

Innovate UK Global Expert Mission Report

Health Technologies in Taiwan

March 2024





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01. Executive Summary

The Global Expert Mission provided valuable insights into Taiwan's healthcare system, regulatory environment, innovation landscape and potential collaboration opportunities with the United Kingdom (UK).

Taiwan operates a comprehensive, universal coverage healthcare system. Notable features include advanced digital infrastructure such as the My Health Bank app and the National Health Insurance Cloud System.

The funding of healthcare services involves government contributions, employer contributions and individual co-payments. Unlike the UK, Taiwan does not have a primary healthcare gatekeeper role, allowing patients to directly access healthcare providers of their choice.

The UK and Taiwan have shared healthcare goals and challenges. Institutions like the National Biotechnology Research Park and Industrial Technology Research Institute showcased Taiwan's commitment to innovation in healthcare. Key areas of interest include drug discovery, medical device development and Smart Medical City initiatives. Challenges such as staffing shortages and operational efficiency were also noted.



Discussions with organisations like the Data Research and Technology Center and the Artificial Intelligence (AI) Foundation highlighted Taiwan's growing interest in employing AI in healthcare. The government subsidises AI initiatives, but challenges remain in areas such as data sharing, regulation and reimbursement.

There were several observed opportunities for collaboration between Taiwan and the UK including knowledge exchange, training programmes, ecosystem development, and regulatory alignment. Joint research projects in clinical trials, medical device development, and health data infrastructure are potential areas for collaboration.

There were also several barriers to collaboration including bureaucratic hurdles, a lack of drivers for innovation in the Taiwanese healthcare system, regulatory differences and cultural challenges. Funding constraints, market readiness disparities also pose challenges.

Despite these barriers, Taiwan's vibrant and growing innovation landscape offers numerous opportunities for collaboration with the UK in healthcare technology. By addressing challenges and leveraging strengths, Taiwan and the UK can foster innovation, drive economic growth and improve healthcare outcomes through strategic partnerships.

02. Acronyms

AI	Artificial Intelligence
APEC	Asia Pacific Cooperation
B2B	Business-to-business
B2C	Business-to-consumer
B2G	Business-to-government
CE	Conformité Européenne
CR&D	Collaborative Research and Development
CRO	Clinical Research Organisation
DBT	Department for Business and Trade
DCB	Development Center for Biotechnology
DHT	Digital Health Technology
DolT	Department of Industrial Technology
DRTC	Data Research and Technology Center
DSIT	Department for Science, Innovation and Technology
EHR	Electronic health record
EMR	Electronic medical record
EU	European Union
FCDO	Foreign, Commonwealth and Development Office
FDA	Food and Drug Administration
FP	Framework programme
FWCI	Field-weighted citation impact
G2G	Government-to-government
GDP	Gross domestic product
GDPR	General Data Protection Regulation
GEM	Global Expert Mission
GP	General Practitioner
GxP	Good Practice
IDA	Industrial Development Administration

IDAP Innovative Devices Access Pathway IoMT Internet of medical things loT Internet of Things Intellectual property ISO International Organisation for Standardisation ISTI ITRI Industrial Technology Research Institute KPI Key performance indicators KTN Knowledge Transfer Network MHRA MOEA Ministry of Economic Affairs MOHW Ministry of Health and Welfare MOST Ministry of Science and Technology MoU Memorandum of understanding **NBRP** National Biotechnology Research Park NHI National Health Insurance NHIA National Health Insurance Administration NHS National Health Service NTHU National Tsing Hua University NTU National Taiwan University NTUST NYCU National Yang Ming Chiao Yung University PwC PricewaterhouseCoopers QMS Quality Management System R&D Research and development RNA Ribonucleic acid SCARU Self-Care Academic Research Unit SIN Science and Innovation Network

IP

- Industry, Science and Technology International Strategy Center
- Medicines and Healthcare Products Regulatory Agency
- National Taiwan University of Science and Technology



SMEs TAFOAS TAITRA TCIRD TCP **TEEMA TFDA** TIIRDF **TMBI** TMU TOFOAS **TSICO TSMC** TSS UK UKCA UKRI US WEF

Small and medium sized enterprises The Advancement of Outstanding Scholarship Taiwan External Trade Development Council Taiwan-Canada Industrial Research and Development Foundation Technical Cooperation Programme Taiwan Electrical and Electronic Manufacturers' Association Taiwan Food and Drug Administration Taiwan-Israel Industrial Research and Development Foundation Taiwan Medical and Biotechnology Industry Association Taipei Medical University Taiwan-Singapore Industrial Collaboration Office Taiwan Semiconductor Manufacturing Company Taiwan Startup Stadium United Kingdom United Kingdom Conformity Assessed United Kingdom Research and Innovation United States World Economic Forum

- Taiwan Foundation for the Advancement of Outstanding Scholarship

03. Introduction

Innovate UK and Global Expert Missions

Innovate UK, the UK's innovation agency, supports business-led innovation and is part of UK Research and Innovation (UKRI). UKRI convenes, catalyses and invests in close collaboration with others to build a thriving, inclusive research and innovation system. To this end, Innovate UK helps businesses to identify the commercial potential in new technologies and turn them into new products and services that will generate economic growth and increase productivity. With a strong business focus, Innovate UK drives growth by working with companies to de-risk, enable and support innovation. Innovate UK Business Connect exists to connect innovators with new partners and new opportunities beyond their existing thinking - accelerating ambitious ideas into real-world solutions.

As innovation is increasingly a global endeavour and the ambition of UK businesses to become truly international enterprises is at its highest, Innovate UK established its Global Expert Mission (GEM) programme in 2017. Delivered by Innovate UK Business Connect, in partnership with the UK Science and Innovation Network (SIN), GEMs help further Innovate UK's global strategy by providing the evidence base for where it should invest and by providing the opportunities for UK businesses to build partnerships and collaborations with key economies.

Mission Overview and Objectives

This GEM brought a team of UK-based healthcare innovation experts to assess the health technology ecosystem in Taiwan, to help identify key areas for collaboration and potential programmes needed to enable UK innovators to collaborate with Taiwanese partners.

The objectives of the mission were to:

- Help determine how Innovate UK can best support UK businesses more effectively and efficiently when considering health innovation partnerships with Taiwan. Our assessment includes where best to focus efforts on technology and sector areas, locations and the type of programmes needed to maximise opportunities between Taiwan and the UK.
- Develop a deeper understanding of the research and innovation landscape on health technology and build relationships with key individuals and organisations.
- Identify synergies and relative strengths and weaknesses across the health innovation sector in Taiwan.
- Understand the healthcare market in Taiwan and develop long term engagement strategies with key stakeholders to support business collaboration for new products and services.

Mission Scope

The UK delegation focused on five key areas:

- Healthcare System and Routes to Market: It is important to understand how new innovations are procured within the Taiwanese healthcare system and the value propositions that are important for commercial success. As well as being an important market in itself, collaboration with Taiwanese companies could also facilitate better access to the rest of the Asia Pacific region for UK companies.
- Technology and Joint Innovations: Taiwan has a mature market in areas such as medical devices. pharmaceuticals and biotechnology. As Taiwan is committed to developing high level and high-value products, it is important to assess potential synergies with UK companies developing complementary products and services and to review how collaborative activity would work best in practice.
- Healthcare Data: Taiwan has one of the most advanced healthcare data systems in the world, including an active engagement process with companies to develop new products and services. Areas such as healthcare data access, safety and security will be vital for the next generation of healthcare worldwide. Collaborations in this space would be hugely advantageous to UK companies.

- **Regulation:** An increasingly important factor for how UK companies develop their strategies, with complexities around UK and European Union (EU) regulatory requirements prompting companies to focus initially on the United States (US) market with the UK and EU becoming secondary markets. It is important that UK companies also consider other non-European markets and collaborations including Taiwanese companies. This approach could give UK companies better and earlier access to regulatory evidence, both in Taiwan and the rest of the Asia Pacific.
- Healthcare Challenges: Taiwan faces many of the same healthcare challenges as the UK, including a declining birth rate and ageing population (see Figure 1), increasing burden on the healthcare system requiring more activity to take place outside of the hospital setting, and the need to significantly reduce the costs of healthcare provision. UK-Taiwan collaborations could produce successful products, services and pathways in both markets and internationally.

Percentage of Population aged 65+ (%)



Figure 1 Current and projected ageing population trend in Taiwan. Adapted from PricewaterhouseCoopers (PwC) Guide to Taiwan's health industries





The Taiwan GEM explored the following areas in more detail:

Healthcare System and Health Data Management

- Understand the healthcare ecosystem, how it is provided and procured, and the value propositions it places on future innovations.
- Understand healthcare data processes, how healthcare data is collected, stored, processed and accessed.
- Understand the landscape for conducting clinical studies in Taiwan and how overseas organisations can participate.
- Identify common healthcare challenges and opportunities for collaboration to address them.

Medical Device Industry & Academia

- Understand the focus, capabilities and future innovations of Taiwanese medical devices companies and provide insights into the synergies between UK and Taiwanese companies with a view to collaboration.
- Initiate discussions with Taiwanese companies to facilitate access to markets through collaborations, i.e. for the UK organisations to access the Taiwan and Asia Pacific markets, and for the Taiwanese organisations to access the UK market.
- Clarify the current barriers, e.g. cultural, language, local contact opportunities and considering joint ventures as the best approach.
- Understand what research and development (R&D) activities are taking place in universities and how their work is commercialised.

Regulation

- Understand the regulatory landscape and requirements for health technologies in the Taiwanese market.
- Explore the existing and potential routes for UK companies to engage with the regulatory agencies in Taiwan.





Internationally ranked health care system, 6th year in a row^a



in world competitiveness rankings 2023°



2024 projected Medical Technology market^e



a Health Care Index 2024

- **b** Taipei Times
- c IMD, World Competitiveness Rankings 2023
- d MOHW, National Health Expenditure
- e Statista, Medical Technology Taiwan
- f Statista, Medical Technology Taiwan
- g IMF, World Economic Outlook Database
- h Taipei Times



Best destination for investment in Asia^b



GDP on National Health Expenditure^d



Anticipated 2024-2028 annual growth rate^f



GDP on **Research and Developmenth**

UK...



Internationally ranked health care systemⁱ



29th

in world competitiveness rankings 2023^j



2024 projected Medical Technology market¹



6th

Largest economy by GDP, 2024ⁿ

Health Care Index 2024 i.

- IMD, World Competitiveness Rankings 2023
- k ONS, Healthcare expenditure, UK Health Accounts: 2021
- I Statista, Medical Technology United Kingdom
- m Statista, Medical Technology United Kingdom
- n IMF, World Economic Outlook Database
- o ONS, Gross Expenditure on R&D (GERD): Total as a percentage of GDP

Health Technologies in Taiwan





04. Market Overview

In recent years, the health technologies sector in Taiwan has experienced significant growth, driven by advancements in technology, increasing healthcare expenditures and a growing focus on innovation. This sector encompasses a wide range of products and services, including medical devices, digital health solutions, pharmaceuticals and biotechnology.

Taiwan is the world's 21st largest economy, dedicating 3.46% of its gross domestic product (GDP) on R&D, compared to the UK's 1.65%. Taiwan employs over 262,000 skilled professionals in R&D, compared to 251,000 in the UK - this represents 1.1% of Taiwan's population vs. 0.4% of the UK's population.1 Given Taiwan's population is only 23.4 million people, the health technologies industry must look internationally to find sufficient market size.¹



1 National Statistics ROC, 2024

- 4 MOEA Science and Technology Competitiveness Rankings
- 5 World Economic Forum Global Competitiveness Index UK



Taiwan is internationally recognised for its tech sector, with businesses including Taiwan Semiconductor Manufacturing Company (TSMC) who are the world's largest semiconductor chip manufacturer, and Foxconn who are the world's largest contract electronics manufacturer.^{2,3} The World Economic Forum (WEF) ranks Taiwan as 4th in innovation capability, and the UK 11th.4,5

² Taiwan Semiconductor Manufacturing Company

³ Foxconn

Value of the Sector, Prior and Forecast Growth

The medical technology market in Taiwan is valued at approximately US\$2.88 billion, encompassing a wide range of products and services including digital health and pharmaceuticals, although the largest segment of this market belongs to medical devices with a market volume of US\$2.41 billion.⁶ The sector plays a critical role in driving economic growth, creating jobs and improving healthcare outcomes for the population of Taiwan. In contrast, the UK health technologies sector is valued at US\$20.18 billion, reflecting the larger market size and established infrastructure. In line with Taiwan, medical devices represent the biggest sector in the UK with a market volume of US\$18.21 billion.7

The Taiwan health technologies sector has witnessed steady growth in recent years, fuelled by government initiatives, investment in R&D and collaborations between industry players, academic institutions and international partners. The biotechnology sector contributes significantly to Taiwan's economy, almost doubling in market size in the past decade with the medical technology market poised to increase significantly in the next 5 years (see Figure 2).⁸ This growth is projected to continue, driven by factors such as an ageing population, increasing healthcare demand due to both ageing and chronic disease and increased awareness of preventative healthcare measures.^{9,10}

The Taiwan health technology market is projected to grow by 5.44% until 2028, with a market volume of US\$3.56 billion by 2028.11 The UK health technologies sector has also experienced notable growth at a similar pace. Similarly to Taiwan, the revenue in the UK health technology market is expected to grow at 5.45% annually, with a larger market volume of US\$24.95 billion expected by 2028.¹²

Market size of Taiwan's biomedical industry, 2012-2021



Note: The health and wellness sector is excluded from the overall biomedical industry for analysis purposes.

Figure 2 Market size of Taiwan's biomedical industry Source: Adapted from PWC's Taiwan Health Industries Guide

12 Statista, 2024: Medical Technology - United Kingdom.

Source: Industrial Development Bureau (MOEA), 2013-2022 Biotechnology Industry White Papers.

⁶ Statista, 2024: Medical Technology - Taiwan

⁷ Statista, 2024: Medical Technology – United Kingdom

⁸ Guide to Taiwan's health industries

⁹ Population aging and its impacts: strategies of the health-care system in Taipei

¹⁰ Predictors of Use of Preventative Health Services for People with Disabilities in Taiwan

¹¹ Statista, 2024: Medical Technology - Taiwan



Number of Companies and Skilled Workers

The GEM found that the Taiwan health technologies sector is home to a growing number of companies, ranging from multinational corporations to start-ups and small and medium sized enterprises (SMEs). These companies operate across various sub-sectors, including medical devices, telemedicine, health informatics and biotechnology. While the sector has seen an influx of talent in recent years, there remains a need for skilled workers, particularly in areas such as data science, bioinformatics and clinical research.

Adoption and Uptake

The adoption and uptake of health technologies in Taiwan have been increasing steadily, driven by factors such as regulatory reforms, digitalisation of healthcare services and changing consumer preferences. Patients are increasingly embracing telemedicine, wearable devices and mobile health apps to manage their health and monitor chronic conditions remotely. Healthcare providers are leveraging technology in a bid to streamline processes, improve efficiency, enhance patient care and reduce costs.



^{13 90%} of NHS trusts now have electronic patient records

Similarly, although perhaps not as widespread as in Taiwan, the UK has seen a rise in the adoption of health technologies across the healthcare continuum. From the introduction of electronic health records (EHRs) and telehealth platforms to artificial intelligence (AI) and precision medicine, technology is playing an increasingly prominent role in shaping the future of healthcare delivery in the UK.^{13,14} Government initiatives such as the NHS Long Term Plan, the Accelerated Access Collaborative and the Innovative Devices Access Pathway (IDAP) are driving innovation and encouraging the adoption of new technologies to improve patient outcomes and drive efficiencies within the healthcare system.^{15,16,17}

¹⁴ NHS England, 2024: Technology Enabled Care Services (TECS)

¹⁵ NHS Long Term Plan

¹⁶ NHS Accelerated Access Collaborative

¹⁷ The Innovative Devices Access Pathway (IDAP)

Taiwan's commercial ecosystem

Health technology companies in Taiwan are exploring a wide range of business-toconsumer (B2C) and business-to-business (B2B) use cases to address the evolving needs of consumers, healthcare providers and state-level agencies. For instance, B2C companies are developing wearable devices and mobile apps to empower individuals to take control of their health and wellness. B2B companies are partnering with healthcare institutions to implement electronic health record systems, telemedicine platforms, and remote monitoring solutions. State-level initiatives focus on leveraging technology to improve the delivery of healthcare services and enhance population health outcomes. Additionally, public and private institutions are proactively working with state-level agencies to facilitate knowledge sharing, regulatory alignment, and joint R&D efforts to drive innovation and address common healthcare challenges.

Entry and Growth Barriers

Despite the growth opportunities in the Taiwan health technologies sector, several barriers hinder entry and expansion for companies, both domestic and international. Regulatory challenges, including lengthy approval processes and complex reimbursement systems, can impede market entry and product commercialisation. Limited access to funding, talent shortages and intellectual property concerns pose additional barriers to growth and innovation.

The UK health technologies sector also faces barriers such as regulatory uncertainties, market fragmentation and resource constraints. Additionally, uncertainties due to changes to trade agreements with the EU and access to EU research funding have added complexity to the operating environment for health technology companies in the UK.

Conclusion

In conclusion, the Taiwan health technologies sector has experienced significant growth in recent years, driven by factors such as technological advancements, increasing healthcare demand and government support. While the sector faces challenges such as skilled labour shortages and regulatory complexities, opportunities abound for companies looking to innovate and capitalise on emerging trends. By leveraging lessons learned from the UK and other global markets, Taiwan can further strengthen its position as a hub for health technology innovation and drive positive health outcomes for its population.







05. The Innovation Landscape

Innovation Support

Taiwan's health technology sector thrives on collaboration between various stakeholders, including national institutes, government agencies, universities and other funders. These entities play a crucial role in driving R&D, fostering innovation and advancing the adoption of cutting-edge technologies in healthcare.

Institutes and Agencies

In Taiwan, several institutes and agencies are actively involved in funding and supporting health technology R&D. One of the key organisations in this regard is the Ministry of Science and Technology (MOST), which oversees R&D initiatives across various sectors, including health and biotechnology.¹⁸ MOST provides grants, funding opportunities, and research support to universities, research institutions, and industry partners engaged in health technology innovation.

Additionally, the Ministry of Health and Welfare (MOHW) plays a vital role in shaping healthcare policies, regulations and standards related to health technology.¹⁹ MOHW collaborates with other government agencies and stakeholders to promote the development and adoption of innovative healthcare solutions, with a focus on improving patient outcomes and enhancing healthcare delivery. It is also responsible for the welfare agenda, including the provision of social protection mechanisms including social care.

¹⁸ National Science and Technology Council19 Ministry of Health and Welfare

The Taiwan Food and Drug Administration (TFDA) regulates medical devices, pharmaceuticals and other healthcare products, ensuring safety, efficacy and quality standards are met.²⁰ TFDA's role is crucial in facilitating the commercialisation and market access of health technologies in Taiwan and abroad.

The National Health Insurance Administration (NHIA) oversees Taiwan's National Health Insurance (NHI) programme, which provides universal coverage to the population.²¹ Providing the majority of national healthcare expenditure (see Figure 3), NHIA is involved with healthcare financing, reimbursement, and policy formulation. They also collaborate with other government agencies and stakeholders to promote digital health, telemedicine and health informatics adoption and improve healthcare delivery and efficiency.

The Ministry of Economic Affairs (MOEA) in Taiwan are responsible for promoting economic development, industrial competitiveness, and trade. They support the growth of the health sector via policies encouraging innovation, investment and entrepreneurship through collaboration with industry associations, research institutions and international partners.²² Additionally, the Taiwan External Trade Development Council (TAITRA) is responsible for promoting Taiwan's trade and investment interests globally, facilitating international collaboration, market access and business opportunities for health technology companies looking to expand their presence overseas. 23

Finally, the Industrial Development Administration (IDA) are responsible for promotion of industrial development and competitiveness in Taiwan, supporting the health technology sector through policies, incentives and programmes that encourage innovation, investment and promotion of exports. 24





Source: Ministry of Health & Welfare

Figure 3 Taiwan's National Healthcare Expenditure from 2011 – 2020. Adapted from PwC Guide to Taiwan's health industries

20 Taiwan Food and Drug Administration

- 21 National Health Insurance Administration, Ministry of Health and Welfare
- 22 Ministry of Economic Affairs
- 23 Taiwan External Trade Development Council
- 24 Industrial Development Administration, Ministry of Economic Affairs





Universities and Research Institutions

Taiwan's universities and research institutions are at the forefront of health technology R&D, driving innovation and knowledge creation in collaboration with innovation agencies, industry partners and international collaborators. Institutions such as National Taiwan University (NTU), National Tsing Hua University (NTHU), Academia Sinica, National Cheng Kung University, The National Yang Ming Chiao Yung University (NYCU), The National Chiao Tung University, Industrial Technology Research Institute (ITRI), Taiwan Tech (formerly National Taiwan University of Science and Technology (NTUST)), Taipei Medical University (TMU) and Chang Gung University have dedicated research centres and laboratories focused on health technology, biomedical engineering and biotechnology.

These universities receive funding from grants, industry partnerships and international collaborations to support interdisciplinary research projects aimed at addressing healthcare challenges and developing novel technologies. Academicindustry partnerships play a crucial role in translating research findings into practical applications and commercial products for the healthcare market.

Other Funders and Stakeholders

Various other funders and stakeholders contribute to the health technology ecosystem in Taiwan. Private foundations, venture capital firms, and industry associations provide funding, investment and support to startups, SMEs and established companies engaged in health technology innovation.

The Taiwan Foundation for the Advancement of Outstanding Scholarship (TAFOAS) is a private foundation providing scholarships, grants and funding support to outstanding scholars, researchers, and students in Taiwan.²⁵ It offers funding opportunities for research projects and initiatives in the health technology sector.

Venture capital firms include AppWorks Ventures who invest across technology startups, including health technology, providing funding, mentorship and support to early-stage companies with a high growth potential.²⁶ Fenox Venture Capital are a global firm with a presence in Taiwan, investing in innovative startups and technologies, providing both funding and strategic guidance.²⁷



²⁵ Taiwan Foundation for the Advancement of Outstanding Scholarship

Industry associations including the Taiwan Electrical and Electronic Manufacturers' Association (TEEMA) who represent the interests of electrical and electronic manufacturers in Taiwan, including companies involved in health technology. TEEMA provide networking opportunities, industry insights and support services.28 The Taiwan Medical and Biotechnology Industry Association (TMBIA) provides support to health technology companies in the form of advocacy, networking and business development initiatives.²⁹ The Taiwan Startup Stadium (TSS) is a startup ecosystem builder in Taiwan, supporting early-stage companies across various industries, including health technology. Their support includes mentoring, training, and networking opportunities, connecting startups with investors and industry partners.30



²⁸ Taiwan Electrical and Electronic Manufacturers' Association

32 UK-Taiwan Collaborative R&D

International organisations and bilateral funding programmes play a significant role in facilitating collaboration and knowledge exchange between Taiwan and its global partners. Initiatives such as the Taiwan-US Science and Technology Agreement and the Taiwan-UK Joint Committee on Scientific and Technological Cooperation provide platforms for collaborative research projects, joint funding opportunities, and researcher mobility programmes.^{31,32}

²⁶ Appworks

²⁷ Fenox Venture Capital

²⁹ Taiwan Medical and Biotechnology Industry Association

³⁰ Taiwan Startup Stadium

³¹ AIT and TECRO sign an Agreement on Scientific and Technological Cooperation.



Taiwan's Policy Landscape and Roadmaps

Taiwan has developed several white papers, policy documents and roadmaps to guide health technology R&D and investment priorities. These documents outline strategic objectives, priority areas and funding strategies to support innovation and address healthcare challenges. The MOHW publishes a health and welfare report each year, with a detailed outline of expenditure, health indicators and goals.³³

The White Paper on Science and Technology (2023-2026) covers goals surrounding development of science and technology in Taiwan.³⁴ The Taiwan Biotechnology Strategy White Paper highlights key areas of focus, including precision medicine, regenerative medicine and digital health, and outlines policy recommendations to promote growth and competitiveness in the biotechnology sector. The 2023 Precision Medicine Industry Policy White Paper proposes recommended when taking a precision medicine approach.³⁵

Similarly, the NHIA has published policy documents and roadmaps to promote the adoption of digital health technologies, telemedicine and health informatics to enhance healthcare delivery and efficiency. ³⁶

In addition, Taiwan has a Biomedical Industry Innovation Program focusing on pharmaceuticals, medical devices, applied biotechnology and health and wellbeing. 37

³³ Ministry of Health and Welfare 2023 Taiwan Health and Welfare Report

³⁴ White Paper of Science and Technology (2023-2026)

^{35 2023} Precision Medicine Industry Policy White Paper Paves the Way for the Biotechnology in Taiwan

³⁶ National Health Insurance Administration

³⁷ Promoting Precision Health as a Strategic Industry

Bilateral Cooperation with the UK and International Partners

The Science and Innovation Network (SIN) plays a crucial role in facilitating research collaboration and knowledge exchange between Taiwan and the UK. SIN's snapshot documents provide insights into key research priorities, funding opportunities and collaborative initiatives in the health technology sector, helping to foster partnerships and collaboration between researchers and institutions.³⁸

In November 2022, Innovate UK and the Taiwan Department of Industrial Technology (DoIT) signed an MOU on R&D and innovation cooperation and working with ITRI have since run two bilateral collaborative research and development (CR&D) calls with the first resulting in the funding of nine projects, including one focused on biosciences, and the second call launched in April 2024.

In 2023 the UK and Taiwan signed a memorandum of understanding (MOU) to strengthen health cooperation in areas including pandemic preparedness, digital health, health insurance, mental health, and healthy ageing.³⁹ A goal of the MOU is to provide the framework for further cooperation on activities such as information sharing and exchange, visits, joint workshops and meetings.

Other bilateral agreements and joint funding programmes exist between Taiwan and the UK, such as the previously mentioned Taiwan-UK Joint Committee on Scientific and Technological Cooperation, provide avenues for joint research projects, researcher exchanges, and capacity building initiatives. Taiwan has also participated as a third market in several EU Framework Programmes (FPs) for research and innovation, including Horizon 2020 and its successor Horizon Europe.⁴⁰



Additionally, Taiwan and the EU established the Technical Cooperation Programme in 2019, which allows recognition of OMS certifications between Taiwan and certain European Notified Bodies.⁴¹ These programmes include opportunities for collaborative research projects between Taiwanese and European partners in various fields, including health technology.

40 European Parliament recommendation of 21 October 2021 to the Vice-President of the Commission / High Representative of the Union for Foreign Affairs and Security Policy on EU-Taiwan political relations and cooperation

Health Technologies in Taiwan

Further bilateral organisations include the Taiwan-Israel Industrial R&D Foundation (TIIRDF), Taiwan-Canada Industrial Research and Development Foundation (TCIRD), Taiwan-Singapore Industrial Collaboration Office (TSICO) and the Asia Pacific Economic Cooperation (APEC).

In addition, the British Council and the Ministry of Education in Taiwan established the first Taiwan-UK University Consortium in 2023, bringing together eight higher education institutions from Taiwan and the UK with the goal of academic collaboration to address global challenges.42

³⁸ UK Science and Innovation Snapshot: Taiwan

³⁹ UK-Taiwan MOU Health Preparedness

⁴¹ TFDA continues its collaboration with the European Union in the context of TCP. 42 The British Council and the Ministry of Education in Taiwan establish the first ever Taiwan-UK University Consortium

Quality of Research and Collaboration Impact

The quality of research in the health technology sector in Taiwan is evidenced by its field-weighted citation impact (FWCI), a metric that measures the relative citation impact of research outputs compared to the global average in the field. Between 2013-2023, research papers from Taiwanese research organisations referencing health technology in its title or abstract were cited an average of 22.4 times, compared to 33.6 from the UK and 19.3 globally.43 Taiwan's health technology research has demonstrated strong citation impact across various sub-fields, reflecting the calibre of research and its contribution to global scientific knowledge.44,45

Taiwan's health technology sector benefits from the active involvement of institutes, agencies, universities, and other funders, driving research, innovation, and collaboration in partnership with international stakeholders such as the UK. White papers, policy documents and roadmaps guide strategic priorities and investment decisions, while collaboration with the UK and other partners fosters highquality research and impactful solutions to healthcare challenges. With a strong foundation in research excellence and collaboration, Taiwan is well-positioned to continue driving innovation and advancing the field of health technology.





- 44 NYCU Academic Hub
- 45 Journal Articles using Taiwan's National Health Insurance research data



Health Technologies in Taiwan



06. Stakeholder Engagement



The team visited a number of organisations across the Taiwan's healthcare innovation ecosystem. This included private and public organisations including businesses, academia and state-level innovation and regulatory authorities to better understand the challenges, opportunities and drivers in Taiwan's complex healthcare landscape.

NORTHERN TAIWAN

Taipei | Hsin-chu New drugs Biologics IVDs Medical Devices Digital Health

VISITED STAKEHOLDERS

1. Hsin-chu

- Industrial Tecnology Research Institute
- National Yang Ming Chiao Tung University
- 2. T'ao-yüan
- Min-Sheng Smart Medical City

3. Taipei

- Ministry of Health & Welfare
- National Biotechnology Research Park
- Taipei Bioinnovation Park
- Acer Medical
- National Taiwan Univeristy Cancer Center
- Development Center for Biotechnology

CENTRAL TAIWAN

Taichung

Pharmaceuticals Medical Devices Precision Machineries Instruments for minimally invasive surgeries

SOUTHERN TAIWAN

Tainan | Kaohsiung | Pingtung

Pharmaceuticals Herbal Medicines Implants Animal Vaccines Animal Breeding Functional Foods Instruments for minimally invasive surgeries

Healthcare System and Regulations

MOHW

Taiwan's MOHW, established in 1971,^{46,47} provided an overview of their healthcare system and models for reimbursement of health technologies in Taiwan. A number of technological applications are used in Taiwan including My Health Bank – where people can access their digital health records online, the NHI cloud, and the electronic medical record (EMR) system.⁴⁸

The funding of healthcare services in Taiwan involves a combination of contributions from Taiwanese authorities, employer contributions and individual co-payments. Pricing for services considers international and internal prices, with mechanisms in place for reimbursement and cost control. The healthcare system's unique aspects include balanced billing and no primary care gatekeeper role, ⁴⁹offering efficient care with no waiting lists.

Medical devices in Taiwan are regulated under the Medical Devices Act, which has similarities to regulatory pathways in the UK, but is much more aligned with regulatory requirements in the US. The regulatory system uses Good Practice (GxP) principles, classifying devices into three classes based on risk. Clinical studies for medical devices in Taiwan must follow International Organisation for Standardisation (ISO) 14155 for Good Clinical Practice, and manufacturers are required to have a Quality Management System (QMS) in place, with requirements similar to those in ISO 13485. Taiwan has introduced legislation for the regulation of AI devices under the Medical Devices Act, with a focus on risk-based classification and licensing of AI products.

While there is a high level of digitisation in Taiwan, adoption of digital health applications among the general public is still limited.

NTU Cancer Center

The NTU Cancer Center boasts state-of-theart facilities with an emphasis on efficiency. The centre handles a significant portion of Taiwan's cancer cases, specialising in lung cancer, liver cancer, breast cancer, and leukaemia conducting multiple clinical trials for lung cancer treatments. Despite being a comprehensive cancer centre, NTU Cancer Center faces challenges with staffing and operational efficiency. However, it collaborates internationally, with a wide range of relationships within Asia, Europe and the US. Financially sustained, it offers integrated screening and diagnostics pathways, with high patient volumes incentivised through payment based on activity.



⁴⁶ Taiwan Food and Drug Administration

⁴⁷ Ministry of Health and Welfare

⁴⁸ My Health Bank

⁴⁹ The reimbursement coverage decisions and pricing rules for medical devices in Taiwan

Insight...

Management and Processing of Health Data in Taiwan

Taiwan has a sophisticated infrastructure of technology that enables healthcare delivery, with key components including:

My Health Bank App is used by 11.04 million people (39% of the population)

Integration of personal health data on a single platform with public-private collaboration

- NHI information (e.g., Western and traditional Chinese medicine records, surgical data, etc.)
- Contracted medical institutions are encouraged to upload data (e.g., laboratory test results, imaging reports)
- Disease risk assessment enabled (e.g., cardiovascular disease assessment)
- Self-input (e.g., dietary/exercise data, menstrual cycle tracking)
- Cross-agency data (e.g., organ donation directive, vaccination records)

NHI Cloud System

A cloud-based system for patient medical records has an overall usage rate of 98% among medical institutions

Proactively prompts cross-agency data integration and alerts of possible medication interactions, duplicate medication/testing, etc.

Virtual Health Insurance Cards

Issued to enable the smart healthcare model

Issued to almost 500,000 people (April 2023)

NHI Telemedicine

Enables specialised medical care in remote areas

Integrates front-end software and hardware, Internet of Things (IoT) related medical devices and provides smart applications

Joint Innovation and Healthcare Challenges

NBRP

The National Biotechnology Research Park (NBRP)⁵⁰ is a collaborative hub integrating state level agencies, academia, and industry to support translational research and startups. They have the BioHub Taiwan Accelerator, which fosters innovation. Industry presentations highlighted Instant NanoBiosensors Alzheimer's detection blood test, Pythia Biotech's organ-on-chip technology for drug development, Ochre Bio's RNA therapeutics, and the Taiwan Biobank's vast sample collection.

Opportunities include UK-Taiwan Biobank collaboration and potential partnerships for research translation. The NBRP offers infrastructure, funding, and accelerator programmes, with a focus on advancing healthcare technologies and fostering international collaborations. There is a clear enthusiasm for collaboration with the UK and a willingness to explore joint initiatives.51,52,53,54,55



- 50 National Biotechnology Research Park
- **51** Instant NanoBiosensors
- 52 Pythia biotech
- 53 Ochre Bio
- 54 Taiwan Biobank
- 55 Al Bioelectronic Healthtech

Insight...

Start-ups supported by NBRP

The NBRP under the Biomedical Translation research centre (BioTReC) currently houses 46 tenants as part of their innovation incubation centre, 14 of which are operating in smart healthcare and precision medicine. The centre supports translational research, business mentoring and assists with technology transfer and IP. Highlight of companies below who are current tenants at the NBRP.

- Instant NanoBiosensors are focused on Alzheimer's detection, developing cutting-edge technology to enable rapid and accurate diagnosis of the disease through blood tests. Their innovative approach aims to facilitate early detection and intervention for Alzheimer's patients.⁵⁶
- Pythia Biotech's lung-on-a-chip technology is a microfluidic device that mimics the structure and function of the human lung, allowing for the study of lung diseases and drug testing in a controlled laboratory environment. This innovative platform offers a more accurate and ethical alternative to animal testing for respiratory research.⁵⁷

56 Instant NanoBiosensors 57 Pythia Biotech 58 Ochre Bio 59 Taiwan Biobank



- Ochre Bio specialising in liver disease research and treatment. They develop innovative therapies, including RNA therapeutics, with a focus on addressing unmet medical needs in liver-related conditions.58
- Taiwan Biobank provides access to biological specimens and data collected from the Taiwanese population. By employing a centralised recruitment strategy and gathering extensive health, lifestyle and omics information, the Biobank aims to enhance understanding of chronic disease development and progression, ultimately supporting translational research for improved future health outcomes.⁵⁹



DCB

The Development Center for Biotechnology (DCB) was established jointly by the government and industry and focuses primarily on drug discovery and the drug discovery pipeline. It benefits from government subsidies, tax benefits, loans and grants to support R&D, available to both local and international organisations with an entity in Taiwan. DCB collaborates with pharmaceutical companies like Amgen, Takeda, Janssen and GlaxoSmithKline, emphasising unmet clinical needs and showing interest in omics research such as metabolomics and proteomics.

The organisation, under the Ministry of Economy, receives 70–80% of its funding from Taiwanese authorities and is keen on linking other companies into the UK for investment in SMEs/startups. Key areas of interest include liver disease, infectious diseases, clinical trials and the microbiome. Additionally, DCB plays a crucial role in reducing supply chain shortages for essential drugs.

Min-Sheng Smart Medical City

The Smart Medical City project by ShareHope Medicine aims to digitise healthcare, offering comprehensive services like pharmacy, clinics, surgeries, and Al diagnosis under one roof, integrating remote health services through Al and EMRs. The goal of the delegation's visit was to understand how healthcare is delivered in Taiwan and see an example of the integration of digital health into everyday healthcare. The clinic is developing wearable tech integration and focusing on preventative medicine, prescribing treatments based on patient metrics. Additionally, the Smart Medical City are planning an allinclusive medical tourism programme. In collaboration with Microsoft, they developed a smart voice system called Hermes which transcribes clinician spoken word directly into patient notes. Their patient database includes a disease prediction model. They conduct clinical studies on-site, and receive 80% of revenue from the NHI. Opportunities include potential partnerships for scaling clinic services in the UK.

While in the UK there is a gate-keeping system to specialist healthcare in the form of General Practitioners (GPs), in Taiwan it is possible to book an appointment directly with the healthcare provider of your choice. This provides both benefits, in that patients can access any healthcare provider of their choice, and downsides that specialist care may be at capacity due to seeing patients who would have benefited from seeing a different speciality provider.

Acer Medical

Acer Medical, a division of Acer, focuses on medical devices and AI solutions. Notable achievements include TFDA approval for AI-driven retinal imaging and osteoporosis detection tools. Collaboration interests involve R&D funding, hospitalat-home initiatives and knowledge of regulation to enable market access. Acer Medical's small team of 40 shares support functions with Acer. Despite challenges in Taiwan's healthcare system, Acer Medical is pioneering preventative medicine and imaging solutions. It was noted that reimbursement codes and TFDA approvals enable widespread adoption of technologies, with potential collaborations emphasising hospital-at-home solutions and B2C digital health platforms. Notably, Acer Medical prioritises equity in health and aims to integrate digital twins for appointment management.

Roundtable

Senior stakeholders from leading healthcare and medical device companies provided an overview of Taiwan's healthcare landscape, challenges, trends and opportunities for collaboration.

- Al Bioelectronic Health: specialises in radio-frequency identification systems for supply chain tracking, particularly in the healthcare industry. Their technology utilises Al to enhance the efficiency and accuracy of tracking medical supplies, pharmaceuticals and other healthcare products throughout the supply chain.
- CHC Healthcare Group: involved in various aspects of healthcare, including pharmaceuticals, medical devices and healthcare services and partner with various other providers and manufacturers. They are known for research, development, manufacturing and marketing of pharmaceutical products and medical devices. They contribute to the development and improvement of healthcare infrastructure and services in Taiwan.

- FTC Foxconntech Corp: one of the world's largest electronics manufacturing companies, also involved in R&D and encourage innovation via investment in emerging technologies and startups. They also provide supply chain management and technology services, including design, engineering and quality control.
- **ISTI in ITRI:** The ISTI at ITRI in Taiwan facilitates international collaboration, technology transfer, and market expansion by connecting ITRI with global organisations, conducting market analysis, assisting in technology transfer activities and advocating favourable policies for innovation.
- tWAN Biotech Co: Taiwan's first imaging clinical research organisation (CRO) specialising in clinical research projects that apply imaging biomarkers as trial endpoints. They offer services including imaging clinical research design, site qualification, blinded independent central review, and imaging training for sponsors, CROs, and scientists developing drugs, medical devices, and radiology Al software.

Taiwanese experts delivered a series of presentations that showcased innovations, technologies and Taiwan's strengths, needs, views of the UK, regulatory system, healthcare challenges and perspectives on efficient healthcare management. Strengths of the Taiwanese system included accessible healthcare via the NHI and digital medical records, while challenges included a shortage of nurses and low reimbursement rates for medical devices.

Taiwan's regulatory system highlighted fast-track processes for AI products and telemedicine. Despite low healthcare spending (5% of GDP), Taiwan maintains high-quality healthcare through cultural obedience, early detection, and comprehensive screening for diseases. Opportunities for collaboration include leveraging Taiwan's manufacturing expertise and collaborative regulatory environment. The UK could contribute by providing expertise in setting healthcare agendas and developing technologies to support healthcare staff.

ITRI

ITRI is an applied technology research institute founded in 1973 and employing around 6,000 people.⁶⁰ ITRI was the birthplace of companies such as TSMC, UMC, Taiwan Mask Corp., Epistar Corp., Mirle Automation Corp. and Taiwan Biomaterial Co. ITRI's goal is the development of industry, creation of economic value and enhancement of social wellbeing via technological R&D. ITRI is Innovate UK's partner (along with DoIT) for the delivery of the bilateral collaborative R&D calls. ITRI presented information on the Taiwan healthcare system and health data management, including how clinical studies are conducted in Taiwan and how overseas organisations can participate.

As with NYCU, ITRI showcased impressive projects. Visits to labs and presentations showcased a range of technologies and prototypes, demonstrating the depth of expertise and capabilities in areas like medical devices, AI, telemedicine, and IoT. These technologies have potential applications in various healthcare settings, including hospitals, care homes and community dwellings. They had a willingness and desire to collaborate internationally with a precedent for doing so. They receive funding from Taiwanese authorities and have robust mechanisms for commercialisation of innovations.

60 Industrial Technology Research Institute

Specific departments within ITRI concentrate on biomedical big data, Al, precision diagnostics, regenerative medicine, and more. To enable innovative health technology products, they assist researchers with regulatory aspects such as QMS and have access to patient data through insurance systems. They expressed interest in UK clinical study applications and real-world data usage for medical devices, seeking insights from the UK's approach. Potential opportunities include collaboration on ISO 13485 certifications and developing real-world data programmes for medical devices. ITRI shows support for enhancing the national My Health Bank app (discussed above and below), possibly integrating IoT and wearables for improved user records.

Insight...

ITRI's Biomedical Technology and Device Research Laboratories

ITRI has established two co-creation platforms leveraging advances in biomedical sciences and digital technology. The **Smart Healthcare** platform is designed to support researchers in developing digital therapeutics, testing and verification of products and services and training. The **Smart MedTech** platform, in partnership with AstraZeneca's Future Healthcare Lab 2.0, supports businesses to develop and test tele-surgery systems, verification of medical devices and compliance with international regulations.

PoseFit

ITRI's PoseFit Mirror utilises 2D skeleton extraction and motion tracking to assess muscular function, posture, motion balance, and flexibility, offering personalised strengthening exercises based on the results. With a user-friendly interface and no additional devices required, it simplifies screening procedures, making it suitable for long term care facilities or fitness centres to improve care and quality of life for the elderly.⁶¹

Full Body Strideway Analysis System

Assesses gait and posture without requiring the use of wearable devices or sensors. Employing a pressure sensing mat, cameras and an AI image recognition engine to measure walking speed, stride length, cadence, foot pressure, trajectory of the centre of mass and upper limb movements, the system allows the evaluation of the subject's physiological age and offers suggested preventative or corrective measures.⁶²

nsight.

Innovation Towards 2035

ITRI recently launched their technology strategy and roadmap with a focus on R&D investment in several key areas including smart living and quality health. The institute is leveraging and bringing together technology innovations from different domains to address fundamental challenges in healthcare delivery.

- Smart Living: ITRI is investing in R&D to develop autonomous mobility services, XR systems, smart consumer services and logistics.
- Quality Health: There is a focus on big data and AI with the institute actively working towards preventative health technologies such as precision and regenerative medicine and smart medical equipment.

NYCU

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NYCU, a university focused on They have a robust mechanism for biomedical sciences and electronics⁶³ commercialisation of innovations, is deeply involved in cutting-edge providing resources, mentorship and research and innovation, particularly incentives for faculty members and in biomedical technology, medical alumni to spin off companies and bring devices, AI, data science and computer innovations to market. There is a focus science. They showcased impressive on technology translation and creating projects with applications in healthcare, viable commercial products. The telemedicine, preventative care, and university does not claim intellectual ageing-related issues - reflecting property (IP), instead taking equity. a broader societal focus on health NYCU have strong partnerships with and wellbeing. These included brain-Japan. When considering which computer interfaces, lung-on-a-chip regulations to focus on, NYCU technology and sports technology discussed following a US FDA-based startups. They demonstrated a regulatory model, as they find European strong willingness to collaborate markets challenging to access. internationally, with current partnerships NYCU fosters strong collaborations spanning Asia, Europe and the US. They between academia and industry, had an interest in cooperating with encouraging faculty members to the UK on real-world data utilisation, take board positions and spin off regulatory standards, and technology companies. This collaborative approach translation. They receive funding accelerates the translation of research from both Taiwanese authorities, into commercial products and fosters who provide incentives for startups innovation ecosystems conducive and initiatives to keep Taiwanese to entrepreneurship and economic companies in Taiwan while expanding growth. Personal relationships are key globally, and from alumni who have to their network, presenting a potential gone on to have successful businesses challenge for establishing links with the UK. Overall, NYCU boasts robust infrastructure and government support, making it a valuable partner for future

collaborations.

Healthcare Data and AI

DRTC & AI Foundation

The delegation met with representatives from organisations working in Al in Taiwan. The Data Research and Technology Center (DRTC) is an Al-based innovation centre in Taiwan's biotechnology food industry. The Al Foundation shared around regulation, approvals and certification of Al in healthcare, and Taiwan Web Service Corporation shared around democratising generative Al to empower digital health innovation.

In Taiwan, there is a growing interest in employing AI across healthcare to minimise errors and facilitate innovation. The stakeholders discussed a preference for a global AI regulation framework and are aiming to carry out collaborative projects to accelerate AI research using big data. Taiwan's authorities subsidise AI work, and there's a push for 'green AI' to reduce cloud energy consumption. While Taiwan is receptive to AI, there was discussion of remaining buyer scepticism. There is the potential, however, to integrate data collected by the Ministry of Digital Affairs which can be used for AI-based research. Challenges discussed included AI reimbursement and unclear funding responsibility. An AI expert panel is being considered to facilitate a central mechanism for AI-development and regulation. The Taiwan team prioritises leveraging public healthcare data, AI regulation and drug design.

There is a vibrant innovation landscape in Taiwan, marked examples of cutting-edge research, robust regulatory frameworks, and a strong emphasis on collaboration. Opportunities for international partnerships appear to be available, offering avenues for mutual growth and advancement in health technologies, research translation and market access.

"We were able to understand the digital health landscape from research to patient care; from policy to implementation at scale. Taiwan offers huge potential for collaboration with the UK, we have complementary approaches and strengths and a lot to learn from each other." SmartCo Consulting

07. Collaboration Opportunities

Healthcare Systems & Routes to Market

The UK and Taiwan could leverage each The opportunity exists to establish long term other's strengths for enhanced healthcare strategic partnerships aimed at fostering delivery and innovation. The UK's NHS innovation, economic growth, and societal and Taiwan's MOHW could collaborate to impact, involving formal collaboration exchange knowledge and best practices agreements, joint funding initiatives and in healthcare management and financing. ongoing engagement to address shared For example, Taiwan has efficiently rolled challenges. There is the possibility of joint out a large-scale personal health data ventures, distribution agreements and management platform called the My Health collaborative market entry strategies, and a potential entry point to Asia Pacific and app and has invested in cloud storage system to track and store patient EMRs. This China for the UK. would be of great interest to the UK's NHS with opportunities to share ideas and cocreate solutions for the UK health service.

In addition, partnerships between the NHS and Taiwanese healthcare technology companies like Acer Medical could facilitate the adoption of digital health solutions, improving patient access and engagement. There is an opportunity for UK and Taiwan to focus on knowledge exchange, capacity building initiatives and the adoption of digital health solutions. Joint projects could explore areas such as telemedicine, hospital-athome models and preventative healthcare strategies, aiming to improve patient outcomes and healthcare efficiency.

"The Ministry of Health & Welfare's innovative approach to leveraging digital health technology including self-generated data, telemedicine & remote patient monitoring presents significant opportunities for joint initiatives."

Imperial College London

Technology & Joint Innovations

The UK and Taiwan have the potential to collaborate on groundbreaking healthcare technologies and joint innovations, leveraging each other's expertise. For instance, organisations such as Pythia Biotech in Taiwan, with its organ-on-a-chip technology could collaborate with UK-based research institutions to advance research in drug development and disease modelling. Joint projects could also involve companies like Ochre Bio, focusing on RNA therapeutics for liver diseases, collaborating with UK biotech firms to accelerate the development of novel therapies. Taipei Bioinnovation Park and the NBRP have excellent facilities housing a number of businesses in supporting early-stage research and commercial development.

Ecosystem Development and Innovation

Collaboration to establish or build on health-focused incubators, accelerators, and innovation hubs facilitating startups, SMEs, and innovators' access to funding, mentorship, and support services would nurture entrepreneurship and has the potential to further increase cross-border innovation. Funding exchange programmes between UK and Taiwanese universities would foster relationship building for potential future collaborations.

Training and Capacity Building

Implementing training programmes is vital for sharing expertise in healthcare regulation, QMS, and digital health innovation between Taiwan and the UK. Fostering joint training programmes, academic exchanges and collaborative research projects involving researchers and industry professionals will lead to greater knowledge exchange, skills development and facilitate technology transfer.

Collaboration on Clinical Research and Technology Development

There is the opportunity to leverage translational research capabilities and expertise in both markets to accelerate the discovery and development of new therapies, particularly addressing unmet medical needs such as rare diseases. Collaborations could include the sharing of expertise, resources, and regulatory insights to accelerate medical device development, including nanobiosensors for disease detection and AI-based technologies for healthcare applications. Taiwan has a mature innovation ecosystem in clinical and medical technology in which the UK can benefit from. Additionally, joint partnerships across both regions could establish population evidence from a range of ethnicities or diversities.

Insight...

NBRP BioHub Ecosystem

Located in the NBRP in Taipei, it provides infrastructure, business mentoring and training programmes, fostering collaboration with global partners, and expanding its reach into the global healthcare market.

Healthcare Data

Healthcare data management presents opportunities for collaboration between the UK and Taiwan, with a focus on interoperability, data security, and AI applications. Both Taiwan and the UK have advanced health data infrastructure, including EMRs and data sharing platforms. Collaborative projects could involve developing standards for data exchange, leveraging AI for predictive analytics and precision medicine, and conducting realworld data studies to inform healthcare decision making. By sharing expertise and resources, the UK and Taiwan can harness the power of healthcare data to improve patient care, accelerate medical research and drive innovation in healthcare delivery.

Collaboration in healthcare data management could involve organisations such as Taiwan's My Health Bank and the UK's NHS, working together to develop interoperable health data platforms. For example, the NHS could share its expertise in data security and privacy with Taiwanese organisations to ensure compliance with international standards. Joint initiatives could include the development of Al-driven predictive analytics tools for personalised medicine, benefiting from the data collected by both groups.

UK-Taiwan Biobank Collaboration

The Taiwan Biobank and the UK Biobank could collaborate by sharing best practices in biobanking operations, data management and governance. There is an opportunity to exchange biological samples and data to facilitate cross-population studies, enabling researchers to compare genetic, environmental and lifestyle factors contributing to various diseases. Additionally, joint research projects could be initiated to leverage the strengths of both Biobanks, leading to a deeper understanding of disease aetiology and potential therapeutic targets on a global scale. From 2025, Taiwan Biobank will be open to collaborating directly with foreign institutions (public or private).

Next Generation Digital Health Platform

The Next Generation Digital Health Platform aims to integrate various healthcare systems including the Hospital Information System, medical diagnostic equipment, and the NHI system to automate clinical and administrative processes, improving efficiency and patient satisfaction. By adopting the Fast Healthcare Interoperability Resources framework, it facilitates data exchange, reduces transaction losses, and allows patients to engage in selfmanagement through personal devices. The platform's goals include achieving system interoperability, establishing secure communication channels, integrating mobile solutions, ensuring the stability of core infrastructure and automating processes for efficient digitalisation of healthcare information.

Regulation

Regulatory alignment is essential for facilitating the adoption of healthcare technologies and ensuring patient safety. Both the UK and Taiwan have regulatory frameworks for medical devices, pharmaceuticals, and digital health solutions. Collaborative efforts could focus on aligning regulatory standards and promoting mutual recognition of certifications. By establishing common guidelines and sharing best practices, the UK and Taiwan can create a conducive environment for innovation, allowing companies to navigate regulatory pathways more efficiently and bring their products to market faster.

Organisations such as the UK's Medicines and Healthcare products Regulatory Agency (MHRA) and TFDA could collaborate to align regulatory standards and streamline approval processes. For instance, the MHRA could provide guidance to Taiwanese companies like Instant NanoBiosensors on navigating the UK regulatory landscape for Alzheimer's detection blood tests, facilitating market access and commercialisation.

The alignment of regulatory standards and processes for medical devices and healthcare technologies would involve best practice sharing and facilitating mutual recognition of certifications. This would enable market access and expansion for both the UK and Taiwan.

There may be opportunity to establish a system like the Taiwan-EU Technical Cooperation Programme (TCP) between Taiwan and the UK, which would involve mutual recognition of QMS certificates. A pool of EU Notified Bodies now accepts QMS certification issued by the TFDA, while the TFDA accept ISO 13485 certificates from those same EU Notified Bodies.

UK Approved Bodies are also accredited to certify against ISO 13485 requirements for medical device organisations. Introduction of the same recognition system between UK Approved Bodies and the TFDA could strengthen the appeal of manufacturers gaining ISO 13485 certification through a UK organisation, and ensure a collaborative approach to medical device regulatory requirements while also strengthening QMS certification from the TFDA.

Insight...

An overview of the clinical trials regulation process in Taiwan

Pre-clinical Study

Clinical investigation plan should be approved by the IRB and TFDA For non-significant risk (NSR) trials, TFDA review can be exempted

- Using licensed product within it's approved intended use/ indication
- Legally using **specimen or data** for testing **without using the results for patient diagnosis**
- Non invasively collecting data without ionizing radiation from the subject or using such data for investigation, without using the results for patient diagnosis

Clinical study

Amendments to the plan should be approved before implementation

Periodic status reports may be required

Post-Clinical Study or premature termination

Clinical study report should be submitted for approval or recordation

GCP compliance inspection may be launched

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Good Clinical Practice (GCP)

Healthcare Challenges

Despite their strengths, both the UK and Taiwan face healthcare challenges that could be addressed through collaboration. In the UK, issues such as workforce shortages, ageing populations, and healthcare inequalities pose significant challenges. Taiwan grapples with similar issues, along with nursing shortages, increased demand for long term care and addressing the needs of a super ageing society that requires specialised treatment and better integrated care models.

There are a number of opportunities for bilateral partnership focusing on innovative solutions such as Al-driven workforce management tools, digital health including telemedicine platforms for remote patient care, hospital-at-home, self-care, and digital health interventions to promote health equity. The UK and Taiwan could bring together expertise to collaborate on initiatives to extend hospital services into patients' homes, leverage internet of medical things (IoMT) ecosystems and digital health solutions to provide care to ageing populations and those with chronic conditions. By pooling their resources and expertise, the UK and Taiwan can tackle common healthcare challenges and create sustainable solutions for the benefit of their populations.

Digital health collaborations could include developing B2C digital health propositions integrated with social media platforms, aimed at engaging and educating users on health and wellness topics. The Min-Sheng Smart Medical City has an ambitious plan on digitalising the patient journey and has invested heavily in digital health innovation. There is an opportunity for the NHS to engage and share best practices on implementing digital technology across NHS trusts. In the telemedicine and digital health arena, the opportunity exists for sharing of experiences in remote patient monitoring and development of digital health solutions to improve access to healthcare and patient outcomes.

The NHS and Taiwan's NTU Cancer Centre could collaborate on innovative solutions to tackle workforce shortages and improve operational efficiency. Initiatives could include knowledge exchange programmes, joint research projects, and technology transfer partnerships aimed at enhancing cancer care delivery. UK-based healthcare providers could collaborate with Taiwanese companies on projects to address challenges such as ageing populations and healthcare inequalities through digital health interventions and telemedicine platforms.

The potential for collaboration between Taiwan and the UK in healthcare and technology presents a myriad of opportunities for mutual benefit and advancement. Through initiatives such as knowledge exchange, training programmes, and ecosystem development, both markets can leverage their respective strengths to foster innovation, address shared challenges and drive economic growth. There appears to be a conducive environment for sustainable partnership and long-term impact. Embracing digital health innovation and cross-sector collaboration further enhances the prospects for improving healthcare outcomes and addressing the needs of ageing populations.

08. Barriers to Collaboration

Bureaucratic Hurdles

Bureaucratic hurdles may hinder the smooth implementation of collaborative projects, including for example differences in healthcare systems and reimbursement models, leading to delays and inefficiencies.

Regulatory Standards

Divergent regulatory environments represent a challenge for aligned standards/guidelines particularly in emerging tech and Al. Navigating different regulatory standards and processes may require significant time, resources, and expertise. However, alignment of these regulatory requirements may be necessary to facilitate smooth collaboration.

Cultural Challenges

Differences in attitudes towards healthcare, technology adoption and data privacy may impede collaboration and aligned goals. Cultural and language difference could create communication barriers. Misunderstandings or differences in work practices, communication styles and expectations could impact the success of collaborative projects.

The healthcare ecosystem in Taiwan also represents challenges, Taiwan has strong ties with other markets (e.g., Japan and the US) which may overshadow collaboration with the UK. Restrictions on healthcare data leaving Taiwan poses a challenge for joint ventures.

Funding and Reimbursement Challenges

Discrepancies in funding mechanisms and reimbursement systems between Taiwan's NHI and the UK's National Health Service (NHS) could complicate joint initiatives and financial sustainability. For example, Taiwan does not offer a market with high reimbursement rates for medical devices, with a preference for generic brands over brand names, and restriction on hospitals operating for profit. Disparities in healthcare market access and reimbursement mechanisms between Taiwan and the UK can create barriers to the adoption and commercialisation of healthcare products and services. Limited reimbursement options for innovative technologies, particularly AI-driven solutions, may hinder their uptake and scalability in both markets.

Limited Data Accessibility

Data sharing may be limited due to legal and regulatory constraints in Taiwan. There would be a requirement for robust data governance frameworks to ensure compliance with relevant regulations. Challenges related to data sharing and accessibility, including siloed patient data within hospital groups and limited access to national research databases. may hinder collaborative research and innovation efforts. Legal and regulatory constraints regarding data privacy and security, particularly where personal health data cannot leave Taiwan, which can pose challenges for collaborative initiatives involving data sharing and integration. Compliance with stringent data protection regulations may require careful consideration and implementation of appropriate safeguards to ensure data security and privacy. Compliance with data privacy regulations, such as General Data Protection Regulation (GDPR) in the UK and similar laws in Taiwan, can complicate data sharing and collaboration efforts, particularly in healthcare and biomedical research. Establishing robust data governance frameworks and ensuring compliance with relevant regulations are essential for addressing these concerns.

IP Concerns

As for operating with most international markets, clear agreements and legal frameworks for IP management and licensing would be needed. IP concerns, including issues related to ownership, protection, and licensing, can pose barriers to collaboration. Disagreements over IP rights or concerns about IP theft may hinder the sharing of proprietary information and technologies. Clear agreements and legal frameworks for IP management and licensing are essential to address these concerns. Any reluctance to licence IP to UK companies may hinder partnerships.

Lacking Drivers for Innovation Size of Market and Market

The Taiwanese healthcare system may not be sufficiently set up to encourage While Taiwan is interested in accessing the European market, they are potentially not innovation. For example, the pay-per-visit sufficiently interested in the UK, which is reimbursement model where Doctors are reimbursed based on the number of patients a small market (as is Taiwan). Differences they see is not optimal for AI or 'at home' in the readiness of healthcare markets for health interventions to reduce patient visits. digital health solutions and innovations This contrasts with the UK's approach may affect the scalability and adoption of collaborative projects, particularly if there where the strategy is to reduce hospital is limited demand or acceptance of new visits facilitated by digital interventions. While Taiwan is increasingly adopting digital technologies. Strong existing partnerships interventions for healthcare delivery (see with other international markets, coupled to Infobox 1) there may be an opportunity for established market players in both Taiwan the UK to share learning and best practices. and the UK, may create competition for resources and collaboration opportunities, **Resource Constraints** potentially limiting the scope of joint Limited funding, infrastructure, and human initiatives. While a small market has resources may constrain collaborative downsides, they also have opportunities. For example, the UK has strong life science and efforts, especially for startups and smaller research sectors, and clinical data generated organisations. Access to funding, grants, in the UK is accepted in other market and other resources to support collaborative submissions (e.g., the EU).

R&D initiatives can help mitigate these constraints. Factors such as staffing shortages, limited funding for R&D, and competing priorities within healthcare organisations may constrain the resources available for collaboration and innovation efforts.

Readiness

While barriers to collaboration are present, none appear to be insurmountable. Addressing these barriers will require proactive efforts from both Taiwanese and UK stakeholders to foster mutual understanding, streamline processes, and develop strategies for overcoming regulatory, cultural, and operational challenges to successful collaboration in the healthcare sector.

09. Conclusion

A collaboration between Taiwan and the UK in health technology holds significant promise for driving innovation, fostering economic growth and addressing shared societal challenges. The multifaceted nature of the partnership, spanning innovation partnerships, collaborative funding, business innovation support, regulation and standards alignment, business opportunities, skills development, private investment and policy alignment highlights the depth and breadth of the potential impact.

Synergistic capabilities include Taiwanese expertise in manufacturing and R&D of electronics, while the UK has a wealth of knowledge and science and technology expertise to contribute. There remain challenges to achieving successful collaboration, including regulatory divergences, differences in how health services are reimbursed, data interoperability issues and IP concerns. However, overcoming these would enable access to expertise, mutually beneficial collaboration, and the potential for long term strategic partnerships.

By leveraging each other's strengths in research, development, and manufacturing, both markets can accelerate progress in critical areas such as Al-driven diagnostics, medical device development, precision medicine and digital health innovations. Joint initiatives aimed at translating innovative technologies into commercial products with global market potential not only enhance market access but also promote economic opportunities for both nations. The establishment of long-term strategic partnerships through joint funding initiatives and ongoing engagement is essential for sustaining innovation ecosystems and addressing emerging challenges effectively. This includes addressing regulatory hurdles, promoting data sharing, and investing in R&D to support cross-border projects.

The focus on healthcare workforce and ageing population solutions by both markets reflects a commitment to improving healthcare access and outcomes, particularly in the face of demographic shifts and workforce shortages. Technologyenabled approaches such as telehealth, hospital-at-home models and digital health solutions offer promising avenues for enhancing healthcare delivery and patient care.

A partnership between Taiwan and the UK in health technology would exemplify a synergistic approach to innovation and collaboration. Through strategic alignment and effort, significant strides can be taken in advancing healthcare innovation, driving economic growth and improving societal wellbeing.

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