



香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY



Driving Socioeconomic Impact Through Research and Innovation: Insights from HKUST

Executive summary

Universities have become key drivers of technological innovation, societal progress, and sustainable development by developing effective models for translating research excellence into tangible socioeconomic impacts. These models will not only inform best practices among universities worldwide but will also help advance national and regional agendas. At the same time, universities face mounting challenges and opportunities, from advancing technological innovation to addressing pressing environmental and social issues.

This report looks at how The Hong Kong University of Science and Technology (HKUST) achieves these impacts on economic growth and societal well-being by leveraging research innovation, industry partnership, and sustainability initiatives. It serves as a case study that gives valuable insights into effective strategies for creating meaningful societal value. The findings also highlight the importance of building robust research ecosystems, fostering entrepreneurship, and aligning with strategic priorities such as sustainability and policy influence.

Key findings from the quantitative analysis of HKUST:

HKUST demonstrates rapid research growth, strong interdisciplinary excellence, and extensive, high-impact collaborations with leading industry partners across local, regional, and global scales.

- **HKUST is a fast-growing young university with diverse interdisciplinary strengths.**

HKUST has rapidly emerged as a dynamic, fast-growing university, with its research publication output achieving an impressive compound annual growth rate of 10% in the past five years. The university has established distinctive strengths, particularly in Engineering and Computer Science, which together account for more than half of HKUST's total research output, and each showed stronger scholarly impact than Hong Kong's average level, as measured by field-weighted citation impact (FWCI). Beyond these flagship disciplines, HKUST consistently excels across a diverse range of fields—including Materials Science, Physics and Astronomy, Mathematics, Chemical Engineering, and Social Sciences—each surpassing the Hong Kong average in FWCI, further highlighting the university's broad-based research excellence.

- **HKUST's academic–corporate collaborations achieve high research impact and showcase strong global connections, especially within the technology sector.**

Academic–corporate collaboration has always been one of the key differentiators between HKUST and its peers. Over the past five years, 6.2% of HKUST's research output has involved partnerships with industry, well above the global average of 2.7%. These collaborations not only demonstrate HKUST's proactive approach to building productive industry relationships but also yield high-impact results, with collaborative publications achieving an FWCI of 4.4—considerably ahead of international peers. Computer Science is a key subject area of industry collaboration at HKUST, with collaborative publications primarily coming from sub-areas of Software (accounting for 30.7% of collaborative publications), Information Systems (17.3%), and Computer Science

Applications (17.1%), and a particularly high scholarly impact for collaborative output in Computer Networks and Communications (FWCI 5.8). HKUST maintains a far-reaching yet diverse global partnership network, with strong regional ties—particularly in the Greater Bay Area and other key Chinese innovation hubs—and robust collaborations with leading technology firms in the US, Europe, and broader Asia. This tri-regional network underscores the university's dual role as an anchor for local and regional development and as a globally engaged research institution.

- **The university's partnerships with top industry leaders run wide and deep.**

HKUST's commitment to impactful industry engagement is evidenced by the quantity and quality of scholarly output produced together by researchers and their industry partners. While Computer Science is the field with the most research output of this nature, HKUST's engagement also encompasses the Social Sciences and the Arts and Humanities, showcasing the university's breadth of industry partnerships beyond technical fields. These authors are linked with corporate partners across local, regional, and global contexts, reflecting HKUST's ability to foster industry collaboration at multiple scales. Most notable are the deep institutional partnerships developed with leading technology companies such as Tencent—which stands out as the most productive corporate partner in HKUST's academic–corporate research collaborations. The university's extensive network of corporate collaborators, including Chinese tech giants and prominent international firms, highlights its active engagement across digital, artificial intelligence (AI), and technology sectors worldwide.

HKUST achieves exceptional growth in patents, IP commercialisation, and entrepreneurship, translating research excellence into impactful innovation and economic value both locally and globally.

- **HKUST's rapid growth in patents and knowledge transfer highlights its leadership in innovation and its strong collaborations with industry.**

The period between 2019 and 2024 saw HKUST's impressive growth in patent applications and grants, rising to over 1,670 applications and 700 grants. IP licensing also expanded steadily, with over 120 new agreements signed and bringing the total to more than 360 licences. These figures reflect very strong commercialisation of research. The university holds 235 academic–corporate co-owned patents, producing 1.19 co-owned patents per 100 publications, and achieves a citation impact 1.4 times the world average for these patents. HKUST's research is widely cited by international patents—especially by major US and Chinese corporations—demonstrating global technological influence and impactful industry partnerships.

- **A rapidly growing spinout network exemplifies HKUST's entrepreneurial leadership and local economic contribution.**

More than 600 spinout companies have been established at HKUST between 1995 and 2023. More than 80% were founded within the last decade or so, highlighting the effectiveness of HKUST's expanding entrepreneurial support ecosystem. The vast majority are located within 100 kilometres of the university and clustered in the Greater Bay Area, signalling HKUST's key role in stimulating local economies and regional innovation networks. These spinouts are leaders in tech-driven fields such as AI, fintech, blockchain, microelectronics, robotics, healthcare, advanced materials, and more, with a select group also extending their reach to international innovation hubs.

- **Alumni-founded companies further strengthen HKUST's entrepreneurship ecosystem and regional impact.**

HKUST is a cradle of forward thinkers and entrepreneurs. Its alumni founded over 500 spinout companies between 2000 and 2023, with over 80% of these companies established in the past decade. This rapid acceleration of entrepreneurial activities could only have come to fruition with the university's unwavering support and endeavour in targeted initiatives. Alumni are founders of the majority of HKUST's spinouts, with over 80% of alumni-founded ventures in technology sectors. These companies are primarily based within the Greater Bay Area and within 100 kilometres of HKUST's campus, where they contribute to local economic growth; others are increasingly expanding into regional and international markets. This further reinforces HKUST's position as a fertile ground for innovation.

HKUST delivers global impact in sustainability and policy, combining research excellence, strategic innovation, and meaningful engagement with major international organisations and stakeholders.

- **HKUST demonstrates sustained excellence and specialisation in SDG-related research that addresses sustainability challenges.**

Over a quarter of HKUST's research output is dedicated to topics aligned with the United Nations Sustainable Development Goals (SDGs), achieving one of the fastest growth rates among peers and ranking second in research impact. HKUST has demonstrated a strong research commitment to SDG 14 (Life Below Water), SDG 7 (Affordable and Clean Energy), and SDG 11 (Sustainable Cities and Communities), with high specialisation in these SDG areas—particularly in SDG 14 and SDG 7, where its high relative activity index (RAI) surpasses the averages for Hong Kong, Chinese mainland, and the world. Its contributions in these areas address pressing sustainability issues such as renewable energy, marine ecosystems, and urban development.

- **HKUST excels in strategic fields crucial to global sustainability and technological advancement.**

In priority areas such as Net Zero, AI, Environmental Science, New Materials, and Quantum Technology, HKUST's research impact surpasses the global average. Notably, it leads its peers in research impact within AI, Net Zero, and New Materials, and demonstrates high specialisation across most of these fields. Together, these achievements underscore HKUST's research excellence and reinforce its position as a front-runner in global research across vital strategic areas.

- **HKUST's research has substantial influence on international policy and global organisations.**

HKUST leads peers in the average number of policy citations its research attracts. These works are frequently referenced by high-profile international organisations, including the WHO, World Bank, UNESCO, and OECD. Through its strong contributions to key intergovernmental and national research agendas in North America and Europe, the university's research plays a significant role in shaping global health, economic, and development policy.

This report highlights HKUST's integrated approach to research excellence, industry collaboration, entrepreneurship, and sustainability as a model for universities worldwide. HKUST's success demonstrates that strategic focus, active industry engagement, and societal orientation can amplify a university's socioeconomic impact. As universities globally seek to

navigate a future of increasing societal expectations and technological change, HKUST's experience may shed light on transforming academic excellence into tangible societal benefits—an endeavour that remains central to the mission of higher education institutions everywhere.

Circle of Time

This 8.5m tall sculpture stands in the centre of the Entrance Piazza of the University. It is made of steel and mounted on a paved podium of broad steps in the centre of a pool of flowing water—a metaphor for the passage of time and a synthesis of art and science. The podium also incorporates a carved mural depicting 39 Chinese achievements in all fields of science and technology. The installation took place on 8 October 1991. The red sundial has since then become an icon of HKUST.

The Circle of Time was created by the Perth-based, Irish sculptors Charles and Joan Walsh-Smith.

For more information:



Contents

Executive summary	1
Contents	5
Introduction	6
Chapter One — Strategic Alliances and Collaboration with Industrial Partners	10
Chapter Two — Entrepreneurship and Transformation of Discovery to Impact	30
Chapter Three — Sustainability Innovation and Societal Impact	50
Appendix A	62
Appendix B	65
Appendix C	67
About	68

Introduction

In today's increasingly interconnected and globalised world, with its emphasis on science and technology innovation, universities serve not only as important sources of new ideas and knowledge but also as incubators for innovative talent. They also play a pivotal role as catalysts for innovation and societal progress, moving beyond the traditional role of centres of teaching and research. Recognising this evolving role, it is essential for universities to strategically focus on translating research into impactful societal outcomes, thereby reinforcing their socioeconomic influence and their position as engines of societal transformation.

To remain relevant and impactful, universities are increasingly involved in actively cultivating an innovation ecosystem. By building partnerships, fostering entrepreneurship, and translating cutting-edge research into practical solutions, they support the development of new industries, help drive technological advancements, accelerate economic growth, and address pressing societal challenges. The Hong Kong University of Science and Technology (HKUST) is a trailblazer in adopting this new model of development.

In just three decades, HKUST has evolved into a globally recognised academic and research powerhouse. It now stands ready to embark on the next phase of its remarkable journey with the launch of the Strategic Plan 2031. Building upon the success of previous plans and the HKUST 3.0 Vision Plan introduced in 2023, the Strategic Plan 2031¹ reflects the collective aspirations of the entire University community—including alumni, students, faculty, staff, and governance bodies—through extensive consultation and engagement. This roadmap articulates five core objectives that will guide HKUST's development in the years leading up to its 40th anniversary and beyond: becoming a university of talents, an international leader in education and research, a wellspring of innovation and entrepreneurship, an exemplar of sustainable and quality practices, and a champion of diversity, inclusiveness, and openness. Central to this report is the objective of establishing HKUST as a visionary university of innovation and entrepreneurship—a priority that underscores the University's commitment to strengthening its innovation ecosystem, fostering academic–corporate collaboration, and nurturing the next generation of entrepreneurs and innovators. By synergising efforts across the spectrum from research to real-world impact, HKUST aims to create transformative economic and societal benefits at local, regional, and global levels.

HKUST's strategic vision is in line with the HKSAR government's prioritisation of innovation and technology (I&T) as a cornerstone of Hong Kong's future development, as reflected in a series of ambitious policies and initiatives rolled out over 2023–2024. The government's I&T agenda—articulated through the Hong Kong Innovation and Technology Development Blueprint,² with increased funding for research and development, support for start-up incubation, and strengthened cross-border collaboration within the Greater Bay Area—has created a fertile landscape for universities and enterprises to thrive. HKUST has proactively leveraged these

¹ <https://strategicplan.hkust.edu.hk/overview>

² https://www.itib.gov.hk/en/publications/I&T%20Blueprint%20Book_EN_single_Digital.pdf

policies to further amplify its role as a key driver of technological progress and entrepreneurship. By aligning with government priorities, the University has been able to accelerate the translation of research into commercial impact, attract world-class talent, and expand its contributions to Hong Kong's emergence as a leading innovation hub in the region and on the international stage. This synergistic relationship between policy direction and institutional capability has positioned HKUST at the forefront of I&T development, empowering the University community to deliver transformative economic and societal benefits in line with both local aspirations and global challenges.

HKUST has established a comprehensive and dynamic knowledge transfer (KT) ecosystem that serves as a powerful engine for translating academic excellence into real-world impact. Central to this ecosystem are key units such as the Office of Knowledge Transfer (OKT), which acts as an essential bridge between HKUST's research community and industry partners, identifying commercial opportunities and facilitating collaboration, funding, and start-up creation. Complementing this is the HKUST Entrepreneurship Centre (EC), which cultivates a vibrant entrepreneurial culture by guiding students and researchers through the journey from innovative ideas to viable businesses, supported by a robust programme of incubation, mentorship, and competitions. Over the years, the KT ecosystem has expanded to encompass network-building initiatives that connect academia with the private sector, targeted funding support for DeepTech ventures, and signature events that foster cross-sector dialogue and innovation. These efforts have been marked by significant milestones, including the successful launch of major venture investment funds, the digitalisation of IP management processes, and a growing portfolio of high-impact spinouts and alumni-founded companies. Collectively, this integrated system has positioned HKUST as a regional and global leader in knowledge transfer, empowering the University community to drive technological advancement, entrepreneurship, and sustainable economic and societal progress.

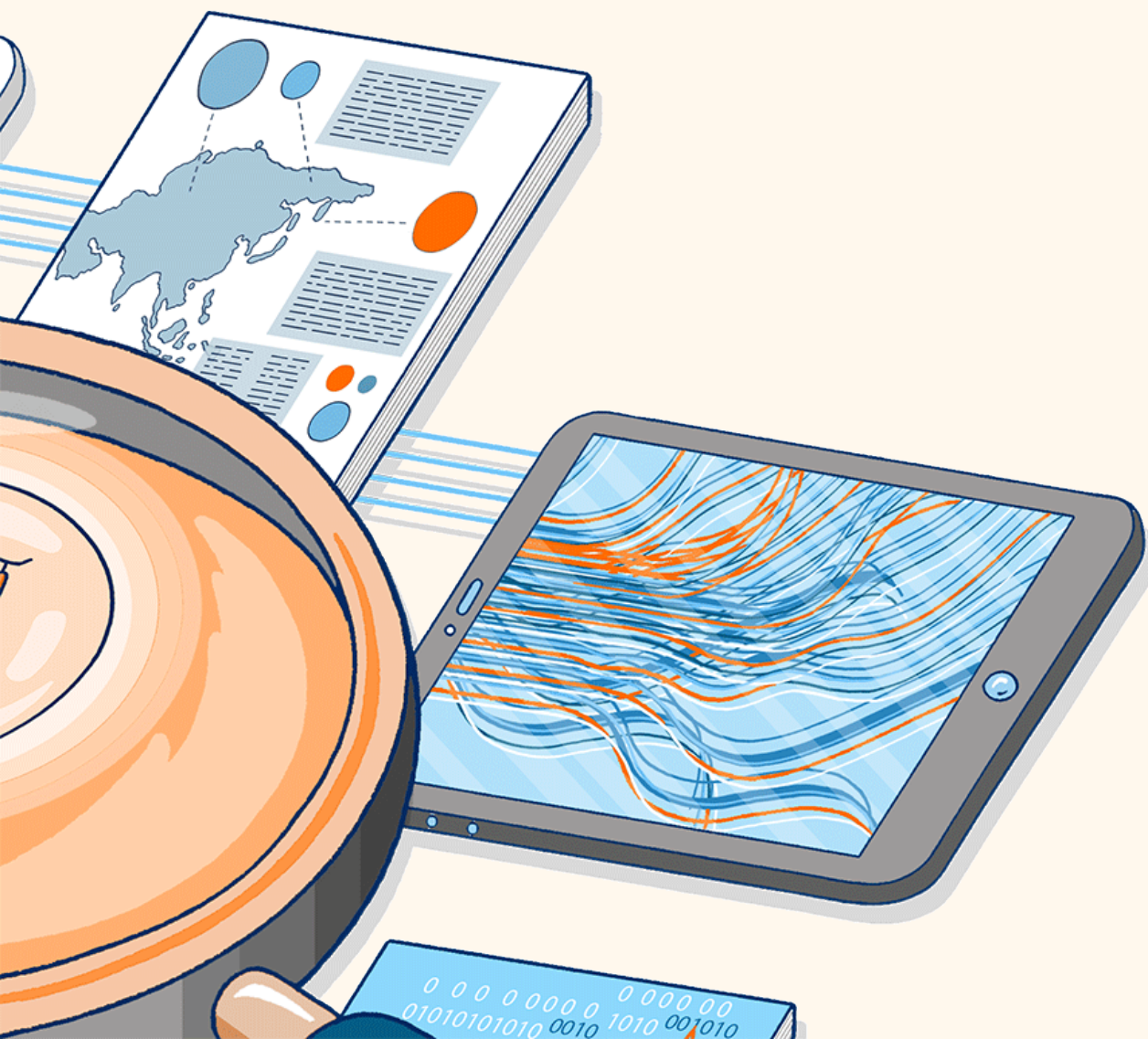
This report provides a comprehensive overview of HKUST's achievements and ongoing efforts to foster academic–corporate collaboration, drive innovation and entrepreneurship, and advance sustainability with far-reaching economic and societal impact. By providing an evidence-based assessment of HKUST's activities and progress in these strategic domains, by evaluating its performance through key benchmarks, this report aims to offer insights into the University's contributions and impact at the local, regional, and global levels. It also seeks to shed light on how universities with similar missions can assess progress toward nurturing innovation ecosystems and make societal contributions.

Methodologically, the report draws on both quantitative metrics, benchmarking the university against leading peer institutions, and qualitative case studies, to deliver in-depth, evidence-based insights. The report is structured into three chapters. Chapter One evaluates HKUST's performance on academic–corporate collaboration, revealing significant research impact and multi-regional influence; Chapter Two assesses HKUST's patent output, intellectual property licensing, spinout companies, and the alumni network, demonstrating rapid growth in entrepreneurship with deep expertise in the technology sector, as well as substantial support for the local economy; and Chapter Three reviews HKUST's alignment with the Sustainable Development Goals (SDGs), excellence in strategic research fields, and societal impact measured by media and policy uptake, showcasing the University's distinctive strengths in sustainability and its broad societal reach.

Measuring the innovation and socioeconomic impacts of universities remains a complex and evolving task. Therefore, it should be noted that this report is based on currently available data and selected indicators, and may not capture all aspects of HKUST's diverse activities or the full scope of its impact. Readers are encouraged to consider these findings within the context of the methodologies and data sources used, and to be mindful that some qualitative contributions and emerging developments may not be fully reflected. Further research is needed to develop a more comprehensive evaluation framework for universities embracing the new model of development and focusing on driving innovation and societal development.

Chapter 1

Strategic Alliances and Collaboration with Industrial Partners



1.1 Overview of research performance

HKUST is committed to research excellence, demonstrated by its fast-growing research output and strong performance in Engineering and Computer Science. Through interdisciplinary collaboration and targeted research initiatives, the university continues to drive innovation and achieve impactful breakthroughs across diverse fields.

Overall scholarly output

The Hong Kong University of Science and Technology (HKUST) has consistently demonstrated its dedication to advancing research, education, and knowledge transfer, as evidenced by its outstanding record of scholarly achievement. Since 2010 (Figure 1.1.1), the university has achieved steady year-on-year growth in research output—a clear reflection of its expanding research capacity and productivity. Its research output more than doubled from slightly over 2,000 publications in 2010 to almost 5,000 publications in 2023. This upward trajectory has gained remarkable momentum in recent years. Over the past five years alone, HKUST's research publication output has grown at an impressive compound annual growth rate (CAGR) of 10%, outpacing Hong Kong's average of 9% during the same period. Such sustained growth not only highlights the university's accelerating research productivity but also reinforces its role as a key driver of innovation in the region.

This growth in research volume has been accompanied by an increase in global influence and scholarly impact. HKUST's field-weighted citation impact (FWCI) rose from 1.97 in 2021 to 2.28 in 2024, underscoring the growing visibility of the university's research in the global research community. This momentum is further reflected in the university advancing 13 places in the QS World University Rankings 2025, securing a position among the world's top 50 universities. Together, these achievements highlight HKUST's unwavering commitment to excellence and growing recognition of its leadership in cutting-edge research on the global stage.

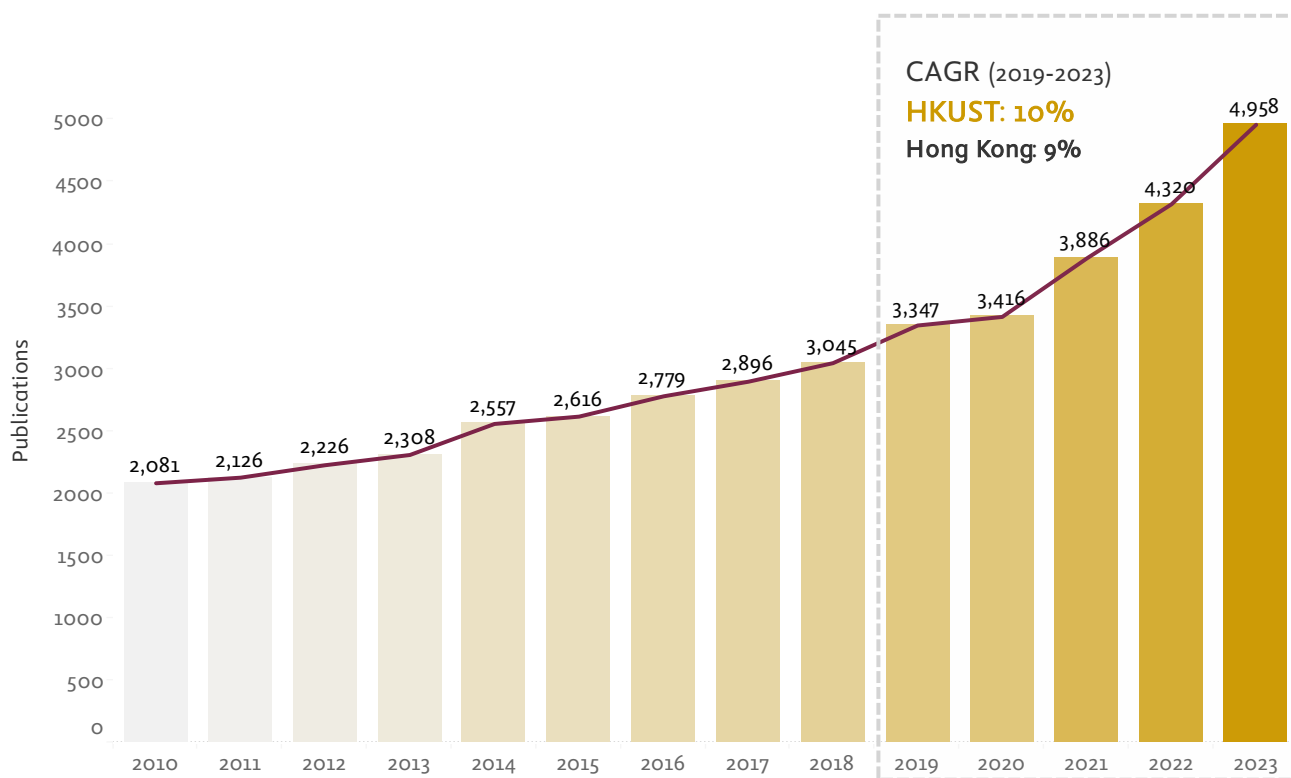


Figure 1.1.1 Research output trend of The Hong Kong University of Science and Technology (2010–2023).

Source: Scopus

Building on its robust research momentum, HKUST has cultivated distinctive disciplinary strengths, particularly in Engineering and Computer Science. These two subject areas contribute 35.1% and 30.4% (Figure 1.1.2), respectively, of HKUST's total research output, together comprising a majority of the university's scholarly output and demonstrating their pivotal role in the university's research ecosystem. Notably, both subject areas consistently outperform Hong Kong's average FWCI for the respective subject field, underscoring high output and exceptional academic influence.

Beyond these flagship subject areas, HKUST excels in a diverse range of fields where its research quality shines. Materials Science, Physics and Astronomy, Mathematics, Chemical Engineering, and Social Sciences all rank among the university's top 10 research areas by output share—and each surpasses Hong Kong's average FWCI for the corresponding subject area. This broad-based excellence reflects HKUST's ability to foster cutting-edge research across multiple domains, ensuring its contributions resonate both locally and internationally.

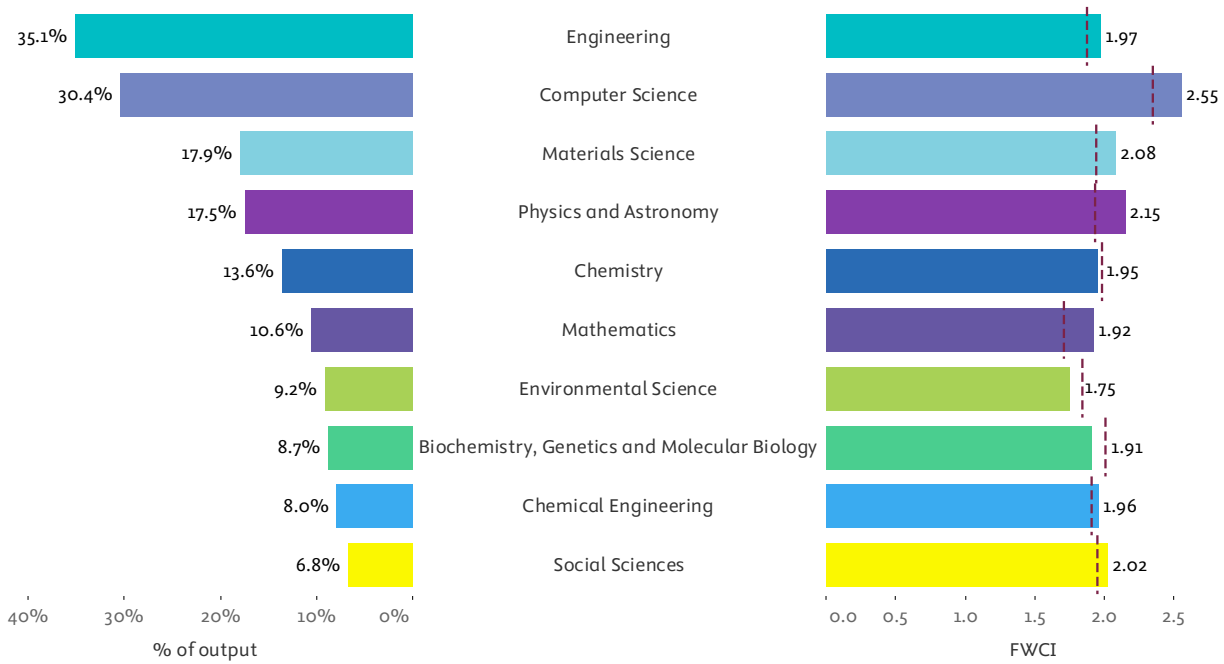


Figure 1.1.2 Top 10 subject areas by publication share and corresponding FWCI at The Hong Kong University of Science and Technology (2019–2023).

The dashed lines in the right figure represent the FWCI of the corresponding subject area for Hong Kong, as a benchmark for HKUST.

Source: Scopus

1.2 Academic–corporate joint research

HKUST demonstrates notable strength in academic–corporate joint research, consistently surpassing the global average in both output share and scholarly impact. Its balanced approach, which maintains strong local partnerships while achieving significant global reach, underscores HKUST’s capacity to deliver high-quality, relevant research with broad industry engagement.

Academic–corporate collaborative output and impact

The role of universities in fostering innovation has fundamentally evolved. Where traditional institutions once viewed industry partnerships primarily as funding opportunities, next-generation universities recognise them as essential drivers of systemic change. Strategic alliances with industry partners now extend beyond transactional relationships, serving as dynamic platforms for co-creation, where joint research initiatives accelerate knowledge transfer, shape real-world solutions, and redefine the boundaries of academic impact.

At HKUST, this paradigm shift aligns seamlessly with its Strategic Plan 2031,¹ which emphasises interdisciplinary collaboration, entrepreneurial education, and societal transformation. By embedding joint research with industry into its core mission, HKUST ensures its discoveries translate into tangible advancements—whether in biomedical innovation, sustainable technologies, or smart city development.

Academic–corporate co-authored publications serve as a key metric for assessing the depth and impact of university–industry research partnerships. These collaborative outputs not only reflect the integration of academic expertise with industry needs but also demonstrate a university’s ability to translate research into real-world applications. Globally, institutions with robust industry engagement typically show higher citation impact and greater innovation potential in their collaborative publications. This pattern is clearly evident for the six universities studied in this report (Figure 1.2.1), where the FWCI of academic–corporate co-authored publications consistently surpasses that of the university’s overall research.

HKUST performs strongly among peer institutions: over the past five years, 6.2% of its total research output involved academic–corporate collaboration, considerably exceeding the global average of 2.7%, though lower than some international peers. This higher-than-average collaboration rate highlights HKUST’s proactive efforts to cultivate productive industry partnerships. Moreover, the FWCI of HKUST’s collaborative publications reached 4.4, positioning the university well ahead of international peers and underscoring the high scholarly impact and real-world relevance of its joint research output.

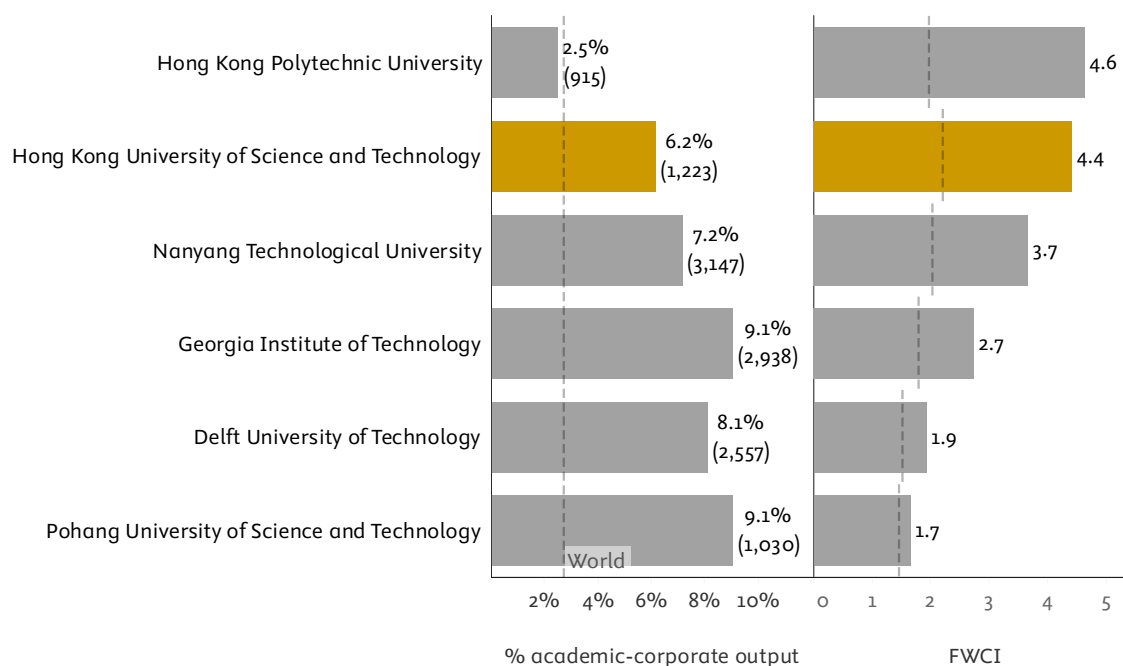


Figure 1.2.1 Share and FWCI of academic–corporate collaborative output (2019–2023).

The number of publications with academic–corporate collaboration is shown in brackets. The dotted lines represent the FWCI for the universities’ total output. The universities are sorted based on the FWCI of their academic–corporate collaborative output.

Source: Scopus

Dominant fields for academic–corporate joint research

Compared with its technology-focused peers, HKUST’s academic–corporate joint publications are uniquely concentrated in Computer Science, highlighting its leading expertise and industry relevance in this field (Figure 1.2.2). While the academic–corporate publications of Hong Kong Polytechnic University, Georgia Institute of Technology, and Nanyang Technological University are balanced across both Computer Science and Engineering, Delft University of Technology emphasises Engineering collaborations, and Pohang University of Science and Technology diversifies its corporate collaboration across Engineering, Materials Science, and Physics. This comparative analysis highlights HKUST’s distinctive strength in Computer Science within academic–corporate partnerships, setting it apart as a key driver of innovation in the technology sector.

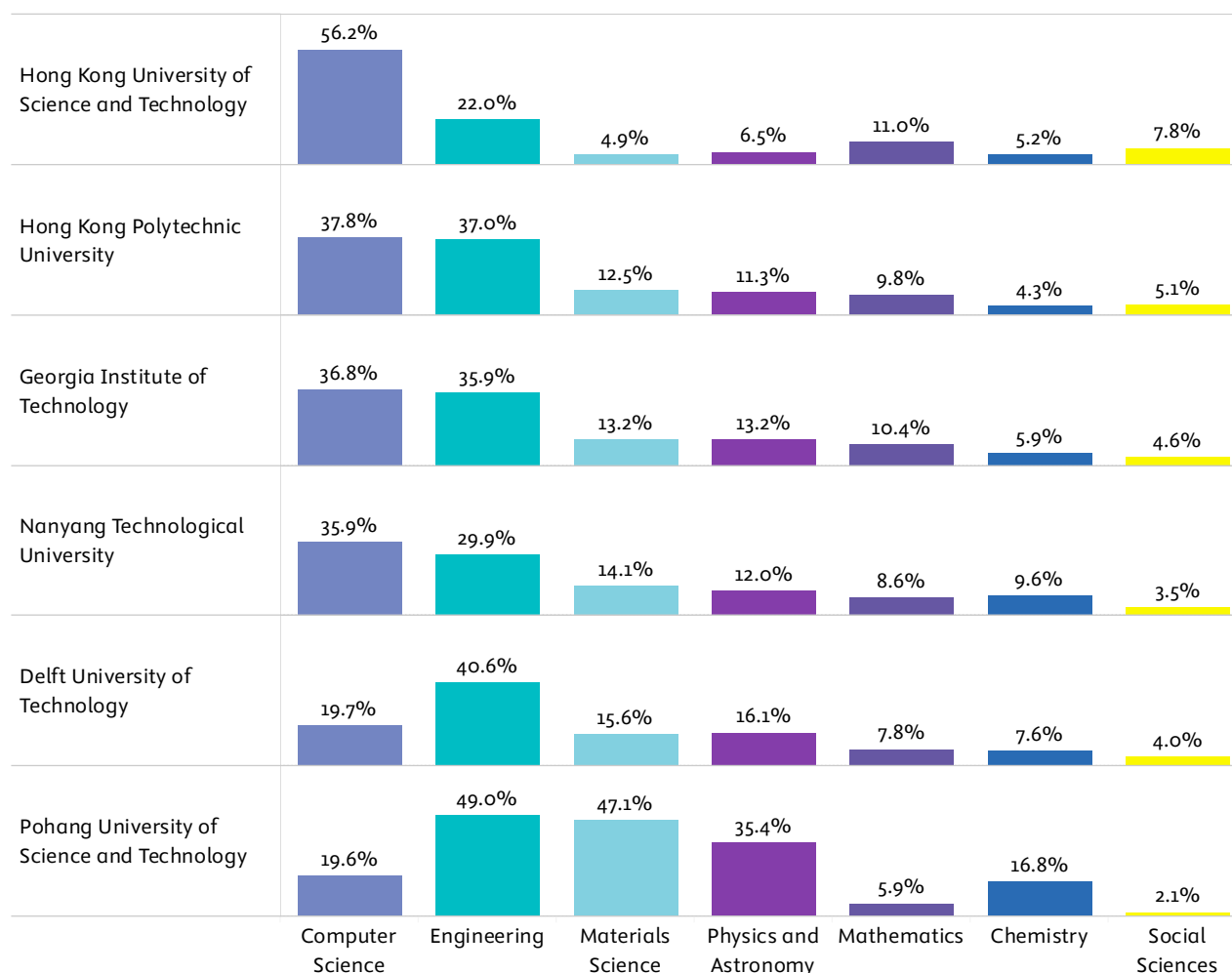


Figure 1.2.2 Top 5 ASJC subjects by output share in academic–corporate collaborations for HKUST and comparators (2019–2023).
Source: Scopus

Building on its robust research momentum and distinctive disciplinary strengths, HKUST has established an impressive profile in industry partnerships, with Computer Science emerging as a clear leader (Figure 1.2.3). The university’s collaborations with industry are particularly pronounced in this field, as evidenced by both the substantial volume of joint publications and their exceptional impact—over 56% of HKUST’s academic–corporate co-authored papers are in Computer Science, where the FWCI reaches an outstanding 4.4. This strength extends beyond Computer Science. Engineering—already one of HKUST’s flagship subject area in terms of research volume and influence—also plays a prominent role in driving academic–corporate joint research, further solidifying HKUST’s leadership in technological innovation and application.

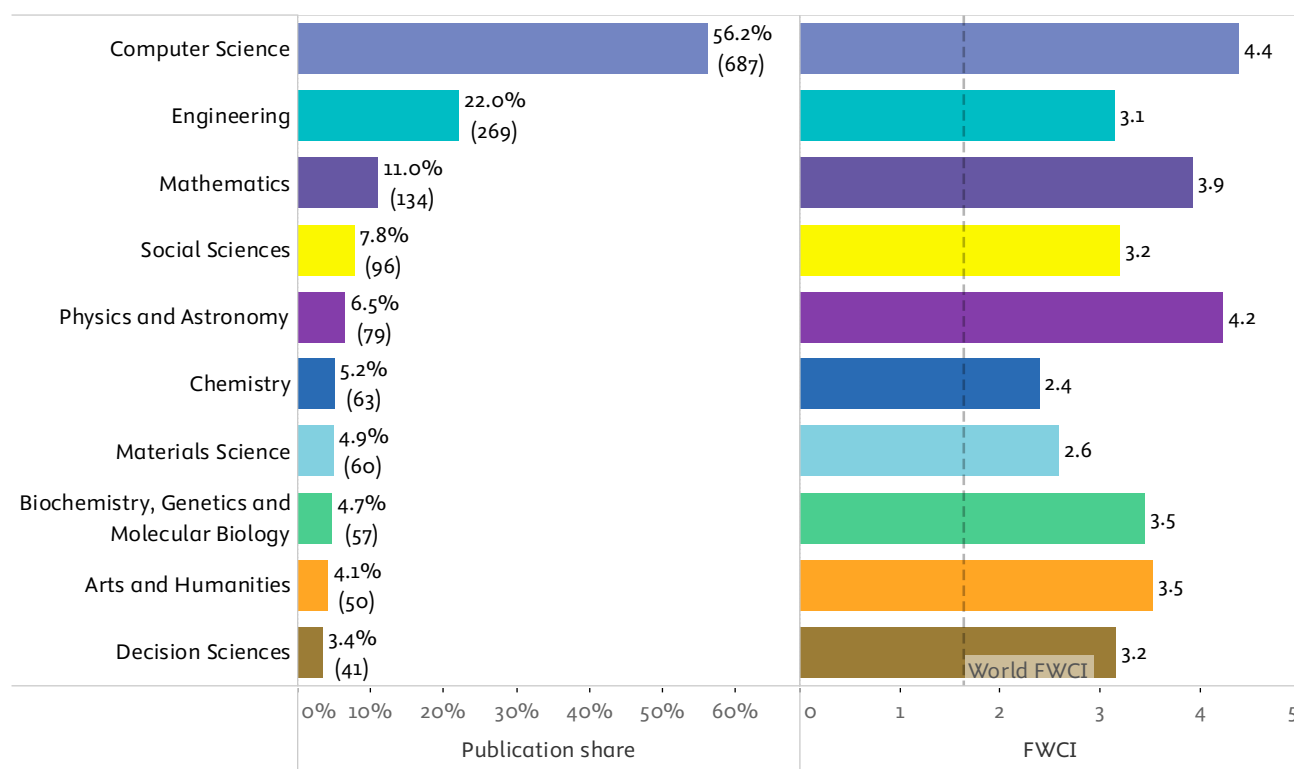


Figure 1.2.3 Top 10 subject areas by publication share and corresponding FWCI for academic–corporate collaborative publications at HKUST (2019–2023).

The number of publications is shown in brackets. The dotted lines in the panel at right represent the FWCI for the world’s academic–corporate collaborative publications.

Source: Scopus

A deeper look at HKUST’s academic–corporate collaborative research reveals concentrated strengths within key subfields of Computer Science and Engineering (Figure 1.2.4). In Computer Science, *Software* leads in publication share (30.7%), followed by *Information Systems* (17.3%) and *Computer Science Applications* (17.1%). Notably, *Computer Networks and Communications* stands out with the highest scholarly impact (FWCI 5.8), highlighting the influence of HKUST’s research in this subfield.

In Engineering, *Electrical and Electronic Engineering* accounts for the highest share (12.6%) of the collaborative publications. *Control and Systems Engineering*, while a smaller share at 6.2%, achieves the highest scholarly impact (FWCI 3.8) among engineering subfields.

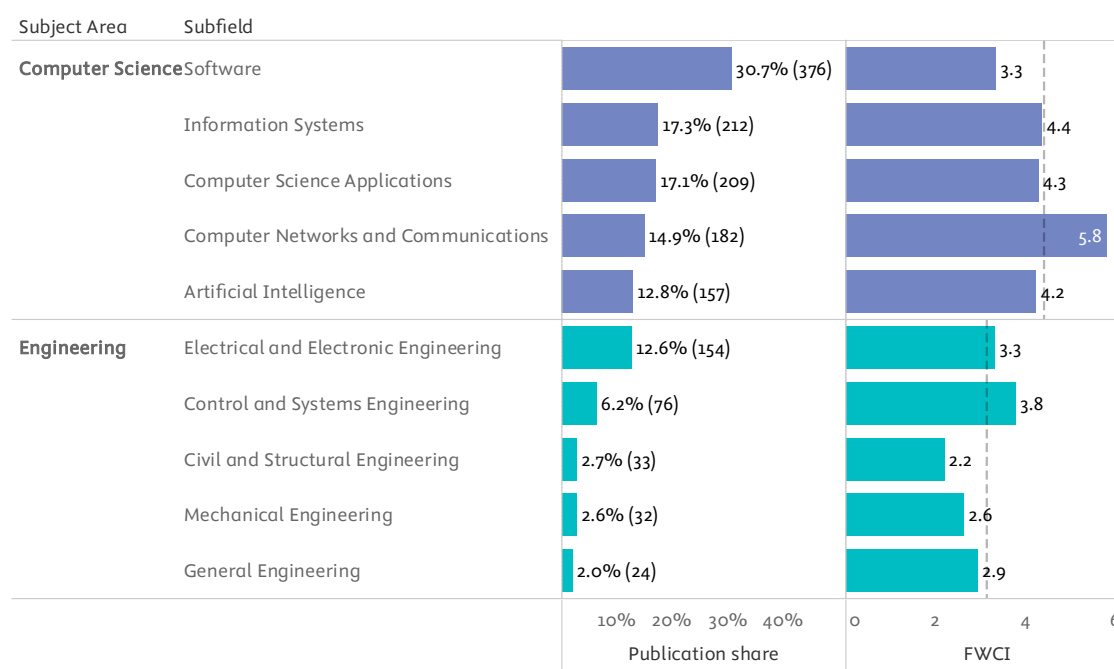


Figure 1.2.4 Top 5 subfields by publication share and corresponding FWCI for academic–corporate collaborative publications in Computer Science and Engineering at HKUST (2019–2023).

The count of joint publications is shown in brackets. The dotted line presents the overall FWCI benchmark for HKUST's academic–corporate joint publications in these subject areas.

Source: Scopus

Academic–corporate collaboration by geographic distance

The spatial distribution of university–industry joint research reveals distinct patterns of knowledge exchange and impact diffusion. As the Figure 1.2.5 illustrates, geographical proximity remains a key driver of research collaboration intensity, with local partnerships (within 100 km) demonstrating markedly higher publication density³ across all universities. This ‘local advantage’ reflects the importance of face-to-face interaction, shared regional priorities, and ecosystem integration in fostering productive research partnerships.

Compared with its peers, HKUST stands out for its balanced local–global engagement strategy. While maintaining strong local ties—evidenced by 27% of its academic–corporate joint publications originating from local collaborators (ranking second among peer universities)—the University simultaneously demonstrates impressive global reach. Approximately 42% of its academic–corporate collaborative publications come from collaborators located more than 4,000 km away, only lower than Nanyang Technological University among the peer institutions studied here.

In contrast to HKUST, Nanyang Technological University demonstrates a predominantly global footprint, with approximately 62% of its collaborative publications and 83% of its corporate partners located more than 4,000 km away, and a much lower percentage of academic–corporate joint research occurring with local collaborators. Pohang University of Science and Technology, on the other hand, emphasises a strong local and regional focus. It has over 50% of

³ Publication density measures the number of collaborative publications per corporate collaborator by distance between the university and the corporate collaborator.

collaborative publications with regional corporate partners (located between 100 km and 4,000 km) and exhibits the greatest concentration of publication activity within its local area.

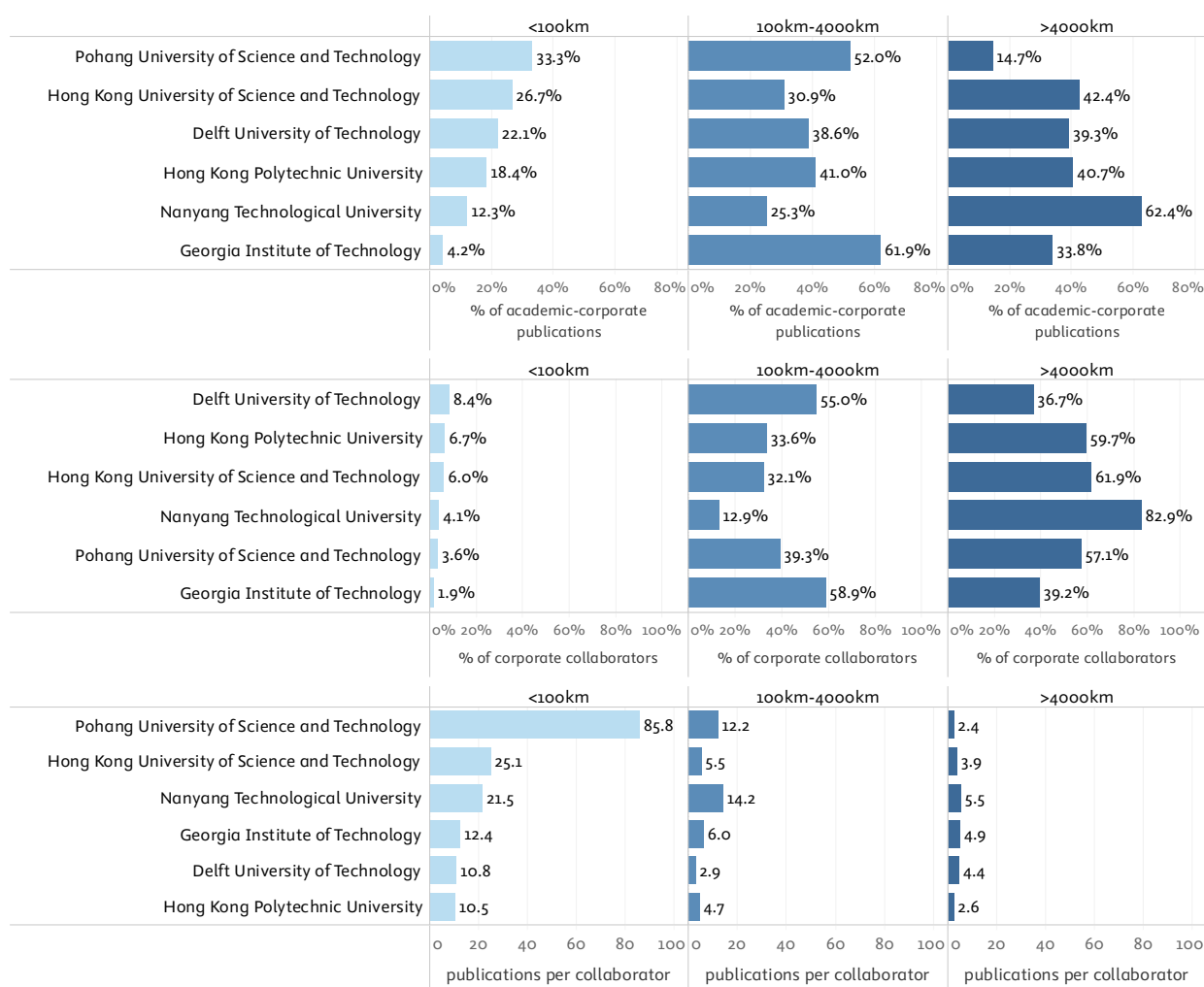


Figure 1.2.5 Top: Share of academic–corporate joint publications by distance between the university and corporate collaborators. The universities are sorted based on the share of joint publications with collaborators within 100 km from the university.

Middle: Share of unique corporate collaborators by distance between the university and collaborators. The universities are sorted based on the share of collaborators within 100 km of the university.

Bottom: number of joint publications per collaborator by distance between the university and collaborators, illustrating collaboration density. Universities are sorted based on the joint publications per collaborator within 100 km of the university.

Source: Scopus

A more granular analysis of the distribution of industrial partners by distance reveals distinct patterns in subject area focus of industrial partnerships across the benchmark institutions (Figure 1.2.6). In line with findings above, HKUST demonstrates both local and global reach and a focus on computer science or IT-related industries. While most of HKUST’s corporate collaborators are located more than 4,000 km away, HKUST’s most productive partnerships, mainly in the Computer Science sector, are within 1,000 km, reflecting strong local and regional ties. Delft University of Technology maintains robust collaboration networks at local, regional, and global levels, securing a higher number of collaborators and co-authored outputs, particularly in Engineering. Georgia Institute of Technology’s major collaborators are predominantly US-based

corporations with a primary focus on Computer Science. As for Hong Kong Polytechnic University, despite most partners being distant, it has its most productive ties within 1,000 km in Computer Science. Nanyang Technological University’s key collaborators are largely global, situated over 4,000 km away, with Computer Science as the main subject. Pohang University of Science and Technology’s collaborations are both regional and global, but its most productive partnership, concentrated in Engineering and Materials Science, lies within 100 km. These variations underscore the unique strategic priorities and disciplinary focuses of each university in building academic–corporate partnerships.

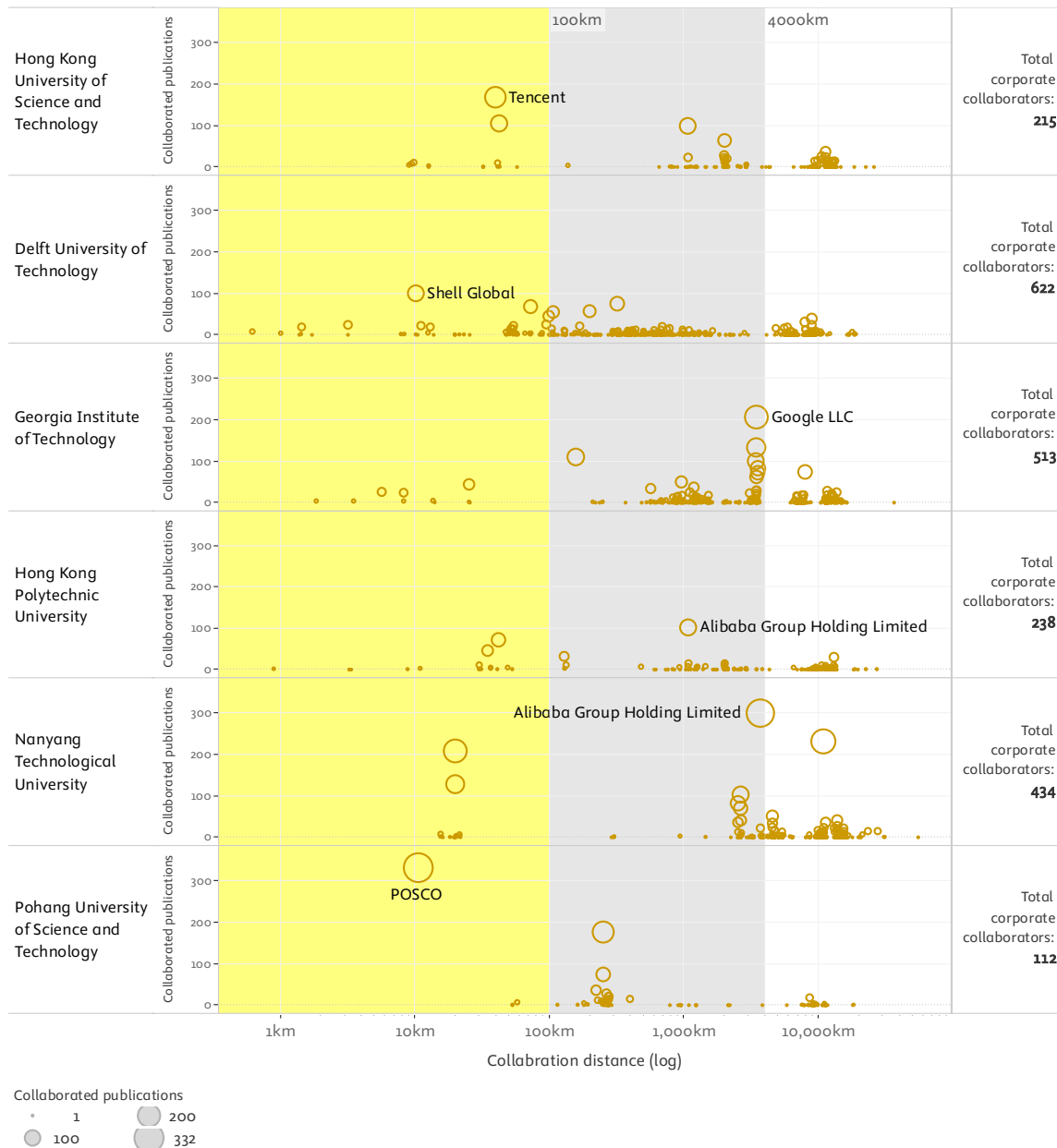


Figure 1.2.6 Distribution of corporate collaborators by distance from the university (log horizontal axis) and number of joint publications (vertical axis), 2019–2023. Each bubble represents a unique corporate collaborator, with the size of the bubble indicating the number of joint publications.

Source: Scopus

Geographic distribution of HKUST's corporate collaborators

Figure 1.2.7 provides a more detailed view of HKUST's corporate collaborators by distance. Within a 100 km radius, HKUST maintains strong collaborative ties with leading corporates in the Greater Bay Area, such as Tencent, Arup, and DJI, with Tencent emerging as HKUST's most prolific industry collaborator. Expanding to the 100–4,000 km range, HKUST partners with major technology firms in other key Chinese innovation hubs, including Alibaba in Hangzhou and Baidu in Beijing. Across the broader Asian region, the University's collaborative network extends to prominent Japanese companies such as Hitachi and Nissan, as well as South Korean giants LG and Samsung. Beyond Asia, HKUST engages with world-renowned technology leaders in the United States, including Google, Amazon, and NVIDIA. This diverse and geographically expansive network underscores HKUST's capacity to foster high-impact partnerships that integrate local and regional industry clusters with the global innovation landscape.

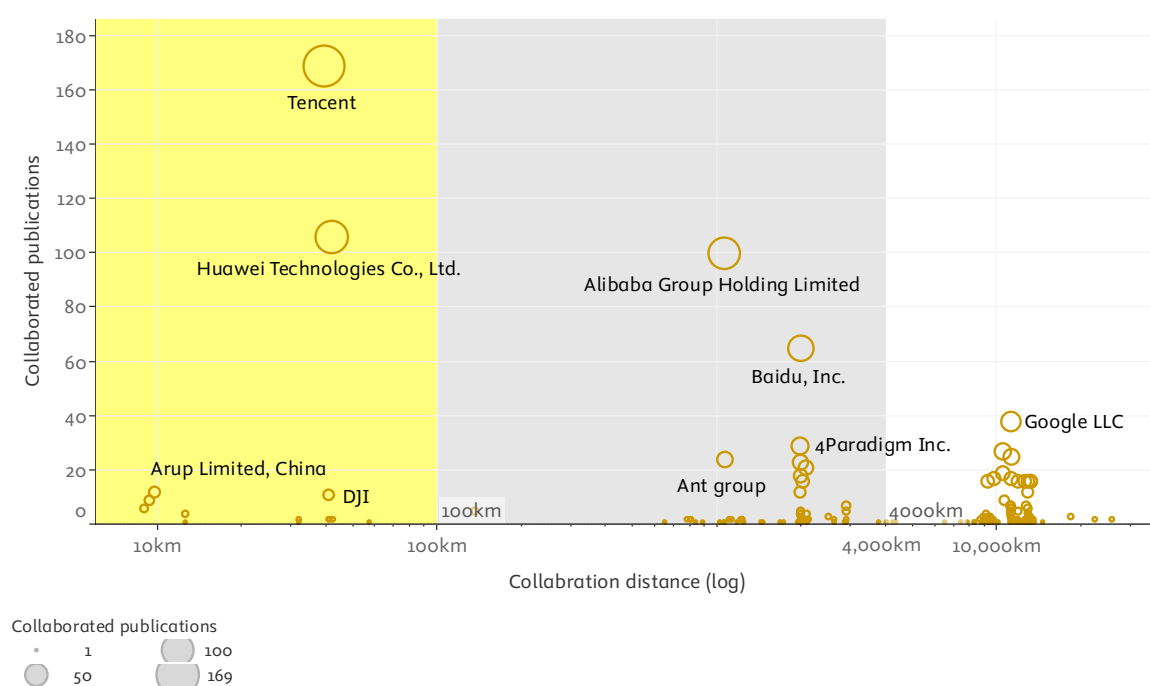


Figure 1.2.7 A detailed view of the distribution of corporate collaborators by distance from HKUST (log horizontal axis) and number of joint publications (vertical axis), 2019–2023. Each bubble represents a unique corporate collaborator, with the size of the bubble indicating the number of joint publications.

Source: Scopus

The spatial distribution (Figure 1.2.8) of HKUST's corporate research partners reveals a strategically balanced global network concentrated in three key innovation hubs: Chinese mainland (particularly the Greater Bay Area and major metropolitan innovative hubs), the United States (notably Silicon Valley and major tech corridors), and Europe (with strong representation from Germany and the UK). This tri-regional collaboration pattern reflects HKUST's dual role as both an anchor institution for regional development and a global research partner.

Hong Kong University of Science and Technology

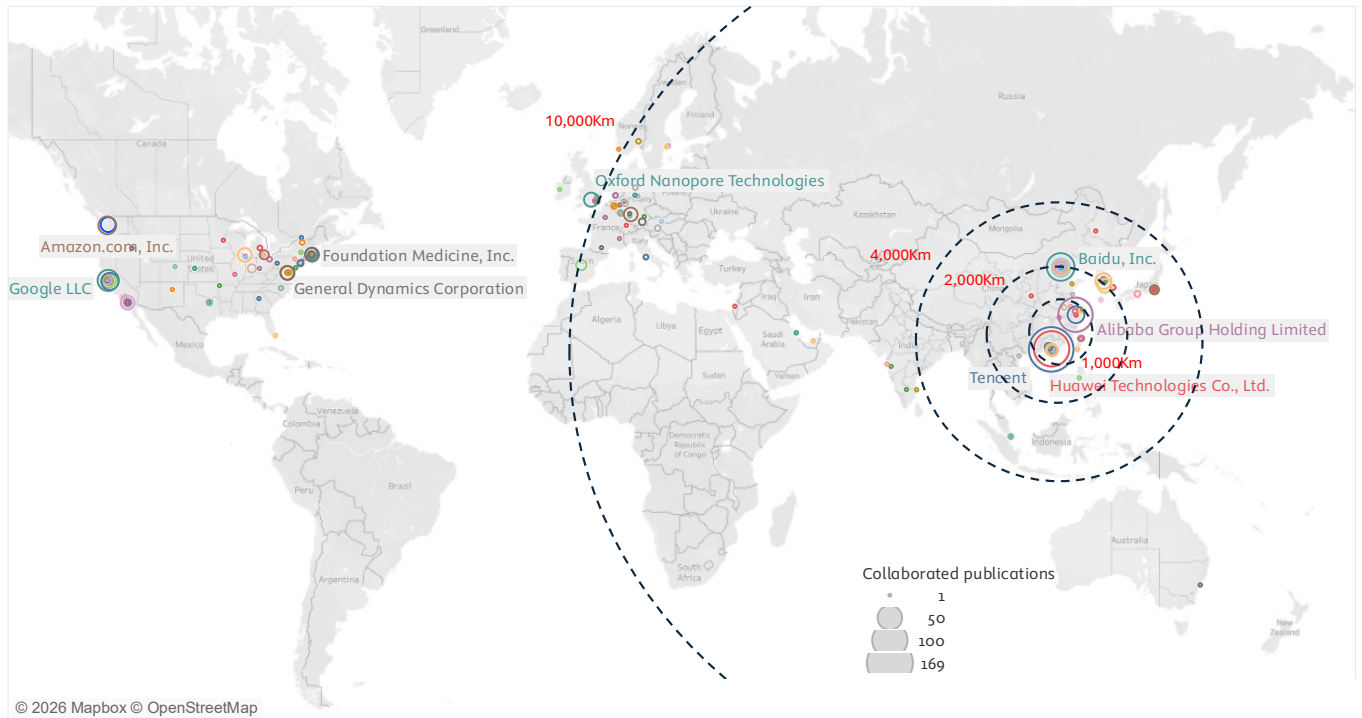


Figure 1.2.8 Geographical distribution of the corporate collaborators of HKUST (2019–2023). Each bubble represents a unique corporate collaborator, with the size of the bubble indicating the number of joint publications.

Source: Scopus

CASE STUDY

Universities as agents of change: advancing societal benefit through academic–corporate collaboration in antimicrobial innovation

Modern society faces growing threats from infectious diseases, antimicrobial resistance, and environmental pollution. Addressing these challenges demands not only scientific breakthroughs but also seamless collaboration between academia and industry, inspired by a new conception of the university as an active agent in socio-economic progress. One significant achievement is the HKUST–CIL Joint Laboratory, under the leadership of Professor Kinglun Yeung, which exemplifies this approach. Partnering with Germagic Biochemical Technology and the Hong Kong Water Supplies Department, the team has successfully translated fundamental research into market-ready solutions, including antimicrobial filters used globally during the COVID-19 pandemic and the MAP-1 polymer that protects pets and enhances public infrastructure.

At the core of the research, Professor Yeung's team engineered multilevel antimicrobial materials capable of targeting microbial envelopes, proteins, and genetic material, achieving swift elimination of bacteria and viruses such as MERS and COVID-19 within 60 seconds. These solutions were rigorously field-

tested, demonstrating reliable efficacy in real-world contexts. The research extended further to address silent, yet substantial, challenges in urban environments: antibiofouling epoxy coatings were developed to mitigate biofilm formation in water pipes and pumps, enabling the Hong Kong Water Supplies Department to enhance operational efficiency and sustainability with lower energy usage and reduced maintenance frequency. These advances illustrate the seamless continuum running from scientific inquiry and laboratory validation, through industrial partnership, to deployment on the ground for maximum societal benefit.

The economic impact of the research projects has been significant. The commercial scale-up through industry partners such as Chiaphua Industries Ltd. led to hundreds of millions in sales worldwide for air purification systems. The Germagic PET line, built on MAP-1 polymer technology, reached more than 800 organisations and generated tens of thousands of units in retail sales in 2024. Meanwhile, the application of antibiofouling coatings reduced municipal energy consumption, resulting in direct cost savings as well as environmental benefits. The experience gained through this industry–academia–government cooperation fostered a vibrant entrepreneurial landscape, giving rise to four technology spinouts and reinforcing Hong Kong’s position in emerging environmental and biotechnology sectors.

The wider social implications of these achievements are equally significant. Rapid product deployment during the COVID-19 crisis safeguarded medical staff and the wider community, while technology donations to hospitals in major Chinese mainland cities demonstrated a swift and compassionate response to public emergencies through robust industrial–academic alliances. Improvements in water and drainage systems enabled by innovative coatings not only advanced public health, but also contributed to the creation of safer, more liveable urban environments for millions. Policy makers, business leaders, and the broader public have gained from the timely availability of scientifically validated, economically viable, and socially responsible technological solutions. This case exemplifies an advanced mode of collaboration, where boundaries between research, industry, and society are intentionally permeable, unlocking new avenues for transformative impact and sustainable progress. In doing so, HKUST’s approach signals a new ethos in university engagement—one that is defined by actionable partnership, continual innovation, and a far-reaching positive influence on everyday life.

1.3 University–industry joint affiliations

HKUST exhibits a strategically balanced approach to joint affiliations, with robust and tightly integrated academic–industry collaboration across local, regional, and global levels. Representative partners include technology leaders such as Tencent, Alibaba, Amazon, and Google, demonstrating HKUST’s extensive industry engagement and global reach.

University–industry joint affiliations

Next-generation universities are moving from joint research to pioneering deeply integrated university–industry ecosystems. A key development in this progression is the shift from collaborative research projects to arrangements in which researchers hold joint affiliations with both academia and industry. This institutionalises partnerships at a structural level and weaves an enduring fabric of collaboration beyond joint research. This framework informs research agendas, educational programmes, and innovation strategies.

Over the past five years, HKUST has had 90 researchers with joint affiliations, accounting for 1.08% of the total—more than twice the share of its local peer institutions (Figure 1.3.1). Among global peers, Nanyang Technological University stands out with both the largest number and highest proportion of researchers with joint affiliations. In comparison, Georgia Institute of Technology, Delft University of Technology, and Pohang University of Science and Technology each has a joint affiliation share slightly above 2%, indicating broader adoption. These variations reflect different institutional strategies and highlight the increasing importance of affiliation beyond just the home institution to cultivate sustainable, enduring, and mutually beneficial partnerships between universities and industry.

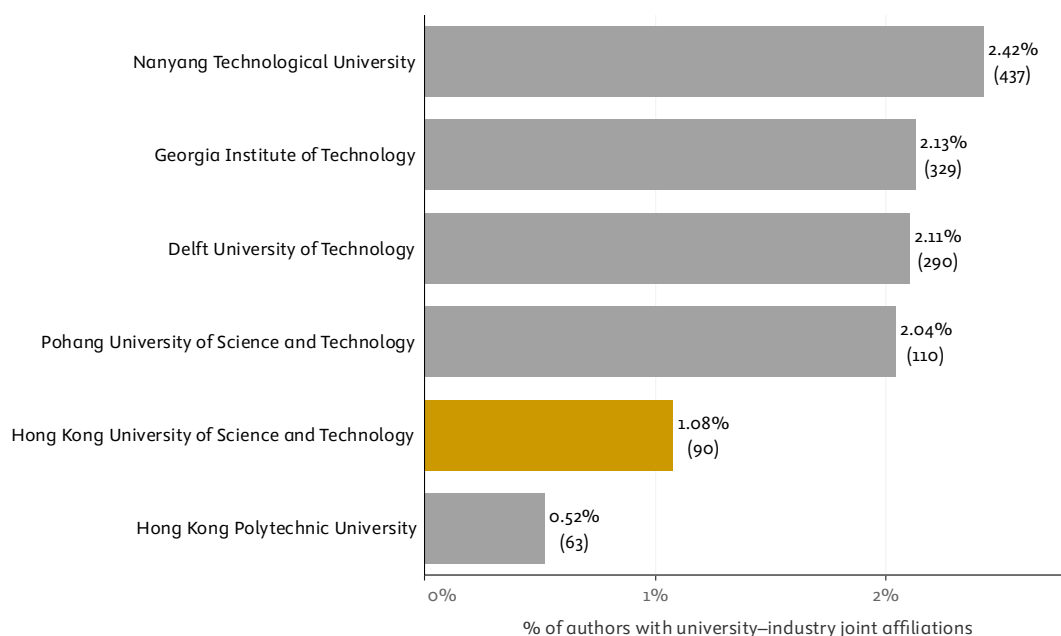


Figure 1.3.1 Share of university authors with university–industry joint affiliations (2019–2023). The count of authors is shown in brackets.

Source: Scopus

Primary fields for joint university–industry affiliations

An analysis of the top ASJC subject areas by output share for publications authored by researchers with university–industry affiliations sheds light on the disciplinary focuses of HKUST compared to its peer institutions (Figure 1.3.2). At HKUST, Computer Science leads as the subject area with the greatest share of research output with joint affiliations, while notable contributions to such output also come from Social Sciences and Arts and Humanities, which is quite uncommon among peer institutions. This demonstrates a broad distribution of subject areas among HKUST’s researchers, extending beyond purely technical domains.

Peer institutions show distinct profiles in this type of research output. Georgia Institute of Technology has a strong emphasis in Computer Science and Engineering, and it diverges from other technology-focused universities with a notable share of output in life sciences, including Medicine and Biochemistry, Genetics, and Molecular Biology. Delft University of Technology maintains a clear focus on Engineering, complemented by relatively unusual concentrations in Earth and Planetary Sciences, Environmental Science, and Energy. Pohang University of Science and Technology is characterised by its primary emphasis on Materials Science, followed by Physics and Astronomy.

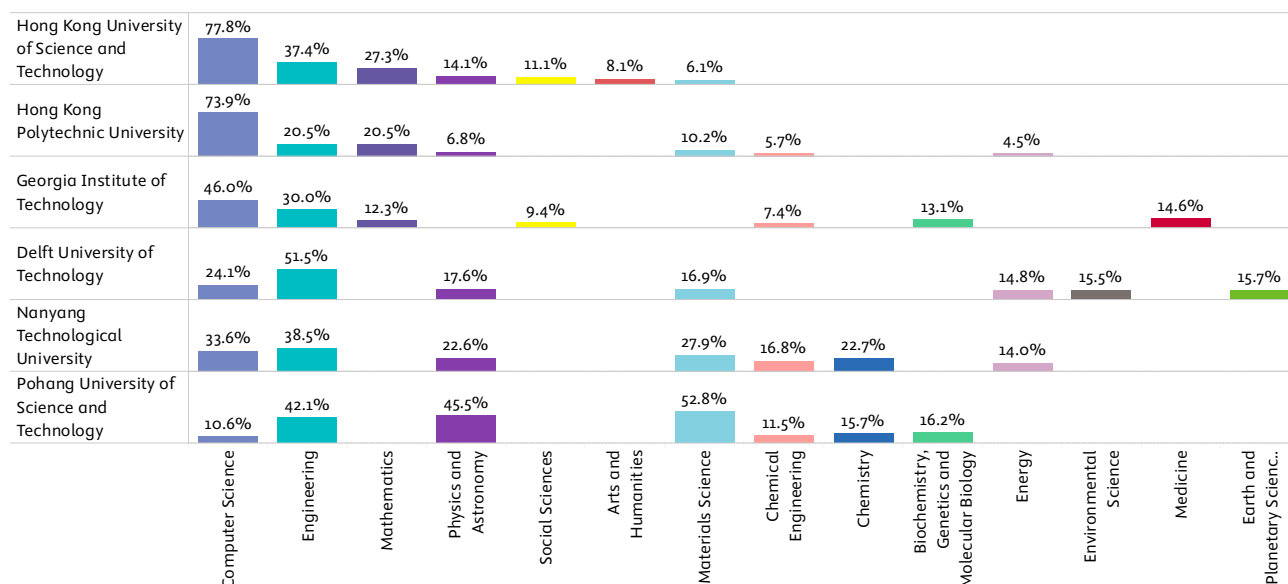


Figure 1.3.2 Top 7 ASJC subject areas by share of publications from researchers with university–industry joint affiliations, HKUST and comparators (2019–2023).

Source: Scopus

Geographic distribution of joint affiliation researchers

A closer examination of the geographic distribution of authorship highlights distinct patterns among the comparator institutions (Figure 1.3.3 and Figure 1.3.4). At HKUST and Delft University of Technology, there is a balanced mix of authors linked to corporate partners who are located locally, regionally, and globally. This diversity reflects these universities' ability to foster industry collaborations both within their immediate ecosystems and across national boundaries. In contrast, at Nanyang Technological University, most joint-affiliation authors are associated with corporations located at greater distances from the university, such as Thales Group and Airbus, indicating a strong emphasis on international industry partnerships. Meanwhile, Pohang University of Science and Technology, Georgia Institute of Technology, and Hong Kong Polytechnic University demonstrate a distinct regional focus, with their authors predominantly engaging with corporate partners located within the surrounding region. These variations highlight the different strategic orientations adopted by each institution in leveraging opportunities provided by joint affiliations to build and strengthen industry ties across geographies.

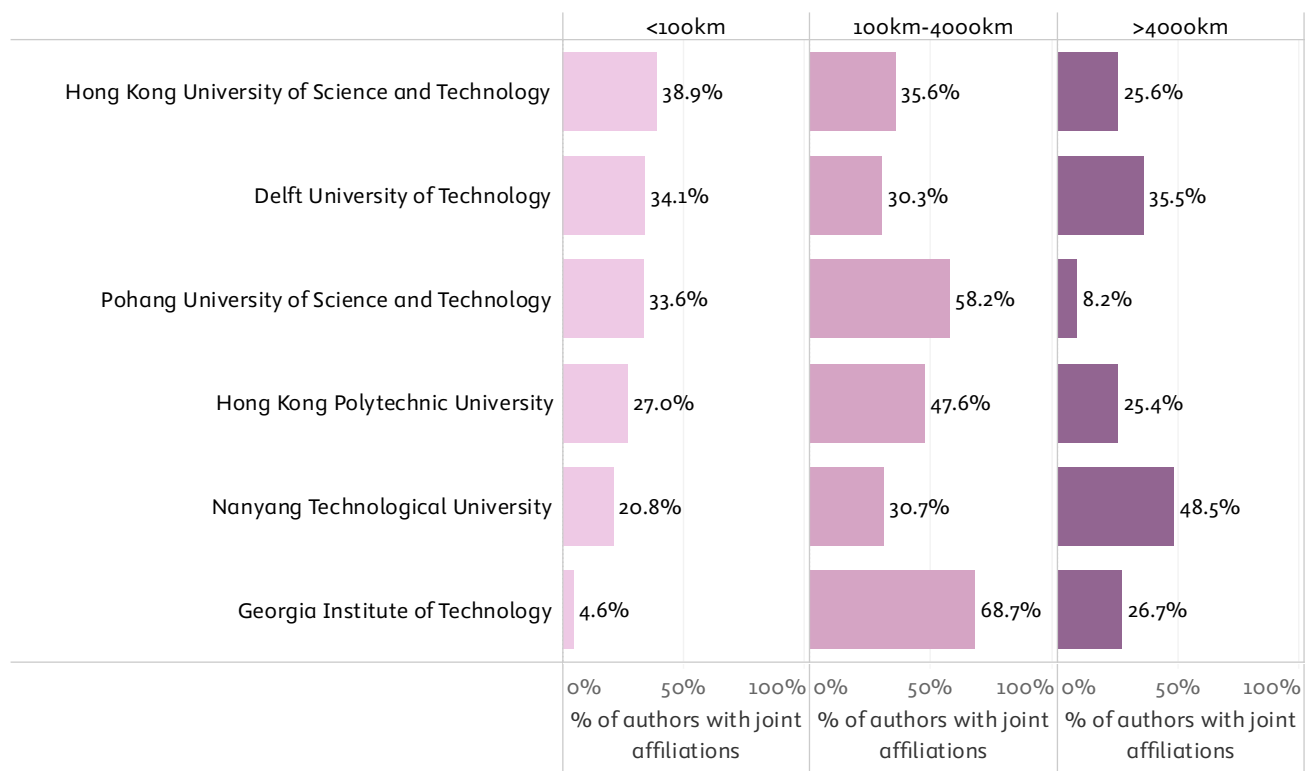


Figure 1.3.3 Share of university authors with a joint university–corporate affiliation by distance between the university and the corporate collaborator (2019–2023). The universities are sorted based on the share of such authors within 100 km of the university.

Source: Scopus



Figure 1.3.4 Distribution of corporate collaborators with which university authors have joint affiliations by distance from the university (log horizontal axis) and number of such authors (vertical axis). Each bubble represents a unique corporate collaborator, with the size of the bubble indicating the number of authors with joint affiliations.

Source: Scopus

Distance from corporate collaborators for HKUST’s joint affiliation researchers

HKUST’s strong academic–industry collaborations are reflected in both its co-authored publication output and joint affiliations with leading technology firms. Notably, most corporations hosting HKUST’s researchers are global and regional leaders in artificial intelligence, internet technology, and digital innovation. The roster includes major Chinese tech giants such as Alibaba, Tencent, Baidu, ByteDance, and JD.com alongside internationally renowned firms including Amazon, Google, and Intel. The list also features companies specialising in cutting-edge AI and data solutions (NAVER, 4Paradigm, and Megvii), as well as leading players in engineering, consultancy, and finance (AECOM, Arup, and Ant Group). This diverse corporate network highlights HKUST’s strong engagement across core high-tech sectors, particularly digital and AI, both within Greater China and globally.

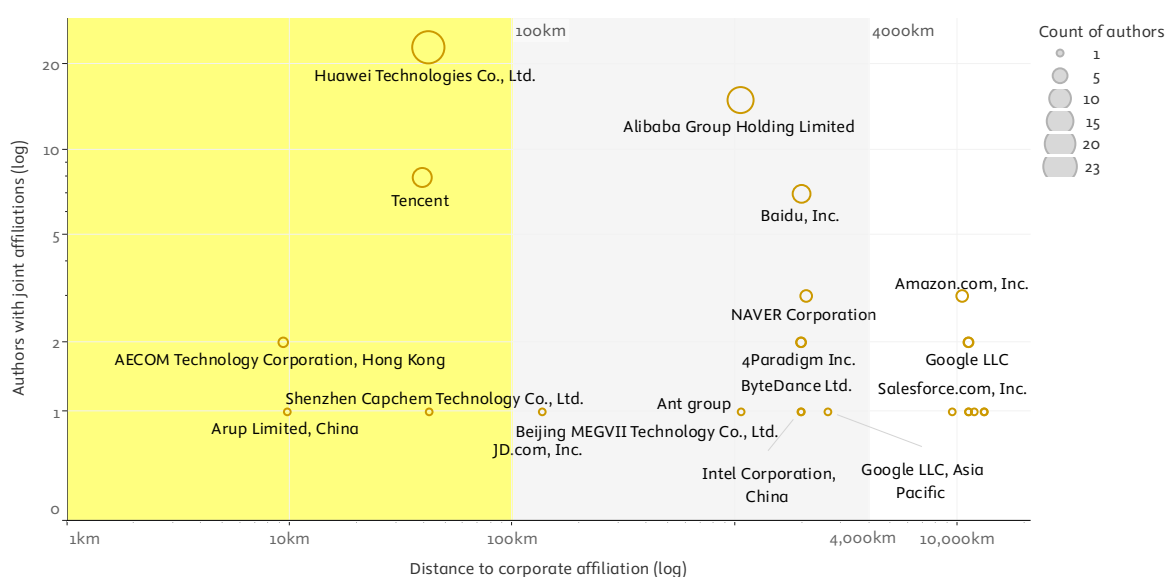


Figure 1.3.5 A detailed view of the distribution of HKUST’s corporate collaborators with which university authors have joint affiliations by distance from the university (log horizontal axis) and number of such authors (log vertical axis). Each bubble represents a unique corporate collaborator, with the size of the bubble indicating the number of authors with joint affiliations.

Source: Scopus

Chapter 2

Entrepreneurship and Transformation of Discovery to Impact



2.1 Knowledge transfer

HKUST has experienced rapid growth in both patent filings and IP licensing in recent years, reflecting the University's vibrant knowledge transfer ecosystem and increasing commercial engagement. Co-owned patents with leading corporate partners underscore HKUST's strength in fostering academic–corporate collaboration and leveraging partnerships for research translation and technology innovation. High rates of patent citation, along with a considerable number of HKUST publications referenced in global patents, further demonstrate the technological relevance and worldwide impact of the University's research output.

Patents and IP licensing

HKUST is dedicated to contributing to economic and societal development, aligning its commitment to innovation and entrepreneurship with the University's five strategic objectives outlined in the Strategic Plan 2031. HKUST's innovation ecosystem synergises all stages from research to impact and nurtures the next generation of entrepreneurs and innovators. In this ecosystem, patent management and strategy and intellectual property (IP) landscaping are indispensable components.

Patent protection and IP licensing are central activities within HKUST's dynamic knowledge transfer ecosystem, both demonstrating a strong upward trajectory in recent years. As shown in Figure 2.1.1, the number of patent applications and granted patents increased substantially between 2019 and 2024, with compound annual growth rates (CAGR) of 11.6% and 31.2%, respectively. In 2024, the University reached a historic peak, recording 443 patent applications and 219 granted patents. From 2019 to 2024, a total of 1,673 patent applications were filed and 706 patents were granted.

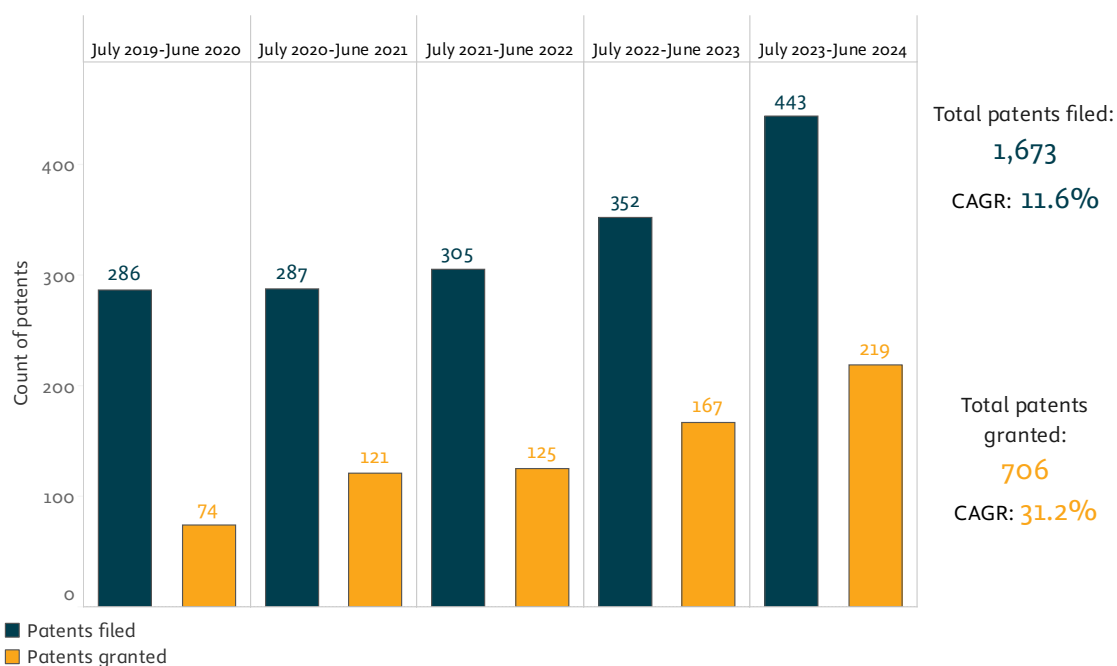


Figure 2.1.1 Number of patents filed and granted at HKUST (2019–2024).

Source: HKUST

Figure 2.1.2 illustrates a positive upward trend in both the aggregated number of IP licences signed and the income generated from IP licensing at HKUST from 2019 to 2024. Specifically, the CAGRs for the aggregated number of IP licences signed and related income were 10.0% and 7.1%, respectively, indicating robust expansion in both the scale and financial return of the University’s knowledge transfer activities. Between 2019 and 2024, HKUST secured more than 100 new IP licensing agreements, bringing the cumulative total of IP licences to 363. IP utilisation rate remained above 30% from 2022 to 2024. This growth underscores the increasing commercial value and impact of HKUST’s research innovations, as well as the University’s strengthened capabilities in facilitating technology transfer and industry collaborations.

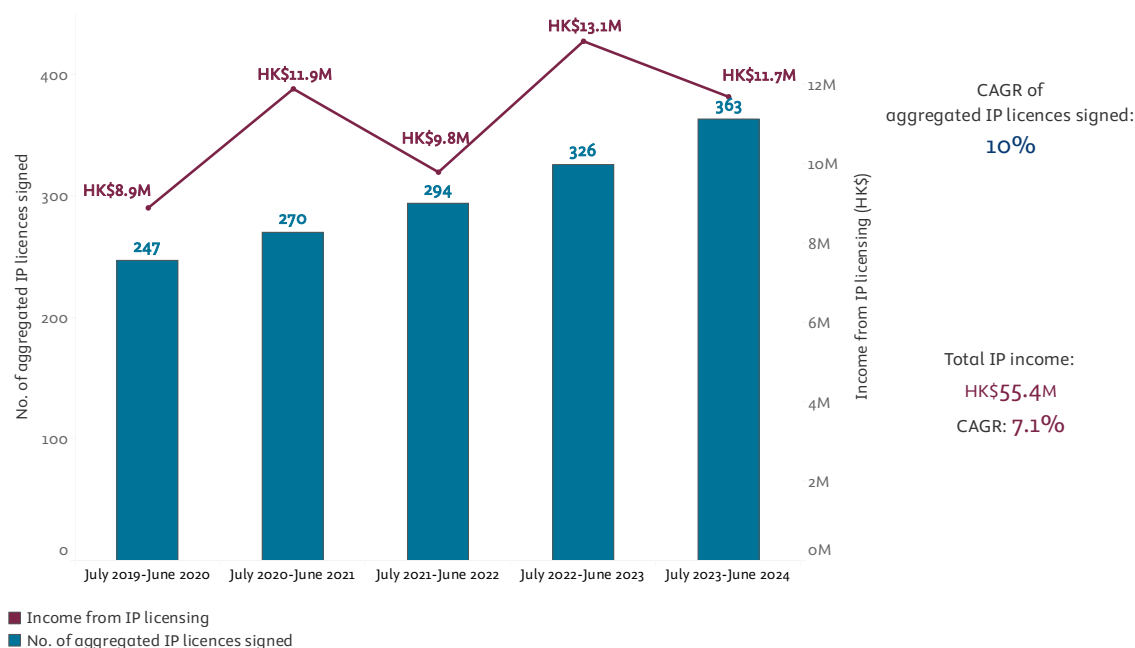


Figure 2.1.2 Number of IP licences and income from IP licensing at HKUST (2019–2024).

Source: HKUST

As part of its commitment to advancing knowledge transfer, HKUST is strategically investing in the development of critical innovation infrastructure and programmes. The University's Strategic Plan 2031 highlights ongoing efforts to enhance the competency and capacity of knowledge transfer units, as well as to sustainably increase investment in support of HKUST innovators. A key milestone in this journey was the approval of HKUST's IP Policy 3.1 by the University Council in October 2023. This updated policy aligns the University's intellectual property practices with the laws and regulations of both the HKSAR and Chinese mainland, enabling the expansion of knowledge transfer activities across both jurisdictions. Policy 3.1 also serves as the foundation for an adapted IP policy for HKUST's Mainland units, with the revised version approved in the second quarter of 2024.

To further strengthen these initiatives, HKUST launched the digitalisation of its IP disclosure and management processes in Q2 2024. This digital transformation has streamlined workflows, reduced administrative burdens, and centralised IP-related data repositories, making information retrieval more efficient and supporting greater collaboration and informed decision-making. The new systems also facilitate improved organisation and tracking of intellectual property assets, enabling more effective analysis, strategic planning, and reporting. Collectively, these developments position HKUST to better support innovation and maximise the impact of its knowledge transfer activities.

Output of academic–corporate co-owned patents

Academic–corporate co-owned patents are intellectual property jointly developed and owned by universities and corporate partners. These patents result from collaborative research efforts, reflecting strong partnerships between academic institutions and industry. Evaluating academic–corporate co-owned patents involves assessing the output and impact of joint innovation between universities and companies. This analysis helps reveal the effectiveness of collaborative

research, highlight key areas of technological advancement, and demonstrate how partnerships contribute to innovation and knowledge transfer.

As shown in Figure 2.1.3, HKUST holds 235 patents that are jointly owned with corporate partners. Each of these patents involves at least one corporate co-owner, reflecting the University’s strong commitment to fostering collaboration between academia and industry and close engagement with industrial partners. When adjusted for research output—a metric that normalises patent activity by the total number of scholarly publications—HKUST produces 1.19 co-owned patents per 100 published papers. Although this figure is lower than that of Pohang University of Science and Technology, which leads with 12.45 co-owned patents per 100 publications, HKUST surpasses other peer institutions, such as Georgia Institute of Technology (1.13) and Nanyang Technological University (1.07). These results underscore HKUST’s relative success in facilitating effective knowledge transfer and building productive partnerships with industry, further demonstrating the University’s prominent role in bridging academic research and real-world applications.

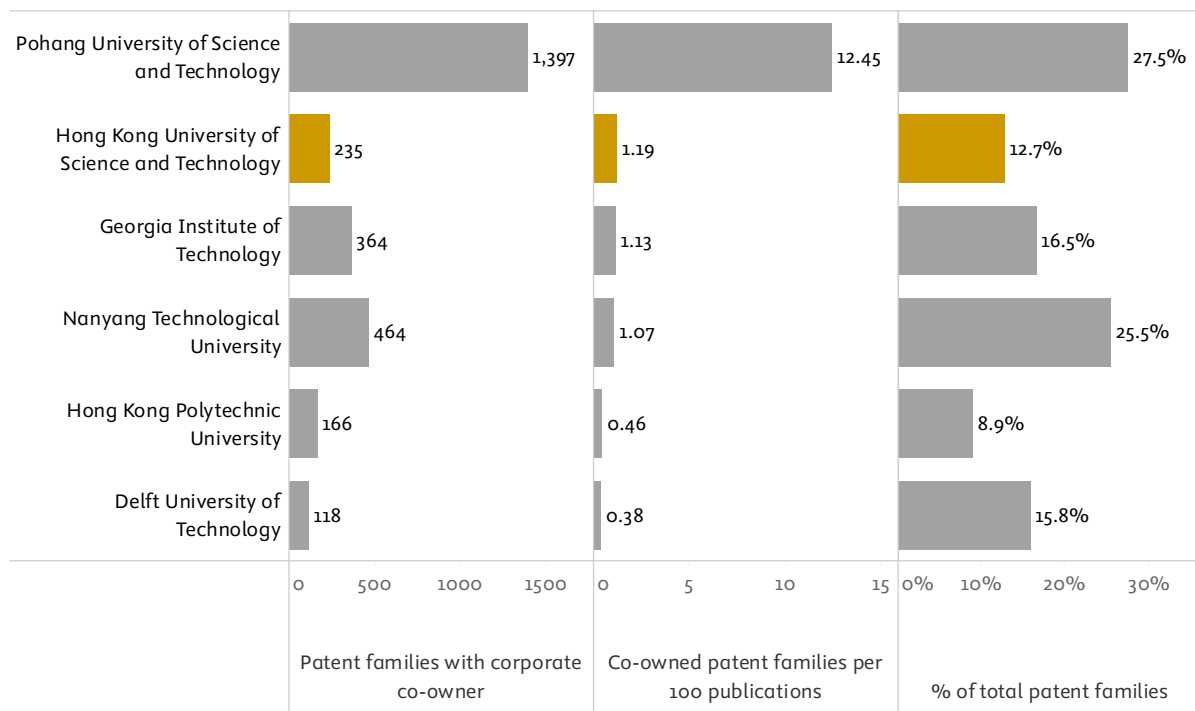


Figure 2.1.3 Patent portfolio co-owned by the university and at least one corporate partner (patents published 2019–2024). The figure displays: 1) Portfolio size 2) Patent portfolio size normalised per 100 scholarly publications 3) share of co-owned patents out of total patent families. The universities are sorted based on patent portfolio size normalised per 100 scholarly publications.

Source: Total Patent

Impact of academic–corporate co-owned patents

To assess the impact of patents, the field-weighted citation impact (FWCI) is commonly used as an indicator. FWCI measures the number of normalised citations a patent receives, providing insight into the technological significance and reach of the underlying invention. Another important metric is market coverage, which quantifies the relative cumulative size of the global markets where the patent is protected, reflecting its commercial and geographical reach.

As illustrated in Figure 2.1.4, HKUST's co-owned patents demonstrate an FWCI that is 1.4 times the global average, indicating that these patents are cited far more frequently than typical patents worldwide. This above-average citation performance highlights the strong relevance and influence of HKUST's inventions within the technological landscape. In terms of market coverage, HKUST is grouped with institutions such as Hong Kong Polytechnic University and Delft University of Technology. However, its market coverage is lower than that of leading peers such as Georgia Institute of Technology and Nanyang Technological University, placing HKUST in the mid-range among comparable universities. These indicators suggest that while HKUST's co-owned patents are highly impactful in terms of technological relevance, there remains potential to further expand their commercial reach and presence in global markets.

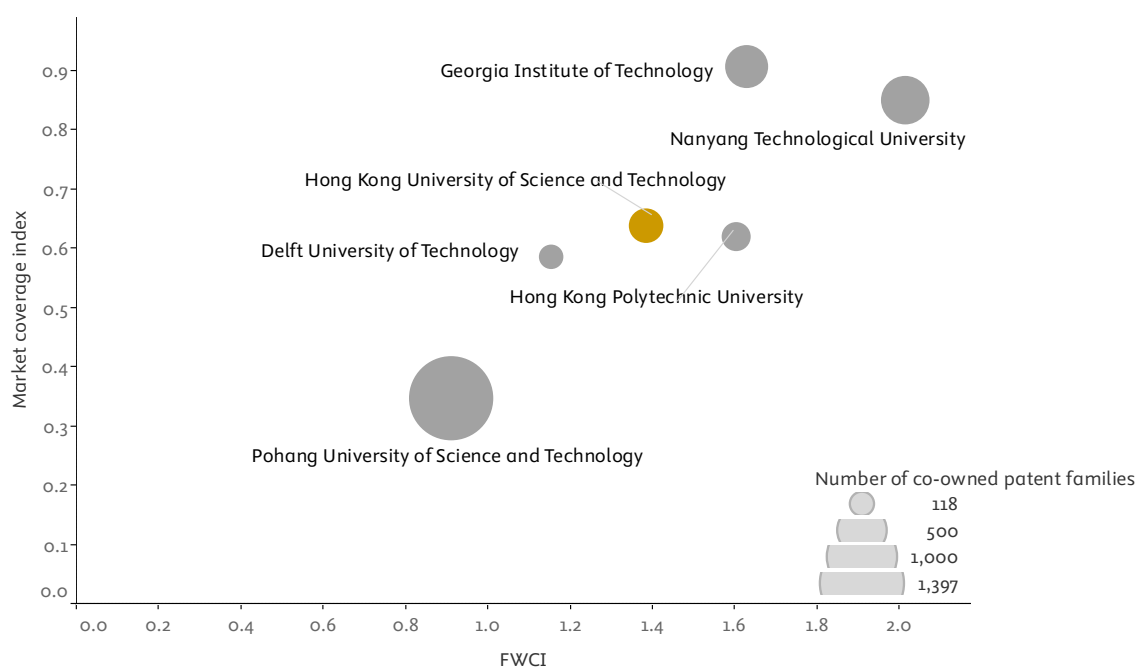


Figure 2.1.4 The FWCI (horizontal axis) and market coverage (vertical axis) of patents co-owned by the university and at least one corporate partner (patents published 2019–2023).

Source: Total Patent

Top corporate partners in academic–corporate co-owned patents

Top corporate partners are those that most frequently collaborate with universities to jointly develop and own patents. These partnerships reflect strong ties between academia and industry in driving innovation and technology commercialisation. Identifying top corporate partners in academic–corporate co-owned patents reveals which companies are most actively engaged in joint research and patent development with academic institutions.

HKUST demonstrates strong collaborations with Greater Bay Area enterprises (shown in Figure 2.1.5), including WeBank (9.4%), Dacang Robotics (8.1%), and Foshan Hinyeun Technology (4.7%). These partnerships have resulted in a distinctive patent portfolio focused on fintech and robotics, reflecting the strength of their collaborative efforts in these fields. In comparison, Pohang University of Science and Technology's co-owned patents with major corporations such as Samsung and POSCO demonstrate its particular strength in the electronics and steel industries. Nanyang Technological University's partnerships with leading companies such as Continental

Automotive Technologies, Singapore Healthcare Services Pte, and Hewlett-Packard Development Company highlight its strengths in the automotive, healthcare, and information technology industries. Hong Kong Polytechnic University’s partnerships with leading organisations such as Huawei and the Artificial Intelligence Design Institute Corporation highlight its strengths in telecommunications and artificial intelligence. Georgia Institute of Technology’s collaborations with major corporations such as ExxonMobil, Dow Global Technologies, and Sila Nanotechnologies highlight its strengths in the energy, chemical, and advanced materials sectors.

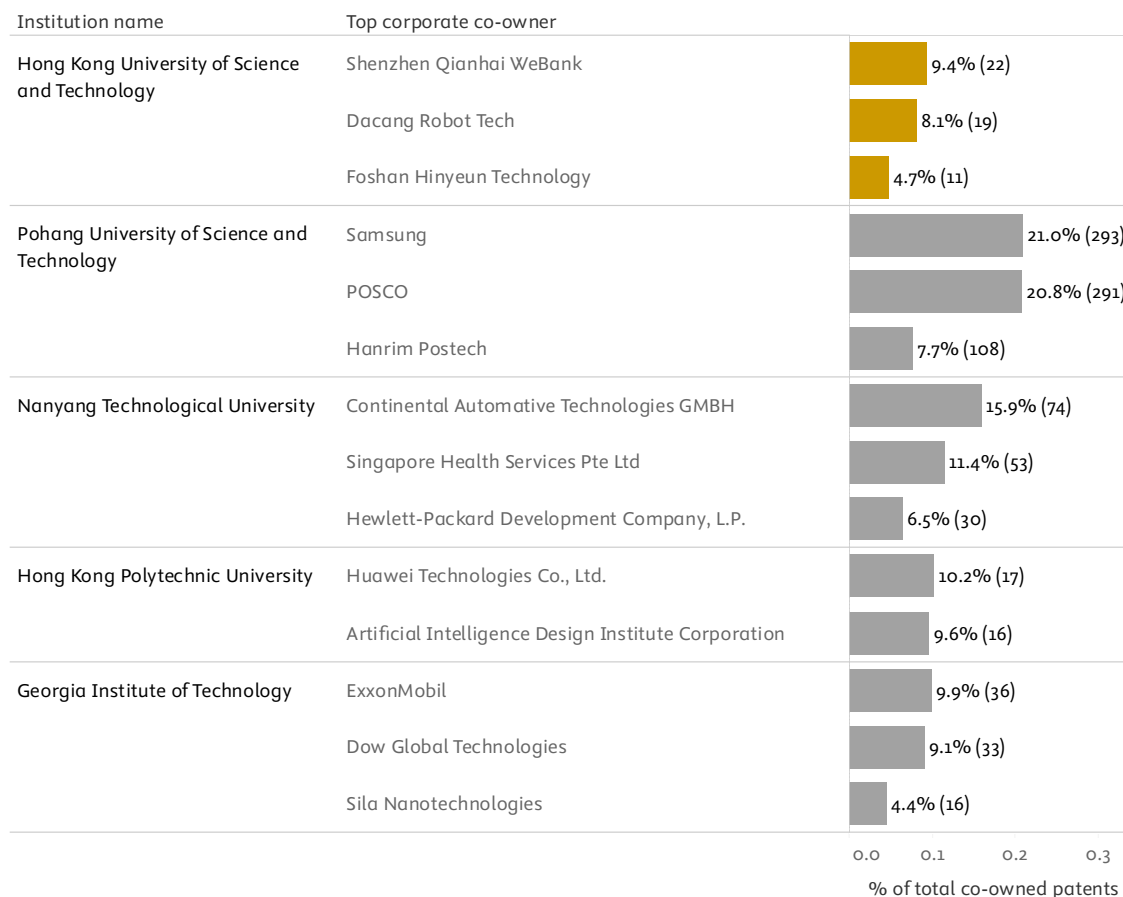


Figure 2.1.5 The top corporate patent co-owners for universities (patents published 2019–2023). Only corporate entities with at least 10 co-owned patents are included. The count of co-owned patents is shown in brackets. Source: Total Patent

Patent citation

Patent documents frequently reference scientific publications as part of the ‘prior art’ search process. These citations are widely recognised as indicators of the close relationship between scientific research and technological innovation. They also serve as valuable tools for analysing patterns of knowledge transfer. Citations to academic papers within patents represent the formal exchange and dissemination of information, reflecting how scientific discoveries contribute directly to technological advancements.

HKUST has demonstrated a strong impact on technological innovation (Figure 2.1.6), with 1,117 of its scholarly publications being cited by international patents. This represents 5.7% of the University’s total research output, positioning HKUST favourably among the peer institutions in terms of research influencing patented innovations worldwide. When examining the frequency of patent citations per 100 publications—a key indicator of the direct translation of academic research into technological applications—HKUST leads its peer institutions with a rate of 12.2. This high level of patent citation underscores the University’s pivotal role in facilitating knowledge transfer from scientific research to industry and highlights the significant contribution of HKUST’s research to the advancement of global technology and innovation.

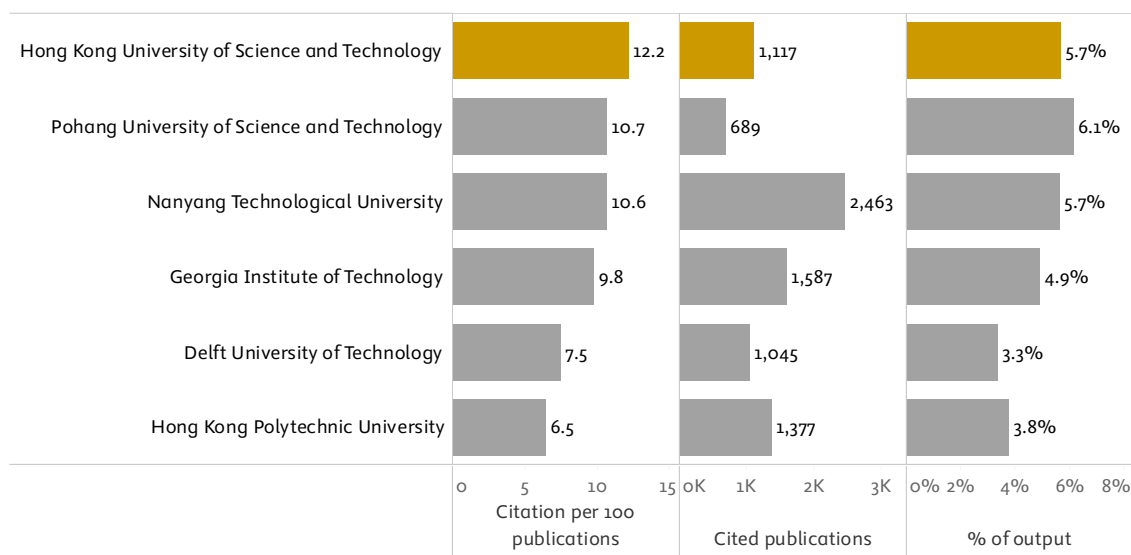


Figure 2.1.6 Patent citation of publications from HKUST and comparator institutions (2019–2023). The figure shows: 1) number of patent citations per 100 publications; 2) number of publications cited at least one time by patents; 3) proportion of publications cited at least one time by patents. Universities are sorted by patent citations per 100 publications.

Source: SciVal

Top 10 patent owners citing HKUST’s publications

Identifying the companies whose patents most frequently reference research produced by HKUST helps show the global reach and influence of the University’s scientific output on technological development. It provides insight into which companies are most actively building upon or utilising the University’s research in their patented innovations. This analysis demonstrates the practical impact of HKUST’s scholarship and reflects the University’s role in shaping advancements across various sectors.

The top patent owners citing HKUST’s publications, shown in Figure 2.1.7, are predominantly leading global corporations, with strong representation from the United States. These organisations are primarily active in sectors such as telecommunications, information technology, software, and semiconductors, reflecting the broad technological relevance of HKUST’s research. Notably, IBM has cited the largest number of HKUST publications (24), underscoring the valuable contributions that the University has made to the international information technology and software industries.

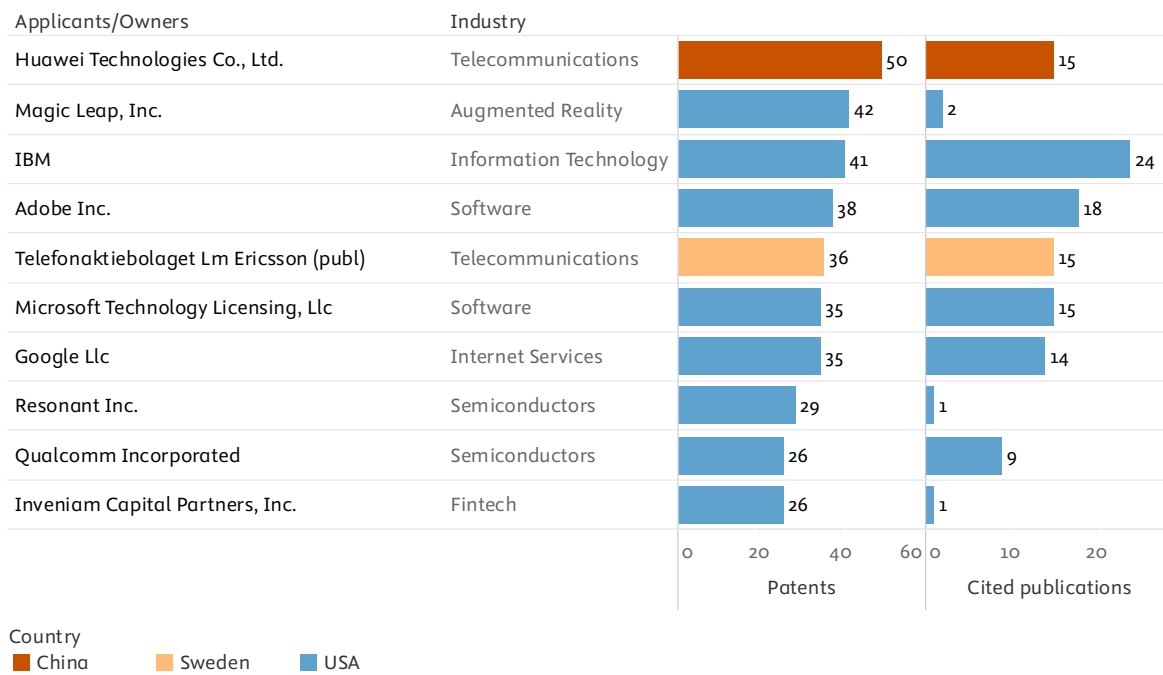


Figure 2.1.7 Top 10 citing corporate entities by number of patents citing HKUST’s publications (2019–2023).

Corporate entities are sorted by number of patents.

Source: SciVal

2.2 Entrepreneurship alumni development

Since 1995, HKUST has generated more than 600 spinout companies that remain in operation, with more than 80% founded in 2016 or later and the vast majority based in the Greater Bay Area. These spinouts are primarily focused on the AI, fintech, healthcare, and advanced materials sectors, driving local economic development and technological innovation. The reach of HKUST's spinout network, both regionally and internationally, underscores the University's pivotal role in translating research excellence into real-world impact.

Spinout companies

Since its early days, HKUST has fostered an entrepreneurial spirit by offering a diverse range of initiatives, including formal education programmes and experiential activities, designed to support members of its community in their business ventures. As one of the first universities in Hong Kong to prioritise entrepreneurship, HKUST has made start-up development a central pillar of its Knowledge Transfer (KT) strategy, cultivating a dynamic campus environment and a strong entrepreneurial culture through a well-structured suite of programmes. Building on this foundation, the University has launched two major KT initiatives over the years: the HK\$500 million Redbird Innovation Fund, with the goal of establishing multiple venture investment funds totalling HK\$2 billion, and a second HK\$50 million tranche to the established Entrepreneurship Fund (E-Fund). These efforts are set to further strengthen the University's support for start-up growth, particularly in DeepTech sectors, and reinforce HKUST's leadership in innovation and knowledge transfer.

Figure 2.2.1 shows the establishment of over 600 active spinout companies at HKUST between 1995 and 2023, exemplifying the University's sustained commitment to fostering entrepreneurship and innovation. Notably, around 81% of these spinouts were founded in 2016 or later, reflecting the substantial impact of HKUST's comprehensive entrepreneurial support ecosystem, which has expanded in recent years through the launch of dedicated funding programmes, experiential learning opportunities, and tailored incubation services. The rapid growth in the number of new ventures, particularly after 2013, underscores how the Redbird Innovation Fund and expanded E-Fund initiatives have accelerated start-up development and deepened HKUST's commitment to translating research into real-world business opportunities. This remarkable increase in spinout activity highlights the effectiveness of the University's multifaceted approach to nurturing entrepreneurial talent and strengthening its position as a leader in innovation and knowledge

transfer. Notably, 83% of these spinouts are in the tech industry, highlighting HKUST's strong focus and expertise in the commercialisation of its technologies.

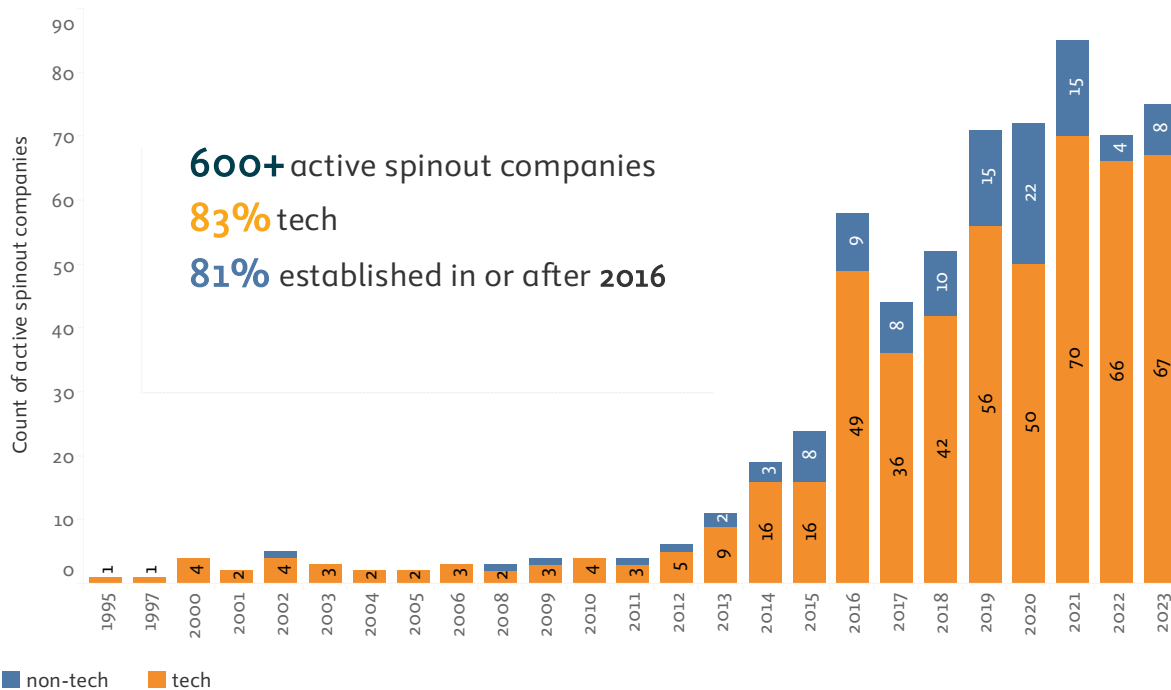


Figure 2.2.1 Distribution of HKUST's active spinout companies by year established (1995–2023).

Above chart reports up to 2023. Data for 2024 and 2025 are pending for collection and verification at the time of this writing.

Source: HKUST

Distribution of spinout companies

Approximately 85% of HKUST's spinout companies are located within a 100-km radius of the University, as shown in Figure 2.2.2, demonstrating HKUST's substantial contribution to the local economy and its pivotal role in regional innovation ecosystems. The concentration of these spinouts' operations close to campus creates high-value jobs, stimulates economic growth, and facilitates knowledge exchange between academia, industry, and the community. Their proximity also enhances opportunities for ongoing academic–corporate collaborations, enabling rapid technology transfer and fostering a culture of entrepreneurship within the region.

These spinouts are at the forefront of applying innovative technologies and pioneering business models across a wide range of sectors, as shown in Figure 2.2.3, including artificial intelligence, fintech, healthcare, energy and environmental technology, and advanced materials. Their activities not only drive technological advancement but also address critical societal challenges, for example, by improving healthcare delivery, supporting sustainable energy transitions, and enhancing financial services. By actively engaging with local partners and stakeholders, HKUST spinouts generate meaningful societal impact, reinforcing the University's position as a catalyst for regional development and as a leader in translating research excellence into tangible benefits for the community.

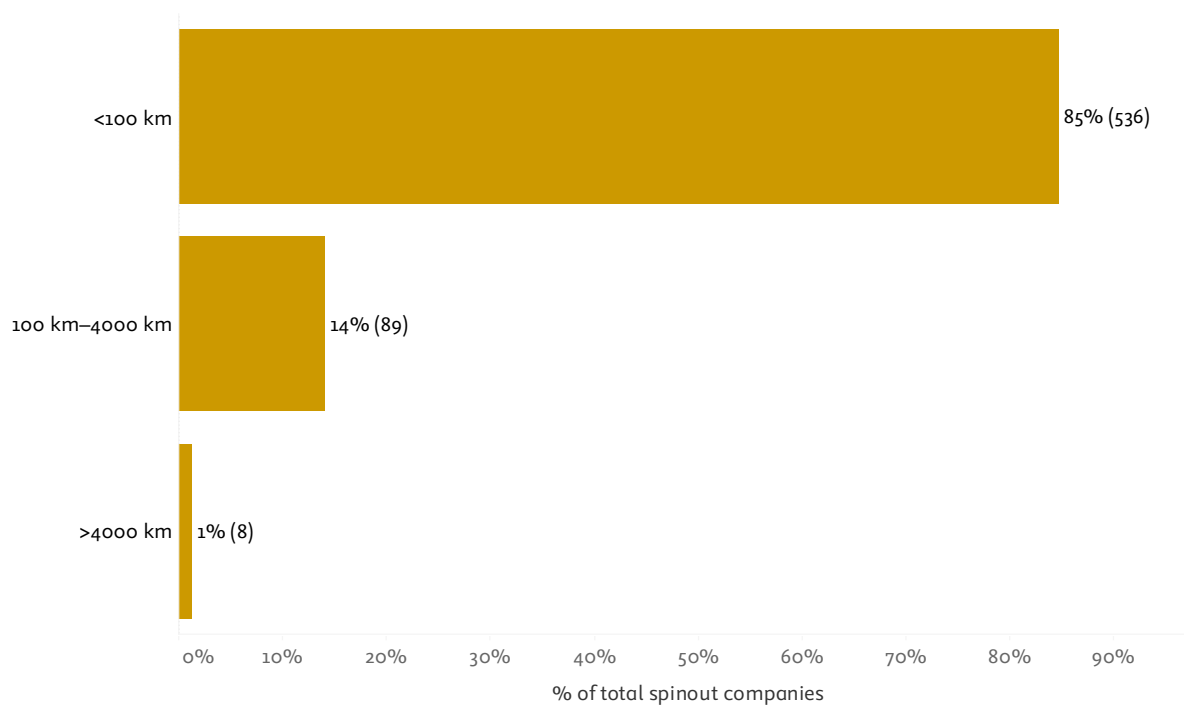


Figure2.2.2 Distribution of HKUST’s spinout companies by distance (1995–2024). The count of spinout companies is shown in brackets.
 Source: HKUST

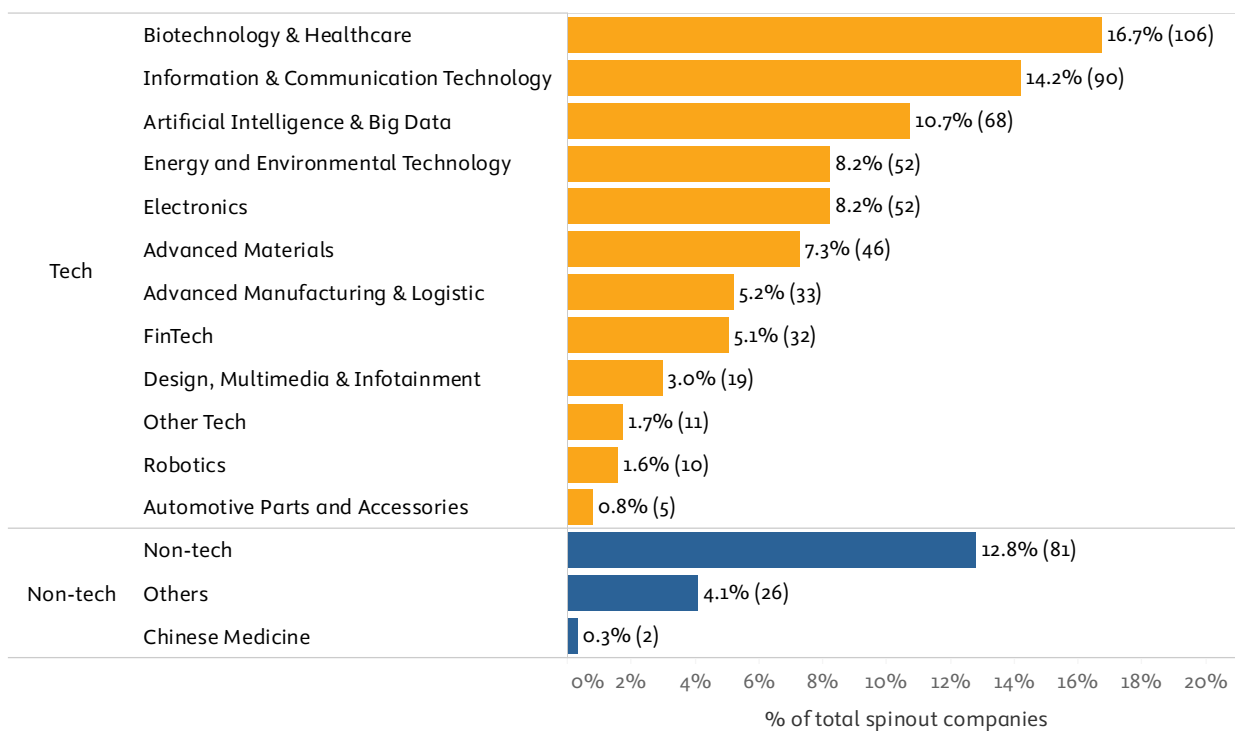


Figure2.2.3 Sectoral distribution of HKUST’s spinout companies (1995–2024). The count of spinout companies is shown in brackets.
 Source: HKUST

A visualisation (Figure 2.2.4) of HKUST's spinout distribution on a world map reveals that the vast majority—98%—are clustered within the Greater Bay Area, underlining the University's strong local and regional engagement. Within this innovation hub, 415 spinouts are headquartered in Hong Kong, reflecting HKUST's deep-rooted influence in the city's entrepreneurial landscape and its ongoing support for local economic growth. Additionally, a substantial number of spinout companies are located in other major cities within the region, with 120 based in Shenzhen, and 53 in Guangzhou. This geographical concentration enables HKUST spinouts to benefit from robust regional networks, streamlined supply chains, and vibrant collaborations with industry and government partners, thereby amplifying their collective impact on economic development, job creation, and technological advancement throughout the Greater Bay Area.

Beyond the region, a select group of HKUST spinouts have extended their footprint internationally, establishing operations in innovation hotspots including Singapore, Russia, the United Kingdom, and the United States. The presence of HKUST-founded companies in these markets demonstrates the University's growing global influence and its commitment to fostering cross-border collaboration, knowledge exchange, and the commercialisation of research on a worldwide scale. Through this dynamic and widespread network of spinouts, HKUST not only reinforces its role in supporting regional economic development but also contributes to the advancement of global innovation ecosystems.



Figure 2.2.4 Geographical distribution of HKUST's spinout companies, 1995–2024.

Source: HKUST

CASE STUDY

Impact on healthcare innovation: economic and societal influence of start-ups

Alzheimer's disease (AD), the most common form of dementia, affects more than 55 million people globally—a number expected to exceed 115 million by 2050, including 40 million in China alone. To address this urgent need, HKUST researchers, led by President Prof. Nancy Ip, have built on three decades of groundbreaking work in molecular neuroscience and neurodegenerative diseases to develop innovative solutions. These efforts have culminated in the launch of a revolutionary AD blood test service—PlasmarkAD™, now available in private hospitals and clinics across Hong Kong, along with preventative measures and novel therapeutic approaches.

To bring the test to market, start-up Cognitact Ltd. was established in 2020 by the team members with assistance from the Office of Knowledge Transfer (OKT), which connected the researchers with investors and helped secure substantial private sector funding. Other start-ups like Infitech Ltd., Editact Therapeutics Ltd., and Plasmotact Therapeutics Ltd. showcase the University's ability to foster entrepreneurship by leveraging its robust knowledge transfer ecosystem, which supports patenting, funding, business development, and investor engagement. These ventures have attracted substantial private sector funding, won prestigious international awards, and contributed to Hong Kong's emergence as a global biotechnology hub.

HKUST's research and innovations in PlasmarkAD™ have made a profound social impact by addressing one of the world's most pressing healthcare challenges. Its applicability across diverse populations promotes health equity on a global scale, particularly in communities underserved by traditional diagnostics. Collaborations with hospitals, NGOs, and community organisations, such as Haven of Hope Christian Service, have brought these innovations into real-world settings, providing early risk assessments and support for patients and caregivers. Additionally, preventative measures like Cogniherbs™ brain health supplements empower individuals to take proactive steps toward healthy ageing.

This blood test is a game-changing innovation, demonstrating how academic discoveries can be transformed into market-ready products that address critical healthcare needs while reducing costs. Moreover, through multifaceted efforts, HKUST has not only advanced public health but also fostered awareness, accessibility, and inclusivity, improving the quality of life for patients, families, and communities worldwide.

CASE STUDY

Impact on entrepreneurship: HKUST's leadership in unicorn development

HKUST has firmly established itself as a leader in unicorn incubation and entrepreneurship development, with its members founding an impressive total of 10 unicorn companies as of May 2025. This achievement underscores the University's dynamic role in nurturing high-growth start-ups and advancing innovative technologies. Notably, HKUST was ranked No. 2 in China for DeepTech unicorn incubation capabilities by New Fortune magazine in 2022, reflecting its strong reputation and impact on the national innovation landscape.

Building on the Strategic Plan 2031's three-fold vision, HKUST continues to reinforce its innovation ecosystem through dedicated infrastructure and robust knowledge transfer (KT) frameworks. A cornerstone of this effort is the DeepTech Incubator, planned as part of the new Innovation Building at the Clear Water Bay campus. This incubator will significantly enhance HKUST's capacity to support business planning and commercialisation of DeepTech projects, providing a strong pipeline for initiatives such as TSSSU, RAISE+, the HKUST Entrepreneurship Fund (E-Fund), and the Redbird Innovation Fund (RIF). By integrating these resources, HKUST not only accelerates the creation of future unicorns but also ensures targeted support for innovative ventures at every stage of development.

The launch of the Redbird Innovation Fund and the Hong Kong government's RAISE+ Scheme have further strengthened the University's entrepreneurial journey. These new funding avenues empower HKUST-affiliated startups to scale their operations, sustain growth, and enhance their transformation potential into unicorns, reinforcing the University's role as an engine of economic and technological progress.

A key example of HKUST's unicorn success is Googol Technology, co-founded by Prof. LI Zexiang and Prof. KO Ping-Keung of the Department of Electronic and Computer Engineering. Established in 1999 and an early participant in the HKUST Entrepreneurship Program, Googol listed on the ChiNext Board of the Shenzhen Stock Exchange in August 2023. As the first Asia-Pacific high-tech company focused on motion controllers and controller-based systems, its products have been deployed across microelectronics, robotics, testing, printing, and packaging. Since its inception, Googol has delivered over 600,000 sets of advanced motion control systems to more than 2,000 equipment manufacturers, demonstrating HKUST's impact on technology commercialisation and industry transformation.

These milestones highlight HKUST's continued support for unicorn growth and a thriving DeepTech innovation ecosystem, reinforcing its leadership in entrepreneurship and knowledge transfer worldwide.

2.3 Entrepreneurial alumni network

HKUST's alumni have established more than 500 spinout companies since 2000, with the majority concentrated in the Greater Bay Area and specialising in technology-driven sectors such as biotechnology, ICT, and AI. These ventures highlight the University's strong entrepreneurial culture and significant contributions to local economic growth and innovation. The global presence of alumni-founded companies further underscores HKUST's role in shaping both regional and international innovation ecosystems.

Alumni-founded spinout companies

HKUST has actively fostered an environment that promotes innovation and commercialisation by strategically investing in the development of strong networks and meaningful partnerships. Recognising the power of connectivity, the University has cultivated a dynamic and supportive alumni network that stretches across industries and continents. This network not only serves as a valuable resource for aspiring entrepreneurs but also enhances mentorship, knowledge sharing, and access to global markets. Through its concerted efforts, HKUST aims not only to enhance its entrepreneurial culture and connectivity but also to empower its community to drive innovation and commercialisation both locally and globally.

HKUST's commitment to nurturing entrepreneurial talent and fostering a supportive alumni network is clearly reflected in the impressive number of alumni-founded spinout companies (Figure 2.3.1). Between 2000 and 2023, a total of over 500 active spinout companies were established by HKUST alumni⁴. These companies are counted in the context of HKUST spinouts explored in the previous section; the overall number of companies founded by HKUST alumni is much higher. Notably, 83% of these alumni-founded spinout ventures were founded in 2016 or later, indicating a remarkable acceleration in entrepreneurial activity within the past decade. This rapid growth, particularly evident after 2013, underscores the effectiveness of HKUST's targeted initiatives and continuous efforts to empower graduates through mentorship, networking opportunities, and access to University resources.

⁴ The actual number of companies started by alumni is many folds higher; the figure here only reflects data collected at the time of writing and companies founded by alumni from spinouts in the previous section.

The fact that more than 80% of HKUST's over 600 spinout companies were founded by graduates of the University further illustrates the central role played by alumni in HKUST's spinout ecosystem. This substantial proportion is a testament to the strength of HKUST's alumni network and its ability to inspire and support entrepreneurial ventures from initial idea to successful commercialisation.

Moreover, the innovation-driven nature of HKUST's alumni community is evidenced by the fact that 81% of these alumni-founded companies operate within the technology sector. This concentration of entrepreneurial activity in fields such as artificial intelligence, fintech, advanced materials, and healthcare highlights the University's prominence as a hub for tech innovation and its success in preparing graduates to lead in cutting-edge industries.

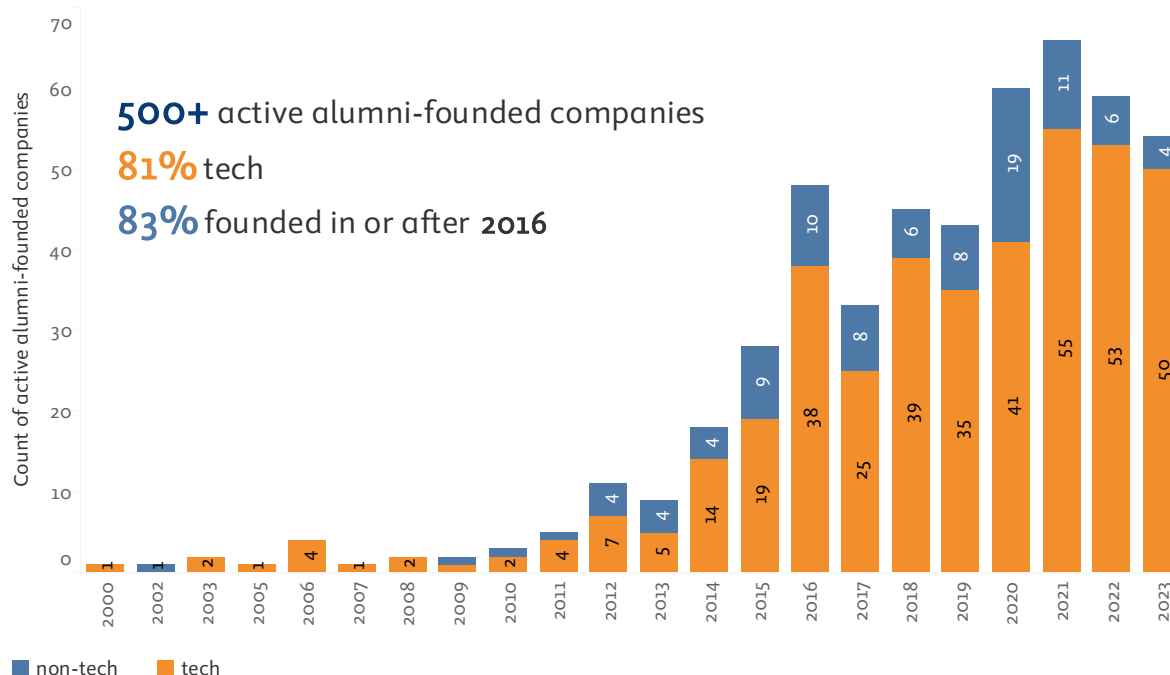


Figure 2.3.1 Distribution of HKUST's active alumni-founded companies by year established (2000–2023).

Above chart reports up to 2023. Data for 2024 and 2025 are pending for collection and verification at the time of this writing.

Source: HKUST

Distribution of alumni-founded companies

As with the University's spinout companies, a significant majority—83%—of HKUST's alumni-founded spinout companies are situated within a 100-km radius of the University, as illustrated in Figure 2.3.2. This close geographic concentration underscores HKUST's strong influence on the local economy, as these ventures directly contribute to job creation, innovation, and the development of a vibrant entrepreneurial ecosystem in Hong Kong and the surrounding Greater Bay Area. The presence of these companies in close proximity to HKUST also facilitates ongoing collaboration between alumni, the University, and industry partners, strengthening knowledge transfer and fostering a culture of continuous innovation.

Additionally, 15% of alumni-founded companies have established operations between 100 and 4,000 km from campus, reflecting the expanding reach and connectivity of HKUST's

entrepreneurial network across regional and international markets. This geographic distribution not only highlights the University’s role in nurturing talent that drives economic activity at home but also demonstrates its ability to shape industries and fuel growth beyond local borders.

Figure 2.3.3 shows that the alumni-founded companies predominantly operate in high-impact sectors such as biotechnology, information and communication technology, artificial intelligence, electronics, energy and environmental technology, and advanced materials. By advancing innovation in these cutting-edge fields, HKUST alumni are actively addressing pressing societal challenges, from healthcare advancements and environmental sustainability to digital transformation.

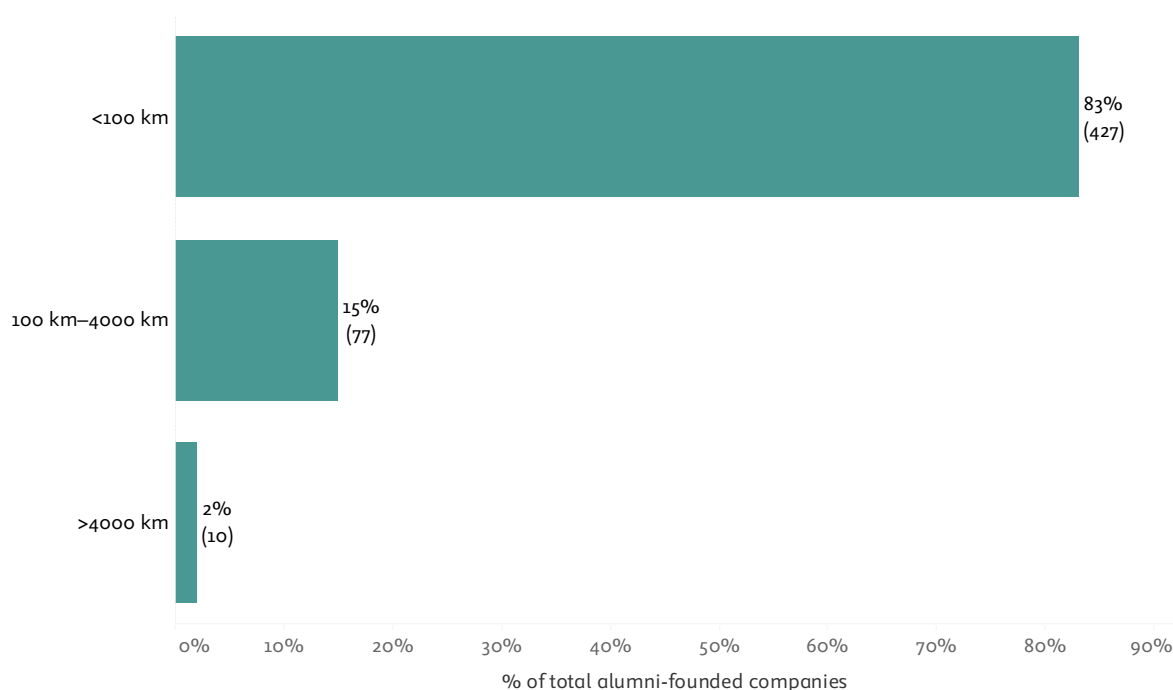


Figure 2.3.2 Distribution of HKUST’s active alumni-founded companies by distance from the University (2000–2025). The count of companies is shown in brackets.

Source: HKUST

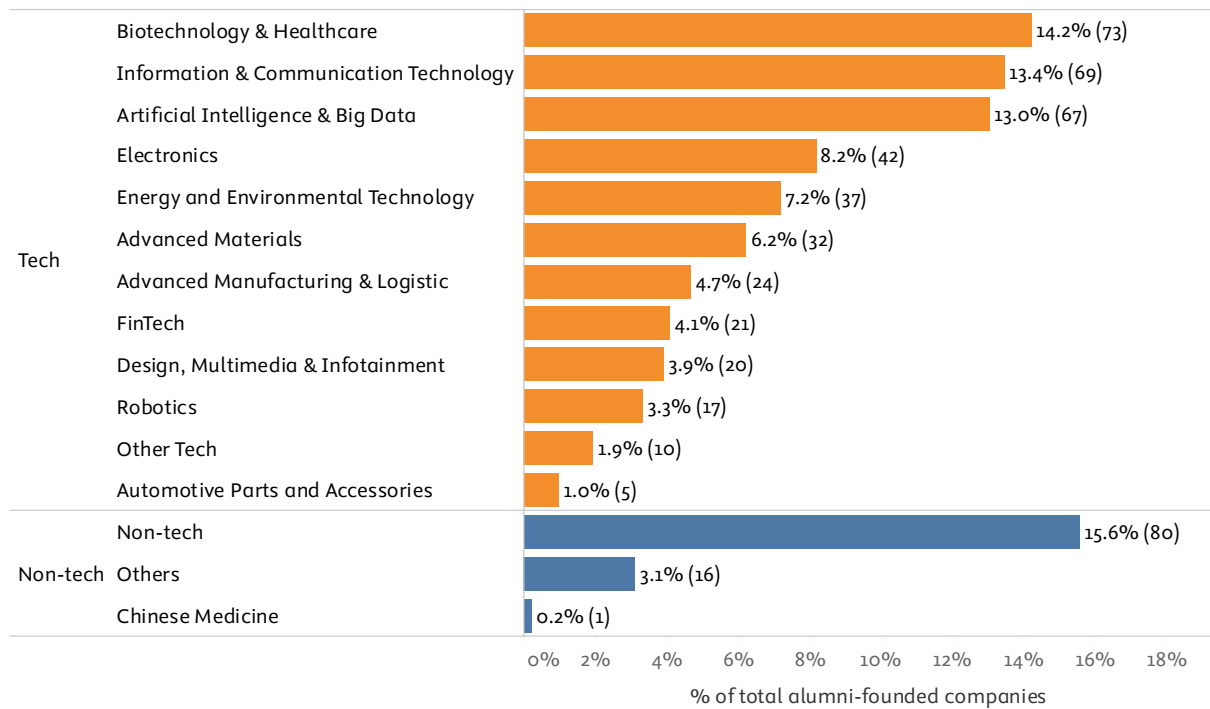


Figure 2.3.3 Sectoral distribution of HKUST's active alumni-founded companies (2000–2025). The count of alumni-founded companies is shown in brackets.

Source: HKUST

A global map of HKUST's alumni-founded companies (Figure 2.3.4) reveals a strong concentration in the Greater Bay Area, with 93% of these businesses established within this dynamic innovation hub. Specifically, 308 companies are located in Hong Kong, 108 in Shenzhen, and 39 in Guangzhou, highlighting HKUST's significant contribution to the economic development and entrepreneurial ecosystem of the region. This geographic focus not only strengthens local industry clusters but also fosters close collaborations between alumni, the University, and local partners, amplifying HKUST's positive impact on job creation, technological advancement, and the overall competitiveness of the Greater Bay Area.

Beyond the region, HKUST's entrepreneurial influence extends to other important global markets. A select number of alumni-founded companies have set up operations in the Chinese mainland outside the Greater Bay Area, as well as in key international hubs such as Singapore, the European Union, and the United States. This international presence demonstrates the University's ability to cultivate globally minded entrepreneurs who adapt their innovations to diverse markets, build cross-border collaborations, and contribute to technology and business development worldwide.



Figure 2.3.4 Geographical distribution of HKUST's alumni-founded companies, 2000–2025.

Source: HKUST

Chapter 3

Sustainability Innovation and Societal Impact



3.1 Contribution to SDGs

HKUST stands out as one of the top universities in sustainability impact, with over a quarter of its research dedicated to addressing SDG-related topics and demonstrating a strong academic impact. The University's distinctive research specialisations in clean energy and marine ecosystems underscore its pivotal role in driving innovative solutions for global sustainability challenges.

Next-generation universities integrate sustainability into all aspects of their mission: research, education, community engagement, and governance. By cultivating a sustainability mindset and driving technological and social innovation, these institutions create an environment where academic excellence and societal impact are interconnected and mutually reinforcing.

HKUST's Strategic Plan 2031 exemplifies this forward-thinking approach, placing sustainability and quality at the core of the University's mission. Building on this strong strategic foundation, HKUST has emerged as an international leader in sustainability, as evidenced by its debut at No. 19 globally and Hong Kong's No. 1 in the 2025 Times Higher Education (THE) Impact Rankings. This recognition reflects HKUST's broad impact in research, stewardship, outreach, and teaching in support of the United Nations Sustainable Development Goals (SDGs).

This international stature is further underpinned by HKUST's outstanding research performance in advancing the SDGs across a wide range of disciplines (Figure 3.1.1). Over the past five years, 26.1% of HKUST's research output contributes to SDG-related topics. With a compound annual growth rate (CAGR) that ranks third among its peers, HKUST shows strong and sustained growth in this critical area. Moreover, it holds the second position in FWCI, highlighting the strong scholarly impact of its research. Together, these metrics underscore HKUST's significant and expanding contribution to global sustainability challenges.

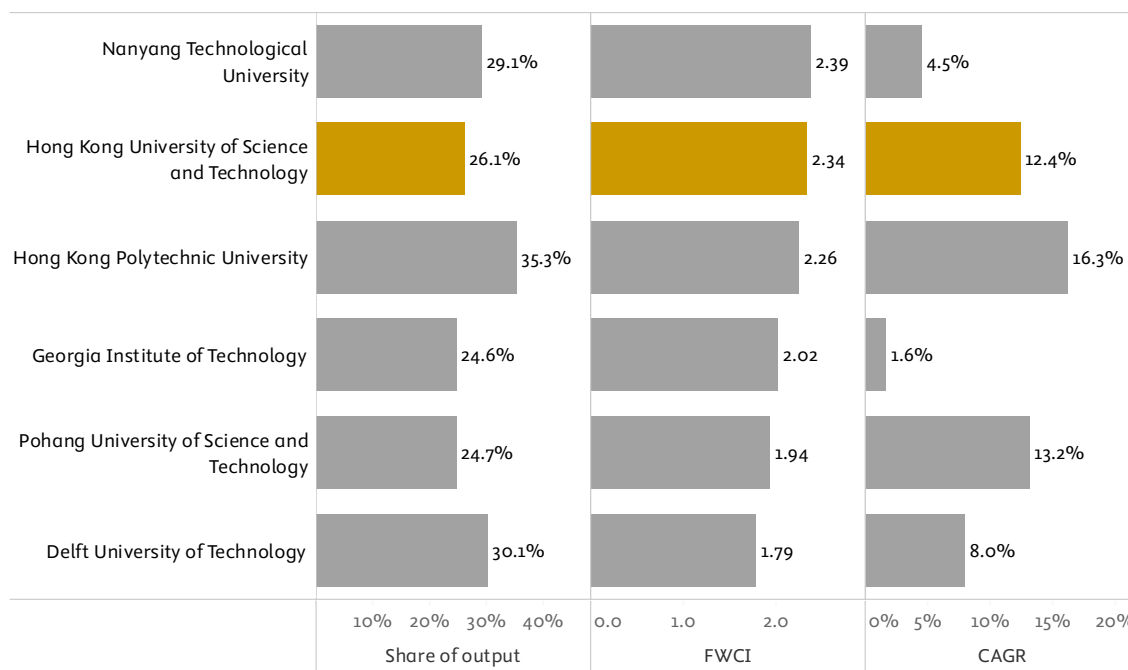


Figure 3.1.1 Share of SDG related publications, FWCI and the compound annual growth rate (CAGR) of SDG-related publications for HKUST and comparator institutions (2019–2023). The universities are sorted based on the FWCI of SDG-related publications.

Source: Scopus

Building on its robust overall SDG-related research, HKUST has developed distinctive research specialisations in specific SDG areas (Figure 3.1.2), particularly SDG 14: Life Below Water, SDG 7: Affordable and Clean Energy, and SDG 11: Sustainable Cities and Communities. Notably, HKUST’s relative activity index (RAI)⁵ in SDG 14 and SDG 7 surpasses the Hong Kong and world averages, underscoring HKUST’s strong commitment to advancing marine sustainability and clean energy solutions. Specifically, its research focuses on innovative solar cells, batteries, and energy-efficient materials relevant to SDG 7, while SDG 14 efforts target marine ecosystem health, including ocean acidification, biodiversity, and water pollution. Furthermore, in all three of these SDGs, HKUST exceeds the Chinese mainland and global averages, highlighting the University’s pivotal role in driving innovative solutions to key sustainability challenges.

⁵ RAI is defined as the share of an institution's scholarly output in an SDG relative to the worldwide share of scholarly output in that same SDG. An RAI value greater than the global benchmark of 1.00 indicates a higher-than-average specialisation in that particular SDG.

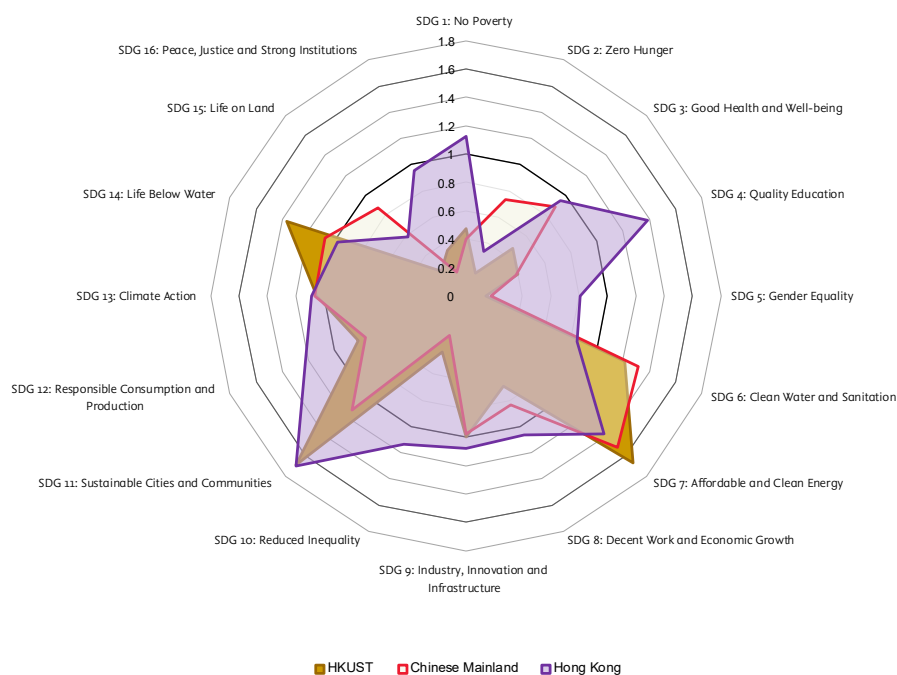


Figure 3.1.2 Relative activity index (specialisation) of HKUST in each SDG area (2019–2023), compared to the global average, Chinese Mainland, and Hong Kong. The global benchmark is represented by the black line at value 1 on the radar chart.

Source: Scopus and SciVal

CASE STUDY

Dynamic traffic modelling for sustainable urban mobility: HKUST's impact on congestion reduction and socio-economic progress

Urban congestion, environmental challenges, and resilient infrastructure are pressing issues in sustainable urban development. Professor Hong Lo and his team at HKUST have made transformative contributions in tackling these problems through the advancement of dynamic traffic modelling. By moving away from traditional static modelling, they have pioneered adaptive methods that address both operational and strategic needs in urban transportation—reducing congestion and emissions while enhancing network connectivity and resilience.

At the heart of this research lies the Dynamic Signal Control Optimization (DISCO) system, an innovative technology that adjusts traffic signals in real-time by factoring in shockwaves and queue spillbacks. The research further incorporates advanced service planning models and machine learning, enabling large-scale optimisation of complex transportation networks. This multifaceted approach allows cities to manage congestion proactively and build more robust, future-ready transport infrastructure.

The application and impact of these innovations are evident in multiple metropolitan regions. In Hong Kong's Tung Chung New Town, the implementation of DISCO at Intelligent Junctions has significantly cut commuter delays, benefitting hundreds of thousands of residents and workers. Collaboration with municipal authorities has transformed traffic management in areas such as the Kwun Tong Commercial-Industrial District—reducing required manpower by 80% and journey times by up to 65%. In severely congested Bangkok, DISCO's introduction at busy intersections has also yielded measurable improvements. HKUST's dynamic simulation models, also adopted by MTR, have further advanced rail service planning and network resilience.

The economic value of these advances is substantial. Reduced travel delays and optimised public transport contribute directly to increased workforce productivity, economic growth, and greater efficiency in the movement of goods and people. The successful adoption of these frameworks in Hong Kong and Bangkok demonstrates their adaptability and economic potential for global cities facing similar challenges.

Beyond the technical and economic sphere, the social impact has also been profound. Reliable, efficient transportation systems improve quality of life, create more equitable access, and promote urban sustainability—all critical components of the UN Sustainable Development Goals. Policymakers and business leaders benefit from data-driven, practical solutions that inform resilient, adaptable city planning.

Through these efforts, HKUST exemplifies the mission of a next-generation university—to drive systemic and sustainable urban transformation not in isolation, but by bridging innovation with immediate societal and economic relevance. The work led by Professor Hong Lo's team not only advances the technical state-of-the-art in transportation science but also reflects a holistic approach to the Sustainable Development Goals, fusing academic rigour, industry cooperation, and public benefit. In doing so, the University positions itself as an essential architect for the cities of tomorrow, proactively shaping urban futures that are efficient, resilient, and profoundly sustainable.

3.2 Alignment with key strategic fields

Aligning research with key strategic fields ensures HKUST remains at the forefront of innovation and societal relevance. HKUST leads its peers in scholarly impact in AI, Net Zero, and New Materials, while showing high specialisation in AI, Net Zero, Environmental Science, and Quantum Technology.

Alignment with key strategic fields is crucial for next-generation universities as it ensures their research and innovation activities remain relevant, forward-looking, and closely connected to societal needs and national priorities. By focusing on fields that are jointly prioritised by government and industry, universities amplify their societal and economic impact, attract leading talent and funding, and position themselves as key drivers of technological progress and global innovation.

Against this backdrop, we examine the five-year research performance of HKUST and its peer institutions in five national and global priority areas: Net Zero, Artificial Intelligence (AI), Environmental Science, New Materials, and Quantum Technology. These fields are selected for their transformative potential: Net Zero⁶ and Environmental Science respond to urgent climate and sustainability goals; AI and Quantum Technology catalyse the next wave of digital innovation; and New Materials enable advances across industries from energy to healthcare. The consistent focus of HKUST and peer institutions on these areas highlights their current relevance and underscores their pivotal role in shaping the industries and socioeconomic landscapes of the future.

Among the five strategic fields (Figure 3.2.1), HKUST stands out as particularly prolific in Net Zero and Environmental Science research, with more than 1,800 publications produced in each field over the past five years, reflecting its high productivity in sustainability and climate action. Compared to its peer universities, HKUST demonstrates notable dedication to both Environmental Science and AI, ranking third in research output share in these areas.

⁶ The Net Zero dataset is a combination of publications from SDG 7 and energy related publications from SDG 13, looking at science and innovation trends in clean energy and carbon removal. The 'Net Zero' report is available from <https://www.elsevier.com/connect/net-zero-report>

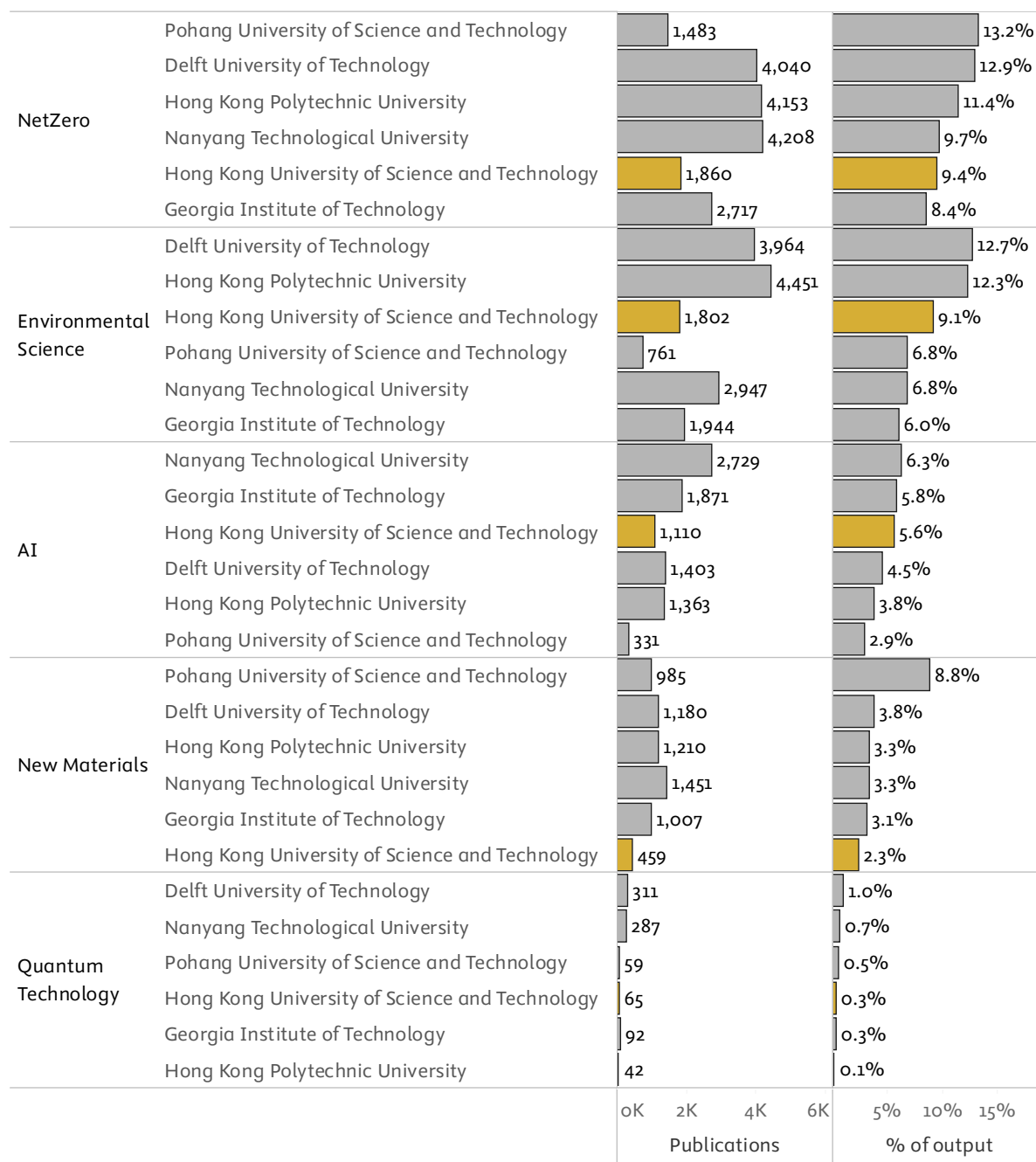


Figure 3.2.1 Number and share of publications in key strategic fields for HKUST (orange) and comparators (grey) (2019–2023). The universities are sorted based on the share of publications in key strategic fields.

Source: Scopus

Within each of strategic fields (Figure 3.2.2), HKUST demonstrates deep specialisation by cultivating expertise in carefully selected niche areas, as evidenced by the University’s leading research output and impact in the most published topics within each field. In the rapidly evolving arena of AI, HKUST distinguishes itself through significant contributions to the topic ‘Federated Learning Systems for Data Privacy Enhancement’. This topic not only represents the highest volume of scholarly publications but also achieves very high FWCI, indicating both productivity

and global research influence. Similarly, in the critical field of Net Zero, HKUST excels in pioneering research on ‘Non-Fullerene Solar Cell Materials’. The University excels in both research output volume and FWCI in this topic, reflecting a sustained commitment to advancing innovative materials and energy solutions essential for sustainable development.

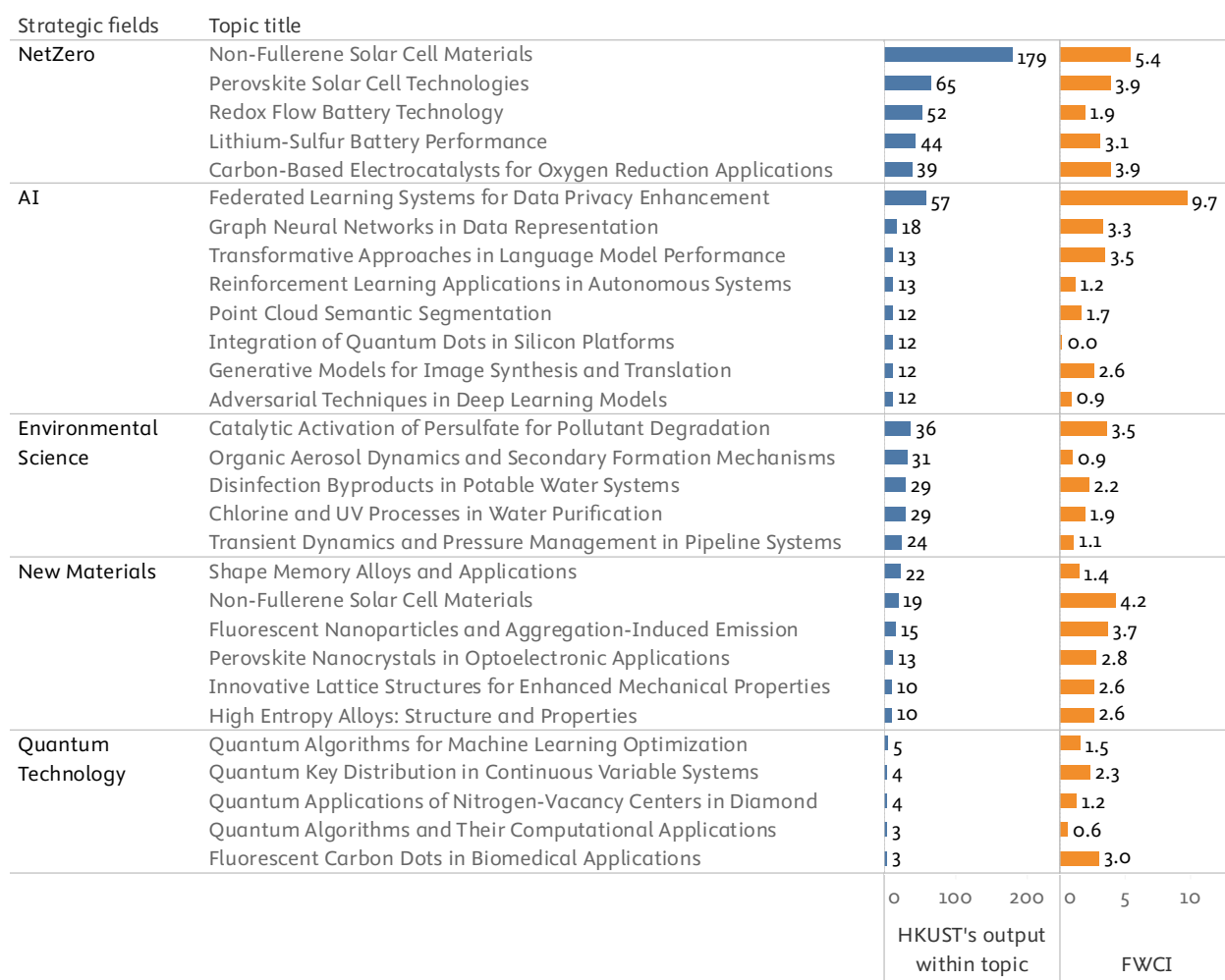


Figure 3.2.2 Number and FWCI of publications in the top 5 most published topics within each key strategic field for HKUST (2019–2023).

Source: SciVal

Beyond productivity, HKUST distinguishes itself through the scholarly impact of its research, with FWCI across all five strategic fields exceeding the global average (Figure 3.2.3). Notably, HKUST leads its peers in FWCI within AI, Net Zero, and New Materials, demonstrating HKUST’s leading research impact in these fields. Furthermore, HKUST’s relative activity index (RAI) in AI, Environmental Science, Net Zero, and Quantum Technology exceeds the world average, underscoring the University’s high specialisation in these pivotal fields. Collectively, these performance indicators reflect HKUST’s ability to deliver both depth and excellence, positioning it at the forefront of global research in key strategic areas.

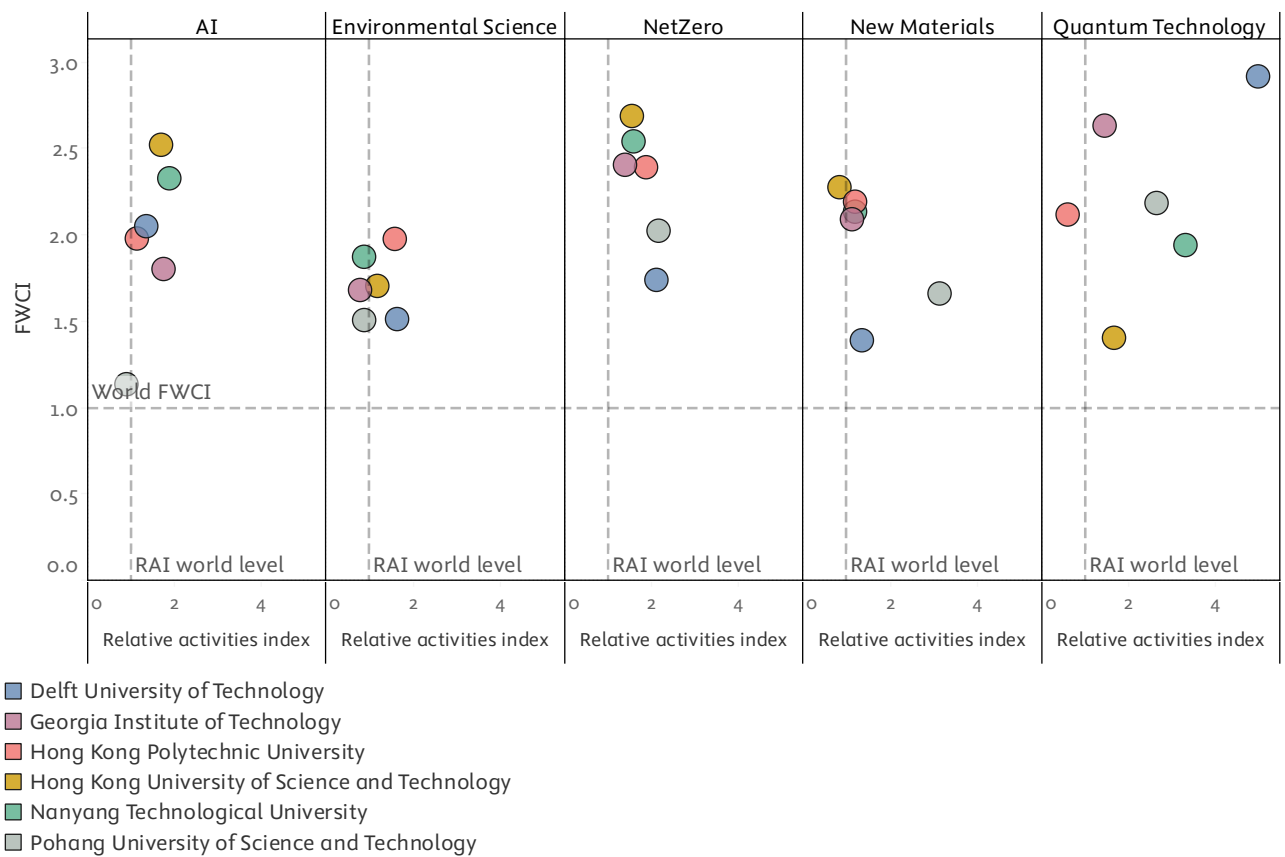


Figure 3.2.3 FWCI (citation impact) and relative activity index (specialisation) of HKUST (orange) and comparators in key strategic fields (2019–2023).

Source: Scopus.

3.3 Societal impact

HKUST stands out for both the depth and global reach of its societal impact, combining high levels of public engagement through social media with exceptional influence on international policy, particularly in global health and economic governance.

Policy citation

Today's leading universities are transcending traditional academic boundaries to deliver societal value. Excellence is increasingly defined by the ability to generate meaningful societal change and drive public value. At HKUST, this shift is reflected in the Strategic Plan 2031, which prioritises translating cutting-edge research into meaningful non-technological solutions that benefit society. By fostering links with government, industry, and communities, HKUST research is incorporated into evidence-based policy frameworks and translated into social innovations, ensuring that its discoveries reach the public quickly and effectively.

An essential aspect of societal impact is the influence research has on policy. To evaluate how effectively academic work informs policymaking, we use policy citations as a key metric. Policy citations quantify the extent to which HKUST's research contributes to real-world decision-making by tracking the number of policy documents that reference the University's scholarly publications. For more detailed information on the data sources for this metric, please refer to Appendix B.

HKUST leads all peer institutions in policy citations (Figure 3.3.1), with 3.6 citations per policy-referenced publication—demonstrating the substantial influence of its research on policymakers. However, only 1.9% of HKUST's total output is cited in policy documents, trailing peers such as Delft University of Technology (5.1%) and Nanyang Technological University (3.3%). Given the overall scarcity of policy citations, this 'high-impact but selective' pattern suggests that HKUST produces particularly authoritative policy-relevant research, while underscoring the potential to further broaden its reach and visibility in the policy arena.

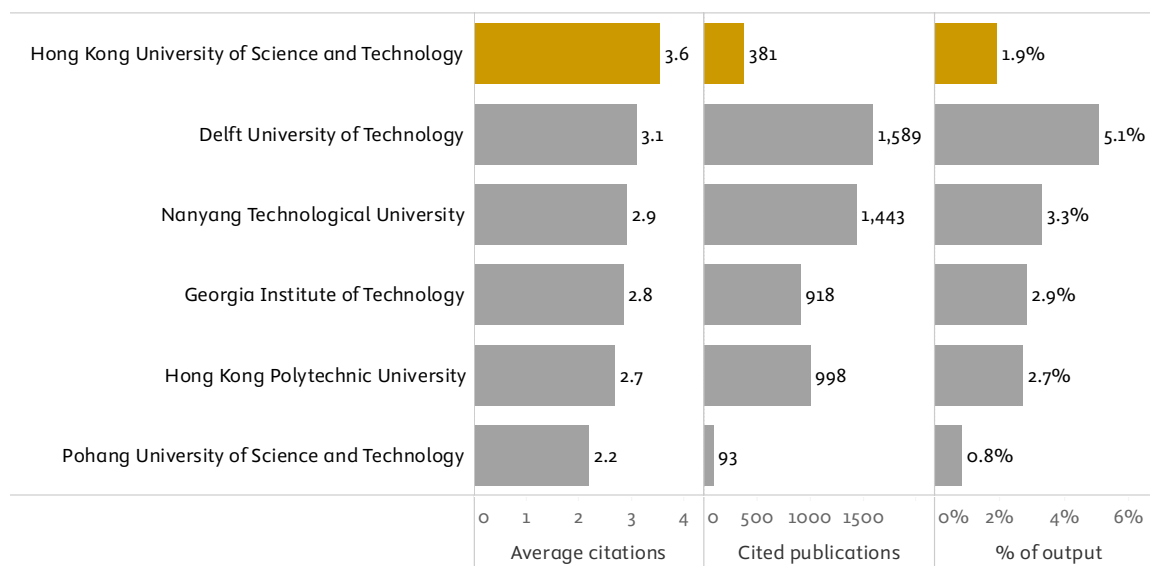


Figure 3.3.1 Policy impact of publications from HKUST and peer institutions (2019–2023).

The figure shows: 1) average policy citations per publication cited; 2) number of publications cited by policy documents; 3) proportion of publications cited by policy documents. Institutions are sorted by average policy citations per publication cited.

Source: *SciVal and PlumX*

HKUST's high level of policy impact is further illustrated by the diversity and prominence of institutions citing its research (Figure 3.3.2). Leading international organisations—including the World Health Organization (WHO) and the World Bank, which reference 85 and 86 HKUST publications, respectively—are among the top users of its work, underscoring the University's influence on global health and development policy. Other prominent intergovernmental bodies among HKUST's top 10 policy citers are UNESCO and OECD. In addition, leading national research institutions in North America and Europe—such as Germany's Ifo Institute⁷ and IZA,⁸ and the United States' National Bureau of Economic Research—regularly cite HKUST's research. This pattern highlights both the University's broad geographic reach and its strong impact in fields such as economic policy and global health governance.

⁷ Ifo Institute is one of Europe's leading economic research institutes, based in Munich, Germany.

<https://www.ifo.de/en/ifo-homepage>

⁸ IZA is a leading research institute specialising in labour market and employment studies. <https://www.iza.org/about-us>

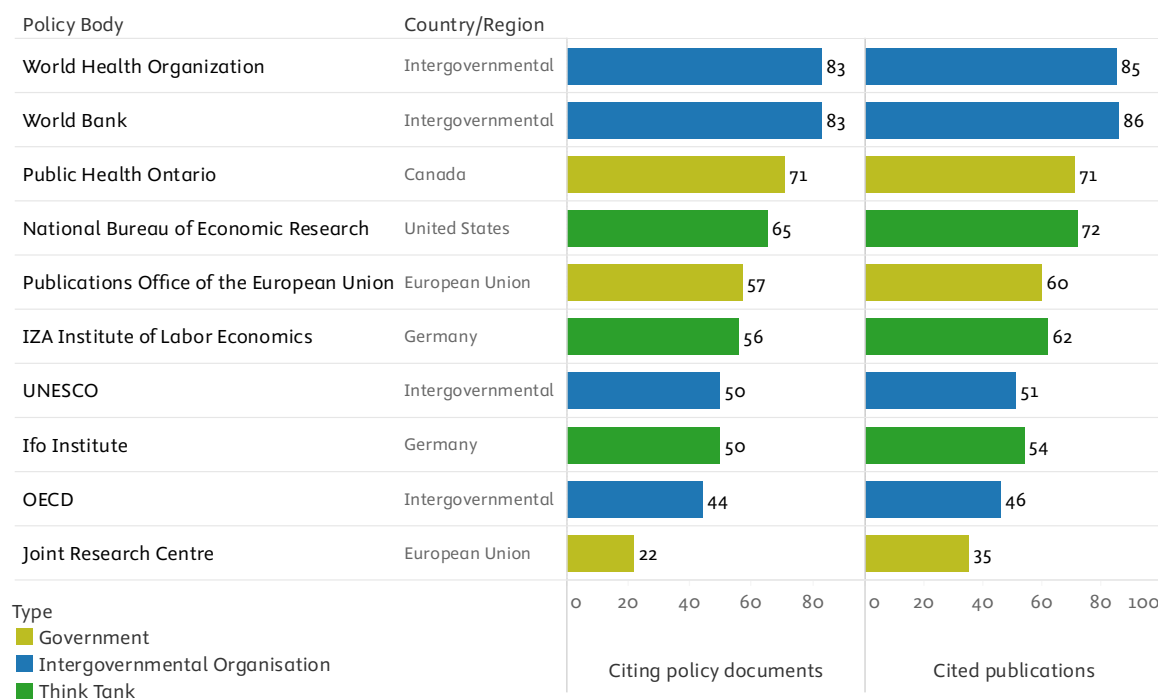


Figure 3.3.2 HKUST’s top 10 most citing policy institutions (2019–2023).

The figure shows: 1) number of unique policy documents citing HKUST’s publications; 2) number of HKUST’s publications cited by policy documents. Institutions are sorted by the number of citing policy documents.

Source: SciVal and PlumX

Social media engagement

In addition to policy influence, engaging with the broader public has become an increasingly important dimension of societal impact for universities. In today’s interconnected world, social media platforms provide a powerful channel for disseminating research findings, stimulating public dialogue, and fostering societal engagement beyond academia.

Within this dimension, social media citation is an indicator that tracks how academic publications capture public attention through interactions such as Facebook likes and shares. This provides valuable insights into the public visibility and discussion generated by HKUST’s scholarly work. Details on the data sources for the metric are available in Appendix B.

Among peer institutions, Delft University of Technology leads in scholarly social media engagement, with 139 citations normalised against total publication output (Figure 3.3.3). HKUST holds a strong second place, achieving 24 citations on the same basis. Although only 4.7% of HKUST’s output is cited on social media—the lowest among its peers—the output cited receives a high number of social media mentions. This pattern is similar to that seen with policy citations, with a smaller proportion of overall output attaining higher visibility compared to peers. Nevertheless, this highlights both a key strength for HKUST—high engagement for its cited work—and an opportunity to broaden the reach of more of its research via social media.

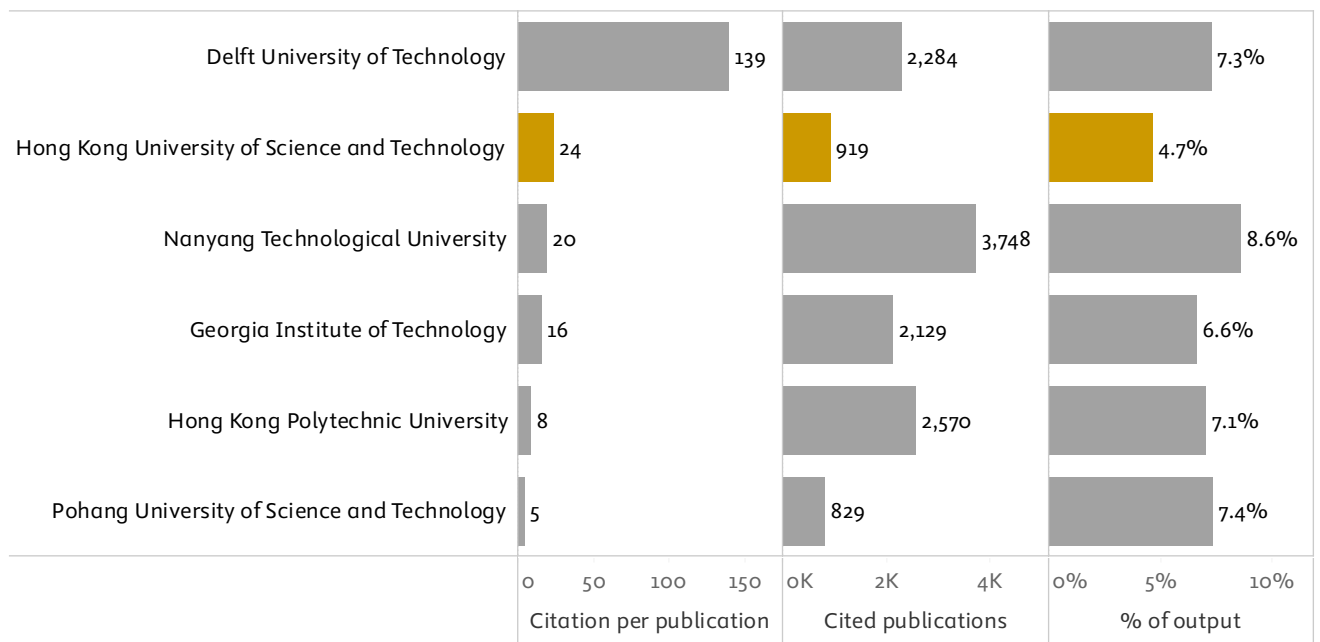


Figure 3.3.3 Social media engagement of publications from HKUST and peer institutions (2019–2023).

The figure shows: 1) number of social media citations normalised against total publication output; 2) number of publications with at least one social media citation; 3) proportion of publications with at least one social media citation. Institutions are sorted by the number of social media interactions per publication.

Source: SciVal

Appendix A

Definitions and descriptions of indicators

Altmetrics

Altmetrics (derived from the term ‘alternative metrics’) is a set of methods to measure the visibility of peer-reviewed scientific publications in traditional news outlets and policy documents and on social media. These mentions are usually tracked through document identifiers such as DOI, PMID and the URL of the article.

This report presents findings on citations and mentions of HKUST’s publications outside of Scopus—for example, in repositories of policy-related literature (such as the UK Parliamentary Office of Science and Technology), and social media platforms (e.g., Facebook). Our analysis captures discussion of research findings outside the academic community, among policymakers or government scientists, scientific educators, and a broad audience of the science-news-reading public. We use the PlumX and Overton databases (see Appendix B for details) to produce our altmetrics indicators. Both databases mix automated coding and parsing methods with some manual curation to link peer-reviewed publication records to those from selected online repositories and aggregators.

Author

Author refers to any individual listed in the author byline of a Scopus-indexed publication.

Bibliometrics

The quantitative data used in this report are analysed using bibliometric techniques. Bibliometrics is a set of methods that use data from databases indexing records of scientific publications and patents, as well as other R&I outputs of growing interest, such as designs and trademarks, to derive new insights into these outputs’ corresponding funding and performance. Within bibliometrics, the branch of scientometrics examines the records of research publications to measure scientific activity. Increasingly, it also examines related types of outputs such as research data sets and protocols. The branch of technometrics focuses on patent records as a proxy measure for innovation. It is being actively expanded to cover other forms of innovation that are not well captured by patents, such as those covered by designs and trademarks.

Citation

A citation is a formal reference in a research journal publication to earlier work. Citations are used to credit the published source of an idea or finding. The number of citations received by a publication from subsequently published articles in the scientific literature is used as a proxy for the influence or impact that publication has had. In this report, ‘citations’ refer to citations by any Scopus-indexed publications, whereas citations made by other types of documents (e.g., policy documents) specifically reference the type of document that the citation was made in (e.g., as ‘policy citations’ or citations in policy documents).

Compound annual growth rate

The compound annual growth rate (CAGR) is defined as the year-over-year constant growth rate over a specified period of time. Starting with the first value in any series and applying this rate for each of the time intervals yields the amount in the final value of the series.

Collaboration

Research collaboration is measured by counting publications resulting from the efforts of two or more authors. Such publications are referred to as co-publications throughout the report. Collaboration can be categorised into various types; in this report, we mainly focus on the academic-corporate collaboration: defined as co-publications in which the authors' affiliations include institutions or organisations from both academia and the corporate sector.

Field-weighted citation impact

Field-weighted citation impact (FWCI) is an indicator of the citation impact of a publication. It is calculated by comparing the number of citations actually received by a publication with the number of citations expected for a publication of the same document type, publication year and subject. An FWCI of more than 1.00 indicates that the entity's publications have been cited more than would be expected based on the global average for similar publications; for example, a score of 2.11 means the entity's publications have been cited 111% more than the world average. An FWCI of less than 1.00 indicates that the entity's publications have been cited less than would be expected based on the global average for similar publications; for example, an FWCI score of 0.87 means the publications have been cited 13% less than the world average. The FWCI is always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document ages (e.g., older documents are expected to have accrued more citations than recently published documents), document types (e.g., reviews typically attract more citations than research articles), as well as subjects (e.g., publications in Medicine accrue citations more quickly than publications in Mathematics). The FWCI uses an unweighted variable 4-year window. The mean FWCI value for 2012 publications, for example, is calculated for documents published in 2012 using their citations from 2012 to 2015. For recent output with less than four years since publication, all citations available at the date of data extraction are used in the calculation. For instance, if an article is published in 2023, and the data are extracted in 2025, the article's FWCI is calculated using the article's 2023–2025 citations.

Publication

Publication (unless otherwise indicated) denotes the main types of peer-reviewed documents published in journals: articles, reviews, and conference papers.

Relative activity index (RAI)

The RAI of an entity against the world for a subject area (subfield) is defined as the share of an entity's article output for a subject area (subfield) relative to the global share of articles for the same subject (subfield). A value of 1.0 indicates that an entity's research activity in a subject area (subfield) corresponds exactly with the global activity in that subject (subfield); a value higher than 1.0 implies a greater emphasis; and a value lower than 1.0 suggests a lesser focus.

Scholarly output

In this report the terms *output*, *articles* and *publications* refer to peer-reviewed articles, reviews and conference papers published in journals and conference proceedings and indexed in the Scopus database.

Appendix B

Data sources and analytical platforms

Overton

Overton is the world's largest searchable index of policy documents, guidelines, think-tank publications and working papers. Its database consists of more than 1.65 million policy documents, with data collected from 182 countries and over a thousand sources worldwide. These policy documents include white papers from international multilateral organisations, as well as guidelines from city councils, parliamentary transcripts and other classes of the so-called 'grey literature'. Around half of these documents make citations to academic or scholarly publications. More than 2 million distinct journal-based publications are cited by at least one policy document in the database.

See <https://www.overton.io>

PlumX

PlumX Metrics provide insights into the ways people interact with individual pieces of research output in the online environment. Examples include research being mentioned in the news or Wikipedia. These metrics are divided into five categories (citations, usage, captures, mentions, social media) to help make sense of the huge amounts of data involved and to enable analysis by comparing like with like.

See <https://plumanalytics.com/learn/about-metrics>

SciVal

SciVal is a web-based analytics solution with unparalleled flexibility that provides access to the research performance of over 20,000 academic, industry and government research institutions and their associated researchers, output and metrics. SciVal allows users to visualise research performance, benchmark relative to peers, develop strategic partnerships, identify and analyse emerging research trends, and create uniquely tailored reports.

See www.scival.com

Scopus

Scopus is Elsevier's expertly curated abstract and citation database with content from over 7,000 publishers to help track and enhance researcher and institutional data and discover global research in all fields. Scopus covers over 84 million items from more than 26,000 serial titles, 240,000+ books and 10.4 million+ conference papers connected through a robust data model including over 94,000 affiliation and 17 million author profiles. Scopus coverage is multilingual and global: approximately 46% of the titles in Scopus are published in languages other than English (or published in both English and another language). In addition, more than half of Scopus content originates from outside North America, representing countries across Europe, Latin America, Africa and the Asia-Pacific region.

See www.scopus.com

Sustainable Development Goals

The Sustainable Development Goals (SDGs), which were launched by the United Nations in 2015,⁹ are defined as “the blueprint to achieve a better and more sustainable future for all”,¹⁰ by addressing the global challenges we face. Since their launch, Elsevier has worked with the research community to map the landscape of sustainability science, starting with the Sustainability Science in the Global Research Landscape report (2015),¹¹ developed with SciDev.net. Since then, we have mapped publications in Scopus to 16 of the 17 SDGs, combining expert-led search queries with machine learning models. The methods and queries for the SDG publication sets are available here:

<https://elsevier.digitalcommonsdata.com/datasets/9sxdykm8s4/1>

⁹ See <https://sdgs.un.org/>

¹⁰ See <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

¹¹ See <https://www.elsevier.com/research-intelligence/resource-library/sustainability-2015>

Appendix C

Data set creation for the five key strategic fields

Data set construction

The data sets for the five industry fields of national strategic importance were built primarily using Scopus All Science Journal Classification (ASJC), research fields curated by SciVal, and relevant Elsevier reports. The ASJC were used in Scopus to classify published research by its subject area. This was done by in-house experts at the moment the serial title was set up for Scopus coverage. The classification is based on the aims and scope of the title, and on the content it publishes. There are in total 27 subject areas and 334 sub-areas. The complete list of Scopus ASJC subject areas is available from

https://service.elsevier.com/app/answers/detail/a_id/15181/supporthub/scopus/

- Artificial intelligence

is defined using publications categorised in Scopus ASJC subject '1702. Artificial Intelligence', a subarea under ASJC first-level subject '17. Computer Science'.

- Quantum technology

is defined using the 'Quantum Technologies' publication set available in SciVal. This research field encompasses publications related to Quantum Computing, Quantum Simulation, Quantum Metrology, Quantum Sensing, and Quantum Communications based on a series of search queries.

- Net Zero/Clean Energy

is defined using the publication set of Elsevier report 'Pathways to Net Zero: The Impact of Clean Energy Research'. The 'Net Zero' data set is a combination of publications from SDG 7 and energy related publications from SDG 13, looking at science and innovation trends in clean energy and carbon removal. The SDG research areas are defined using search queries, augmented with a machine learning (ML) model.

The 'Net Zero' report is available from <https://www.elsevier.com/connect/net-zero-report>

- New Materials

is defined using the publication set of Science Metrix 'Materials' subfield, which is under the field of 'Enabling and Strategic Technologies'.

- Environmental Science

is defined using publications categorised in Scopus ASJC subject '23. Environmental Science'.

About

This report was prepared by Elsevier's Analytical Services in collaboration with The Hong Kong University of Science and Technology, who funded this project. Elsevier's Analytical Services provides expert insights and high-quality data to academic institutions, policymakers, funders, and research institutions. Whether your institution is conducting research or funding it, Analytical Services provides the objective and analytical insight needed to improve your ability to strengthen your research capabilities and establish, execute, and evaluate your research strategy.

For more information about Elsevier's Analytical Services, please visit:

<https://www.elsevier.com/products/analytical-services>

About Elsevier

Elsevier, a global leader in information and analytics, helps researchers and healthcare professionals advance science and improve health outcomes for the benefit of society. Growing from our roots in publishing, we have supported the work of our research and health partners for more than 140 years. Elsevier offers knowledge and valuable analytics that help our users make breakthroughs and drive societal progress. Digital solutions such as ScienceDirect, Scopus, SciVal, ClinicalKey and Sherpath support strategic research management, R&D performance, clinical decision support and health education. Elsevier publishes over 2,650 digitised journals, including *The Lancet* and *Cell*; our 42,000 eBook titles; and our iconic reference works, such as *Gray's Anatomy*. Elsevier is part of RELX, a global provider of information-based analytics and decision tools for professional and business customers.

See www.elsevier.com

About The Hong Kong University of Science and Technology

The Hong Kong University of Science and Technology (HKUST) is a world-class university known for its innovative education, research excellence, and impactful knowledge transfer. With a holistic and interdisciplinary pedagogy approach, HKUST was ranked 6th in the QS Asia University Rankings 2026, 3rd in the Times Higher Education's Young University Rankings 2024, and 19th globally and 1st in Hong Kong in the Times Higher Education's Impact Rankings 2025. Eleven HKUST subjects were ranked among the world's top 50 in the QS World University Rankings by Subject 2026. In addition, in the Times Higher Education World University Rankings by Subject 2026, HKUST's Computer Science discipline which encompasses areas such as artificial intelligence and machine learning, has been ranked No. 1 in Hong Kong for ten consecutive years. Our graduates are highly competitive, consistently ranking among the world's top 30 most sought-after employees. In terms of research and entrepreneurship, over 80% of our work was rated "internationally excellent" or "world leading" in the Research Assessment Exercise 2020 of the Hong Kong's University Grants Committee. As of January 2026, HKUST members have founded over 1,900 active start-ups, including 10 Unicorns and 21 exits (IPO or M&A).

See <https://hkust.edu.hk/>

