Innovation and Technology Training Board

Manpower Update Report
Innovation and Technology Sector
2025

ACKNOWLEDGEMENT

The Innovation and Technology Training Board (ITTB) would like to express its gratitude to the focus group members for their valuable time and insights regarding the manpower landscape in the innovation and technology (I&T) sector.

We would like to express our special thanks to CPJobs and CTgoodjobs for providing access to their database of job vacancies. The perspectives shared by focus group members, alongside the insights from ITTB members and key recruitment platforms, have been instrumental in shaping the findings presented in this report.

Thank you for your support and collaboration in this important endeavour.

Contents

Introduction

Background

The Innovation and Technology Training Board (ITTB) of the Vocational Training Council (VTC) is responsible for determining manpower demand of the sector, assessing whether the manpower supply matches manpower demand, and recommending to the VTC the development of Vocational and Professional Education and Training (VPET) facilities to meet the assessed training needs.

To reflect the dynamics of the evolving manpower landscape, the ITTB conducts a full manpower survey every four years, complemented by two interim manpower updates. Following the release of the full manpower survey in 2022 and the subsequent manpower update in 2024, the ITTB conducted its latest manpower update in 2025.

The 2025 Manpower Update comprises:

(a) Focus Group Meeting: This forum convened industry experts to discuss the latest developments in the innovation and technology (I&T) sector, assess the current manpower situation, identify training needs, address recruitment challenges, and propose actionable measures to overcome obstacles facing the sector; and

(b) Desk Research: An analysis of job advertisements related to the I&T sector was

conducted to provide quantitative insights into hiring trends and skills requirements.

Objectives

The objectives of the manpower update are:

(i) to examine the latest trends and developments in the sector;
(ii) to explore the job market situation and training needs;
(iii) to identify the recruitment challenges; and
(iv) to recommend measures to address the training needs and to ease the problem of manpower shortage.

Methodology

Overview

This update report aims to provide qualitative descriptions of recent developments in the sector through the information obtained from the focus group meeting, supplemented by relevant quantitative data on recruitment advertisements obtained from desk research.

Focus Group Meeting

The focus group was formed through the engagement of industry experts to understand the latest trends and development of the manpower, training needs and recruitment difficulties in the sector. Members participating in the focus group are seasoned industry practitioners from the I&T sector, representing:

(i) IT products and services suppliers;
(ii) IT sales and marketing services;
(iii) manufacturing sector / financing, insurance, real estate and business services sector / community, social and personal services sector / transport and storage services or communications services sector;
(iv) IT system integration sector or IT solution service provider;
(v) technology development and support sector or innovation products and services;
(vi) research and development centre / education and training;
(vii) Hong Kong Science and Technology Parks Corporation;
(viii) Hong Kong Cyberport Management Company Limited; and
(ix) Digital Policy Office.

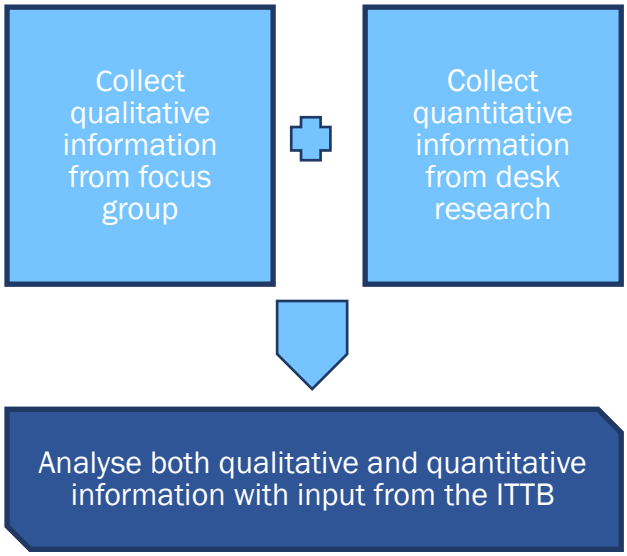
The focus group meeting in hybrid mode, i.e. face-to-face and online, was conducted on 28 August 2025. Members had in-depth discussions on topics set out by the Working Party on Manpower Survey of the ITTB. The discussions at the meeting were recorded and transcribed to facilitate analysis.

Desk Research

The desk research was conducted between August 2024 and July 2025 to collect job advertisements in the I&T sector from major online recruitment portals through an employment information system. The collected information was mapped against the list of related companies under the Hong Kong Standard Industrial Classification. After eliminating duplicated records, around 58,000 recruitment records were captured during the research period.

Data Analysis

The analysis consists of the following three steps:



Limitations

As this is not a full manpower survey, the findings and recommendations drawn from the focus group meeting are more qualitative in nature and the report focuses mainly on the analysis of manpower trends.

The information on job advertisements was collected from major recruitment portals and the Labour Department. Other channels, such as head hunting for managerial positions, recruitment through social media platforms or industry referrals, were not covered. Since the data collected is a snapshot of a particular period without reference to any historical data, this can only serve as reference information supplementary to the findings of the focus group meeting.

Findings

Factors Affecting the Development of the Innovation and Technology Sector

Robust Policy Initiatives

The Government of the Hong Kong Special Administrative Region has prioritised the acceleration of I&T development as a pivotal policy objective. Key initiatives of the Northern Metropolis and San Tin Technopole provide a strategic framework and essential land resources that serve as key hubs for industrial and technological advancement.

The Government places significant emphasis on fostering high value-added advanced manufacturing, fueled by I&T, which is evident through the introduction of various subsidy schemes to support the advancement of "new industrialisation". Notably, the New Industrialisation Funding Scheme (NIFS) is designed to subsidise manufacturers in setting up new smart production lines in Hong Kong, while the New Industrialisation Acceleration Scheme (NIAS) encourages the establishment of new smart production facilities in Hong Kong.

The proactive implementation of these policy initiatives has enabled the Shenzhen-Hong Kong-Guangzhou innovation cluster to achieve the distinction of being ranked first globally in the 2025 Global Innovation Index[1] as published by the World Intellectual Property Organisation.

Hong Kong's Competitive Advantage

A notable source of Hong Kong's competitive advantages lies in its openness and extensive international linkages. The development of the I&T sector is closely intertwined with the broader regional, national and global innovation networks. Hong Kong's strategic geographical location within the Greater Bay Area (GBA) enhances its role as a highly internationalised connecting platform functioning as both a "super-connector" and "super value-adder". This advantageous positioning allows for seamless connections between the East and the West, effectively leveraging its international linkages in an increasingly fragmented global geo-economic landscape.

[1] https://www.wipo.int/web-publications/global-innovation-index-2025/en/cluster-ranking.html

Emerging Sectors and Technologies

In alignment with the national strategy for technological advancement aimed at driving industry restructuring and fostering emerging industries, the Government attaches great importance to sectors such as advanced manufacturing, life and health technology, new energy, artificial intelligence (AI) and robotics, among others. These sectors are essential in promoting multi-faceted economic development and generating high-quality employment opportunities.

AI and data sciences, described as key catalysts for Hong Kong's future I&T development, are bolstered by government initiatives such as the AI Subsidy Scheme and the AI Plus development.

Emerging industries and technologies propel Hong Kong's transformation into an international I&T hub. This shift is driving industrial upgrades and creating an innovation-driven economy, enabling competitiveness on a global scale while remaining well integrated within the regional context.

I&T Talent Cultivation

To expand the talent pool in the I&T sector, Hong Kong has implemented a comprehensive set of policy initiatives aimed at attracting non-local talent. Significant policy initiatives include the Top Talent Pass Scheme (TTPS), the Technology Talent Admission Scheme (TechTAS), the Immigration Arrangements for Non-local Graduates (IANG), and the Vocational Professionals Admission Scheme (VPAS). The recent Talent List review has included newly added professions, with a view to generating new impetus for growth in the development of the sector. These visa and immigration facilitation, coupled with targeted talent admission policies, address the talent shortage and provide the manpower resources for the I&T sector.

Moreover, the Government actively promotes STEAM (Science, Technology, Engineering, Arts, and Mathematics) education in its educational policy framework, aiming to further advance young talent cultivation. The STEM Internship Scheme encourages undergraduates and postgraduates in STEM fields to engage in short-term internships with Government R&D centres and private enterprises, thereby amplifying practical exposure and career interests in the I&T field.

Collectively, these initiatives create a strong talent pipeline that secures sustained growth and enhances the competitive landscape of Hong Kong's I&T ecosystem.

Research and Development Capacity

Government Initiatives and Infrastructure

Research and development (R&D) serves as the cornerstone for I&T advancement in Hong Kong. The Government has devoted substantial resources to a range of infrastructural projects, establishing key R&D centres such as the Hong Kong Applied Science and Technology Research Institute (ASTRI), the Hong Kong Research Institute of Textiles and Apparel (HKRITA), the Logistics and Supply Chain MultiTech R&D Centre (LSCM), and the Nano and Advanced Materials Institute (NAMI). Furthermore, the AIR@InnoHK research cluster, which pooled over a thousand experts, has strengthened Hong Kong's capabilities in research and the advancement of AI and Robotics technologies. These initiatives have contributed to the formation of a dynamic I&T ecosystem, taking forward industry-driven applied R&D work to commercialise their R&D outcomes.

To further promote R&D, the 2025-26 Budget announced the establishment of the Hong Kong Artificial Intelligence Research and Development Institute (AIRDI) to facilitate upstream R&D, midstream and downstream transformation of R&D outcomes, as well as expansion of application scenarios. It will foster an environment conducive to attracting international I&T resources and expertise to Hong Kong, providing key support to Hong Kong's development.

Cross-Sectoral Collaboration

Encouraging collaboration among industry, academia and research sectors is essential for fostering innovation ecosystem. The Government launched the Research, Academic & Industry Sectors One-plus Scheme (RAISe+) to provide funding on a matching basis to unleash the potential of local universities in transforming and commercialising R&D outcomes. Furthermore, the Innovation and Technology Industry-Oriented Fund (ITIF) aims to attract private capital towards emerging industries through government co-investment models.

The Gross Domestic Expenditure on R&D (GERD) for Hong Kong reached approximately 1.11% of its Gross Domestic Product (GDP) in 2023[2]. While the business sector accounts for a sizable share of GERD, the amount it incurred in R&D activities is markedly lower than that of leading innovation-driven economies, due to factors such as limited market size, elevated operating costs, and long payback periods for investments. The prolonged development cycle of R&D requires substantial financial resources, a challenge that is particularly acute for startups and small and medium enterprises (SMEs).

[2] https://www.censtatd.gov.hk/en/wbr.html?ecode=B11100102023AN23&scode=580

Talent Development

To sustain Hong Kong's position as an I&T hub, the Government has intensified efforts to nurture local talent while attracting Mainland and overseas professionals. The Research Talent Hub provides subsidies to eligible companies or organisations seeking to engage university graduates in STEM-related disciplines to conduct R&D work. The launch of TechTAS introduces a fast-track arrangement for eligible companies to admit non-local technology experts for R&D initiatives in Hong Kong. Moreover, the Frontier Technology Research Support Scheme (FTRSS) aims to assist local subsidised institutions in attracting top-notch international scientific researchers to Hong Kong and procuring facilities to conduct research projects in frontier technology fields.

The Government's unwavering commitment to advancing R&D is anticipated to markedly increase the manpower demand for patent professionals, who are vital for bridging the gap between technological innovations and legal protections. These specialists play a crucial role in managing and commercialising patent portfolios to drive the commercial value stemming from innovation. This uptick in demand for patent specialists is evident by a rise in job advertisements, which rose from 437 in 2024 to 578 in 2025.

Furthermore, there has been a notable surge in job postings requiring AI competencies, which doubled from 640 in 2024 to 1,285 in 2025, despite an overall decline of 3.3% in total job advertisements. Nonetheless, a significant gap in qualified professionals persists, a consequence of the heightened demand across the technology sector and R&D fields, compounded by a lack of specialised expertise in emerging technologies, which are increasingly relevant in Hong Kong's intellectual property landscape.

Manpower Demand

Focus Group

In light of recent sector trends and developments, the focus group provided insights into expected shifts in manpower demand. There is expected to be a pronounced demand for experienced practitioners in the I&T sector, particularly for principal jobs associated with AI development, cloud technology, data analytics, cybersecurity, and Internet of Things (IoT).

The widespread adoption of AI technologies across various industries, coupled with the growing importance of cloud technology, has undoubtedly heightened the demand for specialists in AI and cloud infrastructure. Additionally, the need for data-driven decision-making has made the role of data scientist one of the most in-demand careers in today's job market.

Furthermore, the persistent demand for cybersecurity professionals is projected to rise further with the enforcement of the Protection of Critical Infrastructures (Computer Systems) Bill, which will come into effect on 1 January 2026. Organisations will be legally obliged to strengthen the security of their critical infrastructure's computer systems and enhance compliance measures in line with the new legislative requirements.

Looking forward, the convergence of AI and IoT is transforming the technological landscape and creating new career opportunities, including positions such as AI Consultant and AI Integrator.

Desk Research

The ITTB conducted desk research from August 2024 to July 2025, gathering approximately 58,000 job advertisements related to the I&T sector. This reflects a slight decrease of 3.3% compared to the 2024 Manpower Update.

The subsequent section outlines the top ten principal jobs with the highest number of job advertisements, in comparison to the manpower update from the previous year.

Top Ten Principal Jobs				
Rank	2025 Manpower Update		2024 Manpower Update	
1)	Head of IT (including CIO, IT Director, IT Manager, MIS Director, MIS Manager, IS Director, and IS Manager)	23%	Head of IT (including CIO, IT Director, IT Manager, MIS Director, MIS Manager, IS Director, and IS Manager)	20.9%
2)	Programmer (including Software Developer, Software Engineer, Application Developer, Web Developer, Full-Stack Developer, Front-end Developer, Back-end Developer, and Embedded Software / Firmware Developer)	12.9%	Programmer (including Software Developer, Software Engineer, Application Developer, Web Developer, Full-Stack Developer, Front-end Developer, Back-end Developer, and Embedded Software / Firmware Developer)	15%
3)	Systems Analyst	5.6%	Systems Analyst	6.2%
4)	Business Analyst	5.4%	Analyst Programmer (including Programmer Analyst)	5.9%
5)	Project Manager (including Project Director, PMO Manager, Project Leader / Lead, and Scrum Master)	4.9%	Business Analyst	4.8%
6)	Analyst Programmer (including Programmer Analyst)	4.7%	Project Manager (including Project Director, PMO Manager, Project Leader / Lead, and Scrum Master)	4.3%
7)	Data Scientist (including Data Science Specialist, Data Engineer, Data Analyst, Chief Data Officer, and Business Intelligence Specialist)	3.5%	Data Scientist (including Data Science Specialist, Data Engineer, Data Analyst, Chief Data Officer, and Business Intelligence Specialist)	3%
8)	Network Engineer (including Telecommunications Engineer, Network Architect, Network Officer, Network Consultant, and Network Specialist)	2.5%	Network Engineer (including Telecommunications Engineer, Network Architect, Network Officer, Network Consultant, and Network Specialist)	2.6%
9)	Systems Architect (including IT Architect, Software Architect, Application Architect, Solutions Architect, Network Architect, and Technical Architect)	1.2%	IT Sales Representative, IT Marketing Representative (including Sales Engineer, Account Manager, and Marketing Specialist)	1.5%
10)	IT Sales Representative, IT Marketing Representative (including Sales Engineer, Account Manager, and Marketing Specialist)	1.2%	Systems Architect (including IT Architect, Software Architect, Application Architect, Solutions Architect, Network Architect, and Technical Architect)	0.9%

Comparison with 2024 Manpower Update

In comparison to last year's manpower update, recruitment advertisements reveal a steady demand for the top ten principal positions. Similar to previous findings, managerial roles (23%) continue to occupy the highest number of job advertisements, reflecting a strong and persistent demand in the market. Simultaneously, the positions of Programmer, Systems Analyst, Business Analyst, Project Manager and Analyst Programmer (33.5%) remain the most sought-after roles, collectively accounting for approximately one-third of the total vacancies during the period from August 2024 to July 2025.

The findings underscore a continuous trend reflecting a significant shortage of managerial positions in the I&T sector. The demand for programmers and system analysts remains robust, driven by technological advancements, including developments in AI and the expanding digitalisation across various sectors.

Training Needs

Focus Group

The following skills as corresponding training needs have been identified in the I&T sector:

Technical skills

- Artificial Intelligence
- Cloud Infrastructure
- Cybersecurity
- Data Science and Analytics
- AI Ethics

Soft skills

- Interdisciplinary Thinking
- Design Thinking
- Business Acumen and Entrepreneurship
- Adaptability
- Interpersonal Communication Skill

Desk Research

In addition, the advanced technologies, related job titles, and required emerging skills and knowledge identified from the advertisements are summarised in the following table:

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge
Artificial Intelligence	• AI Consultant • AI and Machine Vision Engineer • AI Developer • AI Engineer • AI Researcher • AI Specialist • Data and AI Architect • Manager of AI	• Knowledge of machine learning algorithms, particularly bidirectional encoder representations from transformers (BERT), Light Gradient Boosting Machine (LGBM), and random-forest model • Experience in Microsoft Azure, Azure Databricks, Power BI, Generative AI model application or AI agent building (GANs, LangChain) • Experience in advanced AI techniques, such as transformers, diffusion models, Graph RAG, LoRA, Short-Term and Long-Term Memory, LLM Fine–Tunning, AI Agents, Web Search, vectorisation, data tagging, embeddings or Variational Autoencoders (VAEs) / Generative Adversarial Networks (GANs) • Experience in implementing large language model (LLM) / Retrieval-Augmented Generation (RAG) / Agentic AI-related projects • Sound knowledge of Database Management System DBMS such as Microsoft Structured Query Language (SQL) Server • Understanding of IT governance and enterprise architecture frameworks, and preferably being certified with relevant qualifications such as The Open Group Architecture Framework (TOGAF) • Knowledge of Agile development, DevOps, Docker, Kubernetes, Continuous Integration (CI) / Continuous Deployment (CD) • Experience with cloud AI services, such as Amazon Web Services (AWS) SageMaker, Google Vertex AI, and APIs • Knowledge of Middleware, such as REmote DIctionary Server (Redis) / Elasticsearch / RabbitMQ, etc.

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge
		● Experience in developing deep learning frameworks and proficiency in Python programming using essential libraries such as OpenCV (Open Source Computer Vision Library), TensorFlow, Halcon, VisionPro, Scikit-learn, PyTorch, Keras, Pandas, NumPy, eXtreme Gradient Boosting (XGBoost), etc. ● Experience in developing programmes using Visual Basic, Python, Matrix Laboratory (MATLAB), R, Microsoft Visual C++, C/C++, C#, Java, JavaScript language
Data Science	● Chief Data Officer ● Data Analyst ● Data Analytics Manager ● Data Engineer ● Data Protection Manager ● Data Specialist	● Knowledge of Extract, Transform, Load (ETL) processes for data integration, data streaming, data pipeline, data model implementation and data visualisation ● Knowledge of data lakehouse platform architecture ● Hands-on experience in My Structured Query Language (MySQL), PostgreSQL, MongoDB, Microsoft Structured Query Language (MS SQL), ClickHouse, Oracle Universal Database (UDB) Server database administration ● Experience with big data technologies, such as Hadoop, Spark, Airflow, Kafka, etc. ● Knowledge of data visualisation tools, such as Tableau, Metabase, Qlik Sense ● Experience with Data Bricks, Data Lake, Databricks, Apache Spark, and Big Query concepts ● Familiarity with various data governance tools, such as ETL, data quality / cleansing, master / meta data management, and data profiling ● Possession of Microsoft Azure Data Analytics, Power BI, etc. certification ● Knowledge of orchestration tools, such as Kubernetes

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge

Cybersecurity	• Cybersecurity Analyst
	• Cybersecurity Application Developer
	• Cybersecurity Audit Manager
	• Cybersecurity Engineer
	• Cybersecurity Manager
	• Cybersecurity Specialist
	• Head of IT Risk Control
	• Information Security Analyst
	• Information Security Operation Engineer
		• Comprehensive knowledge in general IT security concepts, including authentication, identification, authorisation, confidentiality, integrity, availability, firewall, intrusion detection system (IDS) / intrusion prevention system (IPS), endpoint security, web proxy, etc.
		• Possession of the following professional certifications:
		  • Cisco Certified Network Associate (CCNA)
		  • Cisco Certified Network Professional (CCNP)
		  • Certified Cybersecurity Operations Analyst (CCOA)
		  • Certified Cloud Security Professional (CCSP)
		  • Certified Ethical Hacker (CEH)
		  • Certified Information System Auditor (CISA)
		  • Certified Information Security Manager (CISM)
		  • Certified Information Systems Security Professional (CISSP) / Certified Information Security Professional (CISP)
		  • Certification for Certificateless Registry for Electronic Share Transfer (CREST)
		  • Certified Scrum Master (CSM)
		  • Computing Technology Industry Association (CompTIA) Security+
		  • GIAC Exploit Researcher and Advanced Penetration Tester (GXPN)
		  • GIAC Incident Handler (GCIH)
		  • Global Information Assurance Certification (GIAC)
		  • GIAC Penetration Tester (GPEN)
		  • GIAC Security Essentials (GSEC)
		  • GIAC Web Application Penetration Tester (GWAPT)
		  • International Information System Security Certification Consortium (ISC2)
		  • Microsoft Certified Solutions Expert (MCSE)
		  • Offensive Security Certified Expert (OSCE)
		  • Offensive Security Certified Professional (OSCP)
		  • Offensive Security Exploit Expert (OSEE)

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge
		• Payment Card Industry Internal Security Assessor (PCI ISA) • Systems Security Certified Practitioner (SSCP) • The Open Group Architecture Framework (TOGAF) ● Familiar with security related standards and references, such as National Institute of Standards and Technology (NIST), ISO 27001, Payment Card Industry Data Security Standard (PCI-DSS), SysAdmin, Audit, Network, and Security (SANS), Open Worldwide Application Security Project (OWASP), General Data Protection Regulation (GDPR), and National Institute of Standards and Technology Special Publication (NIST) 800-53, etc. ● Knowledge of the following security technologies: • Anti-Distributed Denial of Service (Anti-DDoS) Solutions • Cloud Access Security Broker (CASB) • CrowdStrike • CyberArk • Email Gateway • Endpoint Detection and Response (EDR) / Extended Detection and Response (XDR) • Host-based Intrusion Prevention System (HIPS) • Intrusion Detection System (IDS) / Intrusion Prevention System (IPS) • layer 3 / layer 4 / layer 7 firewalls • Multi-Factor Authentication (MFA) • Network Intrusion Detection System (NIDS) • Privilege Access Management (PAM) • Security Information and Event Management (SIEM) • Security Orchestration, Automation, and Response (SOAR) • Secure Socket Layer Virtual Private Network (SSL VPN) • Vulnerability Scanner • Web Application Firewall (WAF) • Web Proxy

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge
		• Zero Trust Network Access (ZTNA) ● Implementing Identity and Access Management (IAM) and Data Loss Prevention (DLP) strategies, incident response and recovery planning
Cloud Computing	● AWS Cloud Engineer ● Cloud Architect ● Cloud and DevOps Engineer ● Cloud Engineer ● Cloud Infrastructure Manager ● Cloud Project Manager ● Cloud Solution Architect	● Knowledge of cloud architecture, cloud technologies and deployment models, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) ● Familiarity with Red Hat OpenShift, Containers, Ansible, Elasticsearch, Grafana, Prometheus, Huawei Cloud Stack (HCS), MySQL, and Redis ● Possession of the following professional certifications: • AWS Certified Solutions Architect • Microsoft Certified: Azure Solutions Architect Expert • Huawei Certified ICT Expert (HCIE) / Professional (HCIP) • Alibaba Cloud Certified Expert (ACE) / Professional (ACP) ● Expertise in Kubernetes and major cloud platforms, using Infrastructure as Code (IaC) such as Terraform and AWS CloudFormation ● Strong understanding of cloud platforms for computing, networking, storage, backup / recovery, and virtualisation
Financial Technology	● Backend Developer ● Fintech Digital Manager ● Fintech Director ● Fintech Product Development Manager ● Frontend Developer ● Innovation & Fintech Project Manager	● Experience in implementing front-end solutions building advanced responsive layouts to support complex user interface concepts ● Experience in developing back-end services and Application Programming Interface (APIs) to support new features and enhancements ● Understanding of data structures and application in User Interface (UI) development ● Experience of end-to-end testing with Playwright or Detox and automated testing suites, like Jest

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge
		● Experience in modern JavaScript libraries/frameworks, such as React.js, Webpack, Vue.js, AngularJS, Spring Boot, Django and Express.js, etc. and knowledge of Babel and ESLint, etc. ● Experience in TypeScript development and its nuances, including ES6+ syntax. ● Experience of Jasper Reports, Websphere MQ, WAS, Oracle, DB2 and X.509, etc. ● Experience with state management, like Zustand and React Query for Application Programming Interface (API) calls/ requests ● Familiarity with Representational State Transfer (REST) APIs, JavaScript Object Notation (JSON), and Test Driven Development (TDD) ● Experience with Progressive Web App (PWA) approaches and Docker ● Experience in browser-based debugging and performance optimization
Robotics	● Mechanical/Robotics Engineer ● Robotics and AI Researcher ● Robotics Systems and Algorithms Researcher	● Experience with Robot Operating System (ROS) software and methodologies ● Familiarity with computer vision libraries and tools, such as Dlib and the Point Cloud Library (PCL) ● Proficiency in real-time operating system development with Real-Time Operating System (RTOS) ● Familiar with various communication interfaces and protocols, including Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I2C), Universal Asynchronous Receiver-Transmitter (UART), Controller Area Network bus (CAN bus), Ethernet, etc. ● Basic knowledge of analog and digital circuits, familiar with the use of various common peripherals and components of Microcontroller Unit (MCUs). ● Experience with Altium Designer, Cadence, or similar tools for circuit diagram and board design

Advanced Technology	Related Job Titles	Required Emerging Skills and Knowledge
		● Experience with 3D CAD software, such as SolidWorks, Fusion 360, etc. ● Strong background in 3D point cloud data processing, including experience with Simultaneous Localisation and Mapping (SLAM) and camera-Light Detection and Ranging (LiDAR) calibration ● Knowledge of parallel computing principles and graphics processing unit (GPU) programming techniques ● Proficiency in 32-bit STMicroelectronics (STM32) microcontrollers and Advanced RISC Machine (ARM) architecture

Recruitment Challenges

The competitive landscape of the job market has led to notable challenges for employers in Hong Kong, particularly in the recruitment process. The difficulties can be attributed to several key factors:

Competitive Market Dynamics

The intense competition among companies across various industries for a limited pool of tech talent has heightened the challenges of both attracting and retaining top candidates.

Moreover, Hong Kong faces stiff competition from other tech-friendly hubs, such as Singapore, which are offering more attractive incentives to skilled professionals. This competitive environment has resulted in many skilled professionals relocating from Hong Kong to other countries in search of better work-life balance, higher salaries, and more favourable immigration policies.

Talent Shortage

A persistently low birth rate combined with an ageing population has led to a decrease in the overall workforce in Hong Kong. This manpower shortage is further aggravated by the outflow of skilled labour, driven by the high cost of living and new immigration pathways in other countries.

Traditionally, students have favoured careers in stable and well-paid occupations in sectors like banking and finance. The drive towards technology, engineering or entrepreneurship is relatively recent, and for some roles, there is an insufficient supply of talent.

Skills Gap

Employers are increasingly reporting challenges in finding candidates who possess the necessary technical and soft skills, especially in emerging technology

areas. There exists a significant mismatch between the skills available in the local workforce and the demands of modern technology roles, which contributes to a number of unfilled vacancies in the market.

Recommendations

In response to the evolving landscape of I&T and its prospective advancements, the following measures are recommended, necessitating the collaborative efforts of various stakeholders, including the Government, training institutions, employers, and graduates/employees:

Government

Advancing the I&T Ecosystem

The Government is steadfast in its commitment to dovetail with national strategies for technological advancement, positioning the region as a leading international hub for I&T. Given the tremendous potential inherent in technological development, it is imperative for the Government to delineate overarching initiatives that facilitate deeper integration with national policies and strengthen ties with the GBA. This may entail the implementation of cross-border industrial attachments, execution of incubation programmes, and facilitating resource sharing in R&D. Attracting and engaging both established large enterprises and dynamic startups to invest in Hong Kong is crucial for fostering economic growth and innovation in the region.

To leverage its unique status as a "super-connector", Hong Kong must capitalise on its distinctive geographic, economic, and regulatory advantages to serve as a gateway to both the Chinese Mainland and global markets. Enhancing its role as a service hub for Mainland enterprises going global, as well as for overseas companies entering Chinese Mainland, is crucial. By leveraging its robust legal system, strong intellectual property protections, and favourable business environment, Hong Kong can solidify its function as a "super value-adder" through offering business support, capital access, and pathways for market entry.

In order to encourage enterprises to invest more in local R&D and promote the vibrancy of local R&D activities, the Government should strengthen the introduction of incentive measures designed to foster synergies among industry stakeholders, academic institutions and research institutions. Such collaboration is critical for ensuring that research outcomes directly inform educational curricula and contribute to workforce development. Acknowledging the challenges posed by high operating costs, government support for R&D initiatives, particularly for SMEs, should be intensified through enhanced funding to increase industry engagement and upgrade their technological capabilities. Furthermore, policies should be instituted to stimulate demand in the public sector in piloting the use of locally developed technologies,

thereby promoting the commercialisation of R&D results.

To sustain a vibrant and evolving I&T ecosystem, the Government should accelerate the development of AI by expanding its application scenarios in public services and various sectors. Advocating for an expansive integration of AI technologies can empower industries, encouraging a close integration of AI with various industries and sectors of the economy and society.

Nurturing Innovative Talent for the Future

Talent is vital in the competitive global landscape. To establish a sustainable pipeline of local talent, the Government should step up its efforts to promote STEAM and digital education in primary and secondary educational settings. Optimising the alignment between primary and secondary curricula in I&T education can cultivate innovative thinking and problem-solving abilities from a young age. The Government should integrate I&T learning elements into educational curricula to enhance students' digital literacy. Through a range of diversified strategies, including the provision of enhanced resource support for educational institutions, the strengthening of teacher training in STEAM education, and the fostering of intensified collaboration with relevant stakeholders, it will lay a solid foundation of talent for future development, as well as promote Hong Kong's standing in the global landscape of science and technological innovation.

To enrich Hong Kong's vocational and professional talent reservoir and create a strong impetus for growth, the development of Universities of Applied Sciences (UAS) should be further advanced to enhance the status of VPET in society and among parents and students. UAS can offer an alternative path for youth aspiring to pursue a career in technical professionals, equipping them with applied skills and industry readiness, thus injecting vitality into the region's development path.

Addressing Talent Shortage

In addressing the challenges posed by manpower shortages in the I&T sector, Hong Kong must prioritise not only nurturing future talent and preserving the competitiveness of the local workforce but also attracting global expertise on an appropriate scale to meet imminent needs through competitive expatriate packages. As an international metropolis where Eastern and Western cultures converge, Hong Kong should maintain its allure for talent worldwide, thereby fostering innovation and growth within the city. Moreover, the promotion of an inclusive working environment is vital for addressing talent retention challenges, ensuring the sustainable development of a skilled workforce.

Training Institutions

Elevating Interdisciplinary Education

In contemporary society, characterised by

complex and multifaceted challenges, the imperative for interdisciplinary education has become increasingly pronounced. Such an educational paradigm requires cross-fertilisation among multiple disciplines, thus cultivating talent that is pivotal for Hong Kong's advancement into an international I&T hub. Students equipped with both technical capabilities and soft skills can bridge the gap between technical solutions and their transformation into products, yielding solutions for society. Training institutions should collaborate to forge a STEAM education path that combines innovation and practice, thereby cultivating an endless source of innovative power for Hong Kong.

Training institutions should enhance the professional capacities of their teaching staff in the implementation of STEAM education by offering structured professional development programmes focused on STEAM education. Training institutions should actively encourage participation in such programmes to foster advancements in digital literacy and overall competence, ultimately facilitating the effective implementation of STEAM education.

Fostering Industry-Institution Collaboration for Diverse Learning Experiences

To cultivate a workforce equipped for the demands of the industry, training institutions should forge robust partnerships with industry partners, facilitating diverse experiential learning and pre-employment pathways for students, such as substantial internships, apprenticeships, final year projects, joint research projects and work-integrated learning programmes that provide real-world experience and direct employment routes, better aligning education with the current market needs and enhancing graduates' readiness.

Training institutions can elevate their I&T career readiness initiatives through partnerships that effectively connect educational endeavours with industry expectations, ensuring that graduates possess the requisite competencies to excel and innovate in technology-driven fields.

Curriculum Alignment with Market Needs

To effectively mitigate the skills gap between training deliverables and employment expectations, continuous engagement with industry stakeholders is essential. Training institutions should collaboratively design curricula that align with current industry needs, ensuring that the curricula impart practical and relevant skills for enhanced employability.

In response to the rapidly evolving I&T environment, training institutions should plan ahead and proactively develop courses centered around emerging technologies, as well as facilitate timely curriculum updates that are specific to industry requirements.

As Hong Kong aspires to position itself as

an international I&T centre, training programmes should encompass both Mainland and international systems, particularly focusing on Mainland-based technologies and certifications to enable seamless knowledge transfer and collaborative efforts.

Expansion of Reskilling and Upskilling Programmes

Reskilling and upskilling programmes are essential for equipping the workforce to navigate technological disruptions and sectoral shifts. By providing targeted training programmes centered on emerging technologies, individuals can attain the latest technical proficiencies essential for evolving I&T roles, enabling them to meet industry demands and catalyse technological advancements.

Training institutions should collaborate with government bodies and industry partners to deliver project-based training that addresses cutting-edge topics in the field. Upskilling initiatives should include ongoing learning opportunities in areas like future skills and innovation-driven, ensuring that current professionals maintain their competitive edge and foster continuous innovation in their fields. The implementation of flexible, industry-aligned courses and competency-based models, including micro-credentialing, will further enhance workforce readiness and address existing skills gaps to satisfy sector demands.

Employers

Supporting the Integration of Incoming Talents

Attracting talent to Hong Kong through various talent attraction initiatives is only an initial step. To effectively retain talent and relieve manpower shortages while sustaining economic development, employers should implement robust support systems, such as comprehensive onboarding programmes and tailored services that address the specific needs of incoming talent. These measures will facilitate their long-term settlement in Hong Kong, enhance their understanding of the local culture, and expand their social networks.

Establishing Industry-Academia Partnerships

Industry-academia partnerships serve as a core driver of a dynamic I&T ecosystem. By bridging theoretical knowledge from academic institutions with the practical demands of industry, these partnerships foster development in entrepreneurship through joint research projects and technology commercialisation initiatives.

Employers and training institutions should collaborate to organise talent development programmes that integrate academic training with industry internships, mentorships and tailored programmes. This collaborative approach leverages complementary expertise and addresses shared challenges. Industry stakeholders gain

access to cutting-edge academic research that informs real-world applications, while educational institutions are provided with industry exposure and practical challenges that enrich both research and curricula. It will drive innovation that translates research findings into real-world, market-ready products and services. Moreover, industry stakeholders should engage actively in policy consultations and curriculum development to align educational outcomes with market needs.

Leveraging Government Funding Initiatives

Investing in employee development is critical for enhancing workforce capabilities and sustaining organisational competitiveness in a fast-paced I&T environment. Employers are encouraged to invest in continuous staff upskilling and foster an innovative culture that promotes collaboration, risk-taking, and R&D engagement.

Employers can capitalise on government funding initiatives on employee training, such as the New Industrialisation and Technology Training Programmes (NITTP), to ensure that employees remain at the forefront of technological advancements. Furthermore, the New Industrialisation Acceleration Scheme (NIAS) offers additional resources to strengthen organisational capabilities, and employers should make good use of these funding initiatives.

Developing Clear Progression Pathways

To reduce career stagnation and enhance employee retention, employers should establish clearly defined progression pathways. This involves identifying the competencies and skills required at each career stage and mapping out visible career paths that show vertical (managerial) and lateral (specialist) progression options. A well-structured progression pathway not only clarifies potential career advancements for employees but also aligns their individual aspirations with business needs, fostering a motivated and engaged workforce.

Graduates and Employees

Adaptability and Embracing Learning

To successfully navigate the ever-evolving I&T landscape, graduates and employees should proactively pursue continued professional development and lifelong learning. This can be achieved through obtaining relevant certifications and pursuing self-directed learning initiatives. The Government has introduced various subsidy schemes and training courses designed to encourage the workforce to reskill, upskill, and pursue lifelong learning. Notable initiatives include the Vplus Subsidy Scheme, the Continuing Education Fund (CEF), as well as placement-tied courses and skills upgrading courses offered by the Employees Retraining Board

(ERB). Staying abreast of rapid technological advancements is essential for meeting employers' expectations, particularly regarding competencies linked to digital transformation.

Participation in internships, hands-on projects, and research initiatives significantly bolsters practical skill sets and enhances employability.

Furthermore, there is a growing emphasis on soft skills, such as communication and problem-solving abilities, which are vital for effective collaboration within cross-disciplinary teams and for the management of complex digital projects. Adaptability and intrinsic motivation for lifelong learning are considered vital traits, as I&T roles now necessitate ongoing learning to keep up with the swift pace of innovation.

Cultivating an Innovative Mindset and Career Aspiration

In a world that thrives on change, it is crucial for graduates and employees to embrace and cultivate an innovative mindset. This can be achieved by participating in STEAM courses, competitions, seminars, and workshops, which will unlock their potential and develop them into innovative professionals with a competitive edge on a global scale. Cultivating an entrepreneurial mindset ignites the spark of innovation and empowers individuals to transform challenges into opportunities for growth.

Cultivating career aspirations early enables students to establish a strong career identity and set realistic expectations regarding the I&T labour market. Clearly defined aspirations inspire students to pursue continuous learning and skill development by educating them about industry needs and potential career pathways. This ultimately enhances their preparedness for future roles in the rapidly changing I&T sector.