically increasing its openness to international science. Chinese citations of US scientific papers have grown from just 2.5 percent of papers published between 1985 and 1995 to 8.8 percent for papers published between 2016 and 2022 – making China more open to international science than Japan across all source regions (see Figure 8).

Only a handful of leading economies can reuse the knowledge behind breakthrough inventions

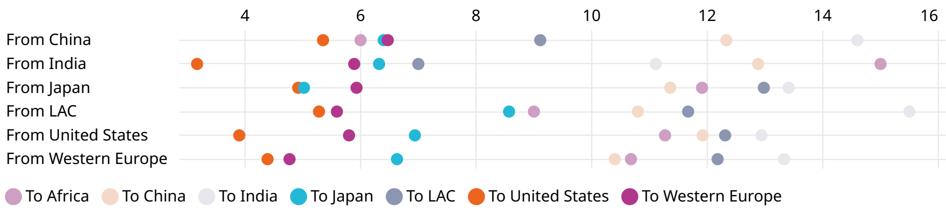
New analysis of how novel combinations of existing technical knowledge spread globally shows that most countries build primarily on domestic breakthrough inventions, but only innovation leaders demonstrate the exceptional ability to rapidly adopt and build upon foreign inventions.

Leading innovation ecosystems reuse knowledge from foreign breakthrough inventions faster

The United States is three times faster at replicating a breakthrough invention originating from India than India itself. For example, India takes on average 11 years to re-invent based on an Indian-originated invention, while it takes the United States only three years (see Figure 9).

Innovation leaders maintain their dominance through rapid reuse of knowledge behind foreign breakthrough inventions

Figure 9 Average time to the first replication of a breakthrough invention in the destination territory, in years



Notes: LAC = Latin America and the Caribbean. Western Europe excludes Germany. Figure data points refer to the average lag to observe a technological trajectory (i.e. international patent family combining pairs of IPC/CPC symbols) within a given window (from 2 to 5 years) from the first time the trajectory is observed. Technological trajectories follow the methodology by Pezzoni, M., Veugelers, R. and Visentin, F. (2023). Technologies Fly on the Wings of Science. *MERIT Working Papers 2023-036*, United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT) https://ideas.repec.org/p/unm/unumer/2023036.html; and Pezzoni, M., Veugelers, R. and Visentin, F. (2022). How fast is this novel technology going to be a hit? Antecedents predicting follow-on inventions. *Research Policy*, 51(3), 104454, https://doi.org/10.1016/j.respol.2021.104454. For more detail see Miguelez, E., Pezzoni, M., Visentin, F. *et al.* (2025). *The Changing Geography of International Knowledge Diffusion. WIPO Economic Research Working Paper Series No. 92*. Geneva: WIPO.

Source: WIPO based on EPO Patstat, Autumn 2025 edition.

Leading innovation ecosystems reuse knowledge from foreign breakthrough inventions more intensively

Even more dramatically, the United States reuses 70 percent of Chinese-originated novel technologies within five years of invention, whereas China reuses less than 5 percent of US technologies within the same timeframe (see Figure 9).

The United States and Europe dominate the early and intensive reuse of breakthrough inventions

Figure 10 Share of origin's breakthrough inventions reused by destination within 5 years of invention, selected regional corridors, 1985–2015

	To Africa	To China	To India	To Japan	To LAC	To United States	To Western Europe
From Africa	11%	2%	0%	34%	2%	70%	66%
From China	1%	8%	0%	52%	4%	70%	53%
From India	0%	4%	4%	42%	4%	88%	46%
From Japan	0%	4%	0%	69%	0%	69%	57%
From LAC	0%	2%	0%	24%	2%	60%	67%
From United States	1%	5%	1%	44%	1%	83%	59%
From Western Europe	1%	12%	1%	48%	1%	74%	71%

Notes: LAC = Latin America and the Caribbean. Western Europe excludes Germany. Figure data points refer to the share of all of the origin's technological trajectories (i.e. international patent family combining pairs of IPC/CPC symbols) being used in a given destination. Technological trajectories follow the methodology by Pezzoni, M., Veugelers, R. and Visentin, F. (2022). How fast is this novel technology going to be a hit? Antecedents predicting follow-on inventions. *Research Policy*, 51(3), 104454, https://doi.org/10.1016/j.respol.2021.104454; and Pezzoni, M., Veugelers, R. and Visentin, F. (2023). Technologies Fly on the Wings of Science. *MERIT Working Papers 2023-036*, United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT), https://ideas.repec.org//p/unm/unumer/2023036.htm. For more detail see Miguelez, E., Pezzoni, M., Visentin, F. *et al.* (2025). The Changing Geography of International Knowledge Diffusion. *WIPO Economic Research Working Paper Series No. 92*. Geneva: WIPO.

Source: WIPO based on EPO Patstat, 2025 Autumn edition.

Developing economies struggle to benefit from global knowledge flows

While developing economies may generate innovative technologies, they show marginal participation in international technological knowledge flows. For instance, Africa has a limited ability to reuse foreign technological knowledge, whereas the technical knowledge behind African breakthrough inventions is re-used extensively in developed economies: 100 percent is reused in Western Europe, 96 percent in the United States, 92 percent in Japan, and 81 percent in Germany (see Figure 10).

Implications for global development and policy

These findings carry profound implications for global development strategies. The acceleration in diffusion speeds and convergence in usage intensity for recent technologies suggest unprecedented opportunities for developing economies to catch up or even leapfrog traditional development stages.

There are four critical factors affecting technology diffusion:

1. **Technology characteristics matter fundamentally**. Technologies with immediate benefits spread faster than complex, costly ones requiring complementary investments. Infrastructure requirements prove particularly crucial – technologies leveraging existing infrastructure (like large language model (LLMs) using the internet) diffuse rapidly, whereas those requiring new networks (like electric vehicles needing charging stations) face significant delays.
2. **Information speed has changed knowledge diffusion dramatically**. While 19th-century knowledge traveled only as fast as it could be transmitted by traditional mail and newspapers, today's digital platforms enable near-instant access to technical information globally.
3. **Technology diffuses faster where it can be absorbed easily**. The absorptive capacity – the ability to understand, adapt and apply new knowledge – varies dramatically across users and contexts. Complex technologies requiring local adaptation demand substantial technical know-how, built through education, training, research institutions, and global knowledge networks.
4. **Public policy and institutions can shape diffusion**. Regulatory and institutional frameworks provide complementary infrastructure investment, standardization and interoperability frameworks, safety regulations and IP systems that balance innovation incentives with technology access.

However, realizing this potential requires addressing persistent capability gaps. Countries showing above-predicted GenAI usage demonstrate that appropriate policies and investments enable the rapid adoption of frontier technologies. Success depends on building absorptive capacity and innovation capabilities through education and skills development, investing in complementary infrastructure, and creating institutional frameworks that support technology adaptation and innovation.

For policymakers, analysis serves to emphasize that encouraging invention alone is insufficient. Equal attention must be focused on creating conditions that enable rapid, broad technology diffusion through infrastructure investment, human capital development, access to financing, appropriate regulatory frameworks, and IP systems balancing innovation incentives with technology access.

This report ultimately demonstrates that while technology diffusion has accelerated dramatically and shows encouraging convergence trends, realizing the full potential of new technologies for global development requires deliberate, coordinated policy action addressing the multiple factors that determine diffusion outcomes.

This Executive Summary highlights the key findings of WIPO's flagship *World Intellectual Property Report 2026: Technology on the Move* and reveals striking patterns in how technologies spread globally, with profound implications for economic development.