



Manpower Update Report

Innovation and Technology Sector

2020

Innovation and Technology Training Board

ACKNOWLEDGEMENT

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Special thanks go to CPJobs and CTgoodjobs who shared with us their database of job vacancies. The views of focus group members and information from major recruitment websites formed an integral part of this report.

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Introduction

Background

The Innovation and Technology Training Board (ITTB) of the Vocational Training Council (VTC) is appointed by the Government of the HKSAR. According to its Terms of Reference, the ITTB 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. A new approach for collecting manpower information is adopted to enhance the effectiveness

and better reflect the dynamics of the manpower situation in the various industries. Under the new approach, one full manpower survey is conducted every four years, and this is supplemented by two manpower updates. The ITTB completed its latest manpower survey in 2018. Two manpower updates should be conducted in 2020 and 2021.

The 2020 manpower information update comprises:

(a) focus group meetings and interviews getting the views of industry experts on the latest developments in the sector, manpower and training needs, and recruitment difficulties, and measures to tackle the challenges the sector faces; and

(b) desk research analysing job advisements including qualifications, experience and skills required by the principal jobs in the Innovation and Technology sector.

Objectives

The objectives of the manpower update are to understand the following issues of the sector:

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

Methodology

Overview

With reference to the 2018 full manpower survey of the innovation and technology sector, this update report aims to provide qualitative descriptions of the recent development of the sector through focus group meetings and interviews, supplemented by making reference to some quantitative data of recruitment advertisements from desk research.

Focus Group

The focus group was formed through engagement of industry experts to understand the latest trend and development of the manpower, training needs and recruitment difficulties in the sector. Members participating in the focus groups are representatives from the innovation and technology sector, including:

- (i) manufacturing sector or innovation products and services;
- (ii) wholesale, retail and import/export trades, catering and hotels;
- (iii) financing, insurance, real estate and business services sector;
- (iv) community, social and personal services or medical and health care services sector;
- (v) transport and storage services sector;
- (vi) electricity, gas, water or construction sector;
- (vii) IT products and services suppliers;
- (viii) digital creative or innovation products and services;

- (ix) wholesale, retail and import/export trades of computer products and software packages;
- (x) communication services;
- (xi) start-up companies; and
- (xii) research centre.

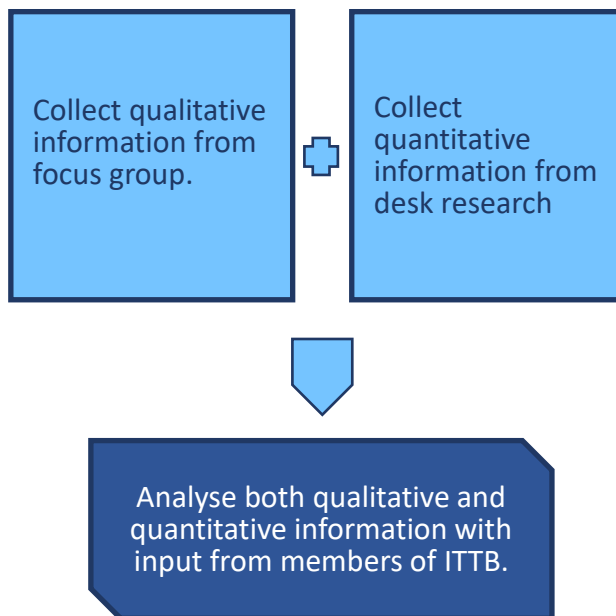
Two focus group online meetings were conducted on 13 and 20 August 2020 with discussion on topics selected by the Working Party on Manpower Survey of the ITTB. The discussions at the meetings were recorded and transcribed to facilitate analysis. In addition, two telephone interviews were conducted on 25 and 28 August 2020 with industry experts who were not able to join the above-mentioned focus group meetings.

Desk Research

Manpower information covering the period between 1 July 2019 and 30 June 2020 was collected through desk research. The information includes the number of job advertisements, required competency, qualification and experience, market remuneration, etc. An integrated database was being developed to capture the relevant recruitment data from the major online recruitment portals. Over 40,000 recruitment records were collected during the research period. Mapping was made with the list of related companies under the Hong Kong Standard Industrial Classification for removal of any duplicated records.

Data Analysis

The analysis consists mainly of the following three steps:



Limitations

As this is not a full manpower survey, the findings and recommendations of the focus group are more qualitative in nature and the report mainly focuses on the manpower trends. The information of job vacancy advertisements was collected from major recruitment websites and Labour Department, while other channels such as newspapers 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 focus group.

Findings

Factors Affecting the Development of the Innovation and Technology Sector

Public Policy

The Government seeks to develop the innovation and technology sector as one of the key economic areas in Hong Kong. Over the years, new initiatives have been introduced to support the development of the sector such as Technology Talent Admission Scheme, Reindustrialisation and Technology Training Programme, Reindustrialisation Funding Scheme, and Technology Voucher Programme. With the supportive measures and

funding schemes provided by the Government, enterprises are more willing to adopt technologies to enhance productivity. Particularly, the Government has put significant efforts in promoting reindustrialisation, attracting advanced technology companies to set up their own businesses in Hong Kong. The innovation and technology applications have grown even stronger in recent years.

Industry 4.0

The Industry 4.0 is progressing rapidly across the globe and business leaders in Hong Kong are getting aware that the integration of Industry 4.0 technologies into their operations will be the way forward for business success. The digital transformation happens in all industries and companies which are trying to adopt advanced technologies such as artificial intelligence, blockchain, robots, drones, cloud computing, augmented reality & virtual reality, and internet of things with an aim to expediting the business process, enhancing flexibility, making intelligent and market driven decisions as well as engaging customers through better experiences. The digital revolution is reshaping the way how businesses are functioning and how companies are interacting with customers.

Greater Bay Area

Hong Kong has its own strength in research and development with a diverse talent pool equipped with international experience and professionalism in intellectual property, though the local market in Hong Kong is too small for high technology companies to sustain profitability and growth. With opportunities brought by the Greater Bay Area, Hong Kong's innovative companies could expand their market to Mainland China, a springboard to strengthen the innovation development of Hong Kong, making it an international innovation and technology hub through mutual collaboration with cities in the Greater Bay Area.

COVID-19 Pandemic

The COVID-19 crisis is expected to last for a considerably long period of time and bring dramatic changes to how individuals live and work as well as how companies manage business resilience, continuity and risk management. Despite the challenges from economic downturn due to COVID-19, the innovation and technology sector has risen to new heights by leveraging technologies in different industries to overcome geographical barriers and social distancing measures. There are different local technological applications being developed in Hong Kong such as solutions applied for quarantine measures, face masks production, and temperature checking equipment. In addition, shopper behavior is changing which leads to exponential growth of e-commerce and online shopping. Education technology is rapidly adopted and penetrated with new ways of learning through digital tools. Robots are also deployed to disinfect public areas and deliver meals to guests in hotels to reduce human interaction. All in all, opportunities arisen will stimulate technological development for the benefit of the local society.

Manpower Demand

Focus Group

With reference to the trends and development of the sector, views of the focus group on the anticipated changes in manpower demand were collected.

Principal jobs related to data analytics, cyber security, user interface and programming are considered to be in high demand. Relevant job titles are Data Scientist, Business Analyst, Cyber Security Engineer, UX/UI designer, Programmer, and Full-stack Software Engineer. In addition, employees possessed both domain knowledge and technical knowledge are very difficult to find.

Desk Research

Out of the relevant recruitment advertisements captured in desk research, the following top five principal jobs with the highest number of recruitment advertisements were identified:

- 1) Programmer / Analyst Programmer / Software Engineer (27%)
- 2) User Support / User Co-ordinator (10%)
- 3) Sales Representative / Marketing Representative / Account Manager / Product Promotion Representative (8%)
- 4) Web Designer / Web Developer (7%)
- 5) IT Architect / Business Analyst (7%)

Comparison with full survey report

According to the 2018 full manpower survey, the top five principal jobs with highest of vacancies were as follows:

- 1) Programmer/Analyst
Programmer/Software Engineer (32%)
- 2) User Support/ Co-ordinator (16%)
- 3) Sales/Marketing Representative/
Account Manager/ Product Promotion Representative (7%)
- 4) Field Technician (6%)
- 5) R&D Technician (5%)

Over the years, programmers still ranked as the most in-demand position and one of the reasons might be due to the automation and digitalisation trend for every business. Companies are investing heavily on application developments where programmers could not be missed in order to achieve this business goal.

Training Needs

Focus Group

Focus group members considered the following skills are essential for employees in the innovation and technology sector:

- Programming Languages, particularly in JavaScript, Python, R, Ruby, Rust, .NET. Working Party Members also considered that Java, Java frameworks, PHP and Objective-C are common programming languages adopted in Hong Kong.
 - Augmented Reality & Virtual Reality
 - Artificial Intelligence
 - Blockchain
 - Data Science and Data Analytics
 - Internet of Things
 - Project Management
 - Problem Solving Skills
 - Research Methodology
-

Desk Research

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

Advanced Technology	Related Job Titles	Emerging skills and knowledge
Artificial Intelligence (AI)	<ul style="list-style-type: none">● AI architect● AI developer● AI engineer	<ul style="list-style-type: none">● Machine learning algorithms and deep learning frameworks● Visualisation Tools● Knowledge of popular programming languages, e.g. Python, Java, R or C++● Analytical thinking and creative vision for future
Blockchain	<ul style="list-style-type: none">● Blockchain architect● Blockchain developer● Blockchain engineer	<ul style="list-style-type: none">● Blockchain framework, such as Ethereum, Hyperledger, R3, Ripple and EOS● Smart contract development● Concepts of cryptography● Knowledge of popular programming languages such as Rust, C++, Java, JavaScript, and Python

Advanced Technology	Related Job Titles	Emerging skills and knowledge
Data Science	<ul style="list-style-type: none"> ● Data Scientist ● Data Engineer ● Data Analyst ● Chief Data Officer 	<ul style="list-style-type: none"> ● Data analysis algorithms (data mining, machine learning, natural language processing) ● Data integration tools ● Data governance ● Advanced analytic capabilities
Cloud Computing	<ul style="list-style-type: none"> ● Cloud Architect ● Cloud Network Engineer 	<ul style="list-style-type: none"> ● Knowledge on different cloud service providers ● Development and Operations (DevOps) ● Knowledge of virtual machine ● Cloud security and recovery mechanisms ● Major Certifications: <ul style="list-style-type: none"> ➤ Amazon Web Services (AWS) Certification ➤ Google Cloud Associate and Professional Certifications ➤ IBM Certified Solution Architect ➤ HP ExpertOne Cloud Certification ➤ EMC Cloud Architect ➤ VMware Cloud Certification
E-sports	<ul style="list-style-type: none"> ● E-sports game tester ● E-sports Game designer/ animator/ motion graphics artist ● E-sports Gaming Content Developer 	<ul style="list-style-type: none"> ● Gaming skill in esports game ● Racing simulation hardware and software setup
Financial Technology (FinTech)	<ul style="list-style-type: none"> ● FinTech & Innovation Manager ● Software Engineer - Fintech ● Fintech developer 	<ul style="list-style-type: none"> ● Financial technology applications (e.g. Electronic Know Your Customer, Big Data, Cloud, AI, Mobile Application, Stored Value Facilities) ● Project management skills in financial services ● Knowledge of FinTech market trends
Internet of Things (IoT)	<ul style="list-style-type: none"> ● IoT Architect ● IoT Engineer 	<ul style="list-style-type: none"> ● Embedded software development ● Data management solutions

Advanced Technology	Related Job Titles	Emerging skills and knowledge
		<ul style="list-style-type: none"> ● High-performing user-friendly web and Mobile User Apps
Extended Reality (such as Augmented Reality (AR), Virtual reality (VR), Mixed Reality (MR))	<ul style="list-style-type: none"> ● AR Developer ● VR Developer ● MR Developer 	<ul style="list-style-type: none"> ● 3D modeling ● 3D scanning ● 3D games engines ● Visualisation tools
Robots	<ul style="list-style-type: none"> ● Robotics Software Engineer ● Robotics Software Architect 	<ul style="list-style-type: none"> ● Robotic systems using a robotic middleware (such as ROS), and existing libraries and tools ● Knowledge of robotics and surrounding systems
Robotic Process Automation (RPA)	<ul style="list-style-type: none"> ● RPA developer ● RPA Architect ● RPA Analyst 	<ul style="list-style-type: none"> ● RPA tools like Automation Anywhere/UiPath/BluePrism
Others	<ul style="list-style-type: none"> ● Microservices Developer ● Microservices Engineer 	<ul style="list-style-type: none"> ● Microservices architecture ● Domain Modelling ● DevOps and Containers

In light of the wide adoption of emerging technologies in Hong Kong, the following key emerging technologies are recommended for employees training in the innovation and technology sector:

Artificial Intelligence

AI technology is broad which involves a wide range of fields from machine learning to robotics and internet of things. AI applications are implemented in many industries in Hong Kong, including finance, marketing, retail, and logistics. There are many popular AI applications in Hong Kong, such as using AI to analyse customer data and monitor IT infrastructure for cyber security as well as using chatbots and robotic process automation, etc. Out

of the above applications, chatbots are commonly used in Hong Kong as Chatbots can automate the routine labour-intensive operations and employees could be deployed to perform more complex tasks other than handling customer service hotline or helpdesk.

Augmented Reality, Virtual reality and Mixed Reality

Apart from the applications in gaming and entertainment industry, AR, VR and MR technology now helps Hong Kong business provide better customer experience and offer three dimensional models of products or information to customers. Industries are deploying AR, VR and MR technology for different purposes, for example, education, marketing events, property development and entertainments.

Cloud Computing

The outbreak of COVID-19 has accelerated digital transformation in the business world. Companies are demanding for cloud solutions and services in order to keep businesses running as effectively and efficiently as possible during the COVID-19 outbreak and to get prepared for the recovery. The social distancing measures have reshaped the cloud market as most of the workforce are required to work from home. Such new form of work has pushed companies to adopt cloud computing faster and at a wider scale than ever before.

Internet of Things

Companies from different industries gain benefits from IoT applications. Manufacturers monitor the equipment performance through real-time IoT dashboards and alerts and enable predictive maintenance when sensors detect a possible failure. Transportation and logistics industry benefits from IoT sensor data for better fleet management based on weather conditions, vehicle or driver availability. The inventory being equipped with sensors allow better temperature-control monitoring and traceability. In addition, IoT applications enable retail businesses to effectively manage inventory, enhance supply chain productivity and reduce operational costs. The development of 5G networks will drastically accelerate the speed how IoT devices connect to sensors and share data.

Blockchain

Blockchain technology is gaining popularity in Hong Kong and is important in the Fintech development in Hong Kong. Apart from developing blockchain solutions for Fintech, blockchain startups in Hong Kong also initiate projects for other industries such as transportation and logistics, real estate and smart contracting, etc.

Recruitment Challenges

Due to the keen competition of the market, some of the employers have experienced difficulties in the recruitment process. The difficulties might be summarised and related to some of the following factors:

Cross-industry Competition for Talents

Innovation and technology jobs are in demand in every industry and the need for employees with IT skills continues to grow vigorously. Employers are not only competing the talents outside of their companies, but also outside of their industries as IT skills are generic and transferrable across the industries.

Entrepreneurship

Employees with outstanding technology skills want to start their own business, especially for millennials who are keen to become business owners and are willing to take on the challenges to launch a startup. It is difficult for companies to retain talented employees who embrace with entrepreneurial goals.

Hard to engage qualified candidates

Technologies have changed drastically and skills required in innovation and technology sector are fast-evolving, employers consider that there is shortage of highly skilled employees especially in advanced technology. Domain knowledge is as important as technical skills in innovation and technology sector. Employers are expecting their employees to possess strong domain knowledge in addition to hands-on technical skills. Notwithstanding this, the market is hard to find talents possessing both the domain knowledge and the technical skills. Employees possessing trade-specific domain knowledge are expertise in solving business problem and contributing to a long-term sustainable vision which are crucial to the project implementation and ultimately the business success.

RECOMMENDATIONS

To meet the future development of the industry, it is considered essential for the government, education institutions and employers to provide suitable training opportunities and measures to the employees and students in the following areas:

Government

Attract Talents to Relocate to Hong Kong

Attracting talents from other countries can provide a quick fix to bridge the human resources gap in innovation and technology sector. However, Hong Kong is known to be one of cities with high cost of living, especially in terms of housing cost. It is a major factor affecting the attractiveness to international or Mainland talents. Apart from offering rent discount for tenants and start-ups in Hong Kong Science and Technology Parks and Cyberport, the Government should consider special measures in providing subsidised housing arrangements to attract technology talents to relocate to Hong Kong so as to enhance Hong Kong's overall competitiveness in the global market.

Provoke Collaboration between Education Institutions and Industries to Develop Local Commercial Innovation

Higher education institutions in Hong Kong have been putting efforts in building their own research and development teams and the Government should play a more active role in bringing the industry and institutions together for closer collaboration in research and development. The Government should provide more incentives and funding for

industry-institution collaboration to encourage more academic research results and student projects being converted to local commercial products and solutions.

Include Innovation and Technology as a Compulsory Subject in Education Curriculum

As digital literacy has become increasingly important in workplace and daily life, it is suggested that innovation and technology should be included as an independent compulsory subject starting from primary education curriculum. By learning basics of coding and applications of technologies, together with principles of problem-solving and creativity, students are able to equip themselves with the skills of the future.

Foster a Culture of Innovation

The Government should take the lead to build an innovative culture in public services and establish the culture with civil servants. The launch of the Smart Government Innovation Lab is a good start to connect the government departments with the innovative solutions from the innovation and technology sector. As the Government is a microcosm of the society, its commitment in the adoption of innovative technology will not only provide better public services to the citizens but also foster an innovation culture in Hong Kong by creating more business opportunities for the innovation

and technology sector. The Government should continue to promote the Smart Government Innovation Lab to the industry and encourage more creative solutions and product suggestions.

Education Institution

Offer Upskilling and Reskilling Training

Automation and digitalisation are transforming the way how job is done. Education institutions should organise training to help individuals enhance digital skills and adapt to use digital tools, especially for those who work in traditional jobs. In addition, COVID-19 has triggered an unprecedented crisis in the tourism and hotel industry, education institutions should offer intensive training to help the current unemployed innovation and technology personnel from tourism and hotel industry to quickly transform their IT skills to other industries so as to enhance their employability.

Forge Partnership with Leading Tech-savvy Companies

The benefits of Industry-Institution collaboration are enormous to both students and companies. Students take the advantage of developing their knowledge and skills through hands-on application of business cases. Company visits and demonstrations of real technological applications can stimulate students' interest and passion in learning innovation and technology. On the other hand, companies fill the talent gap by identifying suitable students as future employees and thus likely receiving fresh and creative solutions from students to

solve existing operational obstacles. Particularly, visits to leading tech-savvy companies in the Mainland or overseas can enhance the understanding of career opportunities outside Hong Kong. It is suggested that promising career prospects related to innovation and technology sector could be shared to secondary students and encourage them to study related programmes and develop their career in the sector.

Enhance Curriculum to be Industry-specific

In order to enhance job readiness of graduates to cope with the ever-changing business environment of the sector, education institutions should provide up-to-date practical and industry-specific training and engage students with strong foundation of IT skills such as programming and coding skills. Industrial attachment opportunities should be offered to students to demonstrate the application of learned skills in the real business world which will accelerate the learning growth of students.

Employer

Utilise Government Funding Effectively

Employers should explore different Government funding schemes to enhance the competitiveness in innovation. Recently, the Government launched Distance Business Programme (D-Biz) for local companies to adopt IT solutions for developing distance business due to the outbreak of COVID-19. With the funding from the Government, employers are able to implement digital transformation and

adopt technologies to cope with the challenges.

Explore Open Source Strategy

There is increasingly number of companies using open source technologies. Employers that consider open source value its advantages in efficiency, flexibility and speed of innovation. Moreover, participation in open source software projects could help employers find and attract better talents. Having said that, other companies have hesitation to use open source as it might not meet compliance requirements in terms of licensing and data privacy.

Adapt to Industry 4.0

Willingness to adapt and change is a crucial in the era of Industry 4.0, employers should therefore be well prepared for digital transformation. Apart from focusing on only return on investment, it is important for employers to understand that technologies can help in all-around business areas including business strategy, technological operations, customer retention, human capital and talent requisition, etc.

Offer On-the-job Training Opportunities

Employers should offer on-the-job training to employees especially for innovative projects and solutions. It gives employees an opportunity to learn new skills at workplace while allowing employers to train up a workforce actively engaged in innovation. Creating an innovation culture is important for organisations to develop new ideas and enhance innovation performance.

Employee

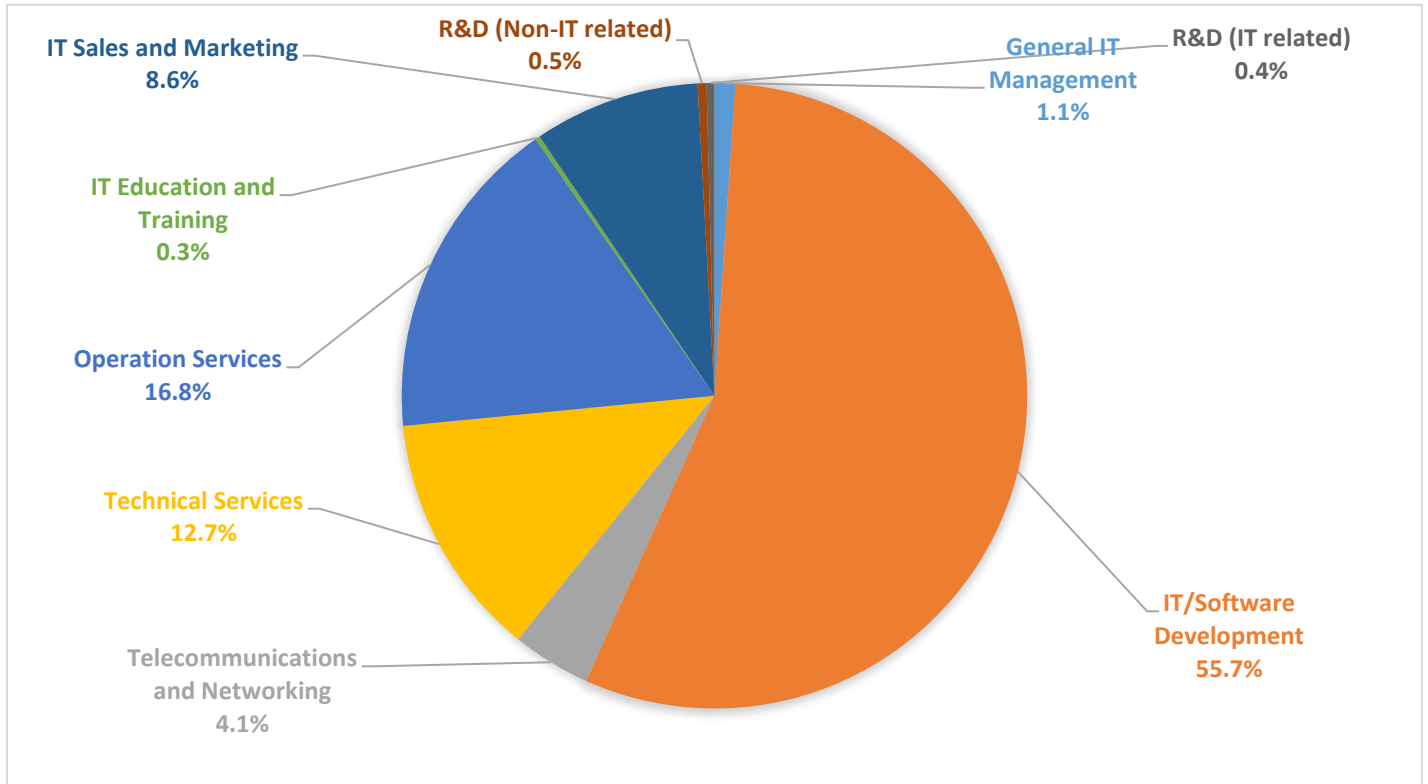
Be a Lifelong Learner

Employees should be aware the future of work and it requires the workforce to be lifelong learners. They are encouraged to make use of the subsidies provided by the Government to learn new skills. It is crucial to build up lifelong learning skills and mindset to invest in themselves for future success.

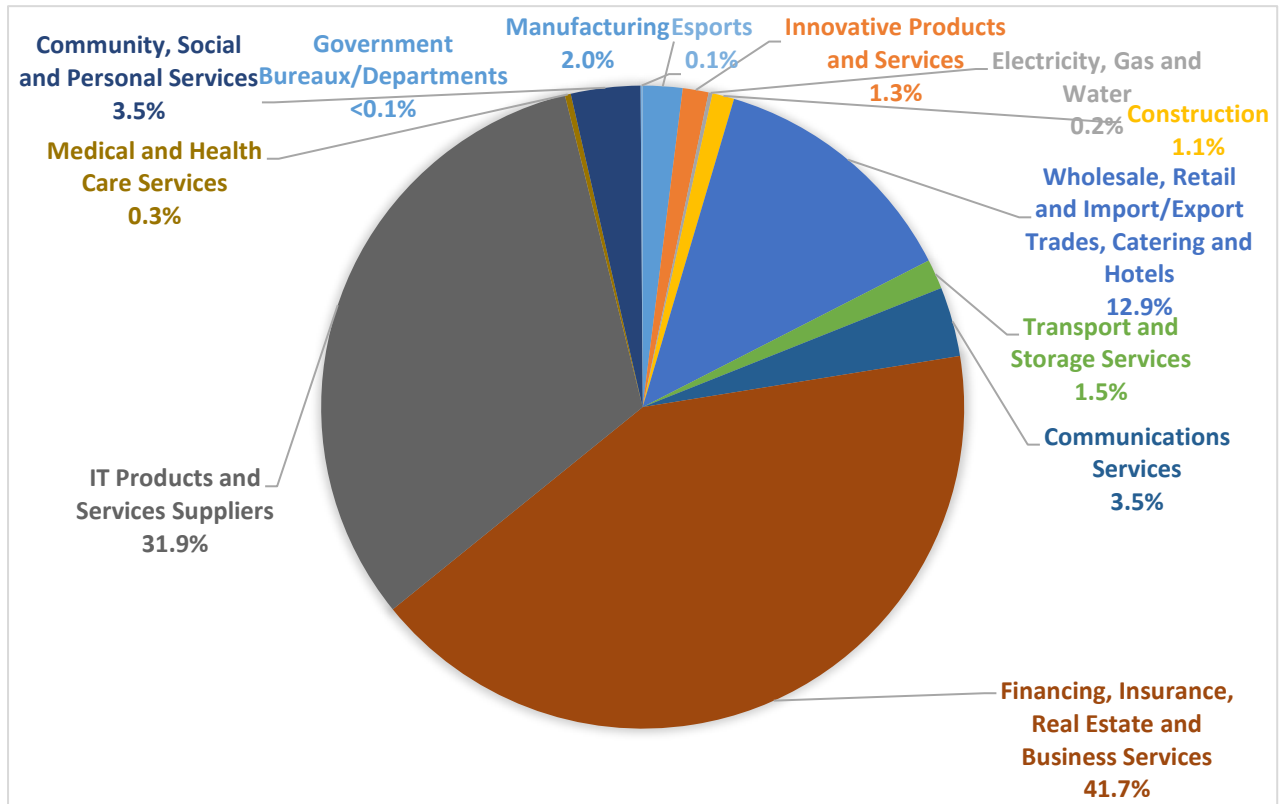
Make a Career Choice based on Interests

Innovation requires creative people and passion to generate new ideas. Employees with genuine interest in innovation will have the initiative to learn new technology themselves. Employees, especially fresh graduates, who wish to join the sector, should consider their interest areas before pursuing a career choice which can lead to professional success and personal satisfaction. Employees should be proactive to share their innovative suggestions and recommendation as employee-led innovation can have manifest impact on new products and services.

**Number of Advertisements from Popular Recruitment Media (1 July 2019 to 30 June 2020)
by Job Category**



**Number of Advertisements from Popular Recruitment Media (1 July 2019 to 30 June 2020)
by Sector**



**Number of Advertisements from Popular Recruitment Media (1 July 2019 to 30 June 2020)
by Principal Jobs**

Job Title	Percentage
Programmer / Analyst Programmer / Software Engineer	26.9%
User Support / User Co-ordinator	10.2%
Sales Representative / Marketing Representative / Account Manager / Product Promotion Representative	8.4%
Web Designer / Web Developer	6.8%
IT Architect / Business Analyst	6.7%
Systems Programmer (in-house/vendor environment) / Systems Engineer	5.3%
Computer Operator / Systems Operator	4.0%
Systems Development Manager	4.0%
System Analyst	3.9%
IT Security Specialist / Information Security Specialist / Information Security Officer	3.0%
Telecommunications Engineer / Network Engineer	2.9%
Database Administrator / Data Warehouse Administrator / Database Designer	2.5%
Project Manager / Project Leader	1.9%
Computer Operations Supervisor / Operations Support Supervisor	1.7%
Data Scientist / Engineer	1.5%
Customer Service Engineer / Field Engineer	1.4%
Computer Game Designer / Computer Game Artist / Computer Game Developer / Computer Graphic Designer / Computer Graphic Artist / Computer Animator / Web Graphic Designer / Visual Effects Designer	1.1%
IT Director / MIS Director / Head of IT / CIO	1.0%
UX Designer	1.0%
Help Desk Representative / Customer Service Officer / Customer Service Representative	0.8%
Network Administrator / Network Officer	0.8%
Quality Assurance Specialist / Software Assurance Specialist / Software Assurance Engineer / IT Systems Auditor	0.6%
Software Product Engineer	0.6%
Technical Writer	0.6%
R&D Researcher / R&D Scientist / R&D Engineer (IT related)	0.4%
Field Technician	0.3%
R&D Researcher / R&D Scientist / R&D Engineer (Non-IT related)	0.3%
Lecturer / Professor / Training Officer	0.2%
Sales Director / Marketing Director / Account Director / Sales Manager / Marketing Manager	0.2%
Software Product Designer / Firmware Product Designer / Product Analyst / Product Developer / Software Product Manager	0.2%
Telecommunications Consultant / Network Consultant	0.2%
Telecommunications Manager / Networking Manager	0.2%

Job Title	Percentage
Computer Operations Manager	0.1%
Help Desk Supervisor	0.1%
IT Trainer / IT Instructor	0.1%
R&D Supporting Staff (Non-IT related)	0.1%
CTO	<0.1%
Customer Engineering Manager / Services Support Manager	<0.1%
R&D Supporting Staff (IT related)	<0.1%
R&D Technician (IT related)	<0.1%
R&D Technician (Non-IT related)	<0.1%
Total	100%

Appendix (d)

Number of Advertisements from Popular Recruitment Media (1 July 2019 to 30 June 2020) by Qualification Requirements

Job Category	Postgraduate	First Degree	Sub-degree	Senior Secondary and below	Unspecified
General IT Management	2.1%	69.9%	2.6%	0.5%	24.9%
IT/Software Development	0.9%	46.2%	21.7%	2.3%	28.9%
Telecommunications and Networking	0.5%	34.7%	34.5%	4.5%	25.7%
Technical Services	0.8%	42.7%	24.3%	4.6%	27.6%
Operation Services	0.8%	20.6%	37.4%	9.4%	31.8%
IT Education and Training	19.8%	41.8%	17.6%	2.2%	18.7%
IT Sales and Marketing	0.5%	39.6%	20.9%	9.6%	29.4%
R&D (IT related)	31.5%	37.0%	2.7%	0.0%	28.8%
R&D (Non-IT related)	22.4%	45.5%	1.8%	0.0%	30.3%

Apart from the academic qualifications, the percentage of advertisements that included different types of IT certifications is shown as follows:

Job Category	IT Certifications*
General IT Management	20.3%
IT/Software Development	6.6%
Telecommunications and Networking	53.2%
Technical Services	30.1%
Operation Services	11.8%
IT Education and Training	4.4%
IT Sales and Marketing	4.0%
R&D (IT related)	1.4%
R&D (Non-IT related)	2.4%

*Examples of the IT certifications: Amazon Web Services (AWS) Certification, Azure Solutions Architect, Citrix Certified Associate (CCA), Cisco Certified Network Associate (CCNA), Certified Information Systems Auditor (CISA), Certified Cloud Security Professional (CCSP), Cisco Certified Network Professional Enterprise (CCNP), Certified Information Systems Security Professional (CISSP), EMC Cloud Architect, Google Cloud Associate and Professional Certifications, HP ExpertOne Cloud Certification, IBM Certified Solution Architect, Information Technology Infrastructure Library (ITIL) certificates, Linux Professional Certifications, Microsoft Certified Educator (MCE), Microsoft Certified Solutions Expert (MCSE), Microsoft Certified IT Professional (MCITP), Oracle Database Certifications, Oracle Java Certifications, Project Management Professional (PMP), Red Hat Certified Engineer (RHCE), Scrum Master, VMware Cloud Certification.