Innovation and Technology Training Board
創新及科技訓練委員會

Innovation and Technology Sector Manpower Survey Report
創新及科技業 • 人力調查報告書

2022

2022 Manpower Survey Report

Innovation and Technology Sector

Innovation and Technology Training Board

Vocational Training Council

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Acknowledgement

The Innovation and Technology Training Board would like to express its gratitude to the Chairman of Hong Kong Information Technology Industry Council, Mr Peter SHUM, and the relevant trade associations for their cooperation and assistance in conducting the survey as well as to provide valuable and professional views on the recommendations. The Training Board also thanks all respondents of the sampled establishments for providing information required by the survey and particularly to all parties, including universities and major tertiary institutions for providing information on programmes and graduate statistics.

1 Executive Summary

Background

1.1 The Innovation and Technology Training Board (Training Board) of the Vocational Training Council (VTC) conducted a manpower survey for the Innovation and Technology Sector from April to July 2022, with the data reference date on 1 April 2022. This report presents the survey findings of the latest manpower situation of the sector and proposes recommendations on the manpower demand and training needs to different stakeholders of the sector, including employers, employees, training providers and the Government by making reference to the business outlook.

Survey Coverage and Methodology

1.2 The survey covered around 96 000 companies which comprised of two major groups of companies, the IT and Communications Services Organisations, and the IT Users Organisations. The IT Users Organisations included almost all major industries in Hong Kong, such as financial services, trading and logistics, professional services and so on. By adopting the stratified random sampling method for selecting companies from the Central Register of Establishments of the Census and Statistics Department (C&SD), and the inclusion of supplementary samples recommended by the Training Board, a total of 1 799 companies were selected for the survey.

1.3 A pack of survey documents was given to each sampled companies. The selected companies were asked to complete a questionnaire, which comprised two parts. Part I collected quantitative manpower information by job categories and by principal jobs, and Part II collected supplementary information related to manpower situation. The respondents were asked to provide manpower information of their companies based on a list of principal jobs, which were defined by the Training Board with detailed job descriptions given for each job.

1.4 During the fieldwork period between April and July 2022, enumerators assisted the respondents to complete the questionnaire through phone calls or on-site visits. The data collection and enumeration processes were closely monitored and data was verified to ensure quality and accuracy. Among the 929 valid sampled companies, 807 were successfully enumerated which contributed to an effective response rate of 86.9%[Note].

[Note] Sampled companies which had been ceased operation, had not employed any IT and R&D staff, or did not reply to the survey, etc. were classified as invalid samples.

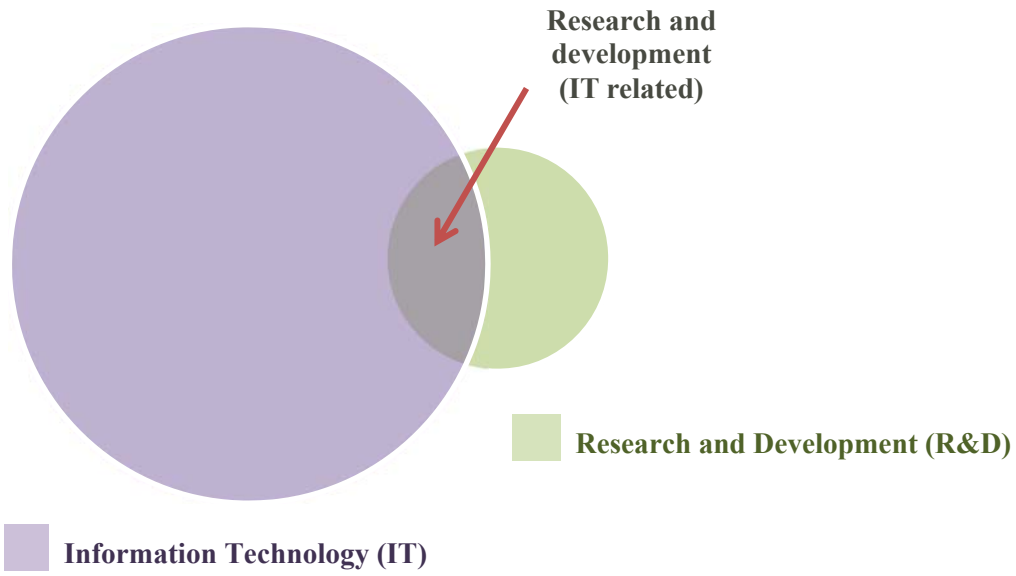
Manpower Projection Methodology

1.5 The Training Board adopts a forecasting method which rests on the weighted averages of historical data for projecting manpower demand of the Innovation and Technology Sector. Taking into consideration of the historical manpower data with heavier weighting given to the recent data, market trends in a longer term, technological developments of the industry and other social-economic determinants, the Training Board made the decision on the manpower projection of all job categories for the period from 2023 to 2026. The details of the projection methodology are provided in **Appendix 8**.

Findings

Overview of Manpower Situation

1.6 Overall speaking, the survey covered the personnel working in the sectors of (i) Information Technology (IT) and (ii) Research and Development (R&D) as shown below. In this report, the statistical findings were separately presented for the two sectors in which the part related to Research and development (IT related) was common to both sectors in order to give a complete picture of the manpower situation.



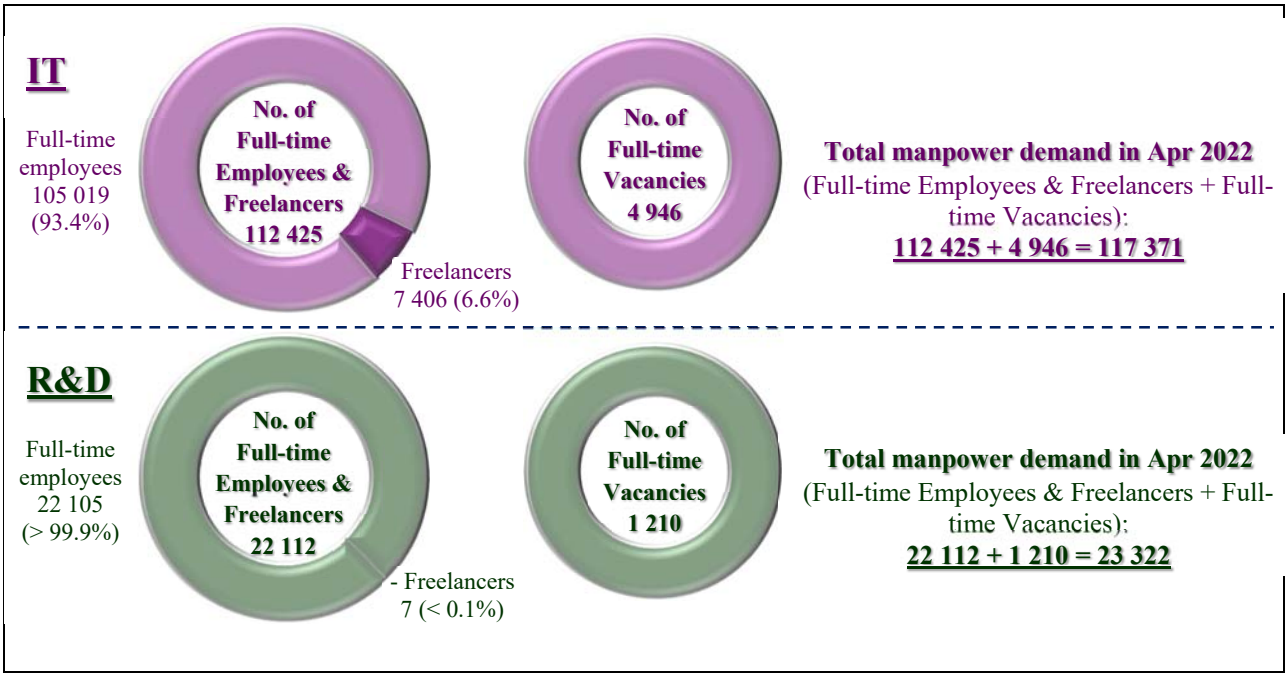
Manpower Situation of Information Technology (IT)

1.7 The survey revealed that as at 1 April 2022 (i.e. the reference date of the survey), a total of 112 425 persons (i.e. full-time employees and freelancers) were employed in the principal jobs of information technology, in which 93.4% were full-time employees (105 019 persons) and 6.6% were freelancers (7 406 persons). Aggregating the 112 425 full-time employees and freelancers and 4 946 vacancies, there were a total of 117 371 posts.

Manpower Situation of Research and Development (R&D)

1.8 As at 1 April 2022, a total of 22 112 persons (i.e. full-time employees and freelancers) were employed in the principal jobs of research and development, in which more than 99.9% were full-time employees (22 105 persons) and less than 0.1% were freelancers (7 persons). Aggregating the 22 105 full-time employees and freelancers and 1 210 vacancies, there were a total of 23 322 posts.

Chart 1a Overview of manpower situation



Note: "Vacancies" refer to those unfilled, immediately available job openings for which the establishment is actively trying to recruit personnel as at survey reference date.

Information Technology (IT)

IT full-time employees and freelancers

1.9 Among the 112 425 full-time employees and freelancers in the principal jobs of IT, relatively more were working in IT and Communications Services Organisations (57.6%; 64 751 persons) than in IT Users Organisations (42.4%; 47 674 persons).

1.10 The top three industry sectors with more IT full-time employees and freelancers were IT products and services suppliers (40.1%), financing, insurance, real estate and business services (11.4%) and wholesale, retail and import/export trades of non-IT products, catering and hotels (9.1%).

Table 1a IT Full-time employees and freelancers – by type of organisation and industry sector

	No. of full-time employees and freelancers	(%)
IT & Communications Services Organisations	**64 751**	**57.6%**
- IT products & services suppliers	*45 106*	*40.1%*
- Wholesale, retail & I/E trades of computer products & software packages	*8 144*	*7.2%*
- Communications services	*7 430*	*6.6%*
- Innovative products & services (IT)	*2 200*	*2.0%*
- Manufacturing (IT products)	*1 135*	*1.0%*
- Digital creative	*736*	*0.7%*
IT Users Organisations	**47 674**	**42.4%**
- Financing, insurance, real estate & business services	*12 846*	*11.4%*
- Wholesale, retail & I/E trades, catering & hotels	*10 267*	*9.1%*
- Community, social & personal services	*7 966*	*7.1%*
- Universities & post-secondary colleges; research & scientific institutes	*4 928*	*4.4%*
- Government bureaux / departments	*3 740*	*3.3%*
- Innovative products & services (non-IT)	*2 209*	*2.0%*
- Transport & storage services	*2 153*	*1.9%*
- Manufacturing (non-IT products)	*1 246*	*1.1%*
- Medical & health care services	*1 182*	*1.1%*
- Construction	*794*	*0.7%*
- Electricity, gas & water	*343*	*0.3%*
Total:	**112 425**	**100.0%**

1.11 Relatively more IT full-time employees and freelancers were engaged in software development (33.6%), followed by infrastructure and operations support (27.7%), IT sales and marketing (9.6%) and technical services (9.0%).

1.12 The top job category for those who were working in IT and Communications Services Organisations was software development (39.4%). For IT Users Organisations, the top job category was infrastructure and operations support (55.5%).

Table 1b IT Full-time employees and freelancers – by job category and type of organisation

Type of organisation / Job category	IT & Communications Services Organisations		IT Users Organisations		Overall	
	No. of full-time employees and freelancers	(%)	No. of full-time employees and freelancers	(%)	No. of full-time employees and freelancers	(%)
Software Development	25 533	39.4%	12 260	25.7%	37 793	33.6%
Infrastructure & Operations Support	4 650	7.2%	26 467	55.5%	31 117	27.7%
IT Sales & Marketing	10 342	16.0%	430	0.9%	10 772	9.6%
Technical Services	9 368	14.5%	733	1.5%	10 101	9.0%
R&D (IT related)	6 543	10.1%	2 308	4.8%	8 851	7.9%
Communications & Networks	5 642	8.7%	333	0.7%	5 975	5.3%
IT Education & Training	63	0.1%	3 815	8.0%	3 878	3.4%
IT Security	1 029	1.6%	558	1.2%	1 587	1.4%
General IT Management	970	1.5%	557	1.2%	1 527	1.4%
Data Management	611	0.9%	213	0.4%	824	0.7%
Overall:	**64 751**	**100%**	**47 674**	**100%**	**112 425**	**100%**

1.13 Programmer is one of the top five prominent principal jobs in both IT and Communications Services Organisations, and IT Users Organisations, as shown in the table below.

Table 1c Top 5 prominent IT principal jobs – by type of organisation

Type of organisation	Top 5 Prominent Principal Jobs	No. of full-time employees & freelancers	% among all full-time employees & freelancers
IT & Communications Services Organisations (Total: 64 751 full-time employees & freelancers)	Programmer	10 763	16.6%
	IT Sales / Marketing Representative	6 232	9.6%
	Service Technician	6 166	9.5%
	Analyst Programmer	4 349	6.7%
	R&D Researcher / Scientist / Engineer (IT related)	4 096	6.3%
IT Users Organisations (Total: 47 674 full-time employees & freelancers)	User Support	21 529	45.2%
	Programmer	4 952	10.4%
	Professor / Lecturer / Training Officer	2 463	5.2%
	Computer / Systems Operator	2 256	4.7%
	Systems Analyst	1 860	3.9%

IT full-time vacancies

1.14 As at 1 April 2022, the total number of full-time vacancies was 4 946, representing a vacancy rate of 4.5% (i.e. vacancies as a percentage of the total number of employees and vacancies). The largest number of vacancies was found in IT products and services suppliers sector (1 826 vacancies), followed by wholesale, retail and import/export trades of non-IT products, catering and hotels (470 vacancies), communications services (468 vacancies), financing, insurance, real estate and business services (464 vacancies) sectors.

Table 1d IT Full-time vacancies – by type of organisation and industry sector

	No. of vacancies	Vacancy rate
IT & Communications Services Organisations	**2 723**	**[4.1%]**
- IT products & services suppliers	*1 826*	*[4.0%]*
- Communications services	*468*	*[6.0%]*
- Wholesale, retail & I/E trades of computer products & software packages	*216*	*[2.6%]*
- Innovative products & services (IT)	*150*	*[6.6%]*
- Digital creative	*47*	*[6.3%]*
- Manufacturing (IT products)	*16*	*[1.7%]*
IT Users Organisations	**2 223**	**[5.1%]**
- Wholesale, retail & I/E trades, catering & hotels	*470*	*[6.1%]*
- Financing, insurance, real estate & business services	*464*	*[3.7%]*
- Universities & post-secondary colleges; research & scientific institutes	*322*	*[6.1%]*
- Community, social & personal services	*292*	*[4.0%]*
- Innovative products & services (non-IT)	*242*	*[10.0%]*
- Government bureaux / departments	*185*	*[4.7%]*
- Medical & health care services	*81*	*[6.4%]*
- Manufacturing (non-IT products)	*52*	*[5.4%]*
- Transport & storage services	*45*	*[3.1%]*
- Electricity, gas & water	*38*	*[10.0%]*
- Construction	*32*	*[5.3%]*
Overall:	**4 946**	**[4.5%]**

$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & industry sector)

1.15 A larger number of full-time vacancies were jobs engaging in software development (1 946 vacancies), followed by infrastructure and operations support (1 081 vacancies), technical services (621 vacancies) and IT related research and development (527 vacancies).

1.16 For IT and Communications Services Organisations, a significant number of vacancies were jobs engaging in software development (1 195 vacancies). For IT Users Organisations, most of the vacancies were jobs engaging in infrastructure and operations support (940 vacancies) and software development (751 vacancies).

Table 1e IT Full-time vacancies – by job category and type of organisation

Type of organisation / Job category	IT & Communications Services Organisations		IT Users Organisations		Overall	
	No. of full-time vacancies	Vacancy rate	No. of full-time vacancies	Vacancy rate	No. of full-time vacancies	Vacancy rate
Software Development	1 195	[4.6%]	751	[5.8%]	1 946	[5.0%]
Infrastructure & Operations Support	141	[3.2%]	940	[4.4%]	1 081	[4.2%]
Technical Services	491	[5.0%]	130	[15.1%]	621	[5.8%]
R&D (IT related)	314	[4.6%]	213	[8.4%]	527	[5.6%]
IT Sales & Marketing	291	[2.7%]	22	[4.9%]	313	[2.8%]
Communications & Networks	219	[3.7%]	28	[7.8%]	247	[4.0%]
IT Security	24	[2.3%]	57	[9.3%]	81	[4.9%]
General IT Management	8	[0.8%]	40	[6.7%]	48	[3.0%]
Data Management	34	[5.4%]	8	[3.6%]	42	[4.9%]
IT Education & Training	6	[8.7%]	34	[0.9%]	40	[1.0%]
Overall:	**2 723**	**[4.1%]**	**2 223**	**[5.1%]**	**4 946**	**[4.5%]**

$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & industry sector)

1.17 Similar to the prominent principal jobs, programmer is one of the top three prominent vacancies in both IT and Communications Services Organisations, and IT Users Organisations.

Table 1f Top 3 prominent IT vacancies – by type of organisation

Type of organisation	Top 3 Prominent Vacancies	No. of full-time vacancies	Vacancy rate
IT and Communications Services Organisations (Total: 64 751 full-time employees & freelancers)	Programmer	488	[4.6%]
	Service Technician	302	[4.7%]
	Analyst Programmer	221	[4.9%]
IT Users Organisations (Total: 47 674 full-time employees & freelancers)	User Support	788	[4.9%]
	Programmer	318	[6.0%]
	R&D Researcher / Scientist / Engineer	203	[10.3%]

$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & industry sector)

IT staff seconded from contractor company

1.18 As at 1 April 2022, there were a total of 4 644 IT staff seconded from contractor companies. The ratio of seconded IT staff to all IT personnel (i.e. full-time employees and freelancers) was 4.0%. Relatively higher seconded IT staff ratio was found in IT Users Organisations (7.2%) than in IT and Communications Services Organisations (1.5%).

1.19 User Support is one of the top three principal jobs seconded from contractor companies in both IT and Communications Services Organisations, and IT Users Organisations.

Table 1g IT Staff seconded from contractor company – by type of organisation

	IT & Communications Services Organisations	IT Users Organisations	Total
No. of IT staff seconded from contractor company (in full-time equivalent)	971	3 673	4 644
% of seconded staff among all IT personnel	1.5%	7.2%	4.0%
Top 3 principal jobs seconded from contractor company	Service Technician User Support Computer Game or Graphic Designer / Artist / Developer; Computer Animator; Web Graphic / Visual Effects Designer	User Support Programmer Systems Analyst	

Average monthly remuneration package of IT employees

1.20 Full-time employees engaging in general IT management tended to have higher income ($50,001 or more; 84.6%), while those who had relatively lower income range ($30,000 or below) tended to be those engaging in infrastructure and operations support (85.6%), IT sales and marketing (77.8%) and technical services (75.7%).

Table 1h Average monthly remuneration package of IT full-time employees – by job category

Job Category	Prominent ranges of remuneration package
General IT Management	$50,001 or more (84.6%)
IT Security	$30,001 - $90,000 (70.0%)
R&D (IT related)	$30,001 - $90,000 (64.7%)
IT Education & Training	$30,001 - $50,000 (62.9%)
Data Management	$20,001 - $50,000 (83.7%)
Communications & Networks	$20,001 - $50,000 (80.3%)
Software Development	$20,001 - $50,000 (66.3%)
Technical Services	$30,000 or below (75.7%)
IT Sales & Marketing	$30,000 or below (77.8%)
Infrastructure & Operations Support	$30,000 or below (85.6%)

Preferred education level of IT employees

1.21 Employers tended to require full-time employees engaging in IT related R&D to attain higher education level (post-graduate degree / first degree level; 81.2%), while the preferred education level for those engaging in infrastructure and operations support tended to be lower (sub-degree or diploma / certificate level; 71.8%).

Table 1i Preferred education level of IT full-time employees – by job category

Job Category	Prominent preferred education levels
R&D (IT related)	Post-graduate degree / First degree (81.2%)
General IT Management	First degree (82.1%)
IT Education & Training	First degree (80.9%)
Data Management	First degree (70.5%)
IT Security	First degree (66.2%)
Software Development	First degree / Sub-degree (81.5%)
Communications & Networks	First degree / Sub-degree / Diploma / certificate (99.5%)
IT Sales & Marketing	First degree / Sub-degree / Diploma / certificate (84.8%)
Technical Services	First degree (25.7%) / Diploma / certificate (58.0%)
Infrastructure & Operations Support	Sub-degree / Diploma / certificate (71.8%)

Preferred year of experience of IT employees

1.22 Employers tended to require full-time employees engaging in general IT management to have more relevant experience (10 years or above: 42.4%; 3 years to less than 10 years: 52.3%). On the other hand, those who were required to have less years of experience (less than 3 years) tended to be those engaging in infrastructure and operations support (80.9%) and technical services (79.1%).

Table 1j Preferred years of experience of IT full-time employees – by job category

Job Category	Prominent preferred years of experience
General IT Management	10 years or above (42.4%); 3 years - < 10 years (52.3%)
R&D (IT related)	3 years - < 10 years (75.8%)
IT Security	3 years - < 6 years (73.7%)
Data Management	1 year - < 6 years (85.1%)
IT Sales & Marketing	1 year - < 6 years (75.6%)
Software Development	1 year - < 6 years (79.4%)
Communications & Networks	< 6 years (92.0%)
IT Education & Training	< 6 years (81.4%)
Technical Services	< 3 years (79.1%)
Infrastructure & Operations Support	< 3 years (80.9%)

Training needs of IT employees in the next 12 months

1.23 The top commonly mentioned training needs of full-time employees in the next 12 months were listed in the table below.

Table 1k Top training needs of full-time employees in the next 12 months – by job category and type of organisation

Type of organisation / Job category	IT & Communications Services Organisations	IT Users Organisations
Software Development	Application Development Tools / Programming Languages	
Infrastructure & Operations Support	Problem Solving Skills	Information & System Security
IT Security		
Technical Services	Applied Basic IT Tools for Business Processes	Virtualisation and Cloud Computing
Data Management	Data Science & Data Analytics	Database
IT Sales & Marketing	Business Communication Skills in Technology Sector	Digital Marketing & e-Commerce
R&D (IT related)	(R&D) Research Methodology	(R&D) Management Skills
Communications & Networks	Networking / Data Communications	
IT Education & Training	e-Learning Technology & Development	
General IT Management	Management Skills & Leadership Skills	Strategic Management

Note: The training needs presented in the table above refer to the need with the highest percentage of respondents regarded it as top 3 for individual job category.

IT employees left and recruited in the past 12 months

1.24 A total of 10 634 employees have left their companies during the 12 months before enumeration. The turnover rate (i.e. the number of employees left as a percentage of the total number of posts) was 10.6%. Slightly higher turnover rate was found in IT and Communications Services Organisations (12.2%) than in IT Users Organisations (8.3%). Analysing by industry sectors, the highest turnover rate was found in communications services sector (14.4%).

1.25 During the past 12 months before enumeration, a total of 11 062 full-time employees were recruited. The number of new recruits was slightly more than the number of employees left. The majority of new recruits (86.3%) had IT relevant experience.

Table 1l IT full-time employees left and recruited in the past 12 months – by type of organisation

	IT & Communications Services Organisations	IT Users Organisations	Total
No. of Full-time Employees LEFT	7 231	3 403	10 634
Turnover Rate	[12.2%]	[8.3%]	[10.6%]
Top 3 industry sectors with the highest Turnover Rate	Communications services [14.4%]	Innovative products & services (non-IT) [11.8%]	
	Innovative products & services (IT) [13.0%]	Wholesale, retail & I/E trades, catering & hotels [9.9%]	
	IT products & services suppliers [12.9%]	Universities & post-secondary colleges; research & scientific institutes [9.3%]	
No. of NEW RECRUITS	7 598	3 464	11 062
% of having relevant experience	88.0%	82.5%	86.3%

Note: The above figures do not cover R&D (IT related) jobs. The corresponding figures will be presented in the section for R&D.

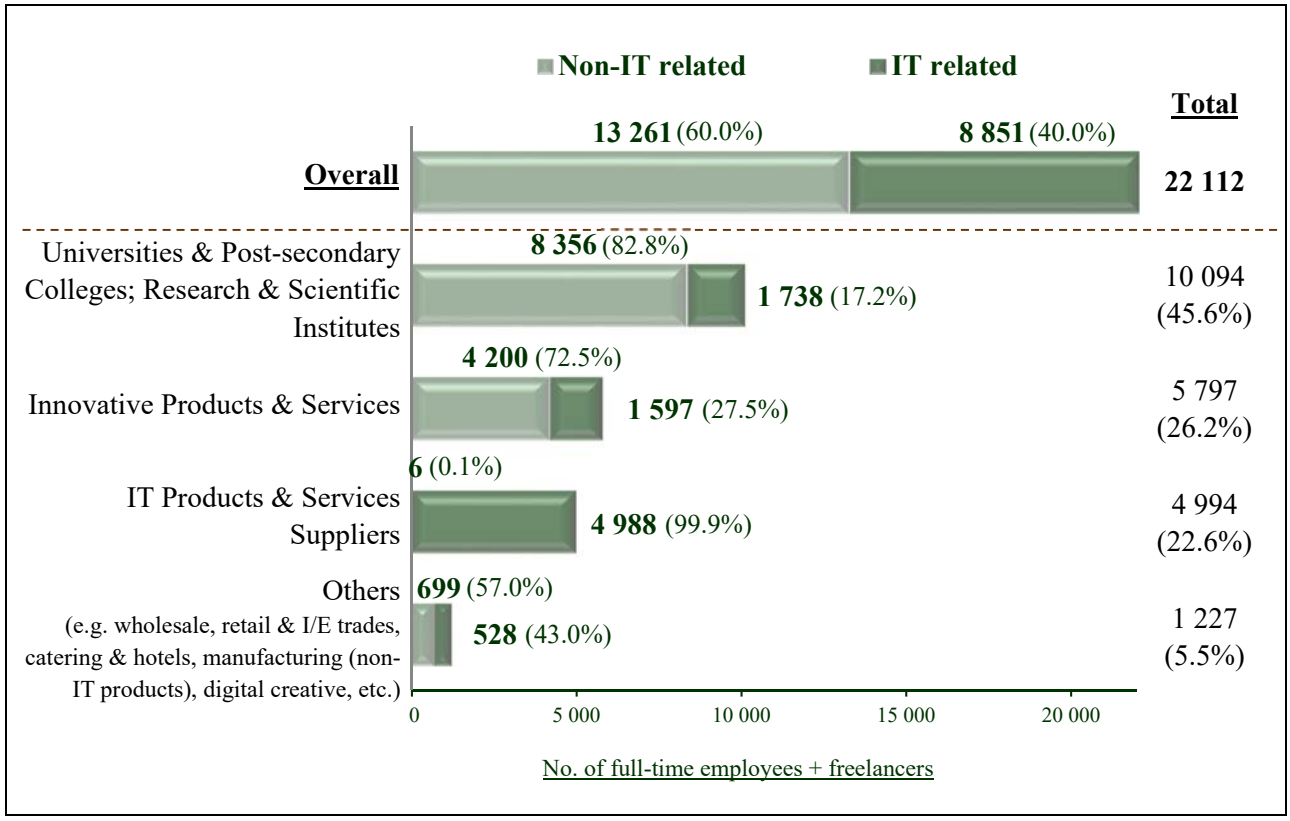
$$\text{Turnover rate} = \frac{\text{No. of employees left}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & industry sector)

Research and Development (R&D)

R&D full-time employees and freelancers

1.26 Among the 22 112 full-time employees and freelancers in the principal jobs of R&D, relatively more were engaged in non-IT related jobs (60.0%; 13 261 persons) than in IT related jobs (40.0%; 8 851 persons). Analysing by industry sectors, the highest percentage of R&D full-time employees and freelancers was found in universities and post-secondary colleges; research & scientific institutes (45.6%).

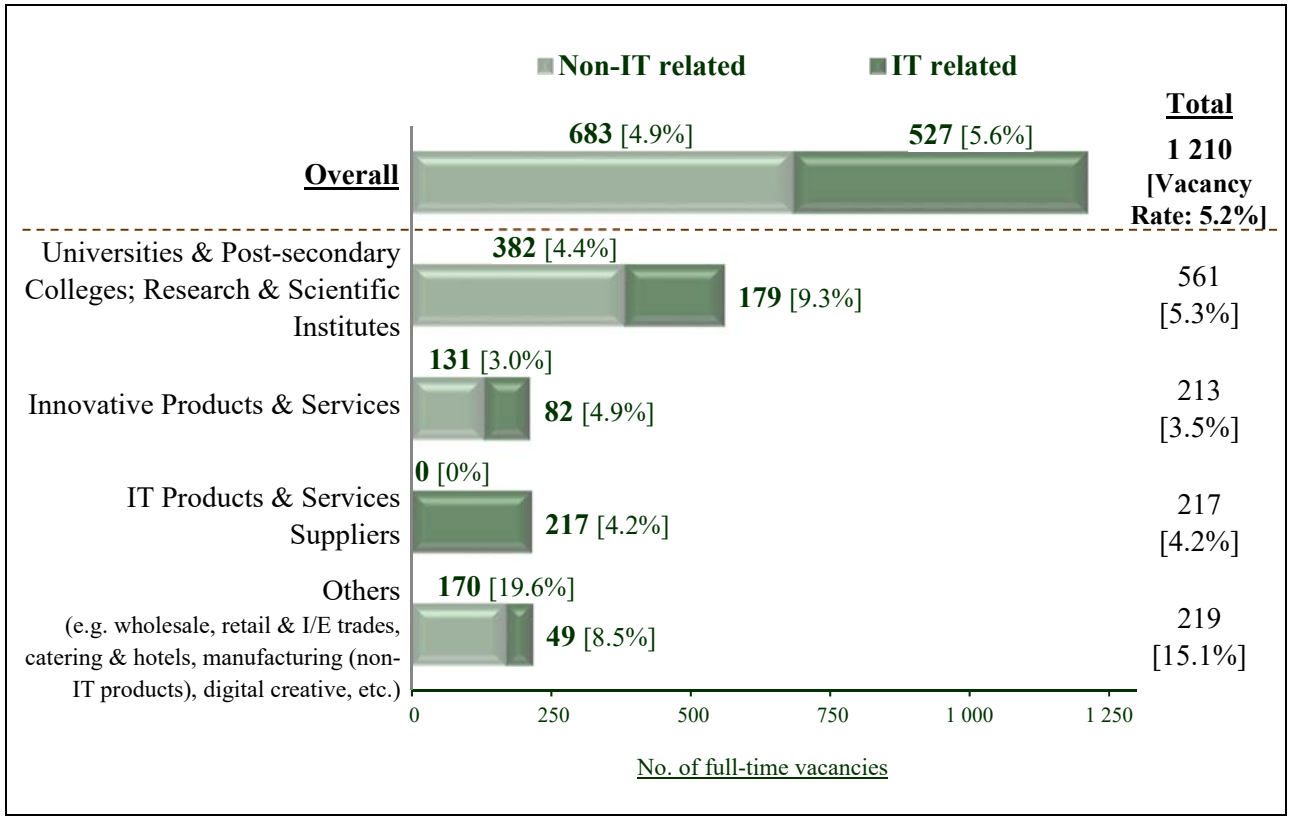
Chart 1b R&D Full-time employees and freelancers – by job category and industry sector



R&D full-time vacancies

1.27 As at 1 April 2022, the total number of R&D full-time vacancies was 1 210, representing a vacancy rate of 5.2%. Relatively more vacancies were found for non-IT related (683 vacancies) than IT related (527 vacancies) jobs.

Chart 1c R&D Full-time vacancies – by job category and industry sector



$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective industry sector & job category)

1.28 R&D researcher / scientist / engineer is the top prominent principal jobs for both non-IT related and IT related jobs, as well as the top prominent vacancies.

Average monthly remuneration package of R&D employees

1.29 57.4% of the full-time employees engaging in non-IT related jobs had higher income range of $50,001 or more, while the corresponding proportion for those engaging in IT related jobs was 48.2%.

Table 1m Average monthly remuneration package of R&D full-time employees – by job category

Job Category	$90,001 or more	$50,001 - $90,000	$30,001 - $50,000	$20.001 - $30,000	$20,000 or below
Non-IT related	15.2%	42.2%	19.4%	18.4%	4.7%
IT related	13.0%	35.3%	29.4%	12.9%	9.5%

Preferred education level of R&D employees

1.30 93.8% of the full-time employees engaging in non-IT related jobs were required to attain higher education level of post-graduate degree / first degree level, while the corresponding proportion for those engaging in IT related jobs was 81.2%.

Table 1n Preferred education level of R&D full-time employees – by job category

Job Category	Post-graduate degree	First degree	Sub-degree	Diploma / certificate	Secondary or below
Non-IT related	53.4%	40.3%	3.6%	2.3%	0.3%
IT related	28.8%	52.4%	13.5%	5.3%	-

Preferred year of experience of R&D employees

1.31 55.4% of the employees engaging in non-IT related jobs were required to have 6 years of experience or above, while the corresponding proportion for those engaging in IT related jobs was 48.4%.

Table 1o Preferred years of experience of R&D full-time employees – by job category

Job Category	10 years or above	6 years – < 10 years	3 years – < 6 years	1 year – < 3 years	< 1 year / no experience required
Non-IT related	28.3%	27.1%	28.2%	12.8%	3.7%
IT related	7.2%	41.2%	34.6%	8.2%	8.9%

Training needs of R&D employees in the next 12 months

1.32 The top commonly mentioned training needs of R&D full-time employees in the next 12 months were "technical skills" for non-IT related jobs and "research methodology" for IT related jobs.

R&D employees left and recruited in the past 12 months

1.33 During the past 12 months before enumeration, the number of new recruits was slightly more than the number of employees left. A total of 1 827 employees have left their companies. The turnover rate (i.e. the number of employees left as a percentage of the total number of posts) was 7.8%. Besides, a total of 2 123 full-time employees were recruited. The majority of new recruits (85.4%) had R&D relevant experience.

Table 1p R&D full-time employees left and recruited in the past 12 months

No. of Full-time Employees LEFT	1 827
Turnover Rate	[7.8%]
No. of NEW RECRUITS	2 123
% of having relevant experience	85.4%

$$\text{Turnover rate} = \frac{\text{No. of employees left}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$

Views of Expected Change and Recruitment Difficulties in Companies

Recruitment difficulties in the past 12 months

1.34 Among the companies which had full-time IT / R&D employees and had engaged in recruitment exercise during the 12 months before enumeration, 74.6% had encountered recruitment difficulties. Among them, the top two difficulties were "candidates lacked the relevant skills / experience" (70.9%) and "candidates found the remuneration package not attractive" (64.2%).

Table 1q Recruitment difficulties in the past 12 months before enumeration

With recruitment difficulties	**74.6%**
Among the 74.6%:	
- Candidates lacked the relevant skills / experience	70.9%
- Candidates found the remuneration package not attractive	64.2%
- Candidates lacked the relevant academic qualification and credential	14.1%
- Candidates' language skills (incl. Putonghua) were not up to expectation	2.2%
- Others (e.g. few applicants during pandemic, need to work on shifts / during weekends, etc.)	0.4%
Without recruitment difficulties	**25.4%**
No. of companies with recruitment exercise (19.7% of all companies having full-time IT / R&D employees)	**4 692**

Note: Respondents may mention more than one recruitment difficulties.

Expected change in the next 12 months in the number of full-time employees

1.35 Among the companies having IT full-time employees, 90.3% expected that their number of IT full-time employees will be the same in the next 12 months after enumeration, while 9.7% expected an increase. On average, the companies anticipated to increase 3.3% of IT manpower in the next 12 months.

1.36 For the companies having R&D full-time employees, 72.0% expected that their number of R&D full-time employees will be the same in the next 12 months after enumeration, while 26.3% expected an increase. On average, the companies anticipated to increase 4.6% of R&D manpower in the next 12 months.

Table 1r Expected change in the next 12 months in the number of full-time employees

IT	Increase	Same	Decrease	Average % of IT manpower change
Among companies having full-time IT employees:				
- IT & Communications Services Organisations	14.2%	85.8%	< 0.05%	+ 4.1%
- IT Users Organisations	4.6%	95.4%	0%	+ 2.0%
Overall	9.7%	90.3%	< 0.05%	+ 3.3%

R&D	Increase	Same	Decrease	Average % of R&D manpower change
Among companies having full-time R&D employees:	**26.3%**	**72.0%**	**1.7%**	**+ 4.6%**

Manpower Analysis

Manpower Changes between 2022 and 2018

Change in number of IT full-time employees and freelancers

1.37 The number of full-time employees and freelancers for the principal jobs of IT has increased from 95 780 in 2018 to 112 425 in 2022, with an increment of 17.4% (+16 645 persons). When analysed by type of organisation, the increment was relatively higher in IT and Communications Services Organisations (21.5%; +11 478 persons) than in IT Users Organisations (12.2%; +5 167 persons).

1.38 When analysed by job category, the increase was mainly attributed by the growth in job categories of software development and R&D (IT related) (+10 181 persons), infrastructure and operations support (+5 933 persons) and IT sales and marketing (+2 229 persons).

Table 1s Change in number of IT full-time employees and freelancers – by type of organisation and job category

	No. of full-time employees & freelancers		Change in 4 years		Annual change in %
	2022	2018			
By type of organisation					
IT & Communications Services Organisations	64 751	53 273	+ 11 478	+ 21.5%	+ 5.0%
IT Users Organisations	47 674	42 507	+ 5 167	+ 12.2%	+ 2.9%
By job category					
Software Development & R&D (IT related)	46 644	36 463	+ 10 181	+ 27.9%	+ 6.3%
Infrastructure & Operations Support	31 117	25 184	+ 5 933	+ 23.6%	+ 5.4%
Technical Services, IT Security & Data Management	12 512	14 210	- 1 698	- 11.9%	- 3.1%
IT Sales & Marketing	10 772	8 543	+ 2 229	+ 26.1%	+ 6.0%
Communications & Networks	5 975	5 973	+ 2	+ <0.05%	+ <0.05%
IT Education & Training	3 878	3 944	- 66	- 1.7%	- 0.4%
General IT Management	1 527	1 463	+ 64	+ 4.4%	+ 1.1%
Overall:	**112 425**	**95 780**	**+ 16 645**	**+ 17.4%**	**+ 4.1%**

Change in number of IT full-time vacancies

1.39 The number of full-time vacancies for the principal jobs of IT has also increased, from 3 231 in 2018 to 4 946 in 2022, with an increment of 53.1% (+1 715 vacancies). The increment was relatively higher in IT Users Organisations (87.9%; +1 040 vacancies) than in IT and Communications Services Organisations (33.0%; +675 vacancies).

1.40 Increase was recorded for all job categories, particularly for software development and R&D (IT related) (+743 vacancies), infrastructure and operations support (+446 vacancies) and technical services, IT security and data management (+345 vacancies).

Table 1t Change in number of IT full-time vacancies – by type of organisation and job category

	No. of full-time vacancies		Change in 4 years		Annual change	Vacancy rate	
	2022	2018			in %	2022	2018
By type of organisation							
IT & Communications Services Organisations	2 723	2 048	+ 675	+ 33.0%	+ 7.4%	[4.1%]	[3.7%]
IT Users Organisations	2 223	1 183	+ 1 040	+ 87.9%	+ 17.1%	[5.1%]	[2.8%]
By job category							
Software Development & R&D (IT related)	2 473	1 730	+ 743	+ 42.9%	+ 9.3%	[5.1%]	[4.5%]
Infrastructure & Operations Support	1 081	635	+ 446	+ 70.2%	+ 14.2%	[4.2%]	[2.6%]
Technical Services, IT Security & Data Management	744	399	+ 345	+ 86.5%	+ 16.9%	[5.6%]	[2.8%]
IT Sales & Marketing	313	291	+ 22	+ 7.6%	+ 1.8%	[2.8%]	[3.3%]
Communications & Networks	247	153	+ 94	+ 61.4%	+ 12.7%	[4.0%]	[2.5%]
General IT Management	48	15	+ 33	+ 220%	+ 33.7%	[3.0%]	[1.0%]
IT Education & Training	40	8	+ 32	+ 400%	+ 49.5%	[1.0%]	[0.2%]
Overall:	**4 946**	**3 231**	**+ 1 715**	**+ 53.1%**	**+ 11.2%**	**[4.5%]**	**[3.3%]**

$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & job category in the respective year)

Manpower Projection and Annual Additional Manpower Requirement

1.41 Annual additional manpower requirements have taken into account the (i) projected manpower trend and (ii) wastage rate of the industry (i.e. percentage of employees leaving the industry permanently on annual basis), the estimated additional annual requirement is shown in Table 1u below.

Table 1u Estimated Annual Additional Manpower Requirement

Job Level	Wastage rate of the industry	Additional Annual Manpower Requirement		
		Average manpower growth (a)	Industry leavers (b)	Total (a) + (b)
(A) Information Technology				
IT Management	1.1%	52	73	125
R&D(IT), Software Development, Communications & Networks, IT Security, etc.		2,233	654	2,887
Hardware and Field Support		659	229	888
Operation Services		1,113	361	1,474
IT Education and Training		-1	42	41
Overall		**4,056**	**1,359**	**5,415**
(B) Research and Development				
Overall	0.1%	**1,075**	**14**	**1,089**

Recommendations

1.42 Taking into account the business outlook and survey findings, the Training Board had the following recommendations:

Government

Request listed companies engaging innovation and technology businesses to bring non-local talents to Hong Kong

1.43 Bringing together talents from around the world is important to strengthening Hong Kong's competitiveness and development. The Government should consider including a special requirement on the Main Board and Growth Enterprise Market Listing Rules that companies engaging in innovation and technology businesses will have to bring a certain number of R&D experts from overseas or Mainland China and/or recruiting a certain number of local R&D employees before they can be listed on the Main Board or Growth Enterprise Market in Hong Kong.

1.44 Such measures could ensure a steady supply of talents from overseas or Mainland China to participate in the R&D development in Hong Kong.

Tax Reduction or other Incentives to Encourage those Graduates Studying in the Mainland China to return to Hong Kong after graduation

1.45 Apart from attracting the overseas young talents to work in Hong Kong, there are quite a number of children of Hong Kong residents receive professional training in the Mainland cities, the Government should consider formulating policies to provide talents with housing allowance and tax reduction so as to attract them to pursue career development in Hong Kong or GBA cities.

1.46 Chinese graduates returning from overseas universities are another vital sources of talents that worth attracting. The Government should continue to examine various arrangements for attracting talents with a view to enriching Hong Kong's talent pool.

"Business to Government" or "Government to Business" business model

1.47 "Business to Government (B2G)" model provides a platform for businesses to sell products and services to government while "Government-to-business (G2B)" model means Government selling to businesses. The G2B partnership is effective for Government particularly to deliver infrastructure services. The public services are provided by using private sector innovation and expertise. The Government will seek innovation that private sector can deliver and can put more investments in innovation and technology and boost up the industry development by offering more attempts on innovation products. Apart from leveraging private funding, the partnership could improve service provision and boost economic growth. Partnership with competent leading innovation and technology companies could help drive the sector grow.

1.48 The new Office for Attracting Strategic Enterprises (OASES) should therefore consider possible G2B partnerships with giant tech-savvy companies to engage them on business areas including life and health technology, artificial intelligence and data science, as well as advanced manufacturing and new energy technology. With the reputation of big brand-name companies investing in Hong Kong, local talents will be retained and more and more overseas talents will be attracted to develop their careers in Hong Kong. Making the local innovation and technology environment appealing and attractive, the Training Board considers that more young generation will be interested to pursue careers in technology and science.

Educate the Public the Vision of Innovation and Technology Development in Hong Kong

1.49 The Government should continue to promote its vision of being the international innovation and technology hub and the promising opportunities that innovation and technology sector could offer to the public, particularly, the workforce and the young generation as well as the parents. It is crucial for the public to be educated that the Government values human capital development,

innovative entrepreneurship and science and technology.

1.50 The Government should lead and develop joint promotion and collaboration with Hong Kong's leading research and development centres and institutions, such as Hong Kong Science Park, Cyberport, Hong Kong Productivity Council and Hong Kong Applied Science and Technology Research Institute Company Limited as well as the five Government funded R&D centres. The collaborative efforts to promote local R&D outstanding achievements will have a stronger effect to draw the attention and recognition of the public.

Relax Immigration Arrangements for Non-local Sub-degree Graduates

1.51 In Policy Address 2022, the Immigration Arrangements for Non-local Graduates will be relaxed by extending the limit of stay from one year to two years to facilitate their staying in or coming to Hong Kong for work; and expand the scope of the arrangements to cover those who graduated from the GBA campus of a Hong Kong university on a pilot basis for a period of two years. The Training Board considers that such initiatives are conducive to attract non-local talents to start their careers in Hong Kong, however, it is worth considering extending to cover more non-local talents, especially for those non-local sub-degree graduates who should also be allowed to stay two years in Hong Kong to explore employment opportunities.

Provide More Resources to Train up Technical Workforce

1.52 Skilled technical workforce is crucial for companies to develop innovation and technology businesses and those positions are in high demand according to the survey results. The Government should therefore provide more resources to training institutions to build up the backbone of the innovation and technology sector.

1.53 By giving more recognition of sub-degree holder, the Government should also consider lowering the entry requirement from degree to sub-degree holder for some technical roles which are more focused on hands-on skills and knowledge instead of only academic qualifications.

Training Institutions

Nurture and Build up the Technical Workforce

1.54 As revealed from the survey results, workforce with technical skills and knowledge are in high demand in the innovation and technology sector. Training institutions should train up more technical workforce as they are vitally important to the research and innovation from contributing knowledge, developing and maintaining the equipment and infrastructures to support the innovators and researchers to develop their inventions. The Training Board considers that their important

roles in innovation and research work have always been undervalued before and more support and efforts should be paid to vocational and professional education and training to build up the technical skills base. Without a reliable and competent technical workforce, Hong Kong is not able to develop and sustain as an international innovation and technology hub.

1.55 It is therefore crucial for Training Institutions to engage students with strong foundation of programming and coding skills so that they fully understand the principles behind and acquire detailed knowledge. By doing so, students will be able to manage and response to the rapidly changing programming languages in ease. Besides, students should be able to demonstrate digital literacy on computer hardware, operating systems, network infrastructure and security, database software, internet web publishing, etc.

Enhance the curriculum for students to learn the advanced technology developed in Mainland China

1.56 In order to develop students' capabilities in working at technology firms in GBA cities, the curriculum should be extended by covering more advanced technology and technology platforms built in the Mainland China in addition to those Western platforms and software. The digital ecosystem in Mainland China is self-reliant and advanced in nature, students should get familiar with its technology, particularly, the software developed in the Mainland has been highly competitive and increasingly adopted in Hong Kong with a number of tech giants like, Alibaba, Baidu, Huawei, Tencent, Xiaomi, Kingdee, etc.

1.57 The advanced technology knowledge and skills from Mainland China are instrumental for students to better integrate into the opportunities brought forth in GBA cities, which in turn the technical workforce will strengthen Hong Kong's roles and functions as a springboard between the Mainland China and the international markets.

Develop interdisciplinary curriculum to equip students of non-IT disciplines with IT and Technology knowledge and skills

1.58 In today's technology-driven economy, Training Board considers that IT skills are one of the generic skills that students must be possessed in order to stay competitive in the workforce. In this connection, interdisciplinary curriculum should be developed to equip students of non-IT disciplines with basic IT and technology knowledge and skills, particularly learning to code.

1.59 It is recommended to introduce basic concepts of coding and applications of technologies to all students even they are not related to IT discipline. Learning the basics of coding not only letting students get familiar with the foundational building blocks of computer programming, it also allows students to develop problem solving skills and foster their own creativity.

Offer more project-based and authentic learning experience

1.60 Project-based learning gives students the opportunity to develop skills and knowledge through engaging them in problems and situations they may face in the real working environment. To facilitate students to acquire the necessary skills and knowledge needed for innovation and technology development, authentic learning experience should be prepared and created to train up the critical thinking and research and collaboration skills.

1.61 In order to nurture students with hands-on practical IT and research skills through successful implementation of project-based learning, teachers and mentors are required to coach more but at the same instruct less so as to embrace students to discover more about their competencies and problem-solving skills. Good ideas and solutions could come from students instead of traditional lectures, teachers are required to plan in details by identifying an appropriate problem in related to innovation and technology development, reviewing each step required to solve the problem and using those steps as project-learning activities with checkpoints and manageable timelines.

1.62 The project-based learning approach will be able to inspire and develop life-long learners as students will be engaged deeply with the real-life problems and motivated to find out practical solutions themselves. The ultimate outcome is expected to achieve that students will end up enjoy understanding the solutions through applications of technologies as much or more than teachers want them to know.

Be forward-looking in equipping students with future skills and competencies required

1.63 In the face of today's rapidly changing and highly technological advancement, the Training Board recommends that training institutions should prepare students for jobs that might have not been created at the moment, for technologies that have not been invented, and also to solve problems that have not been seen or anticipated. It is important for training institutions to be forward looking and get prepared for the knowledge and skills that students will need to thrive in the future. Close collaboration with tech-savvy companies is therefore crucial for institutions to understand the future skills needed and identify skills gap to train up students to be future employees in the innovation and technology sector.

1.64 Apart from hard skills, training institutions should develop students with creativity, imagination, curiosity and resilience. They will have to be educated to be respect and ethical, appreciate the ideas and values of the others and also to cope with failure and rejection when developing innovative products and solutions.

Provide In-Service Training on IT Certificates recognised in Mainland China

1.65 As more and more companies are using software and solution from the Mainland China, the demand on professional certifications recognised in Mainland China are on the rise. Training institutions should provide more training to IT practitioners to assist them in gaining professional recognition of their qualifications and making them more competitive and employable in the market by learning hands-on practice of the Mainland China's software and solution.

1.66 It is also necessary for IT practitioners to keep abreast of the advanced technology development in the Mainland China in order to avoid lagging behind the other GBA cities in developing innovation and technology skills.

Offer Upskilling and Reskilling Training

1.67 Training institutions should continue to organise training to help individuals enhance digital skills and adapt to use digital tools, especially for those who work in traditional jobs to cope with the automation and digital transformation.

Promote the programmes to parents by collaboration with leading companies

1.68 Apart from promoting innovation and technology related programmes to students and teachers, parents are key influencers of young people's career and subject choices. Training institutions are advised to proactively promote the innovation and technology related learning journeys to parents.

1.69 The training institutions should work with leading companies in the innovation and technology sector to promote the promising careers that happening in various industries in order to spark interest from parents. By doing so, parents could exert a much more direct influence on their children's career choices by advising them to study science and technology subjects and pursue in innovation and technology related career pathways.

Embrace teachers with innovative mindset

1.70 In order to empower the young generation to develop a mindset that encourages creativity and embrace adaptation, training institutions should inspire teachers with innovative mindset of successful entrepreneurs and inventors.

1.71 By nurturing teachers with innovative mindset, teachers will be able to lead high quality project-based learning and focus on fostering students' innovation by strengthening critical thinking, creativity, curiosity and deep understanding as well as questioning skills in the curriculum as the key learning outcomes, which are all important attributes for innovation and technology personnel.

Industry

Promote innovation and technology achievements in Hong Kong

1.72 The industry should work together to promote the local innovation and technology achievements to the public and showcase how their research and development efforts have a significant impact on the economic prosperity and the quality of life being enjoyed by members of the public.

1.73 With the enhanced reputation of the innovation and technology sector in Hong Kong, more young talents will be attracted to join the sector and stay in the profession.

Support community events in innovation and technology development

1.74 The industry should also provide more support to community events to let the young generation to experience technology achievements and cutting-edge innovations in Hong Kong, in turn attracting more students to study in STEM related subjects.

1.75 As a long term recruitment tool, the industry will be able to bring together the young generation who are already interested in innovation and technology and cultivate an innovative pool of talents to serve the industry.

Employers

Share best practice and innovative products

1.76 Employers are encouraged to share their best practices to their employees and industry partners on innovation and technology development. Sharing best practices can help companies identify knowledge gaps, improve efficiency and productivity and encourage leadership.

1.77 The Training Board considers that sharing best practices and innovative products will help company nurture an innovative learning culture through knowledge sharing tools and social media networks to attract more talents and adapt technological change and boost up employees' performance. Particularly, research and development activities heavily rely on innovative and creative ideas where employees can share their brainstormed ideas and access freely to right information by integrating best practices to business processes.

Offer intensive on-the-job training to employees and invest on employee development

1.78 Employers should invest more in employee development such as training the workforce on

new technologies and strategies or provide skill-based on-the-job training to improve work performance.

1.79 On-the-job training to employees will result in improved employee performance on innovation and technology and it is expected that it will positively impact business growth and generate profits for the companies.

Partner with training institutions to offer more support to R&D professionals with business and market sense

1.80 In order to effectively commercialise the research results, employers should partner with training institutions to offer more support to R&D professionals to equip them with business and market knowledge. More proactive support from employers would be crucial to combine research activities with production activities of companies so as to improve the quality of research activities and implement feasible innovation projects or solutions based on the research and technological development results.

Implement flexible work arrangements

1.81 Flexible work arrangements have become a hot topic in modern workplaces due to COVID-19 pandemic. More companies are implementing flexible work arrangements with a view to enhancing employee satisfaction and retention, increasing recruitment flexibility, reducing operating costs .

1.82 Young innovators prefer to have virtual and flexible work arrangement permanent, however, it is also advisory to have regular face-to-face interactions and meetings to strengthen mutual trust and connection between team members for innovation and technology development.

Apply the Government funding schemes

1.83 Employers are advised to proactively apply and utilise the Government funding schemes to maximise their resources for innovation adoption. With the funding support from the Government, employers are able to implement innovative solutions and digital transformation by adopting different technologies to strengthen their competitiveness and cope with the challenges.

1.84 Employers should make use of the Innovation and Technology Fund to upgrade their technological level and develop innovative ideas to their businesses and there are different programmes that worth considering for nurturing technology talents and facilitating technology adoption:

- Research Talent Hub – funds engagement of innovation and technology talents to conduct R&D work
- Reindustrialisation and Technology Training Programme – funds staff of local entreprises to receive training in advanced technologies, especially those related to "Industry 4.0"
- STEM Internship Scheme – subsidises undergraduates and postgraduates taking STEM programmes in local universities to enrol in short-term innovation and technology related internships
- Public Sector Trial Scheme – funds production of prototypes/ samples and conducting of trials in the public sector
- Technology Voucher Programme – supports the use of technological services and solutions by enterprises and statutory bodies to improve productivity, or upgrade or transform business processes
- Re-industrialisation Funding Scheme – subsidises manufacturers to set up new smart production lines in Hong Kong
- Innovation and Technology Fund for Better Living – funds innovation and technology projects which will make people's daily living more convenient, comfortable and safer, or address the needs of specific community groups

Employees

Be life-long learners and be persistent

1.85 Life-long learning is key to success for employees to maintain a competitive edge in new technologies and grow through continuous application of knowledge and experience. In fact, lifelong learning requires embracing opportunities to learn and put into practice. There are different ways to achieve lifelong learning such as self-motivated learning through online learning platforms, books and training. It could be in another form of professional learning through networking and industry news and pursuing professional certification and qualifications.

1.86 In addition, grit is also vital for success in innovation. Grit is the passion and perseverance for very long-term goals which is an important attribute for innovators to drive forward through overcoming failures. Grit could be nurtured and developed and young innovators should develop their true grits to learn from mistakes and failures to follow the path and have the motivation and confidence to bounce back from failures.

Broaden own horizons by exploring different opportunities

1.87 Innovation values new ideas and different perspectives. Employees should grasp different opportunities to broaden their horizons to experience innovation and technology development in other GBA cities and countries.

1.88 Through the first-hand observation and experience, employees could make significant contribution to the innovative development and explore the potential business opportunities brought to companies.

Be innovative at work and engage in more projects in building up experiences

1.89 Employees should be innovative at work by identifying problems at an early stage to make operations more efficient, enhance management processes and expedite decision making.

1.90 Employees are recommended to engage in diversified projects and gain more skills and experiences to build up their own technology capabilities for future development.

Be mentors at workplace to share and cultivate innovative culture

1.91 Motivation to innovation and technology will be further strengthened if employees care about the well-being of their younger colleagues, their organisations and in turn their communities, which will be more than just getting a good job and an attractive income. Being mentors at workplace will provide employees with a sense of contribution and ownership to lead the innovative projects and research results.

1.92 Employees should consider themselves as one of the drivers to cultivate innovative culture. Building up an innovative culture will facilitate innovative ideas and processes as well as make people more engaged and productive. Employees should work hand in hand with employers to create innovation and make the difference for the industry and for the community.

Be proactive and develop problem solving skills

1.93 Apart from the technical skills needed for the innovation and technology development, employees should possess proactive problem solving skills to anticipate and resolve challenges independently. In this connection, the employees should be more proactive in using data to analyse the root cause to problem and seek a favourable solution for business prosperity. Establishing positive rapport and building strong relationships with the whole team are key attributes that employers are looking for innovation and technology professionals.

Develop genuine interests in innovation

1.94 Employees with genuine interest in innovation will have the motivation and desire to deeply understand the current technology and explore new technologies 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. In

addition, fresh graduates should have to know that not everyone needs to be entrepreneurs. There are many people who are succeeding in contributing their skills and knowledge into work that could also make a difference to the sector, especially, for those without entrepreneurial spirit to take risks and invest their lives in creating businesses and growing businesses.

1.95 Learning how to learn is also an important skill that employees should have, regardless of their job types, as people will have to proactively solve problems when they encounter challenges in this ever-changing business environment.

2 Introduction

Background

2.1 The Innovation and Technology Training Board (Training Board) of the Vocational Training Council (VTC) is appointed by the Government of the Hong Kong Special Administrative Region (HKSAR) to analyse the manpower situation and training needs of the Innovation and Technology Sector. The Training Board comprises members nominated by major trade associations, trade unions, professional bodies, educational and training institutions and Government departments. The Working Party of the manpower survey is formed by selected members of the Training Board. The membership and terms of reference of the Training Board, as well as the members in the Working Party are listed in **Appendices 1, 2 and 3**.

2.2 The manpower survey of the Innovation and Technology Sector is conducted every four years, followed by two periodic manpower updates supplemented with information collected from focus group and desk research to better reflect the changing trends of the manpower situation. This manpower survey mainly focused on analysis of technical manpower, which refers to the personnel who are expected to apply the innovation and technology knowledge and technical skills required to complete the work assigned.

2.3 Manpower data with respect to survey reference date of 1 April 2022 was collected from April to July 2022. This report presents the survey findings and analysis of the latest manpower situation of the Innovation and Technology Sector and proposes recommendations on the manpower development to the different stakeholders of the sector, including employers, employees, training providers and the Government by making reference to the business outlook.

Objectives

2.4 The objectives of this manpower survey are:

(a) To collect up-to-date manpower information by principal jobs, by job categories and by types of organisations in the Innovation and Technology Sector;

(b) To assess the technical manpower structure;

(c) To forecast training requirements in the near future; and

(d) To recommend to the VTC and relevant stakeholders the development of training strategies to meet the needs.

Survey Coverage

2.5 The survey covered the following industry sectors:

IT and Communications Services Organisations

- Innovative products and services (IT)
  (companies at Hong Kong Science Park and Cyberport)
- IT products and services suppliers
- Manufacturing (IT products)
- Wholesale, retail and import/export trades of computer products and software packages
- Communications services
- Digital creative

IT Users Organisations (covering employment size 5 or more only)

- Innovative products and services (non-IT)
  (companies at Hong Kong Science Park and Cyberport)
- Universities and post-secondary colleges; research and scientific institutes
- Manufacturing (non-IT products)
- Electricity, gas and water
- Wholesale, retail and import/export trades, catering and hotels
- Transport and storage services
- Financing, insurance, real estate and business services
- Medical and health care services
- Community, social and personal services
- Government bureau / departments

3 Methodology

Sample Design

3.1 The survey covered around 96 000 companies which comprised of two major groups of companies, the IT and Communications Services Organisations, and the IT Users Organisations. The IT Users Organisations included almost all major industries in Hong Kong, such as financial services, trading and logistics, professional services and so on. By adopting the stratified random sampling method for selecting companies from the Central Register of Establishments of the Census and Statistics Department (C&SD), and the inclusion of supplementary samples recommended by the Training Board, a total of 1 799 companies were selected for the survey.

Questionnaire Design

3.2 The questionnaire designed for the survey comprised two parts. Part I collected quantitative manpower information by job categories and by principal jobs, and Part II collected supplementary information related to manpower situation. The list of principal jobs was defined by the Training Board with detailed job descriptions given for each job, and was classified into 11 job categories as follows:

- Research and Development (Non-IT related)
- Research and Development (IT related)
- General IT management
- Software development
- Communications and networks
- IT security
- Technical services
- Data management
- Infrastructure and operations support
- IT education and training
- IT sales and marketing

3.3 While job titles adopted in the companies might vary with the descriptions of the principal jobs, respondents were asked to provide manpower information corresponding to the job descriptions and the skill levels of the principal jobs. The definition of terms and the survey documents including a sample questionnaire, explanatory notes, job descriptions for principal jobs and descriptions for types of training are given in **Appendices 4 and 5**.

Data Collection

3.4 Data collection was carried out between April and July 2022. A pack of survey documents was given to each sampled establishment. The respondents of the companies were asked to provide manpower information of their companies at the time of the survey with the reference date on 1 April 2022. During the fieldwork period, enumerators assisted the respondents to complete the questionnaire through phone calls or on-site visits.

3.5 Various measures were taken to assure the quality of the data collection process. These included prior fieldwork preparation, thorough training of fieldwork staff, monitoring of the fieldwork execution, measures to increase the response rate, checking of the completed questionnaires, double data entry and validation and verification of the collected data. The list of quality control measures is shown in **Appendix 6**.

Data Analysis

3.6 Among the 929 valid sampled companies, 807 were successfully enumerated which contributed to an effective response rate of 86.9%[Note]. Taking into account (a) the satisfactory response rate of individual branches, (b) the satisfactory response rate from a majority of prominent and sizeable companies, and (c) the grossing-up of sample results based on the statistically-grounded method, it could be concluded that the survey findings presented in this report contributed to a significant level of representativeness of the Innovation and Technology Sector. The response rate achieved for individual branch was also adequate to produce meaningful breakdown by industry sector. The response profile is shown in **Appendix 7**.

Manpower Projection Methodology

3.7 The Training Board adopts a forecasting method which rests on the weighted averages of historical data for projecting manpower demand of the Innovation and Technology Sector. Taking into consideration of the historical manpower data with heavier weighting given to the recent data, market trends in a longer term, technological developments of the industry and other social-economic determinants, the Training Board made the decision on the manpower projection of all job categories for the period from 2023 to 2026. The details of the projection methodology are provided in **Appendix 8**.

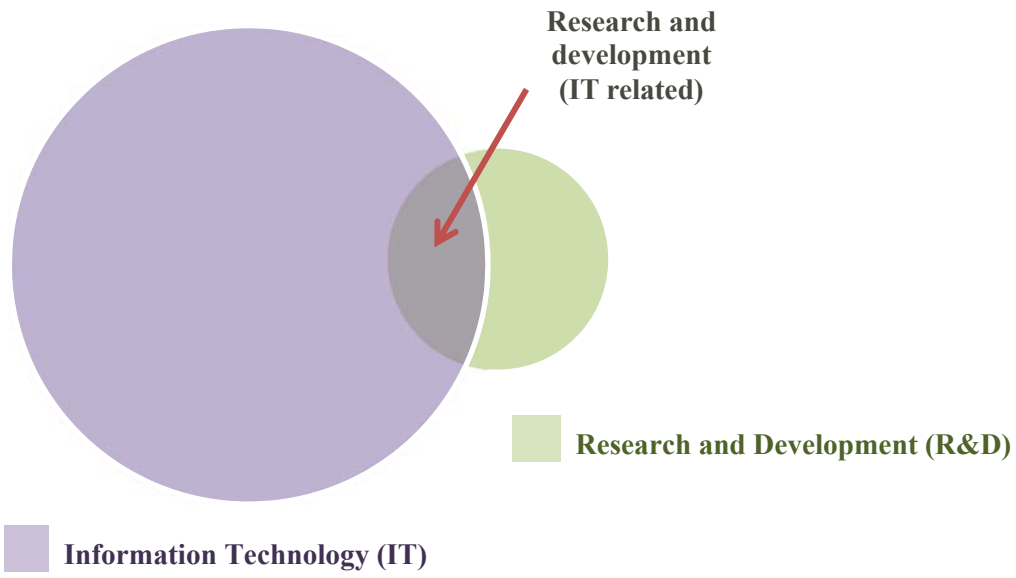
[Note] Sampled companies which had been ceased operation, had not employed any IT and R&D staff, or did not reply to the survey, etc. were classified as invalid samples.

4 Survey Findings

4.1 Overview of Manpower Situation in the Innovation and Technology Sector

Scope of Manpower Survey

4.1.1 Overall speaking, the survey covered the personnel working in the sectors of (i) Information Technology (IT) and (ii) Research and Development (R&D) as shown below. In this report, the statistical findings were separately presented for the two sectors in which the part related to Research and development (IT related) was common to both sectors in order to give a complete picture of the manpower situation.



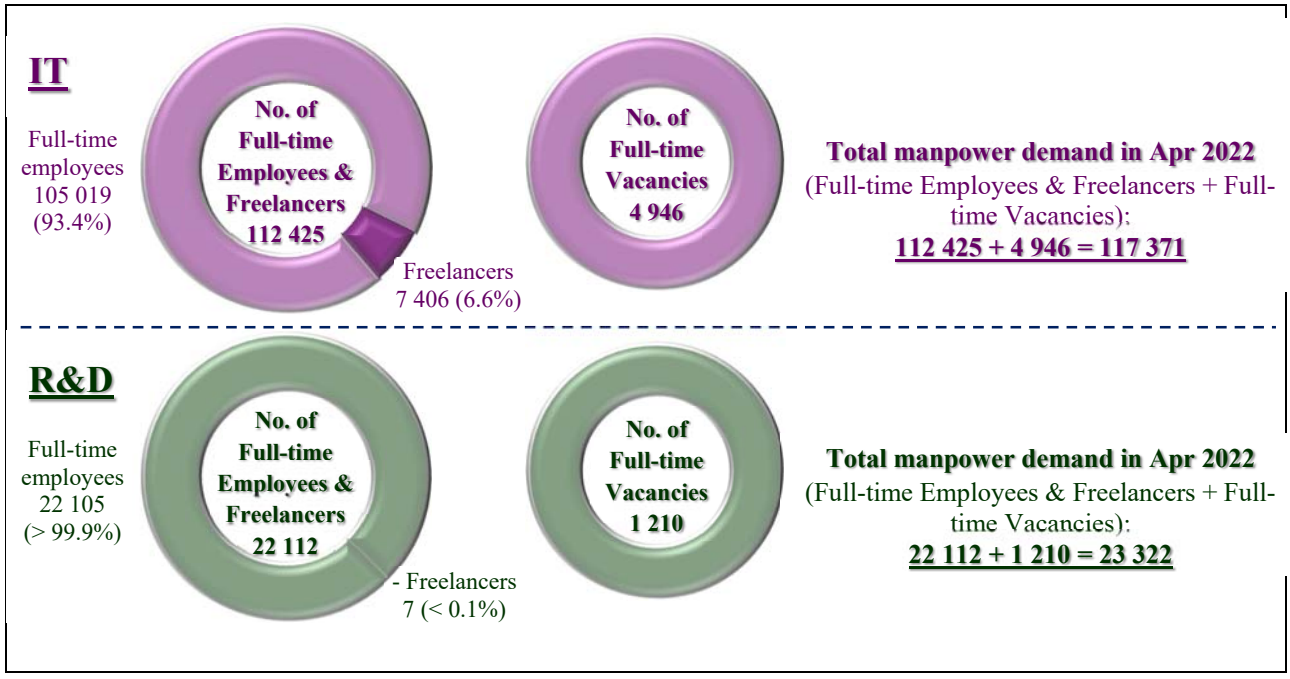
Manpower Situation of Information Technology (IT)

4.1.2 The survey revealed that as at 1 April 2022 (i.e. the reference date of the survey), a total of 112 425 persons (i.e. full-time employees and freelancers) were employed in the principal jobs of information technology, in which 93.4% were full-time employees (105 019 persons) and 6.6% were freelancers (7 406 persons). Moreover, there were a total of 4 946 full-time vacancies of information technology. Aggregating the total number of full-time employees and freelancers as well as vacancies, it was estimated that there were a total of 117 371 posts.

Manpower Situation of Research and Development (R&D)

4.1.3 As at 1 April 2022, a total of 22 112 persons (i.e. full-time employees and freelancers) were employed in the principal jobs of research and development, in which more than 99.9% were full-time employees (22 105 persons) and less than 0.1% were freelancers (7 persons). In addition, there were a total of 1 210 full-time vacancies of research and development. Aggregating the total number of full-time employees and freelancers as well as vacancies, it was estimated that there were a total of 23 322 posts.

Chart 4.1 Overview of manpower situation



Note: "Vacancies" refer to those unfilled, immediately available job openings for which the establishment is actively trying to recruit personnel as at survey reference date.

4.2 Information Technology (IT)

4.2.1 IT Full-time Employees and Freelancers

By Type of Organisation and Industry Sector

4.2.1.1 Among the 112 425 full-time employees and freelancers in the principal jobs of IT, relatively more were working in IT and Communications Services Organisations (57.6%; 64 751 persons) than in IT Users Organisations (42.4%; 47 674 persons).

4.2.1.2 Analysing by industry sectors, the highest percentage of IT full-time employees and freelancers was found in IT products and services suppliers sector (40.1%), followed by financing, insurance, real estate and business services (11.4%), wholesale, retail and import/export trades of non-IT products, catering and hotels (9.1%), wholesale, retail and import/export trades of computer products and software packages (7.2%) and community, social and personal services (7.1%) sectors.

Table 4.2.1a IT Full-time employees and freelancers – by type of organisation and industry sector

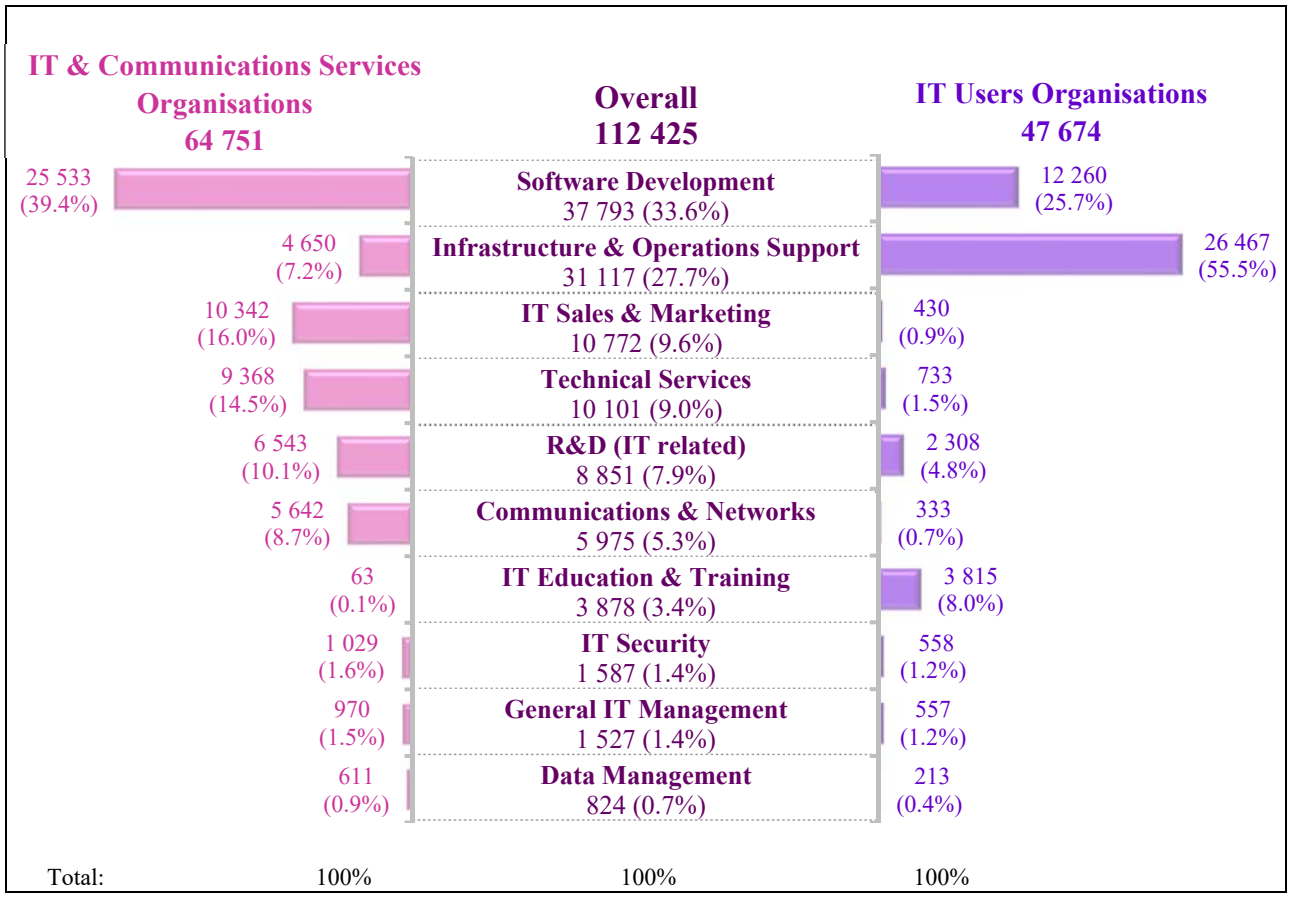
	No. of persons	(%)
IT & Communications Services Organisations	**64 751**	**57.6%**
- IT products & services suppliers	*45 106*	*40.1%*
- Wholesale, retail & I/E trades of computer products & software packages	*8 144*	*7.2%*
- Communications services	*7 430*	*6.6%*
- Innovative products & services (IT)	*2 200*	*2.0%*
- Manufacturing (IT products)	*1 135*	*1.0%*
- Digital creative	*736*	*0.7%*
IT Users Organisations	**47 674**	**42.4%**
- Financing, insurance, real estate & business services	*12 846*	*11.4%*
- Wholesale, retail & I/E trades, catering & hotels	*10 267*	*9.1%*
- Community, social & personal services	*7 966*	*7.1%*
- Universities & post-secondary colleges; research & scientific institutes	*4 928*	*4.4%*
- Government bureaux / departments	*3 740*	*3.3%*
- Innovative products & services (non-IT)	*2 209*	*2.0%*
- Transport & storage services	*2 153*	*1.9%*
- Manufacturing (non-IT products)	*1 246*	*1.1%*
- Medical & health care services	*1 182*	*1.1%*
- Construction	*794*	*0.7%*
- Electricity, gas & water	*343*	*0.3%*
Overall:	**112 425**	**100.0%**

By Job Category and Type of Organisation

4.2.1.3 Among the 112 425 full-time employees and freelancers, relatively more were engaged in software development (33.6%), followed by infrastructure and operations support (27.7%), IT sales and marketing (9.6%) and technical services (9.0%).

4.2.1.4 For those who were working in IT and Communications Services Organisations, relatively more were engaged in software development (39.4%), followed by IT sales and marketing (16.0%) and technical services (14.5%). For those who were working in IT Users Organisations, most of them were engaged in infrastructure and operations support (55.5%) and software development (25.7%).

Chart 4.2.1 IT Full-time employees and freelancers – by job category and type of organisation



Prominent IT Principal Jobs

4.2.1.5 Programmer is one of the top five prominent principal jobs in both IT and Communications Services Organisations, and IT Users Organisations, as shown in Table 4.2.1b below.

Table 4.2.1b Top 5 prominent IT principal jobs – by type of organisation

Type of organisation	Top 5 Prominent Principal Jobs	No. of full-time employees & freelancers	% among all full-time employees & freelancers
IT & Communications Services Organisations (Total: 64 751 full-time employees & freelancers)	Programmer	10 763	16.6%
	IT Sales / Marketing Representative	6 232	9.6%
	Service Technician	6 166	9.5%
	Analyst Programmer	4 349	6.7%
	R&D Researcher / Scientist / Engineer (IT related)	4 096	6.3%
IT Users Organisations (Total: 47 674 full-time employees & freelancers)	User Support	21 529	45.2%
	Programmer	4 952	10.4%
	Professor / Lecturer / Training Officer	2 463	5.2%
	Computer / Systems Operator	2 256	4.7%
	Systems Analyst	1 860	3.9%

4.2.2 IT Full-time Vacancies

4.2.2.1 As at 1 April 2022, the total number of full-time vacancies was 4 946, representing a vacancy rate of 4.5% (i.e. vacancies as a percentage of the total number of employees and vacancies).

By Type of Organisation and Industry Sector

4.2.2.2 Relatively more vacancies were found in IT and Communications Services Organisations (2 723 vacancies) than in IT Users Organisations (2 223 vacancies).

4.2.2.3 Analysing by industry sectors, the largest number of full-time vacancies was found in IT products and services suppliers sector (1 826 vacancies), followed by wholesale, retail and import/export trades of non-IT products, catering and hotels (470 vacancies), communications services (468 vacancies), financing, insurance, real estate and business services (464 vacancies) sectors, and universities and post-secondary colleges; research & scientific institutes (322 vacancies).

Table 4.2.2a IT Full-time vacancies – by type of organisation and industry sector

	No. of vacancies	Vacancy rate
IT & Communications Services Organisations	**2 723**	**[4.1%]**
- IT products & services suppliers	*1 826*	*[4.0%]*
- Communications services	*468*	*[6.0%]*
- Wholesale, retail & I/E trades of computer products & software packages	*216*	*[2.6%]*
- Innovative products & services (IT)	*150*	*[6.6%]*
- Digital creative	*47*	*[6.3%]*
- Manufacturing (IT products)	*16*	*[1.7%]*
IT Users Organisations	**2 223**	**[5.1%]**
- Wholesale, retail & I/E trades, catering & hotels	*470*	*[6.1%]*
- Financing, insurance, real estate & business services	*464*	*[3.7%]*
- Universities & post-secondary colleges; research & scientific institutes	*322*	*[6.1%]*
- Community, social & personal services	*292*	*[4.0%]*
- Innovative products & services (non-IT)	*242*	*[10.0%]*
- Government bureaux / departments	*185*	*[4.7%]*
- Medical & health care services	*81*	*[6.4%]*
- Manufacturing (non-IT products)	*52*	*[5.4%]*
- Transport & storage services	*45*	*[3.1%]*
- Electricity, gas & water	*38*	*[10.0%]*
- Construction	*32*	*[5.3%]*
Overall:	**4 946**	**[4.5%]**

$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & industry sector)

By Job Category and Type of Organisation

4.2.2.4 A larger number of full-time vacancies were jobs engaging in software development (1 946 vacancies), followed by infrastructure and operations support (1 081 vacancies), technical services (621 vacancies) and IT related research and development (527 vacancies).

4.2.2.5 For IT and Communications Services Organisations, a significant number of vacancies were jobs engaging in software development (1 195 vacancies), followed by technical services (491 vacancies) and IT related research and development (314 vacancies). For IT Users Organisations, most of the vacancies were jobs engaging in infrastructure and operations support (940 vacancies) and software development (751 vacancies).

Table 4.2.2b IT Full-time vacancies – by job category and type of organisation

Type of organisation / Job category	IT & Communications Services Organisations		IT Users Organisations		Overall	
	No. of vacancies	Vacancy rate	No. of vacancies	Vacancy rate	No. of vacancies	Vacancy rate
Software Development	1 195	[4.6%]	751	[5.8%]	1 946	[5.0%]
Infrastructure & Operations Support	141	[3.2%]	940	[4.4%]	1 081	[4.2%]
Technical Services	491	[5.0%]	130	[15.1%]	621	[5.8%]
R&D (IT related)	314	[4.6%]	213	[8.4%]	527	[5.6%]
IT Sales & Marketing	291	[2.7%]	22	[4.9%]	313	[2.8%]
Communications & Networks	219	[3.7%]	28	[7.8%]	247	[4.0%]
IT Security	24	[2.3%]	57	[9.3%]	81	[4.9%]
General IT Management	8	[0.8%]	40	[6.7%]	48	[3.0%]
Data Management	34	[5.4%]	8	[3.6%]	42	[4.9%]
IT Education & Training	6	[8.7%]	34	[0.9%]	40	[1.0%]
Overall:	**2 723**	**[4.1%]**	**2 223**	**[5.1%]**	**4 946**	**[4.5%]**

Vacancy rate = $\frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$ (for the respective type of organisation & industry sector)

Prominent IT Vacancies

4.2.2.6 Similar to the prominent principal jobs, programmer is one of the top three prominent vacancies in both IT and Communications Services Organisations, and IT Users Organisations, as shown in Table 4.2.2c below.

Table 4.2.2c Top 3 prominent IT vacancies – by type of organisation

Type of organisation	Top 3 Prominent Vacancies	No. of vacancies	Vacancy rate
IT & Communications Services Organisations (Total: 64 751 full-time employees & freelancers)	Programmer	488	[4.6%]
	Service Technician	302	[4.7%]
	Analyst Programmer	221	[4.9%]
IT Users Organisations (Total: 47 674 full-time employees & freelancers)	User Support	788	[4.9%]
	Programmer	318	[6.0%]
	R&D Researcher / Scientist / Engineer	203	[10.3%]

Vacancy rate = $\frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$ (for the respective type of organisation & industry sector)

4.2.3 IT Staff Seconded from Contractor Company

4.2.3.1 As at 1 April 2022, there were a total of 4 644 IT staff seconded from contractor companies. The ratio of seconded IT staff to all IT personnel (including i.e. full-time employees, freelancers and IT staff seconded from contractor) was 4.0%.

By Type of Organisation and Industry Sector

4.2.3.2 Relatively higher seconded IT staff ratio was found in IT Users Organisations (7.2%) than in IT and Communications Services Organisations (1.5%). Analysing by industry sectors, the highest seconded IT staff ratio was found in medical and health care services sector (30.1%), followed by Government bureau / departments (21.8%), construction (20.5%) and transport and storage services (15.5%) sectors.

Table 4.2.3a IT Staff seconded from contractor company – by type of organisation and industry sector

	(a) No. of IT staff seconded from contractor company (in full-time equivalent)	(b) No. of full-time IT employees & freelancers	(a) / (a)+(b) % of seconded staff among all IT personnel
IT & Communications Services Organisations	**971**	**64 751**	**1.5%**
- IT products & services suppliers	*830*	*45 106*	*1.8%*
- Communications services	*50*	*7 430*	*0.7%*
- Innovative products & services (IT)	*36*	*2 200*	*1.6%*
- Digital creative	*35*	*736*	*4.5%*
- Manufacturing (IT products)	*11*	*1 135*	*1.0%*
- Wholesale, retail & I/E trades of computer products & software packages	*9*	*8 144*	*0.1%*
IT Users Organisations	**3 673**	**47 674**	**7.2%**
- Government bureaux / departments	*1 045*	*3 740*	*21.8%*
- Wholesale, retail & I/E trades, catering & hotels	*526.2*	*10 267*	*4.9%*
- Medical & health care services	*508*	*1 182*	*30.1%*
- Community, social & personal services	*448*	*7 966*	*5.3%*
- Financing, insurance, real estate & business services	*441*	*12 846*	*3.3%*
- Transport & storage services	*394*	*2 153*	*15.5%*
- Construction	*205*	*794*	*20.5%*
- Innovative products & services (non-IT)	*74*	*2 209*	*3.2%*
- Manufacturing (non-IT products)	*25*	*1 246*	*2.0%*
- Universities & post-secondary colleges; research & scientific institutes	*6.8*	*4 928*	*0.1%*
- Electricity, gas & water	*0*	*343*	*0%*
Overall:	**4 644**	**112 425**	**4.0%**

Prominent IT Principal Jobs Seconded from Contractor Company

4.2.3.3 User Support is one of the top three principal jobs seconded from contractor companies in both IT and Communications Services Organisations, and IT Users Organisations, as shown in Table 4.2.3b below.

Table 4.2.3b Top 3 IT principal jobs seconded from contractor company – by type of organisation

Type of organisation	Top 3 Principal Jobs Seconded from Contractor Company	(a) No. of IT staff seconded from contractor company (in full-time equivalent)	(b) No. of full-time IT employees & freelancers	(a) / (a)+(b) % of seconded staff among all IT personnel
IT & Communications Services Organisations	Service Technician	841	6 166	12.0%
	User Support	50	3 469	1.4%
	Computer Game or Graphic Designer / Artist / Developer; Computer Animator; Web Graphic / Visual Effect Designer	35	1 157	2.9%
IT Users Organisations	User Support	1 861.6	21 529	8.0%
	Programmer	598	4 952	10.8%
	Systems Analyst	366	1 860	16.4%

4.2.4 Average Monthly Remuneration Package of IT Employees

4.2.4.1 Regarding the average monthly remuneration package, full-time employees engaging in general IT management tended to have higher income. Their common income range was $50,001 or more (84.6%). They were followed by $30,001 - $90,000 for R&D (IT related) (64.7%) and IT security (70.0%). On the other hand, those who had relatively lower income range ($30,000 or below) tended to be those engaging in infrastructure and operations support (85.6%), technical services (75.7%) and IT sales and marketing (77.8%).

Table 4.2.4 Average monthly remuneration package of IT full-time employees – by job category

Job Category	$90,001 or more	$50,001 - $90,000	$30,001 - $50,000	$20.001 - $30,000	$20,000 or below	No. of full-time employees
Overall	**2.4%**	**12.0%**	**24.1%**	**36.1%**	**25.4%**	105 019
General IT Management	24.1%	60.4%	15.4%	0.1%	-	1 527
R&D (IT related)	13.0%	35.3%	29.4%	12.9%	9.5%	8 847
IT Security	0.5%	34.9%	35.1%	29.5%	-	1 587
IT Education & Training	9.0%	16.2%	62.9%	11.9%	-	3 878
Data Management	0.1%	16.2%	45.3%	38.4%	-	814
Software Development	1.1%	14.6%	27.3%	39.1%	17.9%	36 813
Communications & Networks	0.3%	5.5%	33.3%	47.0%	14.0%	5 975
IT Sales & Marketing	0.9%	3.8%	17.5%	48.3%	29.4%	10 772
Technical Services	0.1%	4.3%	19.9%	30.3%	45.4%	10 098
Infrastructure & Operations Support	0.1%	2.2%	12.1%	41.3%	44.3%	24 708

denotes prominent ranges of remuneration package in the respective job category.

4.2.5 Preferred Education Level of IT Employees

4.2.5.1 Employers tended to require full-time employees engaging in R&D (IT related) to attain higher education level. Most of them were required to attain post-graduate degree / first degree level (81.2%). They were followed by first degree level for IT education and training (80.9%), general IT management (82.1%), IT security (66.2%) and data management (70.5%). On the other hand, the preferred education level for those engaging in infrastructure and operations support tended to be lower. Most of them were required to attain sub-degree or diploma / certificate level (71.8%).

Table 4.2.5 Preferred education level of IT full-time employees – by job category

Job Category	Post-graduate degree	First degree	Sub-degree	Diploma / certificate	Secondary or below	No. of full-time employees
Overall	**3.8%**	**39.7%**	**22.6%**	**28.3%**	**5.6%**	105 019
R&D (IT related)	28.8%	52.4%	13.5%	5.3%	-	8 847
IT Education & Training	18.7%	80.9%	0.5%	-	-	3 878
General IT Management	17.4%	82.1%	0.5%	-	-	1 527
IT Security	0.7%	66.2%	30.8%	2.3%	-	1 587
Data Management	0.6%	70.5%	28.5%	0.4%	-	814
Software Development	0.7%	52.5%	29.0%	17.7%	0.1%	36 813
Communications & Networks	0.4%	39.9%	33.9%	25.7%	0.1%	5 975
IT Sales & Marketing	0.4%	27.9%	20.4%	36.5%	14.8%	10 772
Technical Services	-	25.7%	7.7%	58.0%	8.6%	10 098
Infrastructure & Operations Support	-	14.3%	24.7%	47.1%	13.9%	24 708

denotes prominent preferred education levels in the respective job category.

4.2.6 Preferred Years of Experience of IT Employees

4.2.6.1 Similar to the average monthly remuneration package and preferred education level, the preferred years of experience correlated with job categories. Employers tended to require full-time employees engaging in general IT management to have more relevant experience. Most of them (94.7%) were required to have 10 years or above (42.4%) or 3 years to less than 10 years (52.3%) of experience. They were followed by 3 years to less than 10 years for R&D (IT related) (75.8%) and 3 years to less than 6 years for IT security (73.7%). On the other hand, those who were required to have less years of experience (less than 3 years) tended to be those engaging in infrastructure and operations support (80.9%) and technical services (79.1%).

Table 4.2.6 Preferred years of experience of IT full-time employees – by job category

Job Category	10 years or above	6 years – < 10 years	3 years – < 6 years	1 year – < 3 years	< 1 year / no experience required	No. of full-time employees
Overall	**3.0%**	**9.0%**	**25.7%**	**44.4%**	**17.9%**	105 019
General IT Management	42.4%	25.5%	26.8%	5.3%	-	1 527
R&D (IT related)	7.2%	41.2%	34.6%	8.2%	8.9%	8 847
IT Security	1.7%	5.1%	73.7%	19.2%	0.2%	1 587
Data Management	1.8%	12.9%	58.5%	26.7%	0.1%	814
IT Sales & Marketing	2.1%	4.3%	32.7%	42.9%	18.1%	10 772
Software Development	2.6%	7.1%	28.1%	51.3%	10.9%	36 813
Communications & Networks	0.4%	7.6%	28.5%	39.8%	23.8%	5 975
IT Education & Training	9.3%	9.3%	27.1%	18.9%	35.4%	3 878
Technical Services	1.0%	4.4%	15.5%	49.9%	29.3%	10 098
Infrastructure & Operations Support	0.6%	3.7%	14.9%	55.3%	25.6%	24 708

denotes prominent preferred years of experience in the respective job category.

4.2.7 Training Needs of IT Employees in the Next 12 Months

4.2.7.1 When the companies were asked to indicate the training needs of existing employees in the next 12 months, it was noted that "information and system security" was the most common training need across all job categories in different types of organisation. Moreover, "problem solving skills" in IT and communications services organisations and "virtualisation and cloud computing" in IT users organisations were also commonly required for different job categories. Table 4.2.7 showed the top 3 training needs by job category and type of organisation. More detailed analysis by principal jobs can be found in the statistical tables in **Appendix 9**.

Table 4.2.7 Top 3 training needs of IT full-time employees in the next 12 months – by job category and type of organisation

(a) IT & Communications Services Organisations

Job category

Training	Research and Development (IT related)	General IT Management	Software Development	Communications and Networks	Technical Services	IT Security	Data Management	Infrastructure and Operations Support	IT Education and Training	IT Sales and Marketing
Information and System Security				*	*	*		*		
Problem Solving Skills				*		*		*	*	
Applied Basic IT Tools for Business Processes					*			*		
Management skills and leadership Skills		*					*			
Marketing Management		*								*
Application Development Tools/ Programming Languages			*							
Artificial Intelligence (AI)		*								
Business Communication Skills in Technology Sector										*
Business Process Management					*					
Data Science and Data Analytics							*			
Design Thinking	*									
Digital Marketing and E-Commerce										*
e-Learning Technology and Development									*	
Ethics and Professionalism									*	
Internet/Intranet/Web Development							*			
Multimedia and Computer Graphics			*							
Networking/Data Communications				*						
Project Management and Design			*							
Research Methodology	*									
Technical Skills	*									
Virtualisation and Cloud Computing						*				

Note: For each job category, three training needs with the highest percentage of respondents regarded them as top 3 are marked with *

(b) IT Users Organisations

Job category

Training	Research and Development (IT related)	General IT Management	Software Development	Communications and Networks	Technical Services	IT Security	Data Management	Infrastructure and Operations Support	IT Education and Training	IT Sales and Marketing
Information and System Security			*	*		*	*	*		
Virtualisation and Cloud Computing				*	*	*				
Application Development Tools/ Programming Languages			*		*					
Digital Marketing and E-Commerce							*			*
e-Learning Technology and Development		*							*	
Networking/Data Communications				*		*				
Project Management and Design		*							*	
Data Science and Data Analytics										*
Database							*			
IT Applications in Customer Relationship Management / Customer Engagement										*
IT Applications in Product Design									*	
IT Infrastructure Library					*					
Knowledge related to licensing and patent application	*									
Linux/Unix & Open Source								*		
Management Skills	*									
Marketing Management										*
Mobile Computing			*							
Quality Assurance Skills		*								
Research Methodology	*									
Strategic Management		*								
Web Services , XML and JSON Development					*					
Windows Platform Technology								*		

Note: For each job category, three training needs with the highest percentage of respondents regarded them as top 3 are marked with *

4.2.8 IT Employees Left and Recruited in the Past 12 Months

Employees Left

4.2.8.1 A total of 10 634 employees have left their companies during the 12 months before enumeration. The turnover rate (i.e. the number of employees left as a percentage of the total number of posts) was 10.6%. Slightly higher turnover rate was found in IT and Communications Services Organisations (12.2%) than in IT Users Organisations (8.3%).

4.2.8.2 Analysing by industry sectors, the highest turnover rate was found in communications services sector (14.4%), followed by innovative products and services (IT) (13.0%), IT products and services suppliers (12.9%) and innovative products and services (non-IT) (11.8%) sectors.

Table 4.2.8a IT full-time employees left in the past 12 months – by type of organisation and industry sector

	No. of employees left	Turnover rate
IT & Communications Services Organisations	**7 231**	**[12.2%]**
- IT products & services suppliers	*5 262*	*[12.9%]*
- Communications services	*1 118*	*[14.4%]*
- Wholesale, retail & I/E trades of computer products & software packages	*571*	*[7.0%]*
- Innovative products & services (IT)	*145*	*[13.0%]*
- Manufacturing (IT products)	*95*	*[10.7%]*
- Digital creative	*40*	*[7.2%]*
IT Users Organisations	**3 403**	**[8.3%]**
- Financing, insurance, real estate & business services	*1 041*	*[8.3%]*
- Wholesale, retail & I/E trades, catering & hotels	*758*	*[9.9%]*
- Community, social & personal services	*560*	*[7.7%]*
- Universities & post-secondary colleges; research & scientific institutes	*309*	*[9.3%]*
- Government bureaux / departments	*226*	*[5.8%]*
- Innovative products & services (non-IT)	*224*	*[11.8%]*
- Transport & storage services	*106*	*[7.4%]*
- Medical & health care services	*82*	*[6.5%]*
- Construction	*36*	*[5.9%]*
- Manufacturing (non-IT products)	*35*	*[3.6%]*
- Electricity, gas & water	*26*	*[6.8%]*
Overall:	**10 634**	**[10.6%]**

Note: The above figures do not cover R&D (IT related) jobs. The corresponding figures will be presented in the section for R&D.

$$\text{Turnover rate} = \frac{\text{No. of employees left}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective type of organisation & industry sector)

Employees Recruited

4.2.8.3 During the past 12 months before enumeration, a total of 11 062 full-time employees were recruited. The number of new recruits was slightly more than the number of employees left.

4.2.8.4 The majority of new recruits (86.3%) had IT relevant experience. On the other hand, 7.1% were fresh graduates of IT related discipline. Such percentage was relatively higher among the industry sectors of manufacturing (IT products) (28.9%), medical and health care services (21.7%), innovative products and services (IT) (17.0%), digital creative (16.3%) and innovative products and services (non-IT) (15.6%) sectors, indicating that these industry sectors gave more job opportunities for fresh graduates.

Table 4.2.8b IT full-time employees recruited in the past 12 months – by type of organisation and industry sector

	No. of new recruits	% of having relevant experience	% of fresh graduates of IT related discipline
IT & Communications Services Organisations	**7 598**	**88.0%**	**7.7%**
- IT products & services suppliers	*5 868*	*91.0%*	*6.8%*
- Communications services	*763*	*76.5%*	*9.4%*
- Wholesale, retail & I/E trades of computer products & software packages	*634*	*78.7%*	*6.9%*
- Innovative products & services (IT)	*194*	*82.5%*	*17.0%*
- Manufacturing (IT products)	*90*	*70.0%*	*28.9%*
- Digital creative	*49*	*77.6%*	*16.3%*
IT Users Organisations	**3 464**	**82.5%**	**5.8%**
- Financing, insurance, real estate & business services	*1 117*	*87.4%*	*6.1%*
- Community, social & personal services	*626*	*82.6%*	*5.8%*
- Wholesale, retail & I/E trades, catering & hotels	*556*	*60.8%*	*0%*
- Universities & post-secondary colleges; research & scientific institutes	*347*	*93.4%*	*6.1%*
- Government bureaux / departments	*313*	*94.9%*	*3.8%*
- Innovative products & services (non-IT)	*224*	*76.3%*	*15.6%*
- Medical & health care services	*115*	*74.8%*	*21.7%*
- Transport & storage services	*66*	*97.0%*	*3.0%*
- Manufacturing (non-IT products)	*35*	*100.0%*	*0%*
- Electricity, gas & water	*34*	*91.2%*	*8.8%*
- Construction	*31*	*61.3%*	*0%*
Overall :	**11 062**	**86.3%**	**7.1%**

Note: The above figures do not cover R&D (IT related) jobs. The corresponding figures will be presented in the section for R&D.

4.3 Research and Development (R&D)

Background

In the report, Research and Development (R&D) refers to creative works undertaken on a systematic basis so as to increase the stock of knowledge for devising new or improved products/processes/applications (i.e. product/process technological innovation).

To further elaborate, the R&D activities covered in the survey were divided into two areas, (i) the Research and Development (IT related) and (ii) the Research and Development (Non-IT related) The latter referred to the R&D projects that belonged to areas other than IT, such as Biomedical Technology, Material and Precision Engineering, and so on.

In this report, statistics of R&D were presented by four sectors, namely:

- ✧ Universities & Post-secondary Colleges; Research & Scientific Institutes
- ✧ Innovative Products & Services
- ✧ IT Products & Services Suppliers
- ✧ Others *(e.g. wholesale, retail & I/E trades, catering & hotels, manufacturing (non-IT products), digital creative, etc.)*

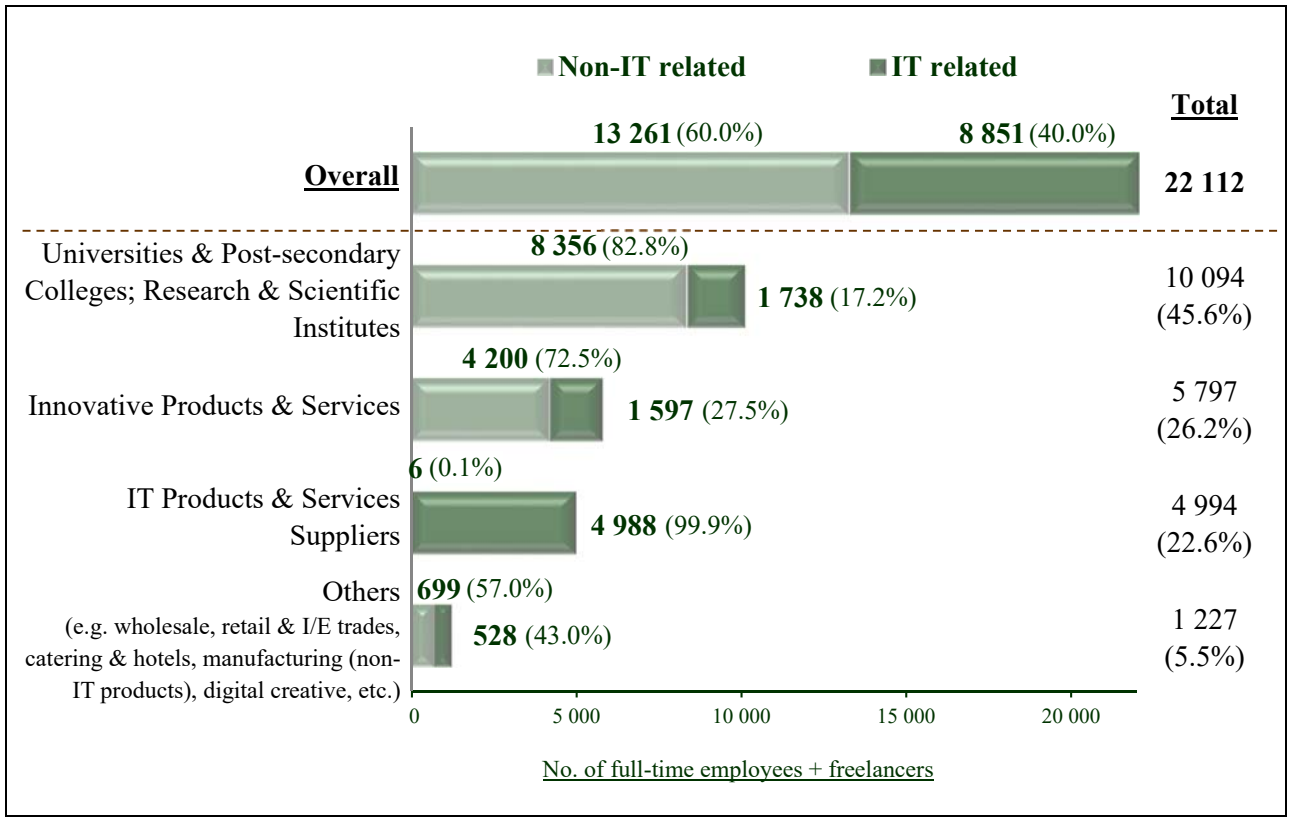
The manpower information (e.g. full-time number of employees, freelancers) of the R&D personnel presented in the report refers to those who were engaged in the 6 principal jobs of R&D on **full-time basis**. Details of the six principal jobs related to R&D is described in **Appendix 5**.

4.3.1 R&D Full-time Employees and Freelancers

4.3.1.1 Among the 22 112 full-time employees and freelancers in the principal jobs of R&D, relatively more were engaged in non-IT related jobs (60.0%; 13 261 persons) than in IT related jobs (40.0%; 8 851 persons).

4.3.1.2 Analysing by industry sectors, the highest percentage of R&D full-time employees and freelancers was found in universities and post-secondary colleges; research & scientific institutes (45.6%). The majority of them (82.8%) were engaged in non-IT related jobs.

Chart 4.3.1 R&D Full-time employees and freelancers – by job category and industry sector



Prominent R&D Principal Jobs

4.3.1.3 R&D researcher / scientist / engineer is the top prominent principal jobs for both non-IT related and IT related jobs, as shown in Table 4.3.1 below.

Table 4.3.1 Prominent R&D principal jobs – by job category

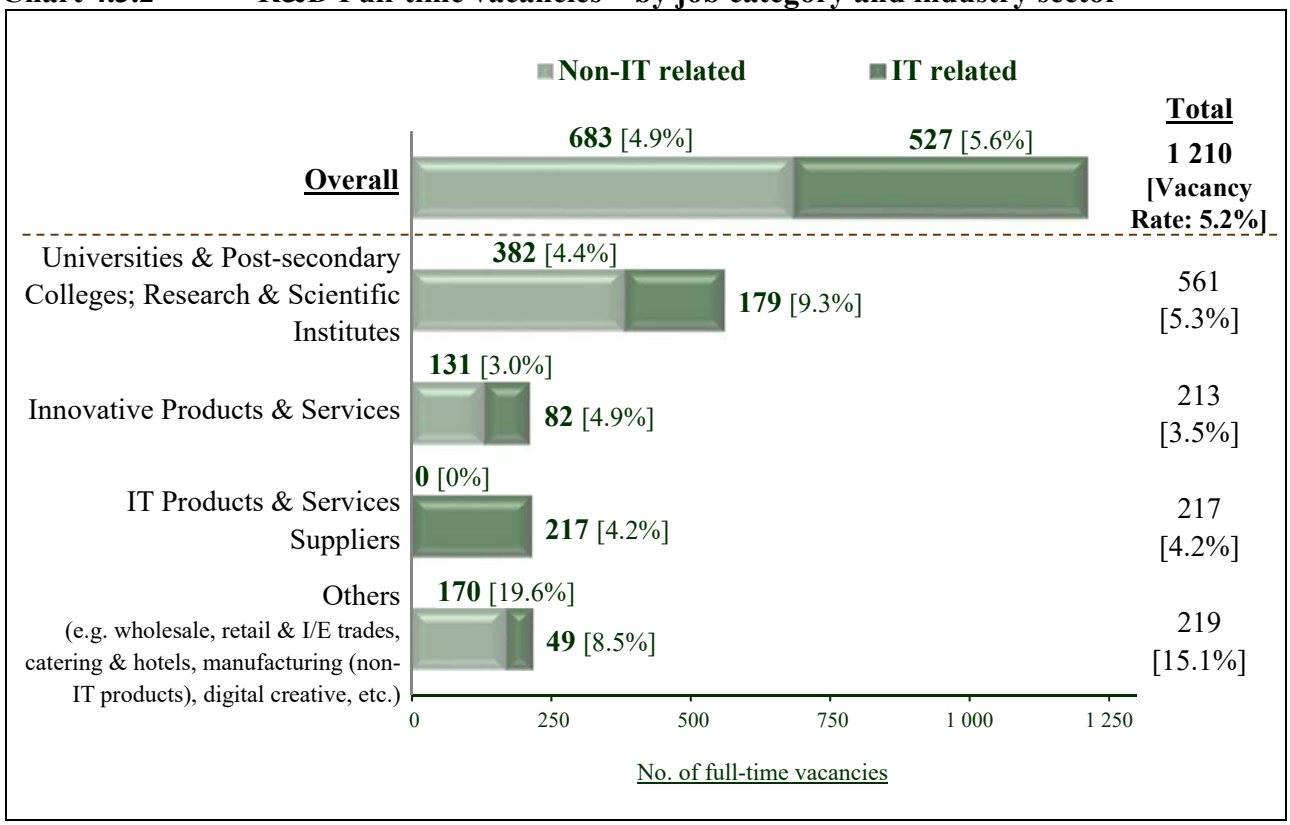
Job category	Principal Jobs	No. of full-time employees & freelancers	% among all full-time employees & freelancers
Non-IT related	R&D Researcher / Scientist / Engineer	8 645	39.1%
	R&D Technician	3 254	14.7%
	R&D Assistant	1 362	6.2%
	Overall	**13 261**	**60.0%**
IT related	R&D Researcher / Scientist / Engineer	5 862	26.5%
	R&D Technician	1 906	8.6%
	R&D Assistant	1 083	4.9%
	Overall	**8 851**	**40.0%**
	Overall	**22 112**	**100.0%**

4.3.2 R&D Full-time Vacancies

4.3.2.1 As at 1 April 2022, the total number of R&D full-time vacancies was 1 210, representing a vacancy rate of 5.2%. Relatively more vacancies were found for non-IT related (683 vacancies) than IT related (527 vacancies) jobs.

4.3.2.2 Analysing by industry sectors, similar to full-time employees and freelancers, the largest number of full-time vacancies was found in universities and post-secondary colleges; research & scientific institutes sector (561 vacancies).

Chart 4.3.2 R&D Full-time vacancies – by job category and industry sector



$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective industry sector & job category)

Prominent R&D Vacancies

4.3.2.3 Similar to the prominent principal jobs, R&D researcher / scientist / engineer is the top prominent vacancies for both non-IT related and IT related jobs, as shown in Table 4.3.2 below.

Table 4.3.2 Prominent R&D vacancies – by job category

Job category	Principal Jobs	No. of vacancies	Vacancy rate
Non-IT related	R&D Researcher / Scientist / Engineer	432	[4.8%]
	R&D Technician	138	[4.1%]
	R&D Assistant	113	[7.7%]
	Overall	**683**	**[4.9%]**
IT related	R&D Researcher / Scientist / Engineer	391	[6.3%]
	R&D Technician	126	[6.2%]
	R&D Assistant	10	[0.9%]
	Overall	**527**	**[5.6%]**
	Overall	**1 210**	**[5.2%]**

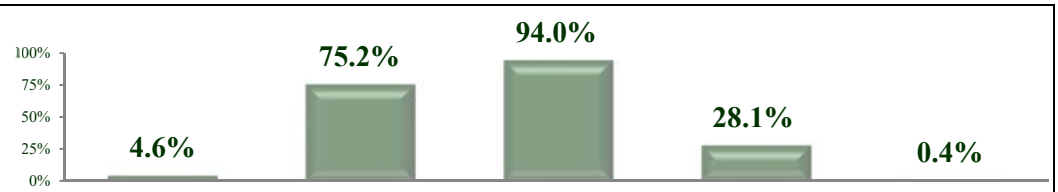
$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective principal job of the respective job category)

4.3.3 Areas of R&D Work Engaged

4.3.3.1 Of all companies covered in the survey, 4.6% were engaged in R&D work. Such percentage was higher in the industry sectors of innovative products and services (94.0%) and universities and post-secondary colleges; research & scientific institutes (75.2%).

4.3.3.2 Among the companies which were engaged in R&D work, "information and communications technology" is the most common area of R&D work engaged. Other key areas included "electronics", "biomedical technology", and "smart living" and "digital entertainment / e-sports".

Chart 4.3.3 Areas of R&D work engaged – by industry sector



Key areas of R&D work engaged (multiple response)	Overall	Universities & Post-secondary Colleges; Research & Scientific Institutes	Innovative Products & Services	IT Products & Services Suppliers	Others
Information & communications technology	70.0%	35.0%	43.3%	84.0%	31.2%
Electronics	8.3%	51.0%	21.7%	-	31.2%
Biomedical technology	4.4%	22.0%	15.5%	-	4.3%
Smart living	8.9%	4.0%	8.5%	8.9%	12.1%
Digital entertainment / e-sports	4.4%	3.0%	2.0%	5.4%	3.5%
Financial technology	2.7%	3.0%	7.0%	1.6%	-
Green technology	2.5%	4.0%	5.5%	0.1%	15.2%
Material & precision engineering	1.3%	9.0%	4.7%	-	-

4.3.4 Average Monthly Remuneration Package of R&D Employees

4.3.4.1 Regarding the average monthly remuneration package, full-time employees engaging in non-IT related jobs tended to have higher income. For those engaging in non-IT related jobs, 57.4% had income range of $50,001 or more, while the corresponding proportion for those engaging in IT related jobs was 48.2%.

Table 4.3.4 Average monthly remuneration package of R&D full-time employees – by job category

Job Category	$90,001 or more	$50,001 - $90,000	$30,001 - $50,000	$20.001 - $30,000	$20,000 or below	No. of full-time employees
Overall	**14.3%**	**39.4%**	**23.5%**	**16.1%**	**6.7%**	**22 105**
Non-IT related	15.2%	42.2%	19.4%	18.4%	4.7%	13 258
IT related	13.0%	35.3%	29.4%	12.9%	9.5%	8 847

4.3.5 Preferred Education Level of R&D Employees

4.3.5.1 Employers tended to require full-time employees engaging in non-IT related jobs to attain higher education level. 93.8% of those engaging in non-IT related jobs were required to attain post-graduate degree / first degree level, while the corresponding proportion for those engaging in IT related jobs was 81.2%.

Table 4.3.5 Preferred education level of R&D full-time employees – by job category

Job Category	Post-graduate degree	First degree	Sub-degree	Diploma / certificate	Secondary or below	No. of full-time employees
Overall	**43.6%**	**45.1%**	**7.5%**	**3.5%**	**0.2%**	**22 105**
Non-IT related	53.4%	40.3%	3.6%	2.3%	0.3%	13 258
IT related	28.8%	52.4%	13.5%	5.3%	-	8 847

4.3.6 Preferred Years of Experience of R&D Employees

4.3.6.1 Similar to the average monthly remuneration package and preferred education level, the preferred years of experience for employees engaging in non-IT related jobs tended to be more. 55.4% of them were required to have 6 years of experience or above, while the corresponding proportion for those engaging in IT related jobs was 48.4%.

Table 4.3.6 Preferred years of experience of R&D full-time employees – by job category

Job Category	10 years or above	6 years – < 10 years	3 years – < 6 years	1 year – < 3 years	< 1 year / no experience required	No. of full-time employees
Overall	**18.5%**	**33.7%**	**31.1%**	**10.6%**	**6.1%**	22 105
Non-IT related	28.3%	27.1%	28.2%	12.8%	3.7%	13 258
IT related	7.2%	41.2%	34.6%	8.2%	8.9%	8 847

4.3.7 Training Needs of R&D Employees in the Next 12 Months

4.3.7.1 When asked the companies to indicate the training needs of existing employees in the next 12 months, "technical skills", "design thinking" and "research methodology" relating to R&D areas were the common training needs for both engaging in non-IT related and IT related jobs. Table 4.3.7 showed the top 3 training needs by job category. More detailed analysis by principal jobs can be found in the statistical tables in **Appendix 9**.

Table 4.3.7 Top 3 training needs of R&D full-time employees in the next 12 months – by job category

Job category	Ranking	Top 3 Training Needs
Non-IT related	**1**	**(R&D) Technical Skills**
	2	**(R&D) Design Thinking**
	3	**(R&D) Research Methodology**
IT related	**1**	**(R&D Research Methodology**
	2	**(R&D) Design Thinking**
	3	**(R&D) Technical Skills**

Notes: (i) Respondents were asked to select at most 3 training areas that are regarded as important for employees.
(ii) Top 1 ranking refers to the training area with the highest percentage of respondents regarded it as top 3, and so on.

4.3.8 R&D Employees Left and Recruited in the Past 12 Months

Employees Left

4.3.8.1 A total of 1 827 employees have left their companies during the 12 months before enumeration. The turnover rate (i.e. the number of employees left as a percentage of the total number of posts) was 7.8%. Relatively higher turnover rate was found in other industry sectors (10.3%; e.g. wholesale, retail and import/export trades, catering and hotels, manufacturing of non-IT products, digital creative, etc.).

Table 4.3.8a R&D full-time employees left in the past 12 months – by industry sector

	No. of employees left	Turnover rate
- Universities & post-secondary colleges; research & scientific institutes	881	[8.3%]
- Innovative products & services	413	[6.9%]
- IT products & services suppliers	384	[7.4%]
- Others	149	[10.3%]
Overall:	**1 827**	**[7.8%]**

$$\text{Turnover rate} = \frac{\text{No. of employees left}}{\text{Total no. of posts (no. of employees + no. of vacancies)}} \quad \text{(for the respective industry sector)}$$

Employees Recruited

4.3.8.2 During the past 12 months before enumeration, a total of 2 123 full-time employees were recruited. The number of new recruits was slightly more than the number of employees left.

4.3.8.3 The majority of new recruits (85.4%) had R&D relevant experience. On the other hand, 12.2% were fresh graduates of R&D related discipline. Such percentage was relatively higher among the industry sector of innovative products and services (24.5%), indicating that they tended to give more job opportunities for fresh graduates.

Table 4.3.8b R&D full-time employees recruited in the past 12 months – by industry sector

	No. of new recruits	% of having relevant experience	% of fresh graduates of R&D related discipline
- Universities & post-secondary colleges; research & scientific institutes	1 088	94.6%	4.7%
- Innovative products & services	502	73.3%	24.5%
- IT products & services suppliers	438	77.4%	16.0%
- Others	95	81.1%	16.8%
Overall :	**2 123**	**85.4%**	**12.2%**

4.4 Views of Expected Change and Recruitment Difficulties in Companies

4.4.1 Recruitment Difficulties in the Past 12 Months

4.4.1.1 Among the 19.7% of the companies which had full-time IT / R&D employees and had engaged in recruitment exercise during the 12 months before enumeration, 74.6% reported that they had encountered recruitment difficulties. Such percentage was relatively higher among small and medium sized establishments with less than 50 employees (79.4%), especially IT and Communications Services Organisations with less than 50 employees (83.2%).

4.4.1.2 Among those which reported recruitment difficulties, the top two difficulties were "candidates lacked the relevant skills / experience" (70.9%) and "candidates found the remuneration package not attractive" (64.2%).

Table 4.4.1a Recruitment difficulties in the past 12 months before enumeration – by employment size

	Overall	Employment size	
		< 50	>= 50
With recruitment difficulties	**74.6%**	**79.4%**	**64.6%**
Among those with recruitment difficulties:			
- Candidates lacked the relevant skills / experience	*70.9%*	*64.5%*	*87.3%*
- Candidates found the remuneration package not attractive	*64.2%*	*61.2%*	*71.6%*
- Candidates lacked the relevant academic qualification and credential	*14.1%*	*11.1%*	*21.6%*
- Candidates' language skills (incl. Putonghua) were not up to expectation	*2.2%*	*2.0%*	*2.7%*
- Others (e.g. few applicants during pandemic, need to work on shifts / during weekends, etc.)	*0.4%*	*0.1%*	*1.1%*
Without recruitment difficulties	**25.4%**	**20.6%**	**35.4%**
No. of companies with recruitment exercise (% of companies with recruitment exercise for full-time IT / R&D employees)	**4 692** (19.7%)	**3 165** (16.1%)	**1 527** (36.6%)

Note: Respondents may mention more than one recruitment difficulties.

Table 4.4.1b Recruitment difficulties in the past 12 months before enumeration – by type of organisation

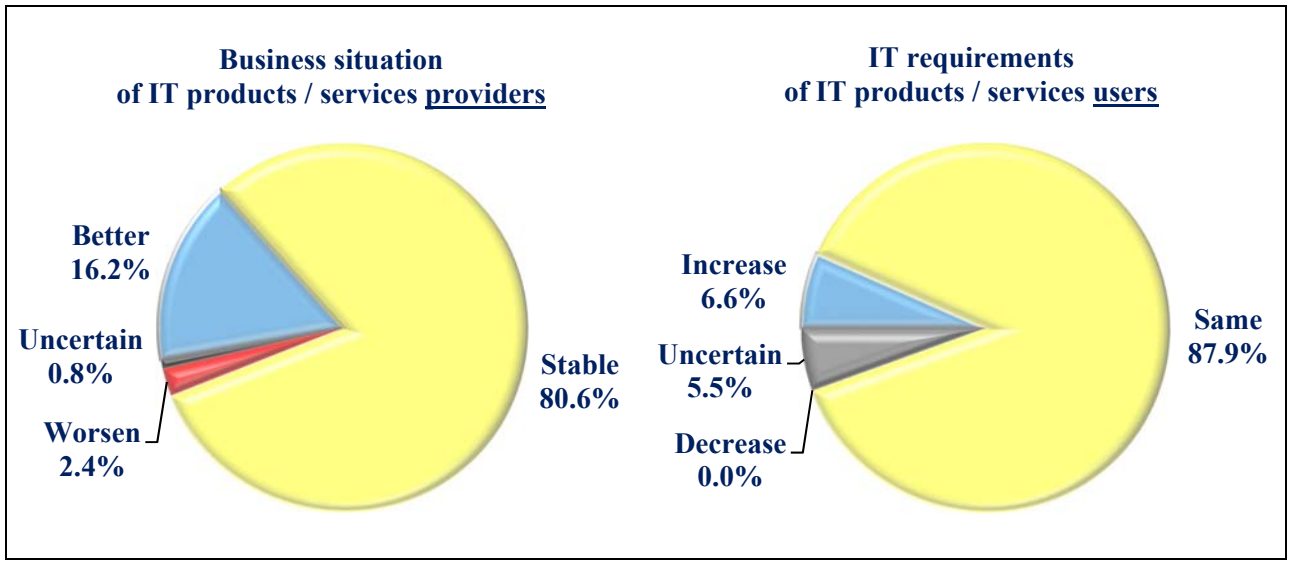
	IT & Communications Services Organisations			IT Users Organisations		
	Overall	Employment size		Overall	Employment size	
		< 50	>= 50		< 50	>= 50
With recruitment difficulties	**82.6%**	**83.2%**	**74.0%**	**60.5%**	**50.8%**	**63.3%**
Among those with recruitment difficulties:						
- Candidates lacked the relevant skills / experience	*63.3%*	*63.1%*	*66.2%*	*89.1%*	*80.7%*	*91.0%*
- Candidates found the remuneration package not attractive	*63.0%*	*63.0%*	*62.8%*	*66.9%*	*39.6%*	*73.2%*
- Candidates lacked the relevant academic qualification and credential	*11.0%*	*9.9%*	*28.3%*	*21.5%*	*26.0%*	*20.4%*
- Candidates' language skills (incl. Putonghua) were not up to expectation	*2.7%*	*2.2%*	*10.3%*	*1.2%*	-	*1.4%*
- Others (e.g. few applicants during pandemic, need to work on shifts / during weekends, etc.)	*0.2%*	*0.1%*	*1.4%*	*0.9%*	-	*1.1%*
Without recruitment difficulties	**17.4%**	**16.8%**	**26.0%**	**39.5%**	**49.2%**	**36.7%**
No. of companies with recruitment exercise (% of companies with recruitment exercise for full-time IT / R&D employees)	**2 983** (23.9%)	**2 787** (22.8%)	**196** (76.0%)	**1 709** (15.1%)	**378** (5.1%)	**1 331** (34.0%)

Note: Respondents may mention more than one recruitment difficulties.

4.4.2 Expected Change in the Next 12 Months in Business Situation / IT Requirements

4.4.2.1 Companies having full-time IT / R&D employees were asked about their expected change in the next 12 months after enumeration. Among the IT products / services providers, the majority (80.6%) expected that their business situation will be stable in the next 12 months. Among the IT products / services users, similarly, the majority (87.9%) expected that their IT requirements will be the same in the next 12 months.

Chart 4.4.2 Expected change in the next 12 months in business situation / IT requirements



4.4.2.2 The major reasons for expecting better business situation / increased IT requirements are:

- Anticipated that the COVID-19 pandemic situation will be eased and the economic condition will be recovered;
- Expected higher adoption of digitalisation, and thus lead to greater market demand;
- Observed an increasing trend in own business volume, and thus anticipating that the general market demand will be increased; and
- Observed the need to upgrade IT systems (e.g. more online transactions).

4.4.2.3 The major reasons for expecting worsen business situation / decreased IT requirements are:

- Worried about the COVID-19 pandemic situation in the Mainland, and affected the business situation in Hong Kong; and
- Keen competition within the industry, for which the project fee should be lowered to fight for more business opportunities and thus affected the profit margin.

4.4.3 Expected Change in the Next 12 Months in the Number of Full-time Employees

IT

4.4.3.1 Among the companies having IT full-time employees, nine out of ten (90.3%) expected that their number of IT full-time employees will be the same in the next 12 months after enumeration. 9.7% expected that their IT employees will be increased. On average, the companies anticipated to increase 3.3% of IT manpower in the next 12 months. Such percentage was slightly higher among the industry sectors of digital creative (7.4%) and innovative products and services (IT) (6.2%).

Table 4.4.3a Expected change in the next 12 months in the number of IT full-time employees

Among companies having IT full-time employees:	Increase	Same	Decrease	Average % of expected change
IT & Communications Services Organisations	**14.2%**	**85.8%**	**< 0.05%**	**+ 4.1%**
- Innovative products & services (IT)	*25.3%*	*74.7%*	*0%*	*+ 6.2%*
- IT products & services suppliers	*16.2%*	*83.8%*	*< 0.05%*	*+ 4.5%*
- Manufacturing (IT products)	*0.3%*	*99.5%*	*0.3%*	*0%*
- Wholesale, retail & I/E trades of computer products & software packages	*4.0%*	*96.0%*	*0%*	*+ 2.9%*
- Communications services	*11.3%*	*88.7%*	*0%*	*+ 2.8%*
- Digital creative	*19.6%*	*80.4%*	*0%*	*+ 7.4%*
IT Users Organisations	**4.6%**	**95.4%**	**0%**	**+ 2.0%**
- Innovative products & services (non-IT)	*23.0%*	*77.0%*	*0%*	*+ 4.1%*
- Universities & post-secondary colleges; research & scientific institutes	*6.1%*	*93.9%*	*0%*	*+ 1.9%*
- Manufacturing (non-IT products)	*6.6%*	*93.4%*	*0%*	*+ 2.5%*
- Electricity, gas & water	*0%*	*100.0%*	*0%*	*0%*
- Construction	*7.9%*	*92.1%*	*0%*	*+ 3.1%*
- Wholesale, retail & I/E trades, catering & hotels	*1.1%*	*98.9%*	*0%*	*+ 0.9%*
- Transport & storage services	*0%*	*100.0%*	*0%*	*0%*
- Financing, insurance, real estate & business services	*7.4%*	*92.6%*	*0%*	*+ 2.8%*
- Medical & health care services	*12.2%*	*87.8%*	*0%*	*+ 3.9%*
- Community, social & personal services	*1.7%*	*98.3%*	*0%*	*+ 1.1%*
- Government bureaux / departments	*16.4%*	*83.6%*	*0%*	*+ 3.9%*
Overall:	**9.7%**	**90.3%**	**< 0.05%**	**+ 3.3%**

R&D

4.4.3.2 Among the companies having R&D full-time employees, most of them (72.0%) expected that their number of R&D full-time employees will be the same in the next 12 months after enumeration. 26.3% expected that their R&D employees will be increased. On average, the companies anticipated to increase 4.6% of R&D manpower in the next 12 months. Such percentage was slightly higher among the industry sector of innovative products and services (6.7%).

Table 4.4.3b Expected change in the next 12 months in the number of R&D full-time employees

Among companies having R&D full-time employees:	Increase	Same	Decrease	Average % of expected change
Universities & Post-secondary Colleges; Research & Scientific Institutes	16.0%	84.0%	-	+ 3.5%
Innovative Products & Services	29.4%	70.6%	-	+ 6.7%
IT Products & Services Suppliers	27.8%	69.4%	2.8%	+ 4.8%
Others	4.9%	95.1%	-	+ 3.4%
Overall:	**26.3%**	**72.0%**	**1.7%**	**+ 4.6%**

5 Manpower Analysis

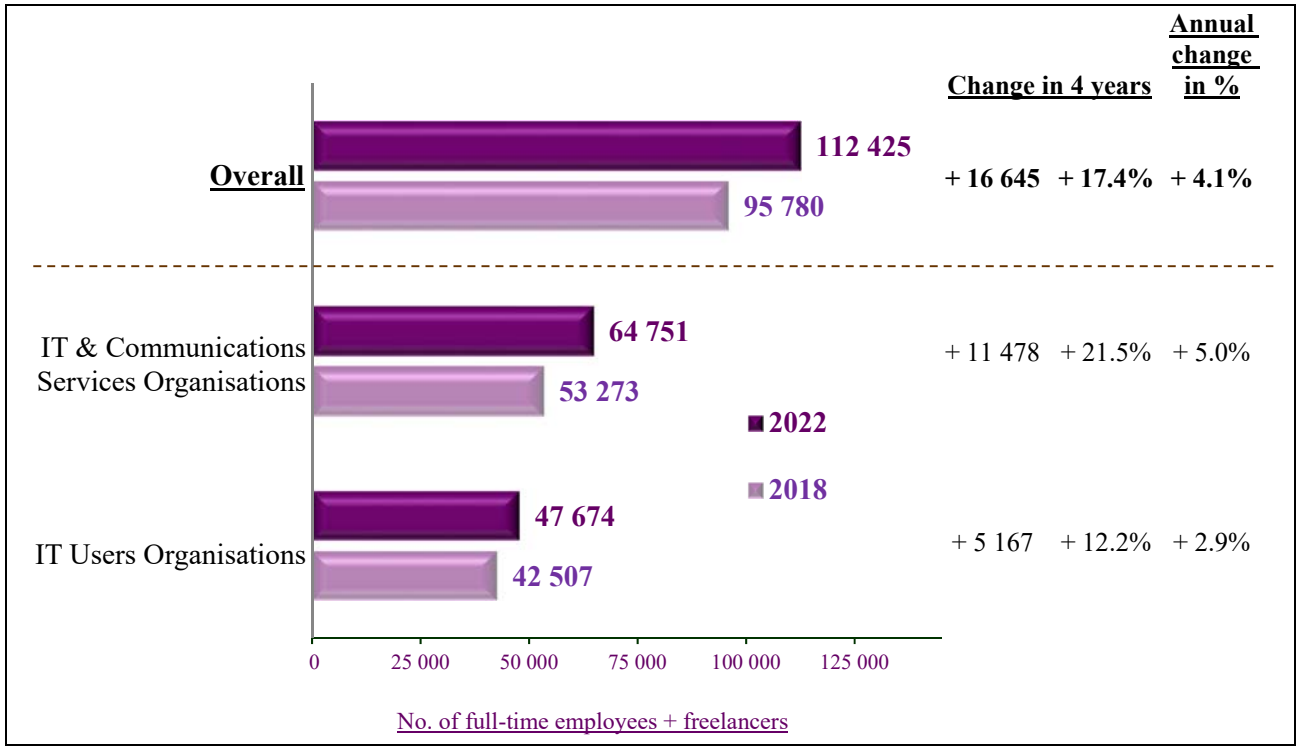
5.1 Manpower Changes between 2022 and 2018

5.1.1 Changes in Number of IT Full-time Employees and Freelancers

By Type of Organisation and industry sector

5.1.1.1 The number of full-time employees and freelancers for the principal jobs of IT has increased from 95 780 in 2018 to 112 425 in 2022, with an increment of 17.4% (+16 645 persons). When analysed by type of organisation, the increment was relatively higher in IT and Communications Services Organisations (21.5%; +11 478 persons) than in IT Users Organisations (12.2%; +5 167 persons).

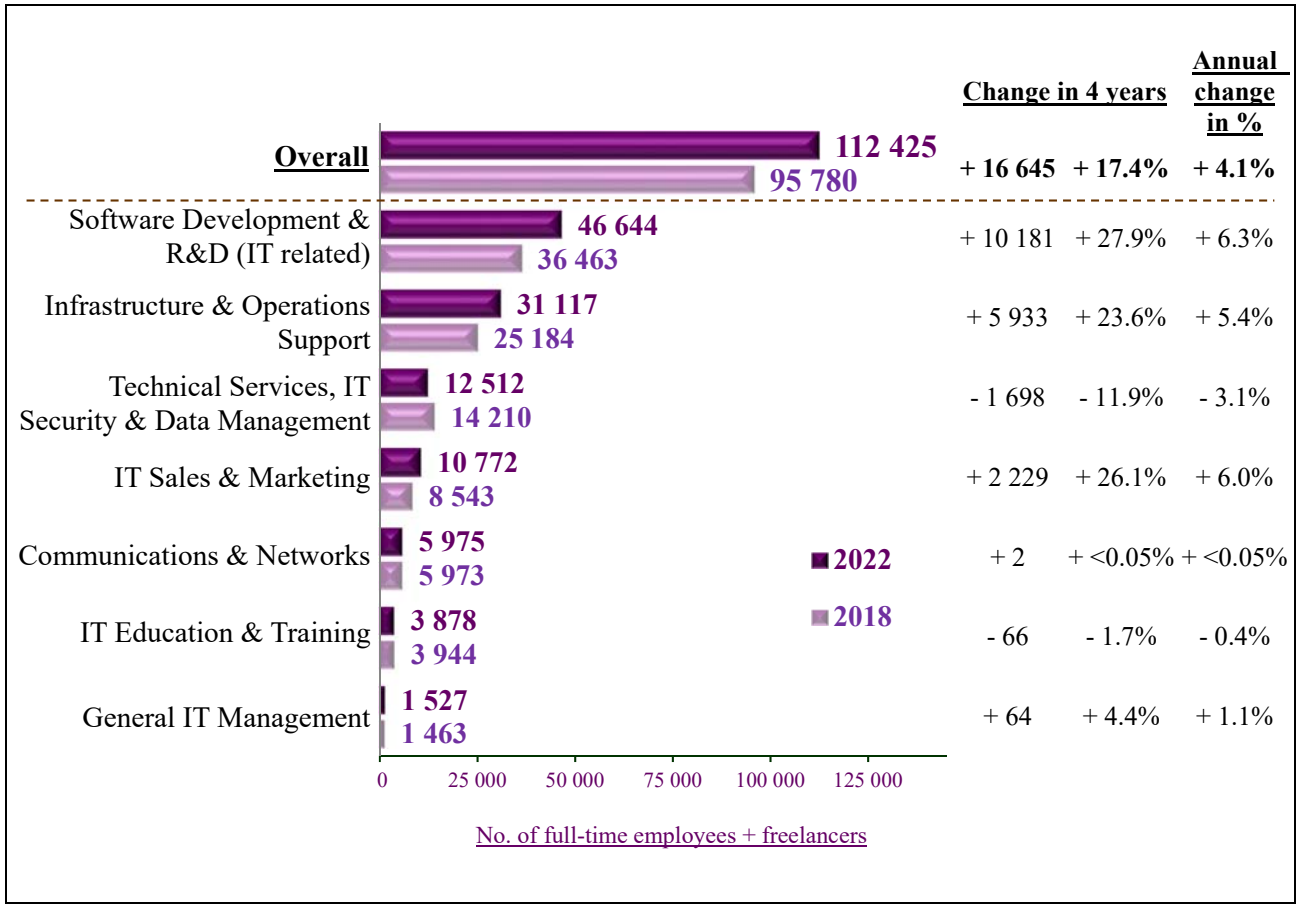
Chart 5.1.1a Change in number of IT full-time employees and freelancers – by type of organisation



By Job Category

5.1.1.2 When analysed by job category, the increase in the number of full-time employees and freelancers was mainly attributed by the growth in job categories of software development and R&D (IT related) (+10 181 persons), infrastructure and operations support (+5 933 persons) and IT sales and marketing (+2 229 persons). It was, however, worth noting that a decrease was recorded for technical services, IT security and data management (-1 698 persons).

Chart 5.1.1b Change in number of IT full-time employees and freelancers – by job category



5.1.1.3 Further analysing by job category in different types of organisation, it was observed that the increase in the number of staff for software development and R&D (IT related) was mainly in IT and Communications Services Organisations (+9 101 persons) than in IT Users Organisations (+1 080 persons). For infrastructure and operations support, a significant increment was found in IT Users Organisations (+6 751 persons), while a decrease was recorded in IT and Communications Services Organisations (-818 persons).

5.1.1.4 Besides, it was also worth noting that the decrease for technical services, IT security and data management was actually in IT Users Organisations (-2 306 persons), whereas an increase was recorded in IT and Communications Services Organisations (+608 persons).

Table 5.1.1b Change in number of IT full-time employees and freelancers – by type of organisation and job category

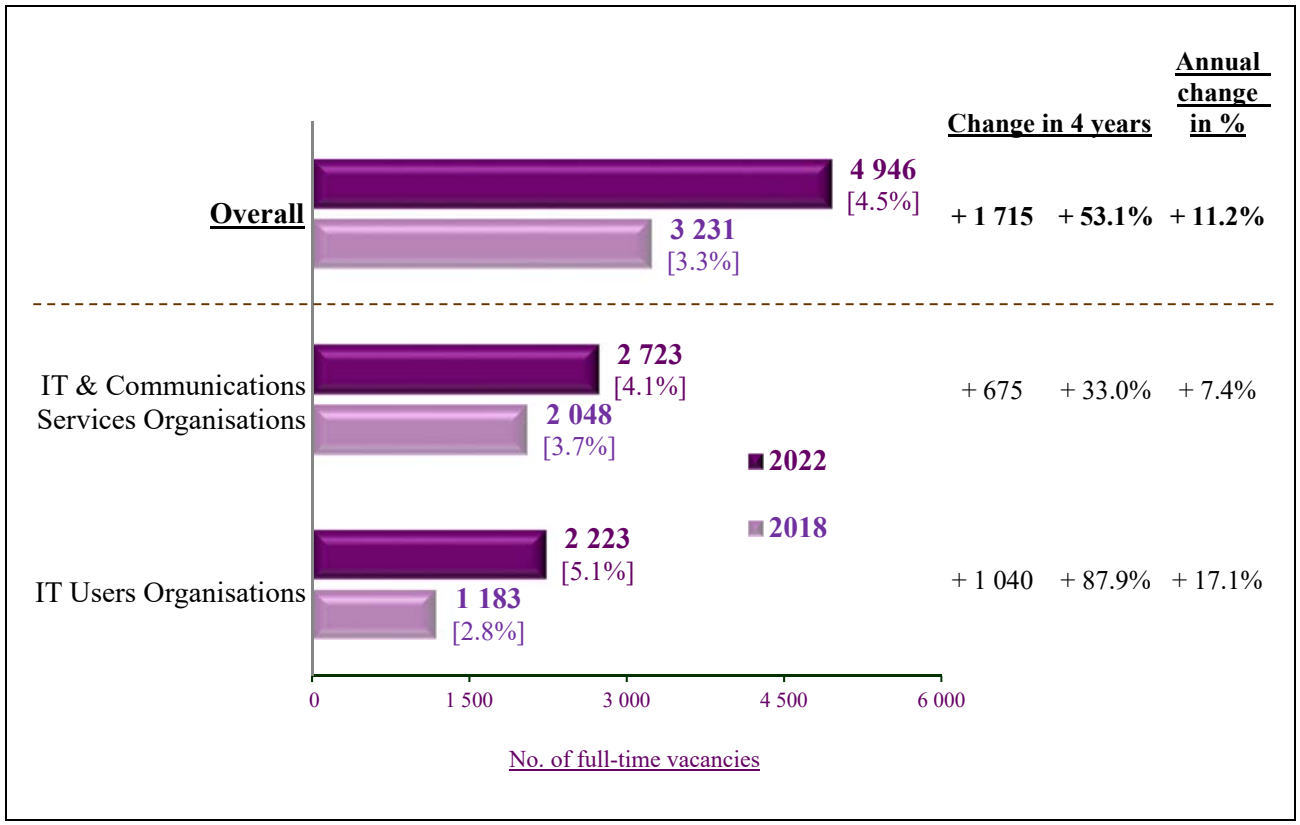
	No. of full-time employees & freelancers		Change in 4 years		Annual change in %
	2022	2018			
IT & Communications Services Organisations	**64 751**	**53 273**	**+ 11 478**	**+ 21.5%**	**+ 5.0%**
Software Development & R&D (IT related)	*32 076*	*22 975*	*+ 9 101*	*+ 39.6%*	*+ 8.7%*
Infrastructure & Operations Support	*4 650*	*5 468*	*- 818*	*- 15.0%*	*- 4.0%*
Technical Services, IT Security & Data Management	*11 008*	*10 400*	*+ 608*	*+ 5.8%*	*+ 1.4%*
IT Sales & Marketing	*10 342*	*8 336*	*+ 2 006*	*+ 24.1%*	*+ 5.5%*
Communications & Networks	*5 642*	*5 346*	*+ 296*	*+ 5.5%*	*+ 1.4%*
IT Education & Training	*63*	*86*	*- 23*	*- 26.7%*	*- 7.5%*
General IT Management	*970*	*662*	*+ 308*	*+ 46.5%*	*+ 10.0%*
IT Users Organisations	**47 674**	**42 507**	**+ 5 167**	**+ 12.2%**	**+ 2.9%**
Software Development & R&D (IT related)	*14 568*	*13 488*	*+ 1 080*	*+ 8.0%*	*+ 1.9%*
Infrastructure & Operations Support	*26 467*	*19 716*	*+ 6 751*	*+ 34.2%*	*+ 7.6%*
Technical Services, IT Security & Data Management	*1 504*	*3 810*	*- 2 306*	*- 60.5%*	*- 20.7%*
IT Sales & Marketing	*430*	*207*	*+ 223*	*+ 107.7%*	*+ 20.1%*
Communications & Networks	*333*	*627*	*- 294*	*- 46.9%*	*- 14.6%*
IT Education & Training	*3 815*	*3 858*	*- 43*	*- 1.1%*	*- 0.3%*
General IT Management	*557*	*801*	*- 244*	*- 30.5%*	*- 8.7%*
Overall:	**112 425**	**95 780**	**+ 16 645**	**+ 17.4%**	**+ 4.1%**

5.1.2 Changes in Number of IT Full-time Vacancies

By Type of Organisation

5.1.2.1 The number of full-time vacancies for the principal jobs of IT has also increased, from 3 231 in 2018 to 4 946 in 2022, with an increment of 53.1% (+1 715 vacancies). When analysed by type of organisation, the increment was relatively higher in IT Users Organisations (87.9%; +1 040 vacancies) than in IT and Communications Services Organisations (33.0%; +675 vacancies).

Chart 5.1.2a Change in number of IT full-time vacancies – by type of organisation

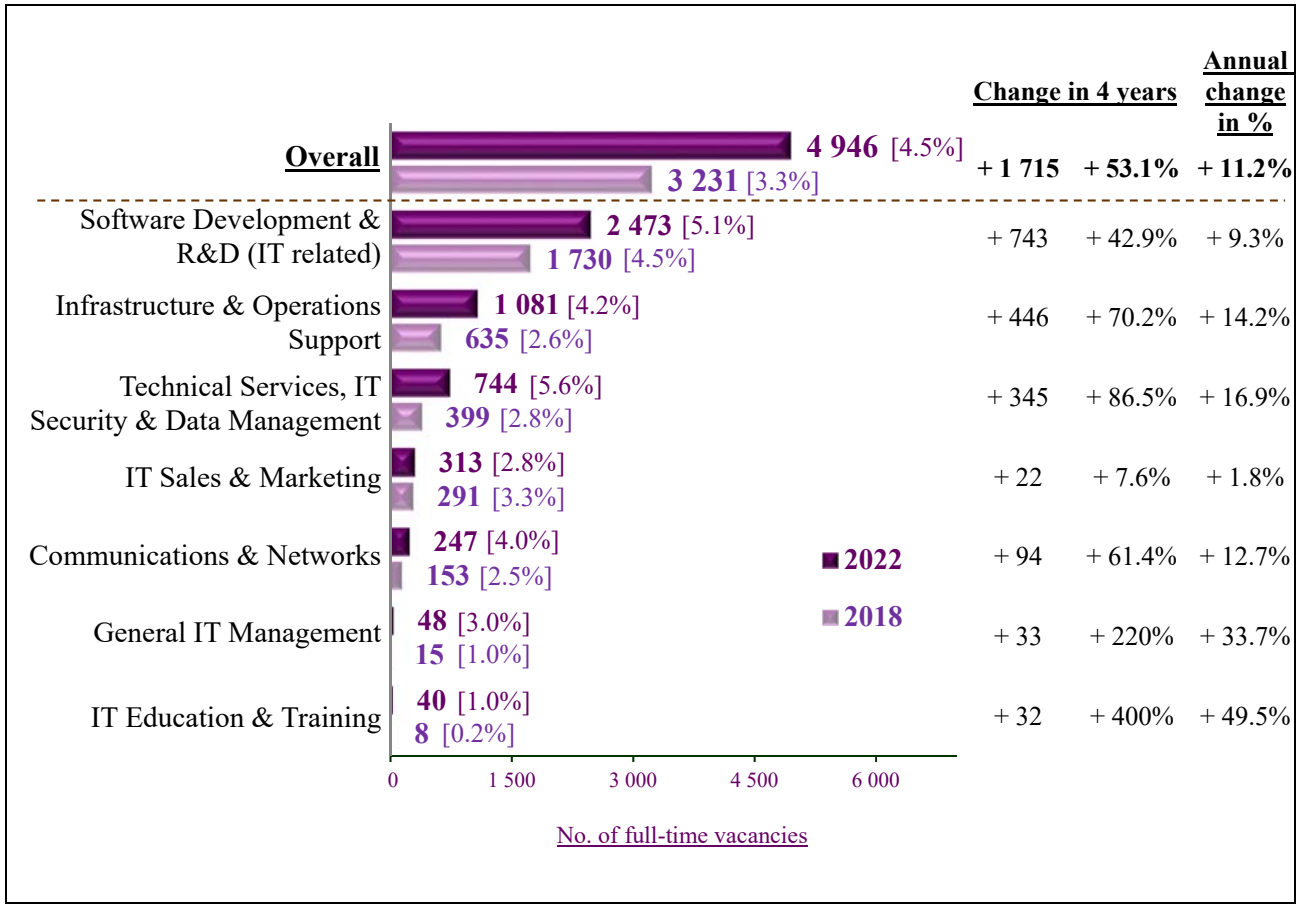


Vacancy rate = $\frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$ (for the respective type of organisation in the respective year)

By Job Category

5.1.2.2 The increase in the number of full-time vacancies was recorded for all job categories, particularly for software development and R&D (IT related) (+743 vacancies), infrastructure and operations support (+446 vacancies) and technical services, IT security and data management (+345 vacancies).

Chart 5.1.2b Change in number of IT full-time vacancies – by job category



$$\text{Vacancy rate} = \frac{\text{No. of vacancies}}{\text{Total no. of posts (no. of employees + no. of vacancies)}}$$ (for the respective job category in the respective year)

5.2 Business Outlook

Hong Kong as Top Science and Tech Cluster

5.2.1 According to the Global Innovation Index 2022 brought out by the World Intellectual Property Organisation[1], Shenzhen–Hong Kong–Guangzhou ranks the top second science and tech cluster in the world, that is, the Hong Kong together with Shenzhen and Guangzhou are the geographical areas around the world with the second highest density of inventors and scientific authors.

Hong Kong as Top Ten Most Vibrant Fintech Hubs

5.2.2 The Global Financial Centres Index 32[2] reveals that Hong Kong ranks as the fourth most competitive financial centre in the world. With regards to financial technology (fintech), Hong Kong is proud to be one of the top ten most vibrant fintech hubs in the world.

Leading destinations for start-ups

5.2.3 Hong Kong is one of the world's and Asia Pacific's leading destinations for start-ups. With reference to the InvestHK's 2022 Startup Survey[3], the number of start-ups and their number of staff employed reached a new record high, with a total of 3 985 start-ups employing 14 932 staff in 2022. The number of start-ups has been increased by 52% from 2018 to 2022 and Hong Kong remains attractive to the startups in a diverse range of industries. The "Fintech" sector retained its top spot, followed by "E-commerce/ supply chain management/ logistics technology". The pandemic had catalysed the popularity of specific sectors, which led to a healthy increase in the number of startups under "Education & learning", "BioTech" and "Health & medical". In addition, start-ups technologies do help SMEs streamline communication and workflow and that is one of the reasons why the number of Hong Kong start-ups continue to grow rapidly.

National 14th Five-Year Plan

5.2.4 The National 14th Five-Year Plan maps out the strategic directions for Hong Kong to collaborate with other Greater Bay Area (GBA) cities in technology development and exchange of talents. Hong Kong, with its unique advantages and strong science and tech capabilities, is able to seize opportunities brought forth by the development of the GBA to develop as an international innovation and technology hub and create more room for the sector to grow in the long term.

[1] World Intellectual Property Organisation, "Global Innovation Index 2022", https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2022-section4-en-cluster-ranking-global-innovation-index-2022-15th-edition.pdf
[2] Long Finance & Financial Centre Futures, "Global Financial Centres Index 32", https://www.longfinance.net/media/documents/GFCI_32_ Report_2022.09.22_v1.0_.pdf
[3] InvestHK, "2022 Startup Survey", https://www.startmeup.hk/wp-content/uploads/2022/11/Startup-Survey-2022.pdf

5.2.5 National 14th Five-Year Plan also includes the Shenzhen-Hong Kong Loop as one of the four major platforms of co-operation in the GBA, which fully demonstrates the importance the Central Government attaches to Hong Kong's innovation and technology and the Loop development.

Recent Government Support for Innovation and Technology

5.2.6 The Government has strived to build Hong Kong into an international innovation and technology hub by steering a number of initiatives as depicted below.

Establishment of Innovation, Technology and Industry Bureau

5.2.7 The Innovation and Technology Bureau was established to formulate holistic innovation and technology policies, thereby strengthening the co-ordination among the Government, industry, academia and research sectors and expediting the development of innovation, technology and related industries in Hong Kong. The bureau was re-titled as the Innovation, Technology and Industry Bureau (ITIB) in July 2022 to highlight the promotion of re-industrialisation development as a standing policy function and work focus of the bureau, as part of its efforts in driving innovation and technology development.

The Innovation and Technology Fund

5.2.8 The Government has set up the Innovation and Technology Fund with an aim to assisting local companies to upgrade their technological levels and introducing innovative ideas to their businesses through 17 funding schemes.

2022 Policy Address

5.2.9 The 2022 Policy Address[4] sets out major initiatives to develop the innovation and technology industry in Hong Kong:

- Financial Secretary (FS) to lead Office for Attracting Strategic Enterprises (OASES) to attract strategic enterprises to Hong Kong with targeted and attractive special facilitation measures
- Chief Secretary for Administration to lead Talents Service Unit to co-ordinate work for recruiting talents and provide them with one-stop support
- Setting up Dedicated Teams for Attracting Businesses and Talents in 17 Mainland Offices and overseas Economic and Trade Offices to proactively reach out to target enterprises and talents
- Establishing the $30 billion Co-Investment Fund to attract enterprises to set up operations in Hong Kong and invest in their businesses
- Launching Top Talent Pass Scheme to attract talents of high salary and graduates of the world's top 100 universities to pursue careers in Hong Kong

[4] "The Chief Executive's 2022 Policy Address" https://www.policyaddress.gov.hk/2022/en/policy.html

- Allowing eligible talents from outside Hong Kong to, upon becoming permanent residents, apply for a refund of the extra stamp duty paid for purchasing residential property locally
- Enhancing existing talents admission schemes to better attract talents
- Enhancing competitiveness in financial services by facilitating large-scale advanced technology enterprises to list in Main Board, promoting the launch of more Renminbi-denominated investment tools, strengthening mutual market access, developing green and sustainable finance, etc.
- Promoting innovation and technology (I&T) development and facilitating commercialisation of research and development (R&D) outcomes
    - Attracting 100 high-potential I&T enterprises to set up operations in Hong Kong in next five years, including at least 20 top-notch I&T enterprises
    - Setting up the $10 billion "Research, Academic and Industry Sectors One-plus Scheme" (RAISe+ Scheme) to support commercialisation of R&D outcomes by university research teams
    - Enhancing existing technology talent schemes and build more accommodation facilities for I&T talents
    - Creating the post of Commissioner for Industry to be responsible for co-ordinating and steering re-industrialisation strategies
    - Pressing ahead with construction of the Hong Kong-Shenzhen Innovation and Technology Park in the Lok Ma Chau Loop and development of San Tin Technopole

5.2.10 The Shenzhen-Hong Kong Innovation and Technology Co-operation Zone (Co-operation Zone), which comprises the Hong Kong-Shenzhen Innovation and Technology Park (HSITP) located at the Lok Ma Chau Loop and the Shenzhen Innovation and Technology Zone, will establish "one zone, two parks" at "one river, two banks" under the auspices of "one country, two systems", would promote the development of the international innovation and technology hub in the GBA.

Standing Committee on STEM Education

5.2.11 To enhance the young generation’s interest and learning motivation in innovation and technology, the Government has set up the Standing Committee on STEM Education to initiate curriculum policies and promote a holistic approach to the curriculum development on STEM education. The Government continues to follow up on the recommendations put forward by the Committee to enhance the strategies for promoting STEM education and provide schools with different support measures. Successful implementation of STEM education is important to increase the competitiveness of Hong Kong to nurture a versatile pool of talents with creativity, collaboration and problem solving skills, as well as to foster innovation spirit as required in today’s digital world.

Uncertainties from Global Economic Performance

5.2.12 According to the World Economic Outlook Report[5] published by the International Monetary Fund in October 2022, global economic activity is experiencing a broad-based and sharper-than expected slowdown, with inflation higher than seen in several decades. The cost-of-living crisis, tightening financial conditions in most regions, Russia-Ukraine conflict, and the lingering COVID-19 pandemic all weigh heavily on the outlook. Global growth is forecast to slow from 6.0 percent in 2021 to 3.2 percent in 2022 and 2.7 percent in 2023. This is the weakest growth profile since 2001 except for the global financial crisis and the acute phase of the COVID-19 pandemic. Undoubtedly, the uncertainties in global economic performance will affect the investment and development of innovation and technology businesses in Hong Kong.

Aging population and talent wastage

5.2.13 Hong Kong is also facing rapidly ageing population and continuously declining fertility rates. Talent wastage caused by emigration tides and challenges posed by the global competition for talents are the barriers for Hong Kong to retain and develop its talent pools for the innovation and technology sector. Attracting talents from around the word is crucial to strengthening Hong Kong's leading position in innovation and technology development, there are comments that Hong Kong's high living cost and limited land supply will hinder talents and investors to develop their careers or businesses in Hong Kong.

Hong Kong's Unique Competitive Advantages

5.2.14 Although there are some challenges ahead, the Training Board believes that Hong Kong's competitive advantages and attractiveness of low and simple tax rate, well-structured intellectual property protection system, accessibility to international and Asian markets, business opportunity in Mainland China and free flow of information will continue to facilitate its development as an international innovation and technology hub.

5.3 Manpower Projection and Annual Additional Manpower Requirement

Manpower Projection

(A) Information Technology (IT)

5.3.1 The Adaptive Filtering Method (AFM) (historical information obtained from manpower surveys) was adopted to project the manpower (i.e. employees, freelancers and vacancies) of the

[5] International Monetary Fund, "World Economic Outlook Report", https://www.imf.org/en/Publications/WEO/Issues/2022/10/11/world-economic-outlook-october-2022

industry in the next four years. Based on the results, only IT Management and IT Education and Training remains steady while the manpower of other sectors was projected to have a noticeable manpower growth, around 3-4% per year. The estimated manpower from 2023 to 2026 is shown in table below. Further details of the manpower projection methodology are shown in **Appendix 8**.

Table 5.3.1 Manpower Projection of IT sector from 2023 to 2026 by AFM

	IT Management (A=0.87)	R&D(IT), Software Development, Communications & Networks, IT Security, etc. (A=0.98)	Hardware and Field Support (A=0.86)	Operation Services (A=0.82)	IT Education and Training (A=0.68)	**Overall (Sum for 5 categories)**
2022 (Actual)	6,591	55,934	19,860	31,068	3,918	**117,371**
2023	6,651 *(0.9%)*	58,108 *(3.9%)*	20,613 *(3.8%)*	32,386 *(4.2%)*	3,917 *(-0.03%)*	**121,675** ***(3.7%)***
2024	6,706 *(0.8%)*	60,321 *(3.8%)*	21,303 *(3.3%)*	33,564 *(3.6%)*	3,915 *(-0.05%)*	**125,809** ***(3.4%)***
2025	6,754 *(0.7%)*	62,574 *(3.7%)*	21,930 *(2.9%)*	34,604 *(3.1%)*	3,914 *(-0.03%)*	**129,776** ***(3.2%)***
2026	6,797 *(0.6%)*	64,866 *(3.7%)*	22,497 *(2.6%)*	35,518 *(2.6%)*	3,913 *(-0.03%)*	**133,591** ***(2.9%)***
Average annual growth rate	***0.8%***	***3.8%***	***3.2%***	***3.4%***	***-0.03%***	***3.3%***

Note: Percentage in the bracket refer to the percentage of annual change over preceding year

(B) Research and Development (R&D)

5.3.2 As limited historical data is available for the research and development sector, the manpower growth in 2023 was based on the employers' forecast of manpower in next 12 months (i.e. +4.6%). The estimated manpower in 2023 is shown in table below.

Table 5.3.2 Manpower Projection if R&D sector in 2023 by employers' forecast

Manpower in 2022	**23,322**
Estimated manpower growth in 2023	+ 1,075 (+4.6%)
Projected Manpower in 2023	24,397

Annual Additional Manpower Requirement

5.3.3 By taking into consideration (i) projected manpower trend and (ii) wastage rate of the industry (i.e. percentage of employees leaving the industry permanently on annual basis), the estimated additional annual requirement is shown in Table 5.3.3 below.

Table 5.3.3 Estimated Annual Additional Manpower Requirement

Job Level	Wastage rate of the industry	**Additional Annual Manpower Requirement**		
		Average manpower growth (a)	Industry leavers (b)	**Total (a) + (b)**
(A) Information Technology				
IT Management	1.1%	52	73	125
R&D(IT), Software Development, Communications & Networks, IT Security, etc.		2,233	654	2,887
Hardware and Field Support		659	229	888
Operation Services		1,113	361	1,474
IT Education and Training		-1	42	41
Overall		**4,056**	**1,359**	**5,415**
(B) Research and Development				
Overall	0.1%	**1,075**	**14**	**1,089**

Manpower Supply and Demand for IT Personnel

5.3.4 In accordance with the estimated annual additional manpower requirements listed in Table 5.3.3, the industry needs additional employees to take up 125 IT management positions, 2 887 R&D(IT), software development, communications and networks, IT security positions, 888 hardware and field support positions, 1 474 operation services positions and 41 IT Education and training positions. By education level of manpower required, the industry needs 173 and 1 934 persons who possess postgraduate and first degree respectively to take up IT positions. In addition, the industry needs to recruit 2 977 persons who possess sub-degree/diploma/certificate qualifications to take up the positions.

Table 5.3.4 Preferred Education Level of the Estimated Annual Additional Manpower of the IT Personnel

Preferred Education Level of IT Personnel Required	**No. of IT Personnel**
Postgraduate	173
Degree	1,934
Sub-degree / Diploma / Certificate	2,977
Secondary or below	331
Total	**5,415**

Estimated Supply of IT or Computing Graduates from Local Educational Institutions

5.3.5 Based on the information provided by UGC, VTC and major universities and tertiary institutions* offering IT related courses, the planned number of graduates in IT and related disciplines is summed up in Table 5.3.5.

Table 5.3.5 Planned Output of Graduates from UGC/Government-Funded IT or Computing Programmes from 2022 to 2026 by Educational Level

Education Level	Year				
	2022	**2023**	**2024**	**2025**	**2026**
Postgraduate	358	447	429	430	438
Degree	2,630	3,168	3,025	3,212	3,127
Sub-degree	865	798	668	668	668
Total	**3,853**	**4,413**	**4,122**	**4,310**	**4,233**

Table 5.3.6 Planned Output of Graduates from Self-Financed IT or Computing Programmes from 2022 to 2026 by Educational Level

Education Level	Year				
	2022	**2023**	**2024**	**2025**	**2026**
Postgraduate	2,790	3,398	3,388	3,444	3,458
Degree	608	502	477	491	489
Sub-degree	193	261	261	261	258
Total	**3,591**	**4,161**	**4,126**	**4,196**	**4,205**

** The Training Board wrote to major universities and tertiary institutions requesting for their estimated number of degree, sub-degree/ diploma/ certificate graduates from IT or Computing Programmes from 2022 to 2026. The estimated number of graduates reported by these institutions have been included in the figures as shown in Table 5.3.5 and 5.3.6. The figures for R&D related programmes were not available to be provided to Board. Users of the survey findings should note that the data collected might not be comprehensive.*

5.3.6 Readers should note that not all graduates would enter the job market immediately after graduation. Quite a number of those graduates would opt for further study.

5.3.7 It is also worthy to note that some local graduates of the IT and related disciplines who did not join the innovation and technology sector might work in other economic sectors in the community or pursue further studies. Users are advised to be cautious when quoting the figures as reference materials.

6 Recommendations

Based on the business outlook, and the manpower supply and demand situation derived from the survey results / findings as well as views and comments collected from various industry leaders, the Training Board recommends the following measures to all major stakeholders to meet the industry demand:

Government

Request listed companies engaging innovation and technology businesses to bring non-local talents to Hong Kong

6.1 Bringing together talents from around the world is important to strengthening Hong Kong's competitiveness and development. The Government should consider including a special requirement on the Main Board and Growth Enterprise Market Listing Rules that companies engaging in innovation and technology businesses will have to bring a certain number of R&D experts from overseas or Mainland China and/or recruiting a certain number of local R&D employees before they can be listed on the Main Board or Growth Enterprise Market in Hong Kong.

6.2 Such measures could ensure a steady supply of talents from overseas or Mainland China to participate in the R&D development in Hong Kong.

Tax Reduction or other Incentives to Encourage those Graduates Studying in the Mainland China to return to Hong Kong after graduation

6.3 Apart from attracting the overseas young talents to work in Hong Kong, there are quite a number of children of Hong Kong residents receive professional training in the Mainland cities, the Government should consider formulating policies to provide talents with housing allowance and tax reduction so as to attract them to pursue career development in Hong Kong or GBA cities.

6.4 Chinese graduates returning from overseas universities are another vital sources of talents that worth attracting. The Government should continue to examine various arrangements for attracting talents with a view to enriching Hong Kong's talent pool.

"Business to Government" or "Government to Business" business model

6.5 "Business to Government (B2G)" model provides a platform for businesses to sell products and services to government while "Government-to-business (G2B)" model means

Government selling to businesses. The G2B partnership is effective for Government particularly to deliver infrastructure services. The public services are provided by using private sector innovation and expertise. The Government will seek innovation that private sector can deliver and can put more investments in innovation and technology and boost up the industry development by offering more attempts on innovation products. Apart from leveraging private funding, the partnership could improve service provision and boost economic growth. Partnership with competent leading innovation and technology companies could help drive the sector grow.

6.6 The new Office for Attracting Strategic Enterprises (OASES) should therefore consider possible G2B partnerships with giant tech-savvy companies to engage them on business areas including life and health technology, artificial intelligence and data science, as well as advanced manufacturing and new energy technology. With the reputation of big brand-name companies investing in Hong Kong, local talents will be retained and more and more overseas talents will be attracted to develop their careers in Hong Kong. Making the local innovation and technology environment appealing and attractive, the Training Board considers that more young generation will be interested to pursue careers in technology and science.

Educate the Public the Vision of Innovation and Technology Development in Hong Kong

6.7 The Government should continue to promote its vision of being the international innovation and technology hub and the promising opportunities that innovation and technology sector could offer to the public, particularly, the workforce and the young generation as well as the parents. It is crucial for the public to be educated that the Government values human capital development, innovative entrepreneurship and science and technology.

6.8 The Government should lead and develop joint promotion and collaboration with Hong Kong's leading research and development centres and institutions, such as Hong Kong Science Park, Cyberport, Hong Kong Productivity Council and Hong Kong Applied Science and Technology Research Institute Company Limited as well as the five Government funded R&D centres. The collaborative efforts to promote local R&D outstanding achievements will have a stronger effect to draw the attention and recognition of the public.

Relax Immigration Arrangements for Non-local Sub-degree Graduates

6.9 In Policy Address 2022, the Immigration Arrangements for Non-local Graduates will be relaxed by extending the limit of stay from one year to two years to facilitate their staying in or coming to Hong Kong for work; and expand the scope of the arrangements to cover those who graduated from the GBA campus of a Hong Kong university on a pilot basis for a period of two years. The Training Board considers that such initiatives are conducive to attract non-local talents to start

their careers in Hong Kong, however, it is worth considering extending to cover more non-local talents, especially for those non-local sub-degree graduates who should also be allowed to stay two years in Hong Kong to explore employment opportunities.

Provide More Resources to Train up Technical Workforce

6.10 Skilled technical workforce is crucial for companies to develop innovation and technology businesses and those positions are in high demand according to the survey results. The Government should therefore provide more resources to training institutions to build up the backbone of the innovation and technology sector.

6.11 By giving more recognition of sub-degree holder, the Government should also consider lowering the entry requirement from degree to sub-degree holder for some technical roles which are more focused on hands-on skills and knowledge instead of only academic qualifications.

Training Institutions

Nurture and Build up the Technical Workforce

6.12 As revealed from the survey results, workforce with technical skills and knowledge are in high demand in the innovation and technology sector. Training institutions should train up more technical workforce as they are vitally important to the research and innovation from contributing knowledge, developing and maintaining the equipment and infrastructures to support the innovators and researchers to develop their inventions. The Training Board considers that their important roles in innovation and research work have always been undervalued before and more support and efforts should be paid to vocational and professional education and training to build up the technical skills base. Without a reliable and competent technical workforce, Hong Kong is not able to develop and sustain as an international innovation and technology hub.

6.13 It is therefore crucial for Training Institutions to engage students with strong foundation of programming and coding skills so that they fully understand the principles behind and acquire detailed knowledge. By doing so, students will be able to manage and response to the rapidly changing programming languages in ease. Besides, students should be able to demonstrate digital literacy on computer hardware, operating systems, network infrastructure and security, database software, internet web publishing, etc.

Enhance the curriculum for students to learn the advanced technology developed in Mainland China

6.14 In order to develop students' capabilities in working at technology firms in GBA cities, the

curriculum should be extended by covering more advanced technology and technology platforms built in the Mainland China in addition to those Western platforms and software. The digital ecosystem in Mainland China is self-reliant and advanced in nature, students should get familiar with its technology, particularly, the software developed in the Mainland has been highly competitive and increasingly adopted in Hong Kong with a number of tech giants like, Alibaba, Baidu, Huawei, Tencent, Xiaomi, Kingdee, etc.

6.15 The advanced technology knowledge and skills from Mainland China are instrumental for students to better integrate into the opportunities brought forth in GBA cities, which in turn the technical workforce will strengthen Hong Kong's roles and functions as a springboard between the Mainland China and the international markets.

Develop interdisciplinary curriculum to equip students of non-IT disciplines with IT and Technology knowledge and skills

6.16 In today's technology-driven economy, Training Board considers that IT skills are one of the generic skills that students must be possessed in order to stay competitive in the workforce. In this connection, interdisciplinary curriculum should be developed to equip students of non-IT disciplines with basic IT and technology knowledge and skills, particularly learning to code.

6.17 It is recommended to introduce basic concepts of coding and applications of technologies to all students even they are not related to IT discipline. Learning the basics of coding not only letting students get familiar with the foundational building blocks of computer programming, it also allows students to develop problem solving skills and foster their own creativity.

Offer more project-based and authentic learning experience

6.18 Project-based learning gives students the opportunity to develop skills and knowledge through engaging them in problems and situations they may face in the real working environment. To facilitate students to acquire the necessary skills and knowledge needed for innovation and technology development, authentic learning experience should be prepared and created to train up the critical thinking and research and collaboration skills.

6.19 In order to nurture students with hands-on practical IT and research skills through successful implementation of project-based learning, teachers and mentors are required to coach more but at the same instruct less so as to embrace students to discover more about their competencies and problem-solving skills. Good ideas and solutions could come from students instead of traditional lectures, teachers are required to plan in details by identifying an appropriate problem in related to innovation and technology development, reviewing each step required to solve the problem and using those steps as project-learning activities with checkpoints and manageable timelines.

6.20 The project-based learning approach will be able to inspire and develop life-long learners as students will be engaged deeply with the real-life problems and motivated to find out practical solutions themselves. The ultimate outcome is expected to achieve that students will end up enjoy understanding the solutions through applications of technologies as much or more than teachers want them to know.

Be forward-looking in equipping students with future skills and competencies required

6.21 In the face of today's rapidly changing and highly technological advancement, the Training Board recommends that training institutions should prepare students for jobs that might have not been created at the moment, for technologies that have not been invented, and also to solve problems that have not been seen or anticipated. It is important for training institutions to be forward looking and get prepared for the knowledge and skills that students will need to thrive in the future. Close collaboration with tech-savvy companies is therefore crucial for institutions to understand the future skills needed and identify skills gap to train up students to be future employees in the innovation and technology sector.

6.22 Apart from hard skills, training institutions should develop students with creativity, imagination, curiosity and resilience. They will have to be educated to be respect and ethical, appreciate the ideas and values of the others and also to cope with failure and rejection when developing innovative products and solutions.

Provide In-Service Training on IT Certificates recognised in Mainland China

6.23 As more and more companies are using software and solution from the Mainland China, the demand on professional certifications recognised in Mainland China are on the rise. Training institutions should provide more training to IT practitioners to assist them in gaining professional recognition of their qualifications and making them more competitive and employable in the market by learning hands-on practice of the Mainland China's software and solution.

6.24 It is also necessary for IT practitioners to keep abreast of the advanced technology development in the Mainland China in order to avoid lagging behind the other GBA cities in developing innovation and technology skills.

Offer Upskilling and Reskilling Training

6.25 Training institutions should continue to organise training to help individuals enhance digital skills and adapt to use digital tools, especially for those who work in traditional jobs to cope with the automation and digital transformation.

Promote the programmes to parents by collaboration with leading companies

6.26 Apart from promoting innovation and technology related programmes to students and teachers, parents are key influencers of young people's career and subject choices. Training institutions are advised to proactively promote the innovation and technology related learning journeys to parents.

6.27 The training institutions should work with leading companies in the innovation and technology sector to promote the promising careers that happening in various industries in order to spark interest from parents. By doing so, parents could exert a much more direct influence on their children's career choices by advising them to study science and technology subjects and pursue in innovation and technology related career pathways.

Embrace teachers with innovative mindset

6.28 In order to empower the young generation to develop a mindset that encourages creativity and embrace adaptation, training institutions should inspire teachers with innovative mindset of successful entrepreneurs and inventors.

6.29 By nurturing teachers with innovative mindset, teachers will be able to lead high quality project-based learning and focus on fostering students' innovation by strengthening critical thinking, creativity, curiosity and deep understanding as well as questioning skills in the curriculum as the key learning outcomes, which are all important attributes for innovation and technology personnel.

Industry

Promote innovation and technology achievements in Hong Kong

6.30 The industry should work together to promote the local innovation and technology achievements to the public and showcase how their research and development efforts have a significant impact on the economic prosperity and the quality of life being enjoyed by members of the public.

6.31 With the enhanced reputation of the innovation and technology sector in Hong Kong, more young talents will be attracted to join the sector and stay in the profession.

Support community events in innovation and technology development

6.32 The industry should also provide more support to community events to let the young generation to experience technology achievements and cutting-edge innovations in Hong Kong, in

turn attracting more students to study in STEM related subjects.

6.33 As a long term recruitment tool, the industry will be able to bring together the young generation who are already interested in innovation and technology and cultivate an innovative pool of talents to serve the industry.

Employers

Share best practice and innovative products

6.34 Employers are encouraged to share their best practices to their employees and industry partners on innovation and technology development. Sharing best practices can help companies identify knowledge gaps, improve efficiency and productivity and encourage leadership.

6.35 The Training Board considers that sharing best practices and innovative products will help company nurture an innovative learning culture through knowledge sharing tools and social media networks to attract more talents and adapt technological change and boost up employees' performance. Particularly, research and development activities heavily rely on innovative and creative ideas where employees can share their brainstormed ideas and access freely to right information by integrating best practices to business processes.

Offer intensive on-the-job training to employees and invest on employee development

6.36 Employers should invest more in employee development such as training the workforce on new technologies and strategies or provide skill-based on-the-job training to improve work performance.

6.37 On-the-job training to employees will result in improved employee performance on innovation and technology and it is expected that it will positively impact business growth and generate profits for the companies.

Partner with training institutions to offer more support to R&D professionals with business and market sense

6.38 In order to effectively commercialise the research results, employers should partner with training institutions to offer more support to R&D professionals to equip them with business and market knowledge. More proactive support from employers would be crucial to combine research activities with production activities of companies so as to improve the quality of research activities and implement feasible innovation projects or solutions based on the research and technological development results.

Implement flexible work arrangements

6.39 Flexible work arrangements have become a hot topic in modern workplaces due to COVID-19 pandemic. More companies are implementing flexible work arrangements with a view to enhancing employee satisfaction and retention, increasing recruitment flexibility, reducing operating costs .

6.40 Young innovators prefer to have virtual and flexible work arrangement permanent, however, it is also advisory to have regular face-to-face interactions and meetings to strengthen mutual trust and connection between team members for innovation and technology development.

Apply the Government funding schemes

6.41 Employers are advised to proactively apply and utilise the Government funding schemes to maximise their resources for innovation adoption. With the funding support from the Government, employers are able to implement innovative solutions and digital transformation by adopting different technologies to strengthen their competitiveness and cope with the challenges.

6.42 Employers should make use of the Innovation and Technology Fund to upgrade their technological level and develop innovative ideas to their businesses and there are different programmes that worth considering for nurturing technology talents and facilitating technology adoption:

- Research Talent Hub – funds engagement of innovation and technology talents to conduct R&D work
- Reindustrialisation and Technology Training Programme – funds staff of local entreprises to receive training in advanced technologies, especially those related to “Industry 4.0”
- STEM Internship Scheme – subsidises undergraduates and postgraduates taking STEM programmes in local universities to enrol in short-term innovation and technology related internships
- Public Sector Trial Scheme – funds production of prototypes/ samples and conducting of trials in the public sector
- Technology Voucher Programme – supports the use of technological services and solutions by enterprises and statutory bodies to improve productivity, or upgrade or transform business processes
- Re-industrialisation Funding Scheme – subsidises manufacturers to set up new smart production lines in Hong Kong

- Innovation and Technology Fund for Better Living – funds innovation and technology projects which will make people's daily living more convenient, comfortable and safer, or address the needs of specific community groups

Employees

Be life-long learners and be persistent

6.43 Life-long learning is key to success for employees to maintain a competitive edge in new technologies and grow through continuous application of knowledge and experience. In fact, lifelong learning requires embracing opportunities to learn and put into practice. There are different ways to achieve lifelong learning such as self-motivated learning through online learning platforms, books and training. It could be in another form of professional learning through networking and industry news and pursuing professional certification and qualifications.

6.44 In addition, grit is also vital for success in innovation. Grit is the passion and perseverance for very long-term goals which is an important attribute for innovators to drive forward through overcoming failures. Grit could be nurtured and developed and young innovators should develop their true grits to learn from mistakes and failures to follow the path and have the motivation and confidence to bounce back from failures.

Broaden own horizons by exploring different opportunities

6.45 Innovation values new ideas and different perspectives. Employees should grasp different opportunities to broaden their horizons to experience innovation and technology development in other GBA cities and countries.

6.46 Through the first-hand observation and experience, employees could make significant contribution to the innovative development and explore the potential business opportunities brought to companies.

Be innovative at work and engage in more projects in building up experiences

6.47 Employees should be innovative at work by identifying problems at an early stage to make operations more efficient, enhance management processes and expedite decision making.

6.48 Employees are recommended to engage in diversified projects and gain more skills and experiences to build up their own technology capabilities for future development.

Be mentors at workplace to share and cultivate innovative culture

6.49 Motivation to innovation and technology will be further strengthened if employees care about the well-being of their younger colleagues, their organisations and in turn their communities, which will be more than just getting a good job and an attractive income. Being mentors at workplace will provide employees with a sense of contribution and ownership to lead the innovative projects and research results.

6.50 Employees should consider themselves as one of the drivers to cultivate innovative culture. Building up an innovative culture will facilitate innovative ideas and processes as well as make people more engaged and productive. Employees should work hand in hand with employers to create innovation and make the difference for the industry and for the community.

Be proactive and develop problem solving skills

6.51 Apart from the technical skills needed for the innovation and technology development, employees should possess proactive problem solving skills to anticipate and resolve challenges independently. In this connection, the employees should be more proactive in using data to analyse the root cause to problem and seek a favourable solution for business prosperity. Establishing positive rapport and building strong relationships with the whole team are key attributes that employers are looking for innovation and technology professionals.

Develop genuine interests in innovation

6.52 Employees with genuine interest in innovation will have the motivation and desire to deeply understand the current technology and explore new technologies 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. In addition, fresh graduates should have to know that not everyone needs to be entrepreneurs. There are many people who are succeeding in contributing their skills and knowledge into work that could also make a difference to the sector, especially, for those without entrepreneurial spirit to take risks and invest their lives in creating businesses and growing businesses.

6.53 Learning how to learn is also an important skill that employees should have, regardless of their job types, as people will have to proactively solve problems when they encounter challenges in this ever-changing business environment.

Appendix 1

Membership of Innovation and Technology Training Board

Chairman

Mr LAI Kai-tung Robert

Members

Dr CHENG Chung-ngam Rocky
Ms FUNG Ka-po Karen
Mr HO Wai-kwok Argon
Mr KAM Wai-ming
Mr KWOK Ngok-wing Jimmy
Dr KWONG Kwok-wah
Mr LAM Heung-yeung Herman
Ir Dr LAU Ming-ho Ritz
Mr LEE King-chung
Mr LEE Sai-yin Patrick
Mr LEUNG Yip-hung
Mr LIO Weng-tong Felix
Prof MENG Mei-ling Helen
Ms NG Gracie
Mr SHEU Chun-fat Fred
Ir Dr TAI Kin-hon Samson
Mr TANG Siu-kun Stephen
Dr YAU Oliver
Mr YEUNG Chi-hung Johnny, MH
Mr PUN Si-keung Jason *(since 19 December 2022)*
Mr WAH Kwok-kee Gavin *(up to 18 December 2022)*
Mr CHAN Hon-kwong Boer *(up to 30 June 2022)*
Mr LEUNG Siu-kwun Alexander *(since 18 July 2022)*
Mr LI King-lok Kevin *(up to 30 June 2022)*
Ir Dr HUI Yan-keung John *(since 15 August 2022)*
Dr LEUNG Hing-pong Joseph *(up to 14 August 2022)*

Secretary

Ms CHAN Chung-man Gaby *(since 19 September 2022)*
Ms LEUNG Kin-tsui Jessy *(up to 18 September 2022)*

Appendix 2

Terms of Reference of Innovation and Technology Training Board

1. To determine the manpower demand of the industry, including the collection and analysis of relevant manpower and student/trainee statistics and information on socio-economic, technological and labour market developments.

2. To assess and review whether the manpower supply for the industry matches with the manpower demand.

3. To recommend to the Vocational Training Council (the Council) the development of vocational and professional education and training (VPET) facilities to meet the assessed manpower demand.

4. To advise the Council on the strategic development and quality assurance of its programmes in the relevant disciplines.

5. To prescribe job specifications for the principal jobs in the industry defining the skills and knowledge and advise on relevant training programme specifying the time a trainee needs to spend on each skill element.

6. To tender advice in respect of skill assessments, trade tests and certification for in-service workers, apprentices and trainees, for the purpose of ascertaining that the specified skill standards have been attained.

7. To advise on the conduct of skill competitions in key trades in the industry for the promotion of VPET as well as participation in international competitions.

8. To liaise with relevant bodies, including employers, employers' associations, trade unions, professional institutions, training and educational institutions and government departments, on matters pertaining to the development and promotion of VPET in the industry.

9. To organise seminars/conferences/symposia on VPET for the industry.

10. To advise on the publicity relating to the activities of the Training Board and relevant VPET programmes of VTC.

11. To administer relevant training schemes and programmes as commissioned by the Government.

12. To submit to the Council an annual report on the Training Board's work, its recommendations on the strategies for programmes in the relevant disciplines and a business plan of the training schemes and programmes mentioned in 11 above.

13. To undertake any other functions delegated by the Council in accordance with section 7 of the Vocational Training Council Ordinance.

Appendix 3

Membership of Working Party on Manpower Survey

Convenor

Mr LAI Kai-tung Robert

Members

Dr CHENG Chung-ngam Rocky
Ms FUNG Ka-po Karen
Mr HO Kwok-wai Argon
Mr LEE King-chung
Mr LEUNG Yip-hung
Mr LIO Weng-tong Felix
Ms Gracie NG
Mr SHEU Chun-fat Fred
Mr TAM Kwok-kiu Edwin
Mr WONG Wing-kwan Ivan
Dr YAU Bun
Mr PUN Si-keung Jason *(since 19 December 2022)*
Mr WAH Kwok-kee Gavin *(up to 18 December 2022)*
Mr CHAN Hon-kwong Boer *(up to 30 June 2022)*
Mr LEUNG Siu-kwun Alexander *(since 18 July 2022)*
Mr LI King-lok Kevin *(up to 30 June 2022)*
Ir Dr HUI Yan-keung John *(since 15 August 2022)*
Dr LEUNG Hing-pong Joseph *(up to 14 August 2022)*

Secretary

Ms CHAN Chung-man Gaby *(since 19 September 2022)*
Ms LEUNG Kin-tsui Jessy *(up to 18 September 2022)*

Terms of reference of the Working Party on Manpower Survey

1. To review the scope of the survey and sample size.

2. To advise on the sampling plan and design of the survey questionnaire.

3. To review and prepare the survey documents.

4. To advise on the formulation of recommendations in the light of the survey findings and business outlook of the economy.

5. To advise on the draft survey report to be submitted to the Innovation and Technology Training Board for endorsement.

Appendix 4

Definition of Terms

Innovation and Technology	"Innovation and Technology" refers to those technologies that create new user experience or improve product performance that bring social and economic value.
Research and Development	"Research and Development activities" refers to creative works undertaken on a systematic basis so as to increase the stock of knowledge for devising new or improved products / processes / applications.
Employees	"Employees" refer to persons who are under the payroll of the sampled establishment / company for the specified job, disregarding whether the employees are deployed to work in other places (including the mainland of China).
Full Time Employees	"Full Time Employees" refer to those working full-time (i.e. at least 4 weeks a month, and not less than 18 hours in each week) under the payroll of the establishment. These include proprietors and partners working full-time for the establishment.
Freelancers	A "freelancer" is a person who pursues a profession without a long-term commitment to any particular employer in the sector. Freelancers may be engaged on a daily, an hourly or a project basis.
Vacancies	"Vacancies" refer to those unfilled, immediately available job openings for which the establishment is actively trying to recruit personnel at the time of survey.
Vacancy Rate	"Vacancy rate" refer to the vacancies as a percentage of the total number of employees and vacancies.
Average Monthly Remuneration Package	"Average monthly remuneration package" refers to the average monthly remuneration package during the past 12 months before enumeration, including basic salary, overtime pay, cost of living allowance, meal allowance, housing allowance, travel allowance,

	commission and bonus. It is an average figure among employees engaging in the same principal job.
Turnover Rate	"Turnover rate" refer to the number of employees left as a percentage of the total number of employees and vacancies.
Postgraduate Degree	"Postgraduate degree" refers to a higher degree(s) (e.g. master degree) offered by local or non-local education institutions, or equivalent.
First Degree	"First degree" refers to the first degree(s) offered by local or non-local education institutions, or equivalent.
Sub-degree	"Sub-degree" refers to the Associate Degree, Higher Diploma, Professional Diploma, Higher Certificate, Endorsement Certificate, Associateship or equivalent programmes offered by local or non-local institutions.
Diploma / Certificate	"Diploma / certificate" refers to technical and vocational education programmes, including Diploma / Certificate courses, Diploma of Foundation Studies, Diploma of Vocational Education and programmes at the craft level or equivalent.
Secondary 4 to 7	"Secondary 4 to 7" refers to the education programmes under the Hong Kong Certificate of Education Examination (HKCEE), the Hong Kong Diploma of Secondary Education (HKDSE) Examination, Diploma Yi Jin, or equivalent.
Secondary 3 or below	"Secondary 3 or below" refers to secondary 3 or below, or equivalent.

Vocational Training Council 職業訓練局

Headquarters (Industry Partnership) 總辦事處(行業合作)
30F, Billion Plaza II, 10 Cheung Yue Street, Cheung Sha Wan, Kowloon, Hong Kong
香港九龍長沙灣長裕街10號億京廣場2期30樓
www.vtc.edu.hk

Telephone No 電話 Facsimile No 傳真

Our Reference 本局檔號 ITTB MPS (2022) Your Reference 來函檔號

1 April 2022

Dear Sir/Madam,

The 2022 Manpower Survey of the
Innovation and Technology Sector

The Innovation and Technology Training Board (the Training Board) of the Vocational Training Council (VTC), was set up by the Government of the Hong Kong Special Administrative Region (HKSAR), is responsible for matters pertaining to manpower training in the industry. In order to collect the latest manpower information for formulating recommendations on future manpower training, the Training Board will conduct the captioned survey from **April to May 2022**. I am writing to enlist your help by providing the relevant information to the survey and your co-operation would be much appreciated.

I enclose the following documents for your reference and completion:

(a) The Questionnaire;
(b) Explanatory Notes (Appendix A);
(c) Description for the Principal Jobs (Appendix B); and
(d) Types of Training under Column (G) of Part I (Appendix C).

The VTC has appointed **Mercado Solutions Associates Ltd. (MSA)** to assist in conducting the above survey. During the survey period, the enumerator of **MSA** will contact your establishment for the survey and answer the questions you may have. If necessary, visit will be made to your establishment to assist in completing and collecting the questionnaire. Alternatively, you may return the copy of the completed questionnaire to **MSA** via fax (2538 8123) or email (ms@mercadosolutions.com).

I assure you that the information provided will be handled **in strict confidence** and published on aggregate basis without reference to individual establishments.

The Survey Report will be uploaded onto the VTC website after completion of the survey. Should you have any queries, please do not hesitate to contact the following hotline during 9:30 a.m. to 6:00 p.m. from Monday to Friday:

- ✧ For matters regarding completion and return of questionnaire(s), please contact Ms. LI of **MSA** at 2538 8150.
- ✧ In case you want to approach VTC directly, please contact Mr. Edward CHAN of **VTC Manpower Survey (Statistical Team)** at 3907 6862.

Yours faithfully,

(LAI Kai-tung, Robert)
Chairman
Innovation and Technology Training Board

Encl.

Vocational Training Council 職業訓練局

Headquarters (Industry Partnership) 總辦事處(行業合作)
30F, Billion Plaza II, 10 Cheung Yue Street, Cheung Sha Wan, Kowloon, Hong Kong
香港九龍長沙灣長裕街10號億京廣場2期30樓
www.vtc.edu.hk

Telephone No 電話　　Facsimile No 傳真

Our Reference 本局檔號 ITTB MPS (2022)　　Your Reference 來函檔號

執事先生／女士：

2022 年創新及科技人力調查

職業訓練局（VTC）屬下創新及科技訓練委員會（下稱本會）由香港特別行政區政府成立，負責就業內人力訓練事宜提供意見。本會將於 **2022 年 4 月至 5 月**期間進行上述調查，蒐集業內人力情況的最新資料，並按此為未來人力訓練制訂適當建議。謹代表本會致函，懇請　貴機構惠予合作提供相關資料，以便進行上述人力調查。

茲夾附下述文件，供　貴機構參閱及填寫：

(1) 調查問卷；
(2) 附註（附錄 A）；
(3) 主要職務工作說明（附錄 B）；及
(4) 第一部份（G）欄內訓練種類說明（附錄 C）。

VTC已委託**米嘉道資訊策略有限公司(米嘉道)**協助進行是次調查。調查期間，**米嘉道**的統計員將聯絡　貴機構進行訪問及解答相關問題。如有需要，統計員會造訪　貴機構協助填寫並收回已填妥的問卷。　貴機構亦可將完成的問卷，以傳真（2538 8123）或電郵(ms@mercadosolutions.com) 交回**米嘉道**。

調查所得的資料將**絕對保密**，本會在發表報告時，只會公布合計數字，不會提及個別機構情況。

調查報告將於調查完結後上載VTC網頁。如對調查有任何查詢，請於星期一至五，上午九時半至下午六時聯絡以下人士：

- ✧ 如欲查詢有關填寫及寄回問卷事宜，請與**米嘉道**李小姐聯絡（電話：2538 8150）。
- ✧ 如希望直接與VTC聯絡，請致電**VTC人力調查（統計組）**陳兆銘先生（電話：3907 6862）。

創新及科技訓練委員會
主席
黎啟東

二〇二二年四月一日
附件

Serial No.

CONFIDENTIAL WHEN ENTERED WITH DATA	填 入 數 據 後 即 成 機 密 文 件

VOCATIONAL TRAINING COUNCIL
職 業 訓 練 局

THE 2022 MANPOWER SURVEY OF THE INNOVATION AND TECHNOLOGY SECTOR
創新及科技業2022年人力調查

The 2022 Manpower Survey of the Innovation and Technology[1] Sector aims at collecting manpower information of the sector concerned for formulating recommendations on future manpower training.
The survey cover the employees engaged in

(i) Research & Development (R&D)[2] and

(ii) Information Technology (IT).

Please provide the information of your establishment as at **1st April 2022** by answering the questionnaire. Thank you.

創新及科技業[1] 2022年人力調查旨在蒐集業內人力情況的最新資料，並按此為未來人力訓練制訂適當建議。
這項調查涵蓋從事

(i) 研究與開發活動[2] 及

(ii) 資訊科技 的員工。

懇請 貴機構根據**2022年4月1日**的人力情況填寫此問卷。多謝合作。

Notes: 1 "Innovation and Technology" refers to those technologies that create new user experience or improve product performance that bring social and economic value.
註 創新科技是指那些能夠帶來社會及經濟價值的創新用戶體驗或改良產品效能的科技。

2 "Research and Development" refers to creative works undertaken on a systematic basis so as to increase the stock of knowledge for devising new or improved products/processes/applications.
研發活動是指在有系統的基礎上進行具創造性的工作。這些工作的目的是為增進知識以發明或改進產品、程序或其相關的用途。

Establishment Information
機構資料

NATURE OF BUSINESS: _____ (For official use) Industry Code _____
業務性質

TOTAL NO. OF PERSONS ENGAGED: _____
僱員總人數

Details of Contact Person*
聯絡人資料*

NAME OF PERSON TO CONTACT: _____ POSITION: _____
聯絡人姓名 職位

TEL. NO. : _____-_____ FAX NO. : _____
電話 圖文傳真

E-MAIL : _____
電郵

** The information provided will be used for the purpose of this and subsequent manpower surveys.*
所提供資料將用作是次及日後人力調查之用。

Survey Reference Date : 1st April 2022
統計日期 : 2022 年4月1日

Part I – Manpower information
第一部份 – 人力情況

Please complete columns 'B' to 'G' of the questionnaire according to the list of principal jobs by referring to Appendix B for job description of individual job.
請根據列表中的主要職務，並參考附錄B有關各種職務的工作說明來填寫表內各欄 'B' 至 'G'。

Principal Jobs (Full-time employees) 主要職務 (全職僱員)

Job Code 職位編號	(A) Principal Job 主要職務 (See Appendix B) （參閱附錄 B）	(B) No. of **Full-time Employees** as at Survey Reference Date 在統計日期的**全職僱員**人數	(C) No. of Vacancies as at Survey Reference Date 在統計日期的空缺額	(D) Average **Monthly** Remuneration Package **每月**平均薪酬 Code 編號 1 $90,001 or more 或以上 2 $50,001-$90,000 3 $30,001-$50,000 4 $20,001-$30,000 5 $10,001-$20,000 6 $10,000 or below 或以下	(E) **Preferred** Level of Education 僱員**宜有**的教育程度 Code 編號 1 Postgraduate Degree 研究生學位 2 First Degree 學士學位 3 Sub-degree (e.g. Higher Diploma) 副學位 4 Diploma/Certificate 文憑／證書 5 Secondary 4 to 7 中四至中七 6 Secondary 3 or below 中三或以下	(F) **Preferred** Years of Relevant Experience 僱員**宜有**的相關年資 Code 編號 1 10 yrs or above 十年或以上 2 6 yrs to less than 10 yrs 六年至十年以下 3 3 yrs to less than 6 yrs 三年至六年以下 4 1 yr to less than 3 yrs 一年至三年以下 5 Less than 1 yr 一年以下 6 No experience 無須經驗	(G) Training Needs of Full-time Employees in the Next 12 Months (Please select up to three options) 未來十二個月全職僱員的訓練需求 (可選最多三項) Code 編號 (See Appendix C) (參閱附錄C)		
		Please enter a zero '0' in the box if no employee/vacancy. 如沒有僱員／空缺，請在方格內填入 '0'。								
e.g.: 例子:	**Job Title A (2 employees and 1 vacancy) 職位甲 (2名僱員及1個空缺)**	**2**	**1**	**3**	**2**	**4**	**02**	**05**	
	(A) Research and Development 研究與開發 *"Research and Development activities" refers to creative works undertaken on a systematic basis so as to increase the stock of knowledge for devising new or improved products/processes/applications. 研發活動是指在有系統的基礎上進行具創造性的工作。這些工作的目的是為增進知識以發明或改進產品、程序或其相關的用途。*								
	Research and Development (Non-IT related) 研究與開發 (與資訊科技不相關)								
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師								
002	R&D Technician 研發技術員								
003	R&D Assistant 研發助理								
	Research and Development (IT related) 研究與開發 (與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師								
052	R&D Technician 研發技術員								
053	R&D Assistant 研發助理								
	(B) Information Technology 資訊科技								
	General IT Management 總資訊科技管理								
101	Head of IT 資訊科技主管								
102	Chief Technology Officer (CTO) 首席技術總監								
	Software Development 軟件開發								
201	Systems Development Manager 系統開發經理								
202	Systems Architect 系統架構師								
203	Project Manager 項目經理								
212	Systems Analyst 系統分析師								
213	Business Analyst 業務分析師								
214	Analyst Programmer 分析程式員								
205	Programmer 程式編製員								

Job Code 職位編號	(A) Principal Job 主要職務 (See Appendix B) （參閱附錄 B）	(B) No. of **Full-time Employees** as at Survey Reference Date 在統計日期的**全職僱員**人數 Please enter a zero '0' in the box if no employee/vacancy. 如沒有僱員／空缺，請在方格內填入 '0'。	(C) No. of Vacancies as at Survey Reference Date 在統計日期的空缺額	(D) Average **Monthly** Remuneration Package **每月**平均薪酬 Code 編號 1 $90,001 or more 或以上 2 $50,001-$90,000 3 $30,001-$50,000 4 $20,001-$30,000 5 $10,001-$20,000 6 $10,000 or below 或以下	(E) **Preferred** Level of Education 僱員**宜有**的教育程度 Code 編號 1 Postgraduate Degree 研究生學位 2 First Degree 學士學位 3 Sub-degree (e.g. Higher Diploma) 副學位 4 Diploma/Certificate 文憑／證書 5 Secondary 4 to 7 中四至中七 6 Secondary 3 or below 中三或以下	(F) **Preferred** Years of Relevant Experience 僱員**宜有**的相關年資 Code 編號 1 10 yrs or above 十年或以上 2 6 yrs to less than 10 yrs 六年至十年以下 3 3 yrs to less than 6 yrs 三年至六年以下 4 1 yr to less than 3 yrs 一年至三年以下 5 Less than 1 yr 一年以下 6 No experience 無須經驗	(G) Training Needs of Full-time Employees in the Next 12 Months (Please select up to three options) 未來十二個月全職僱員的訓練需求 (可選最多三項) Code 編號 (See Appendix C) (參閱附錄C)		
	Software Development 軟件開發									
204	UI/UX Designer 用戶界面、用戶體驗設計師									
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師									
208	Software Product Engineer 軟件產品工程師									
210	Technical Writer 技術撰稿員									
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員、電腦動畫設計師、網頁圖像設計師、視覺效果設計師									
	Communications and Networks 通訊及網絡									
301	Network Manager 網絡經理									
302	Mobile Network Engineer 流動網路工程師									
303	Network Engineer 網絡工程師									
304	Network Administrator 網絡管理員									
	IT Security 資訊保安									
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專責專家、資訊保安專責專家									
407	Cybersecurity Specialist 網絡安全專責專家									
	Technical Services 技術服務									
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師									
404	Services Support Manager 服務支援經理									
405	Service Engineer 服務工程師									
406	Service Technician 服務技術員									
	Data Management 數據管理									
801	Data Scientist 數據科學家									
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員									

Job Code 職位編號	(A) Principal Job 主要職務 (See Appendix B) （參閱附錄 B）	(B) No. of **Full-time Employees** as at Survey Reference Date 在統計日期的**全職僱員**人數	(C) No. of Vacancies as at Survey Reference Date 在統計日期的空缺額	(D) Average **Monthly** Remuneration Package **每月**平均薪酬 Code 編號 1 $90,001 or more 或以上 2 $50,001-$90,000 3 $30,001-$50,000 4 $20,001-$30,000 5 $10,001-$20,000 6 $10,000 or below 或以下	(E) **Preferred** Level of Education 僱員**宜有**的教育程度 Code 編號 1 Postgraduate Degree 研究生學位 2 First Degree 學士學位 3 Sub-degree (e.g. Higher Diploma) 副學位 4 Diploma/Certificate 文憑／證書 5 Secondary 4 to 7 中四至中七 6 Secondary 3 or below 中三或以下	(F) **Preferred** Years of Relevant Experience 僱員**宜有**的相關年資 Code 編號 1 10 yrs or above 十年或以上 2 6 yrs to less than 10 yrs 六年至十年以下 3 3 yrs to less than 6 yrs 三年至六年以下 4 1 yr to less than 3 yrs 一年至三年以下 5 Less than 1 yr 一年以下 6 No experience 無須經驗	(G) Training Needs of Full-time Employees in the Next 12 Months (Please select up to three options) 未來十二個月全職僱員的訓練需求 (可選最多三項) Code 編號 (See Appendix C) (參閱附錄C)		
		Please enter a zero '0' in the box if no employee/vacancy. 如沒有僱員／空缺，請在方格內填入 '0'。								
	Infrastructure and Operations Support 基建和操作支援									
501	IT Operations Manager 資訊科技操作經理									
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任									
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員									
506	User Support 用戶支援									
	IT Education and Training 資訊科技教育及訓練									
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任									
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員									
	IT Sales and Marketing 資訊科技銷售及市場推廣									
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理									
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表									
703	IT Product Promotion Representative 資訊科技產品推廣代表									
	Other Relevant Staff 其他相關員工									
	For Official use									

Part II
第二部份

Other staff
其他員工

1. Please indicate how many freelancers and personnel from outside contractor are working in the area of **Information Technology** as at Survey Reference Date.
請填寫在統計日期 **從事資訊科技工作** 的自由工作者及來自外判公司的員工數目。

Post (Please refer to the principal job in Part I) **職位 (請參考第一部份之主要職務)**	**Freelancers#** **自由工作者#**	**Seconded from outside contractor (In full-time equivalent)** **從外判公司派遣 (以全職額計算)**

 # A freelancer is a person who pursues a profession without a long-term commitment to any particular employer in the sector. Freelancers may be engaged on a daily, an hourly or a project basis.
「自由工作者」指並無與任何僱主建立長期僱傭關係的人士。自由工作者可以日薪、時薪或按項目收取報酬。

New Recruitment
新聘僱員

2. Please state the number of full-time employees **newly recruited** in the following areas in the past 12 months.
請列出 貴公司在過去十二個月內於下列工作範疇**新招聘**的全職僱員人數。

	Research and Development **研究與開發**	**Information Technology** **資訊科技**
(a) Total new recruits 新招聘總人數		
(b) Number of new recruits **from** 新招聘僱員中，**來自**		
(i) an Research and Development / Information Technology position from another company 另一間機構而擔任研究與開發／資訊科技職務者		
(ii) fresh graduates of Information Technology / Research and Development related discipline 應屆資訊科技／研究與開發相關學科之畢業生		

Employees Left
僱員離職

3. Please state the number of full-time employees working in the following areas who have **left** in the past 12 months.
請列出 貴公司在過去十二個月內於下列工作範疇**離職**的全職僱員人數。

(a) Research and Development
研究與開發 [ ]

(b) Information Technology
資訊科技 [ ]

Major Difficulties Encountered in Recruitment
主要招聘困難

4. Please indicate the difficulties encountered in recruitment of full-time employees of your establishment in **past 12 months**.
請指出　貴機構在**過去十二個月**招聘全職僱員時所遇到的困難。

☐ (a) No recruitment was taken place
沒有招聘

☐ (b) Recruitment was taken place and **did not encounter difficulties**
有招聘，並**沒有**遇到招聘困難

(c) Recruitment was taken place and the difficulties encountered were: (You may tick "✓" one or more options.)
有招聘，所遇到的困難是：（可剔"✓"選多於一項。）

☐ (i) Candidates lacked the relevant skills/experience
應徵者並無相關技能／經驗

☐ (ii) Candidates lacked the relevant academic qualification and credential
應徵者未具相關學歷及專業資格

☐ (iii) Candidates' language skills (including Putonghua) were not up to expectation
應徵者語文能力（包括普通話）不夠水平

☐ (iv) Candidates found the remuneration package not attractive
應徵者認為薪酬欠吸引

☐ (v) Others (please specify)
其他（請說明）_____

Research and Development
研究與開發

5. Does your company engage in Research and Development work*?
貴公司有否從事研究與開發方面的工作*？

☐ No 沒有 → Please go to question 6 請跳至第 6 題

☐ Yes 有

(i) Please indicate how many employees **(in full-time equivalent)** are engaging in the area of Research and Development work*.
請填寫從事研究與開發工作*的員工數目。**(以 全職額 計算)** ☐

(ii) Please indicate the type of Research and Development work* your establishment is engaged in. (You may tick "✓" one or more options.)
請指出 貴公司從事那些類型的研究與開發工作*。（可剔"✓"選多於一項。）

☐ (a) Information Communications Technology
資訊及通訊科技

☐ (b) Biomedical Technology
生物醫療

☐ (c) Electronics
電子

☐ (d) Green Technology
綠色科技

☐ (e) Material and Precision Engineering
新物料及精密工程

☐ (f) Financial Technology
金融科技

☐ (g) Digital entertainment/E-sports
電子競技/ 數碼娛樂

☐ (h) Smart Living
智慧生活

☐ (i) Others (Please Specify)
其他（請註明）_____

* *"Research and Development activities" refers to creative works undertaken on a systematic basis so as to increase the stock of knowledge for devising new or improved products/processes/applications.*
研發活動是指在有系統的基礎上進行具創造性的工作。這些工作的目的是為增進知識以發明或改進產品、程序或其相關的用途。

Expected Change in the next 12 Months
未來十二個月的預期變化

6. When comparing with now, please indicate the expected change in the number of employees working in the following areas of your establishment and its percentage changes **in the next 12 months**. (Please tick in the box as appropriate)
相對於現在，請指出 貴公司在**未來十二個月**於下列工作範疇的員工數目及其百分比之預期變化。
(請在適當的格內填上"✓"號)

(i) Research and Development employees
研究與開發人員

☐ (a) Increase 增加 ＋ %
☐ (b) Same 不變
☐ (c) Decrease 減少 - %
☐ (d) No relevant personnel 沒有相關員工

(ii) Information and Technology employees
資訊科技人員

☐ (a) Increase 增加 ＋ %
☐ (b) Same 不變
☐ (c) Decrease 減少 - %
☐ (d) No relevant personnel 沒有相關員工

7. Is your company an Innovation and Technology products and services supplier or a communications services company? (Please tick in the box as appropriate)
貴公司是否一間創新及科技產品及服務供應商或通訊服務公司? (請在適當的格內填上"✓"號)

☐ Yes 是

→ (i) Please indicate your views on the expected change in **business situation** of your establishment **in the next 12 months** and indicate the reasons leading to the change.
請指出 貴公司預計在 **未來十二個月** 之 **業務狀況** 的變化及其變化的原因。

☐ Better 較佳 (Please state reasons (請說明原因 _____)
☐ Stable 穩定
☐ Worsen 較差 (Please state reasons (請說明原因 _____)
☐ Uncertain 不肯定

☐ No 否

→ (ii) Please indicate your views on the expected change in **IT requirements** (e.g. demand on capabilities of IT infrastructure, systems, solutions or services, adoption of IT skills, etc.) of your establishment **in the next 12 months** and indicate the reasons leading to the change.
請指出 貴公司在預計**未來十二個月**對**資訊科技需求(**例如:資訊科技基建、系統、解決方案或服務能力的要求或資訊科技技能應用等)變化及其變化的原因。

☐ Increase 增加 (Please state reasons (請說明原因 _____)
☐ Same 不變
☐ Decrease 減少 (Please state reasons (請說明原因 _____)
☐ Uncertain 不肯定

End of Questionnaire. Thank You for Your Co-operation.
問卷完，多謝合作。

The 2022 Manpower Survey of the Innovation and Technology Sector
創新及科技業2022年人力調查

Explanatory Notes
附 註

Part I
第一部份

1. Principal Jobs - Column 'A'
主要職務 —— 'A' 欄

(a) Please go through column 'A' and mark those principal jobs applicable to your establishment. For detailed job descriptions for principal jobs, please refer to Appendix B.
請瀏覽 'A' 欄，選取適用於 貴機構的主要職務。有關詳細的工作說明，請參閱附錄B。

(b) Please add in column 'A' titles of any principal jobs not mentioned in job descriptions (Appendix B); briefly describe them in respect of the appropriate job categories.
如 貴機構另有技術性主要職務未載於工作說明（附錄B），請一併填入 'A' 欄內，並簡述其所屬的職務類別及等級。

(c) Please note that some of the job titles may not be the same as those used in your establishment. Please classify an employee according to his/her major duty and supply the required information if the jobs have similar or related functions.
調查表內部分職稱可能有別於 貴機構所採用。請根據僱員的主要職責分類。若員工職責與表內某 職務的職責相近，可視作相同職務，請提供所需資料。

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(d) In the event where an employee's duties in your company are split between two or more job titles, please use the job title that best describes his/her principal responsibility.
如 貴公司有員工身兼多項職責，請選用最能反映其主要職責的職稱。

(e) Hardware/software sales employees with technical knowledge in IT products and services should be included and grouped under the job category "IT Sales and Marketing".
請將具有資訊科技產品／服務專業知識的電腦軟、硬件銷售人員包括在「資訊科技銷售及市場推廣」職務類別之下。

2. Number of Full-time Employees as at Survey Reference Date – Column 'B'
在統計日期的全職僱員人數 —— 'B' 欄

For each principal job, please fill in the total number of full-time employees (excluding freelancers) as at survey reference date. The permanent employees include all those under the company's payroll, disregarding whether the employees are deployed to work in other places (including the mainland of China).
請填寫 貴機構於統計日期僱用的每個主要職務的僱員總數（不包括自由工作者）。長期僱員包括在 貴公司人事編制內的所有僱員，不論是否有調往其他地方工作（包括中國內地）。

3. Number of Vacancies as at Survey Reference Date – Column 'C'
在統計日期的空缺額 —— 'C' 欄

Please fill in the total number of existing vacancies as at survey reference date. "Existing Vacancies" refer to those unfilled, immediately available job openings for which the company is actively trying to recruit personnel as at survey reference date.
請填上在統計日期每一主要職務的空缺額。「統計日期的空缺額」是指該職位於統計日期仍懸空，須立刻填補，而現正積極招聘人員填補。

4. Average Monthly Remuneration Package – Column 'D'
每月平均薪酬 ——— 'D' 欄

Please enter the code of average monthly income during the past 12 months for each principal job of full time employee(s). This should include basic salary, overtime pay, cost of living allowance, meal allowance, housing allowance, travel allowance, commission and bonus. If you have more than one employee doing the same job, please enter the average range.
請在'D' 欄填入每個主要職務的全職僱員過去 12 個月每月平均薪酬的編號。這包括底薪、逾時工作津貼、 生活津貼、膳食津貼、房屋津貼、旅行津貼、佣金及花紅。如 貴機構有多於一名僱員擔任同一主要職務， 則請取平均收入。

5. Preferred Level of Education of Employees - Column 'E'
僱員宜有的教育程度 'E'欄

Please enter the code of preferred level of education for each principal job of full time employees.
請在'E' 欄填入 貴機構認為每個主要職務全職僱員宜有的教育程度編號。

Definition of Preferred Level of Education:
宜有的教育程度的定義：

- "Postgraduate Degree" refers to higher degrees (e.g. master degrees) offered by local or non-local education institutions, or equivalent.
  「研究生學位」是指本地或非本地教育機構提供的高等學位（如碩士學位），或同等教育程度。
- "First Degree" refers to First degrees offered by local or non-local education institutions, or equivalent.
  「學士學位」是指本地或非本地教育機構提供的學士學位，或同等教育程度。
- "Sub-degree" refers to Associate Degrees, Higher Diplomas, Professional Diplomas, Higher Certificates, Endorsement Certificates, Associateship or equivalent programmes offered by local or non-local education institutions.
  「副學位」是指本地或非本地教育機構提供的副學士、高級文憑、專業文憑、高級證書、增修證書、 院士銜或同等課程。
- "Diploma/Certificate" refers to technical and vocational education programmes including Diploma/Certificate courses, Diploma of Foundation Studies, Diploma of Vocational Education and programmes at the craft level, or equivalent.
  「文憑／證書」是指技術及職業教育課程之文憑／證書、基礎課程文憑、職專文憑及技工程度的課程， 或同等教育程度。
- "Secondary 4 to 7" refers to Secondary 4-7, covering the education programmes in relation to the Hong Kong Certificate of Education Examination (HKCEE), the Hong Kong Diploma of Secondary Education (HKDSE) Examination, Diploma Yi Jin, or equivalent.
  「中四至中七」是指中四至中七（包括與香港中學會考、香港中學文憑考試、毅進文憑等相關的教育 課程）或同等教育程度。
- Secondary 3 or below" refers to Secondary 3 or below, or equivalent.
  「中三或以下」是指中三或以下，或同等教育程度。

6. Preferred Years of Relevant Experience - Column 'F'
僱員宜有的相關年資 'F'欄
Please enter the code of preferred years of relevant experience which your establishment requires each principal job employees to have.
請在'F' 欄填入 貴機構認為每個主要職務宜有的相關年資編號。

7. Training Needs of Full-time Employees in the Next 12 Months – Column 'G'
未來十二個月全職僱員的訓練需求 ——— 'G' 欄

Please enter the code showing the type of training which your company requires the full-time employees of each principal job to have in the next 12 months in order to meet the emerging trend of the industry. For the detailed types of training, please refer to Appendix C.
請在 'G' 欄填入編號，以反映 貴公司對每一主要職務的全職僱員在未來十二個月的訓練需求，以配合行業的新興趨勢。訓練種類的詳細說明，請參閱附錄C。

Part II
第二部份

8. Question 1 – Freelancers and Personnel from Outside Contractor
問題1 — 自由工作者及外判員工

Please fill in the number of freelancers and personnel from outside contractor (In full-time equivalent) are working in the area of Information Technology as at Survey Reference Date.
請填上 貴公司在統計日期，從事資訊科技工作的自由工作者及來自外判公司的員工(以全職額計算)數目。

9. Question 2 - New Recruitment
問題2 — 新聘僱員

- Please fill in the number of new recruits who engaged in Research and Development or Information Technology in the past 12 months.
  請填入在過去十二個月內 貴公司從事研究與開發或資訊科技之新招聘的僱員人數。
- Please fill in the number of new recruits from a Research and Development / Information Technology position from another company.
  請填入 貴公司的新招聘中，來自另一間機構擔任研究與開發／資訊科技職務的人數。
- Please fill in the number of new recruits who are fresh graduates of Information Technology or Research and Development related discipline.
  請填入 貴公司的新招聘中，應屆資訊科技／研究與開發之相關學科之畢業生人數。

10. Question 3 – Employees Leaving the Company
問題3—僱員離職

Please fill in the number of full time employees engaged in Research and Development or Information Technology who have left in the past 12 months.
請填上過去十二個月內在 貴公司從事研究與開發或資訊科技之全職僱員離職的人數。

11. Question 4 - Major Difficulties Encountered in Recruitment
問題4 — 主要招聘困難

Please indicate the difficulties encountered in recruiting employees engaged in Research and Development or Information Technology in the past 12 months.
請指出 貴公司在過去十二個月，在招聘從事研究與開發或資訊科技之僱員過程中遇上的困難。

12. Question 5 - Research and Development
問題5 — 研究與開發

(i) Please indicate how many employees (in full-time equivalent) are engaging in the area of Research and Development work.
以全職額計算，請填寫從事研究與開發工作的員工數目。

(ii) Please indicate the type of Research and Development work of your establishment
請指出 貴公司從事研究與開發工作的類型。

13. Question 6, 7 – Expected Change in the next 12 Months
問題6、7 —— 未來十二個月的預期變化

Q6) When comparing with now, please indicate the expected change in the number of employees working in R&D and IT of your establishment and its percentage changes in the next 12 months.
問題 6) 相對於現在，請指出 貴公司在未來十二個月於研究與開發及資訊科技範疇的員工數目及其百分比之預期變化。

Q7) Please indicate your views on the expected change in business situation / IT requirements of your establishment in the next 12 months and indicate the reasons leading to the change.
問題 7) 請指出 貴公司預計在未來十二個月之業務狀況／對資訊科技需求的變化及其變化的原因。

Appendix B
附 錄 B

The 2022 Manpower Survey of the
Innovation and Technology Sector
創新及科技業 2022 年人力調查

Job Descriptions of
Principal Jobs in the Innovation and Technology Sector
創新及科技業主要職務工作說明

Part A – Research and Development
A 部份 — 研究與開發

Code 編號	Principal Job 主要職務	Job Description 工作說明
RESEARCH AND DEVELOPMENT (Non-IT related) 研究與開發(與資訊科技 不相關)		
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	Engages directly in professional work of non-IT related R&D activities, those professionals with scientific or technological training. 直接參與跟資訊科技不相關的研發活動的專業工作的人員;指曾接受科學或技術訓練的專業人員。
002	R&D Technician 研發技術員	Participates in non-IT related R&D activities by performing scientific and technical tasks involving the application of concepts and operational methods, and usually under the supervision of researchers/scientists/engineers. 在研究員／科學家／工程師督導下，透過應用概念和運作方法，執行與資訊科技不相關的研發工程中的科學及技術任務。
003	R&D Assistant 研發助理	Engages directly with the performance of non-IT related R&D activities with skilled and semi-skilled technical knowledge. 直接參與跟資訊科技不相關的研發活動而具有熟練及半熟練技術知識的人員。
RESEARCH AND DEVELOPMENT (IT related) 研究與開發(與資訊科技 相關)		
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	Engages directly refer to in professional work of IT related R&D activities, those professionals with scientific or technological training. 直接參與跟資訊科技相關的研發活動的專業工作的人員;指曾接受科學或技術訓練的專業人員。
052	R&D Technician 研發技術員	Participates in IT related R&D activities by performing scientific and technical tasks involving the application of concepts and operational methods, and usually under the supervision of researchers/scientists/engineers. 在研究員／科學家／工程師督導下，透過應用概念和運作方法，執行與資訊科技相關的研發工程中的科學及技術任務。
053	R&D Assistant 研發助理	Engages directly with the performance of IT related R&D activities with skilled and semi-skilled technical knowledge. 直接參與跟資訊科技相關的研發活動而具有熟練及半熟練技術知識的人員。

Part B – Information Technology
B 部分 — 資訊科技

Code 編號	Principal Job 主要職務	Job Description 工作說明
GENERAL MANAGEMENT 一般資訊科技管理		
101	Head of IT 資訊科技主管 (incl. CIO, IT Director, IT Manager, MIS Director, MIS Manager， IS Director; IS Manager) (包括：資訊科技總監、首席資訊總監、資訊科技董事、資訊科技經理、管理資訊系統董事、管理資訊系統經理、資訊系統董事、資訊系統經理)	Focuses on strategic planning as well as manages overall IT functions including application system, office automation and communication networks, services delivery and end user support to meet the business/organisation objectives in the most cost-effective manner in IT User Organisations. 受僱於資訊科技用戶機構，負責制定策略及管理所有資訊科技工作，包括：應用系統、辦公室自動化及通訊網絡、提供服務、支援終端用戶，以最具成本效益方式達到業務／機構目標。
102	Chief Technology Officer (CTO) 首席技術總監 (incl. Technical Director, Technical Manager) (包括: 技術總監、技術經理)	Responsible for the technology direction and strategic roadmap of the company's products and services in IT & Communications Services Organisations. 受僱於資訊科技及通訊服務機構,負責公司產品和服務的技術方向及發展路向。
SOFTWARE DEVELOPMENT 軟件開發		
201	Systems Development Manager 系統開發經理 (incl. Development Manager, Software Development Manager, Systems Manager (Applications), Application Systems Manager) (包括：開發經理、軟件開發經理、系統經理（應用）、應用系統經理)	Analyses organisation functions and processes; designs IT applications and systems, customises package solutions to meet business objectives; manages all phases of the development life cycle including feasibility study, development, implementation and support. 分析機構內各種工作及程序;設計電腦應用軟件及系統或制定套裝方案，達致業務目標；管理系統開發各階段的工作，包括進行可行性研究、開發、推行及支援系統。
202	Systems Architect 系統架構師 (incl. IT Architect, Software Architect, Application Architect, Solutions Architect, Network Architect, Technical Architect) (包括：資訊科技架構師、軟件架構師、應用架構師、解決方案構師、網絡架構師、技術架構師)	Plans, analyses, designs, formulates, deploys, implements enterprise / complex ICT solutions and services including software engineering, application systems, database, servers/internetwork infrastructure, information security and cloud computing. 規劃、分析、設計、建立、部署、實施大型複雜資訊及通訊科技方案與服務，包括軟件工程、應用系統、數據庫、服務器/網際網絡基礎結構、資訊安全和雲計算。
203	Project Manager 項目經理 (incl. Project Director, PMO Manager, Project Leader/Lead, Scrum Master) (包括：項目總監、項目管理辦公室經理、項目組長、敏捷團隊負責人)	Manages specific IT development or services projects based on the user/customer requirements to ensure the implementation is on schedule and within budget; designs the processes that enable the management and service of various user/customer groups are satisfactory to meet the company's standards and requirements. 根據用戶／客戶要求，管理個別電腦開發或項目服務，確保如期推行，不會超出預算；設計工序，確保服務令用戶／客戶滿意，達到公司的標準及要求。
212	Systems Analyst 系統分析師	Gathers, studies, analyses user requirements; designs, develops, implements, enhances, tests, documents and manages application systems. Conducts systems integration test and be actively involved in user acceptance test. Supports and maintains production systems. Liaises, deals with management, users and vendors. 搜集、閱讀和分析用戶需求；設計、開發、實施、升級、測試、文書和管理應用系統。主持系統集成測試，積極參與用戶顏收測試。維護、支持已投產的應用系統。協調、對接用戶和供應商。

Code 編號	Principal Job 主要職務	Job Description 工作說明
213	Business Analyst 業務分析師	Gathers, studies and analyses user requirements; understands and interprets user requirements withbusiness sense, manages and streamlines business workflow and processes. Liaises and collaborates among management, business users and ICT technical team. 搜集、閱讀和分析用戶需求；憑商業知識來理解和解讀用戶需求；管控、精簡業務流程和步驟。在管理者、業務用戶和資訊及通訊團隊間進行溝通協調和協作。
214	Analyst Programmer 分析程式員 (incl. Programmer Analyst) (包括：程式分析員)	Assists in gathering, studying and analysing user requirements; assists in designing applications; develops, enhances, tests and documents applications. Supports and maintains production system. Conducts user training. 協助搜集、閱讀和分析用戶需求；協助系統設計；開發、升級、測試和文書應用系統。維護和支持已投產的應用系統。培訓用戶。
205	Programmer 程式編製員 (incl. Software Developer, Software Engineer, Application Developer, Web Developer, Full-stack Developer, Front-end Developer, Back-end Developer, Embedded Software/Firmware Developer) (包括：軟件開發員、軟件工程師、應用開發員、網頁開發員、全端/全棧開發員、前端開發員、後端開發員、嵌入式/固件開發員)	Develops and tests computer programs to meet business needs according to the requirements laid down by the functional and systems specifications; applies appropriate system and programming tools, and hardware to deliver cost efficient business solutions in all aspects. 根據功能及系統規格，開發及測試電腦程式，應付業務需要；應用合適的系統、程式編製工具及硬件，在各方面提供具成本效益的業務方案。
204	UI/UX Designer 用戶界面、用戶體驗設計師 (incl. Front-end Designer, Web Designer) (包括：前端設計師、網頁設計師)	Design user interfaces. Translates and documents the functional requirements based on user/customer requirements; performs system studies, analysis, design and implementation of computer systems to meet user/customer business and operational needs. 設計用戶界面。根據用戶／客戶要求，制定及記錄功能規格；負責電腦系統的研究、分析、設計及推行，應付用戶／客戶的業務／運作需要。
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、 軟件品質檢查工程師 (incl. QA Specialist, QA Engineer, Systems Auditor) (包括：質量保證專家、質量保證工程師、系統審查師)	Ensures that the development process and deliverables adhere to the quality and security conventions, standards and requirements laid down by the organisation, and/or the system specifications, whichever appropriate, and that the deliverables meet customer requirements. 確保開發程序及製成品符合機構或系統的質量和安全規格及要求，及／或製成品符合客戶的質量和安全要求。
208	Software Product Engineer 軟件產品工程師 (incl. Product Engineer, Product Specialist, Product Consultant, Application Engineer, Application Specialist, Application Consultant) (包括：產品工程師、產品專家、產品顧問、應用工程師、應用專家、應用顧問)	Works on the development of innovative products and user applications; investigates the use of emerging technology; and involves in collaboration with IT companies and/or user organisations to ensure that the developed product or application meets users' needs. 開發新產品及應用軟件；研究新科技的用途；與 電腦公司或用戶機構合作，確保所開發的產品或應用軟件符合用戶需要。

Code 編號	Principal Job 主要職務	Job Description 工作說明
210	Technical Writer 技術撰稿員	Plans, designs and writes user manuals and technical references for the company's range of hardware and software products; and/or involves in the writing of promotional material and newsletters for users. 為公司的軟、硬件產品策劃、設計及編寫用戶手冊及技術指南；及／或參與編寫客戶宣傳資料及通訊。
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師 (incl. Extended Reality Developer, Virtual Production Producer) (包括：延展實境開發員、虛擬製片製作人)	Designs and develops computer games or multimedia products in both programming and creative aspects; prepares creative designs (such as graphic designs, character designs, web designs, and animation designs) for multimedia production, computer game development, computer animation and digital visual effects. Designs, develops, configures and optimises extended reality software to meet market and/or client requirements in virtual reality/ augmented reality/ mixed reality. 負責電腦遊戲或多媒體產品於程式編寫和創作上的設計和開發；為多媒體製作、電腦遊戲開發、電腦動畫和數碼視覺效果籌劃創意設計 (例如: 圖像設計、角色造型設計、網頁設計和動畫設計)。設計，開發，配置和優化延展實境軟件，以滿足虛擬實境/增強現實/混合現實中的市場及/或客戶要求。
COMMUNICATIONS AND NETWORKS 通訊及網絡		
301	Network Manager 網絡經理 (incl. Telecommunications Manager) (包括：電訊經理)	Manages the data and voice networks through which IT services are delivered securely and effectively to meet the organisation's overall IT strategy, policy and standards; liaises/ manages and network carriers and vendors to acquire cost effective services to meet business needs. Translates requirements into properly engineered and tested communication solutions as part of the overall information system in the mixed software/ hardware area of communications/ networks technology. 管理數據及話音網絡，提供安全有效的資訊科技服務，以便符合機構的整體資訊科技策略、政策及標準；為獲取具成本效益的通訊服務，聯絡／管理網絡供應商，以便符合業務需求。因應通訊／網絡技術的需要，提供合適並且經過試驗的軟件／硬件，以配合整個資訊系統。
302	Mobile Network Engineer 流動網路工程師	Architects, setups, configures, analyses and troubleshoots mobile network. 建構、設置、配置、分析及檢修流動網絡。
303	Network Engineer 網絡工程師 (incl. Telecommunications Engineer, Network Architect, Network Officer, Network Consultant, Network Specialist) (包括：電訊工程師、網絡架構師、網絡主任、網絡顧問、網絡專家)	Plans and designs new communication software; installs new networks and services; analyses current and planned network usages; and recommends solutions to solve networking problems. 策劃及設計新通訊軟件；安裝新網絡及提供服務；分析現時及預計網絡使用率；建議方案解決網絡問題。
304	Network Administrator 網絡管理員	Administrates the applications network infrastructure and telephony (voice, data, wireless) systems; oversees the design and installation of wiring for these systems. 管理應用網絡基建及電話系統（話音、數據、無線）；監督有關系統的電線設計及安裝。

Code 編號	Principal Job 主要職務	Job Description 工作說明
IT SECURITY　資訊保安		
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、 資訊/信息安全專家 (incl. IT Security Consultant, IT Security Professional, IT Security Officer) (包括：資訊科技保安顧問；資訊科技保安專業人員；資訊保安主任)	Undertakes IT security risk assessment and audit and review on IT/network security, firewalls and intrusion detection; drafts the information security standards, policy and procedures; and ensures the implementation/work plans are always followed by the IT teams and departments. 負責安全風險評估及審核及檢討資訊／網絡保安、防火牆及侵入偵察設施；擬定資訊保安標準、政策及程序；確保各資訊科技團隊及部門嚴格遵守推行／工作計劃。
407	Cybersecurity Specialist 網絡安全專責專家 (incl. Cybersecurity Analyst, Cybersecurity Engineer, Cybersecurity Architect, Cybersecurity Consultant, Cloud Security Engineer) (包括：網絡安全分析員、網絡安全工程師、網絡安全架構師、網絡安全顧問、雲計算安全工程師)	Helps businesses by protecting their computer and networking systems from potential hackers and cyber-attacks. 通過保護企業的電腦和網絡系統免受潛在的黑客和網絡攻擊。
TECHNICAL SERVICES - SERVERS 技術服務 — 服務器		
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、 雲計算工程師	Specialises in the system support and maintenance for servers, which enable the use of system software for improving the system performance and quality of service. Develops and implements cloud services, migrates existing applications to the cloud on-premises. 專責服務器系統支援及維修，以便提高系統性能及服務質素。開發和實施雲應用服務。
TECHNICAL SERVICES - SERVICE SUPPORT 技術服務 — 支援服務		
404	Services Support Manager 服務支援經理 (incl. Managed Service Manager, Customer Engineering Manager) (包括：托管服務經理、客戶工程經理)	Manages a team of Service Engineers to provide service support in maintaining the service support of IT systems and networks for clients. 管理一組服務工程師，為客戶提供系統和網絡的服務支援。
405	Service Engineer 服務工程師 (incl. Field Service Engineer, Field Engineer, Managed Service Engineer, Customer Engineer) (包括：上門服務工程師、上門維修工程師、托管服務工程師、客戶工程師)	Provides services including installation of IT systems and networks, preventive and remedial maintenance to meet company/ customer service level expectations; provides first level troubleshooting training to customers. 提供符合公司或客戶要求的服務，包括安裝系統和網絡、預防及補救性維修；提供第一階段檢修訓練給客戶。
406	Service Technician 服務技術員	Carries out services including IT systems and networks, preventive and remedial maintenance, as directed by Service Engineer, to meet service level expectations. 按服務工程師指示，提供合乎要求的服務，包括系統和網絡安裝、預防及補救性維修。

Code 編號	Principal Job 主要職務	Job Description 工作說明
DATA MANAGEMENT 數據管理		
801	Data Scientist 數據科學家 (incl. Data Science Specialist, Data Engineer, Data Analyst, Chief Data Officer, Business Intelligence Specialist) (包括：數據科學家、數據工程師、數據分析員、總數據主任、商業智慧專家)	Finds and interprets data sources, manages large amounts of data, merges data sources, ensures consistency of data-sets, and creates visualisations to aid in understanding data. Builds mathematical models using data, presents and communicates data insights and findings to specialists and scientists in their team and if required, to a non-expert audience, and recommends ways to apply the data. 查找和解釋數據源，管理大量數據，合併數據源，確保數據集的一致性，並創建可視化以幫助理解數據。使用數據構建數學模型，向團隊中的專家和科學家展示和交流數據見解和發現，如果需要，向大眾展示和交流數據見解和發現，並推薦應用數據的方法。
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	Plans and controls the set-up and maintenance of database system to ensure a reliable and effective system environment for the development and operation of application systems requiring the database architecture. 策劃及管理數據庫或數據倉庫，提供完善服務，以便開發及運用應用系統。
INFRASTRUCTURE AND OPERATIONS SUPPORT 基建和操作支援		
501	IT Operations Manager 資訊科技操作經理 (incl. IT Infrastructure Manager, Computer Operations Manager, Computer Services Manager, Data Center Manager) (包括：IT 基建經理、電腦操作經理、電腦服務經理、數據中心經理)	Contributes to the planning of IT infrastructure and operations maintenance, service high availability and service management. Directs and controls the operations of all equipment and systems in order to provide accurate, secure and timely information processing to support the company business; works with internal colleagues/users on system development and technical services so as to provide efficient IT services to customers; provides vendor management. 負責 IT 基建設備和操作支援、運維、服務的高可用性和服務管理。監管資訊設備及系統的運作，提供準確、安全及適時的資訊處理服務，以便支援公司業務；與機構內部同事／用戶共同進行系統開發及技術服務，提供有效率的資訊科技服務給客戶；管理電腦供應商。
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、 操作支援主任 (incl. Help Desk Supervisor, Call Centre Technical Supervisor) (包括：求助台主任、技術呼叫中心主任)	Supervises shift team of operators and manages all areas of data centre operations; follows through Change and Problem Management on hardware, software and environment. May provide technical assistance through help desk hotline or call centre. 督導需輪班的電腦操作人員及管理資訊中心各方面的運作；貫徹執行硬件、軟件及環境的轉變及問題管理。可能提供求助中心和電話熱綫服務的技術支援。
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	Operates, monitors and supports computer systems to ensure high system availability and that scheduled events are executed. In small data centres, the responsibilities also include telecommunication and Help Desk. 操作、監控及支援電腦系統，以確保系統在高備用之中及其預定項目能順利執行。在小型資訊中心內，其職責亦包括電訊及求助台服務。

Code 編號	Principal Job 主要職務	Job Description 工作說明
506	User Support 用戶支援 (incl. Help Desk Representative, Call Centre Technical Support) (包括：求助台服務員、呼叫中心技術支援)	Provides technical support services to internal users or external clients, including desktop hardware, system and application software installation; upgrading; problem diagnosis and resolution over the phone/intranet/e-mail; and/or dispatches to user location, if necessary, to help solving the problems. 為機構內部用戶或外間客戶提供技術支援服務，包括：安裝桌面硬件、系統及應用軟件；系統升級；透過電話／內聯網／電郵診斷及解決問題；如有需要，或需造訪用戶協助解決問題。
IT EDUCATION AND TRAINING 資訊科技教育及訓練		
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	Provides education/training for pre-entry or post-entry IT personnel. 為資訊科技從業員提供職前或在職教育／訓練。
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	Provides training for users of IT systems. 為電腦系統用戶提供訓練。
IT SALES AND MARKETING 資訊科技銷售及市場推廣		
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	Sets sales/marketing strategy; advises the sales/marketing representatives on ways to improve their sales/marketing performance; maintains contact with dealers and distributors; analyses sales/marketing statistics gathered by their staff to determine IT sales/marketing potential and inventory requirements; monitors the preferences of customers. 設定銷售／市場策略；建議各種方法以改進銷售／市場代表的業績；保持與代理商及經銷商的聯絡；分析從員工所收集的銷售／市場統計，從而確定資訊科技銷售／市場潛力及存貨需求；監測客戶的喜好。
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表 (incl. Sales Engineer, Account Manager, Marketing Specialist) (包括：銷售工程師、客戶經理、市場代表)	Evaluates customers' business needs and determines areas where the company's IT product/services can complement theirs; explains to customers how the IT products/ services can solve their business problems; checks on proper equipment installation and delivery of services, and working with customers on future needs. 評估客戶業務需要及確定公司各方面的資訊科技產品／服務能配合客戶所需;向客戶說明資訊科技產品／服務如何能解決其業務問題；檢查設備安裝及服務提供是否正確，及制定客戶未來所需。
703	IT Product Promotion Representative 資訊科技產品推廣代表	Involves presenting and demonstrating company's IT products/services. 參與介紹及示範公司的資訊科技產品／服務。

The 2022 Manpower Survey of the
Innovation and Technology Sector
創新及科技業2022年人力調查

Types of Training under Column (G) of Part I
第一部份（G）欄內訓練種類

Enter in Column (G) the training needs of existing employees in the next 12 months according to the following codes:
請將　貴機構於未來十二個月對現職僱員的訓練需求，按下列編號填入(G)欄內：

Information Technology

資訊科技

Code Types of Training/Skills (See Page 4 for definition of each type of training/skills)
編號 訓練/技能種類 (參閱頁數4有關各項訓練/技能種類的說明)

1 Basic Office IT Skills
辦公室資訊科技基本技能

2 Applied Basic IT Tools for Business Processes
基本資訊科技工具在業務的應用

3 Application Development Tools/ Programming Languages
應用開發工具／編程語言
- 3.1 Java / Java Enterprise Edition (JEE)
- 3.2 Java Frameworks e.g. Spring, Struts2, Hibernate, etc.
- 3.3 .NET
- 3.4 C/C++, C#, Objective-C
- 3.5 PHP
- 3.6 HTML
- 3.7 JavaScript (including jQuery, ReactJS, AngularJS, etc.)
- 3.8 CSS
- 3.9 SQL
- 3.10 Other programming languages e.g. Python, R, Kotlin, Swift, etc.
其他程式語言，如 Python, R, Kotlin, Swift 等。

4 Object-Oriented Technology (OO)
物件導向技術

5 Service-Oriented Architecture (SOA)
服務導向架構

6 Linux/Unix & Open Source
Linux/Unix及源碼開放程式

7 Windows Platform Technology
視窗平台技術

8 Web Services , XML and JSON Development
網上服務、XML與JSON開發

9 Multimedia and Computer Graphics
多媒體及電腦圖像

10 Interactive Game Design/Development
互動遊戲設計／開發

11 Internet/Intranet/Web Development
互聯網／內聯網／網絡開發

12 IT Applications in Customer Relationship Management / Customer Engagement
資訊科技在客戶關係管理/客戶參與度的應用

13 Digital Marketing and E-Commerce
數碼市場推廣及電子商貿

14 Information and System Security
資訊及系統保安

15 Database
數據庫

16 Networking/Data Communications
網絡／數據通訊

17 Web Tools and Related Applications
萬維網工具及其相關應用

18 Mobile Computing
流動電腦應用

19 IT Infrastructure Library
資訊科技基礎架構標準庫(ITIL)

20 Radio Frequency Identification (RFID) Technologies
射頻識別(RFID)科技

21 IT Applications in Supply Chain Management (e-Logistics, e-Procurement)
資訊科技在供應鏈管理的應用（電子物流、電子採購）

22 IT Applications in Product Design
資訊科技在產品設計的應用

23 e-Learning Technology and Development
網上教學科技及開發

24 Project Management and Design
項目管理及設計

25 Software Quality (Capability Maturity Model Integration)
軟件質素（能力成熟度模型(CMMI)）

26 Understanding IT Practice in the Chinese Mainland
中國內地資訊科技業概況

27 Virtualisation and Cloud Computing
虛擬化及雲端運算

28 Data Science and Data Analytics
數據科學和數據分析

29 3D printing
3D 打印

30 Extended Reality
延展實境

31 Artificial Intelligence (AI)
人工智能

32 Internet of Things
物聯網

33 Financial Technology
金融科技

34 Robotic Process Automation
機器人流程自動化

35 Business Process Management
業務流程管理

36 Methodology and Approach involving Agile, DevOps, Docker and Containers
涉及敏捷(Agile)、開發營運 (DevOps)、應用容器引擎 (Docker) 和容器 (Containers) 的 方法

Soft-skills 軟性技能:

37 Strategic Management
策略管理

38 Marketing Management
市場營銷管理

39 Quality Assurance Skills
質素保證技能

40 Ethics and Professionalism
道德操守及專業精神

41 Management skills and leadership Skills
管理技能及領導技能

42 Business Communication Skills in Technology Sector
技術領域的商務溝通技能

43 Problem Solving Skills
解決問題的技能

44 Other IT-related Skills
其他與資訊科技有關的技能

Research and Development
研究與開發

45 Technical Skills
專業技能

46 Management Skills
管理技能

47 Knowledge related to licensing and patent application
專利受權及註冊申請知識

48 Research Methodology
研究方法

49 Design Thinking
設計思維

50 Other R&D Skills
其他研究與開發技能

Definition of Type of Training/Skills
訓練/技能種類的說明

Information Technology
資訊科技

1 Basic Office IT Skills
辦公室資訊科技基本技能

Basic Office IT Skills refer to skill sets associated with the office automation tools used by office staff and students to automate daily tasks and operation workflow. Office automation software cover word processor, spreadsheet, web browser, email, fax, scheduler, operating system, etc.
辦公室資訊科技基本技能指辦公室人員及學生日常使用自動化工具的技能。這些工具，如文字處理器、電子報表、瀏覽器、電郵、傳真、排程器、操作系統等軟件。

2 Applied Basic IT Tools for Business Processes
基本資訊科技工具在業務的應用

This category comprises the use of spreadsheet for automation and planning, database for accounting and business applications, word processor in office publications, and Internet in effective customer's communication to increase the productivity and services of the organisations.
這類科技有助提高生產力和加強服務，例如：利用電子報表取代人手處理及策劃各種步驟；借助數據庫處理賬目及發展業務； 以文字處理器協助出版工作； 透過互聯網與客戶有效聯繫。

3 Application Development Tools/ Programming Languages
應用開發工具／編程語言

Application development tools/languages are used to design and develop new custom applications or to modify or enhance customised or packaged applications.
用作設計和開發新的應用軟件，亦有用於修改和改良專門或套裝應用軟件。

3.1 Java / Java Enterprise Edition (Java EE)

Java technology creates applications running on a single computer or distributing among servers and clients on network. Java Enterprise Edition (Java EE), formerly known as Java 2 Platform, Enterprise Edition (J2EE), is a platform-independent, Java-centric environment for developing, building and deploying web-based enterprise applications. Java is also the language for Android mobile development. Popular Java Application Servers include WildFly (formerly known as JBoss), Tomcat, WebSphere and Weblogic, etc.
Java 技術可用作設計功能全面的應用程式；除能在獨立的電腦上運行，亦適合網絡服務器及客戶端使用。Java 平台企業版 (Java EE), 舊名 Java 2 企業版（ J 2 EE）是獨立於平台，以 Java 為中心的環境，用於網上開發，構建和線上網絡的企業應用軟件。Java 也是安卓手機開發的基本語言。主流的Java應用服務器有 WildFly (舊名 JBoss), Tomcat，WebSphere 和 Weblogic 等。

3.2 Java Frameworks e.g. Spring, Struts2, Hibernate, etc.

Java frameworks are bodies or libraries of prewritten codes used by developers to create apps using the Java programming language. A Java framework is a type of framework specific to the Java programming language, used as a platform for developing software applications and Java programs. Popular Java frameworks include Spring, Struts2 and Hibernate, etc.
Java 框架是一種 Java 程式設計語言的框架，可用作開發軟體應用和 Java 程式的平台。框架是一組充當範本或骨架的預編寫代碼庫，開發人員隨後可根據需要填寫自己的代碼來創建應用，使應用按照他們的預期進行工作。主流的 Java 框架有Spring, Struts2 和 Hibernate 等。

3.3 .NET

Microsoft .NET platform includes servers; building-block services (such as Web-based data storage) and device software. ASP.NET is the server-side web application framework. Visual C#， Visual Basic and Visual C++ are popular .NET languages. .NET framework takes the role as an application server.
微軟 NET 使用的平台包括服務器、組件式服務（如網上資料儲存）及電腦裝置軟件。ASP. NET 是服務器端網絡應用框架。Visual C# 、Visual Basic and Visual C++ 是常用的.NET 語言。.NET framework 扮演應用服務器的角色。

3.4 C/C++, C#, Objective-C

C is a general-purpose programming language that is popular, simple and flexible. It is machine-independent, structured programming language which is used extensively in various applications. C++ is an extension of C language and is used

to create computer programs and packaged software, such as games, office applications, graphics and video editors and operating systems. C/C++ is popular in systems and embedded programming. Microsoft C# is a multi-paradigm programming language that features strong typing, imperative, declarative, functional, generic, object-oriented and component-oriented disciplines. Apple Objective-C is the language supported by iOS and macOS.
C 是一種普及、簡單且靈活的通用編程語言。它是與機器無關的結構化編程語言，已在各種應用中廣泛使用。C ++ 是 C 語言的擴展，用於創建計算機程序和打包的軟件，例如游戲，辦公應用程序，圖形和視頻編輯器以及操作系統。C/C++ 是系統和嵌入式系統的主要編程語言。微軟C＃是一種多範式編程語言，具有強類型，命令式，聲明式，函數式，通用的，物件導向和組件為基礎的學科。蘋果Objective-C 是 iOS 和macOS 操作系統上的編程語言。

3.5 PHP

Hypertext Preprocessor is a scripting language used to create dynamic and interactive HTML web pages. A server processes PHP commands when a website visitor opens a page, then sends results to browser.
超文本預處理器是一種腳本語言，用於創建動態和交互式HTML網頁。網站訪問者打開頁面後，服務器會處理PHP命令，然後將結果發送到瀏覽器。

3.6 HTML

HTML (HyperText Markup Language) is the standard markup language used to create web pages. It ensures proper formatting of text and images so that Internet browsers can display them in the ways they were intended to look. HTML is used to create electronic documents (pages) displayed online.
HTML 是用於創建網頁的標準標記語言。它可以確保正確設置文本和圖像的格式，以便 Internet 瀏覽器可以按預期的方式顯示它們。HTML 用於創建網上顯示的電子文件（頁面）。

3.7 JavaScript (including jQuery, ReactJS, AngularJS, etc.)

JavaScript (JS) is a front-end programming language that runs inside a browser and processes commands. JavaScript is used primarily in Web development to manipulate various page elements and make them more dynamic, including scrolling abilities, printing the time and date, creating a calendar and other tasks not possible through plain HTML. It can also be used to create games and APIs. Recent JavaScript development is mainly based on JS library or framework like jQuery, ReactJS, AngularJS, etc. Node.js is however a server-side framework.
JavaScript (JS) 是一種前端編程語言，可在前端瀏覽器中運行處理命令。JavaScript 主要用於網絡開發中，以操縱各種頁面元素並使它們更具動態性，包括滾動功能，打印時間和日期，創建日曆以及其他無法通過純 HTML 進行的任務。它也可以用來創建遊戲和 API。近今的 JavaScript 前端開發較多是使用如 jQuery, ReactJS 或AngularJS 等庫或框架。但Node.js 是個後端框架。

3.8 CSS

Cascading Style Sheets (CSS) is a front-end language used for describing the presentation of a document written in HTML. CSS is designed to enable the separation of presentation and content, including layout, colors and fonts.
CSS 階層式樣式表是一種在前端用來為結構化文件如HTML添加樣式如字型、間距和顏色等的語言。

3.9 Structured Query Language

Structured Query Language (SQL) is a programming language that allows for adding, accessing and managing content in a database. It is typically used in relational database or data stream management systems.
結構化查詢語言（SQL）是一種編程語言，可用於添加，訪問和管理數據庫中的內容。它通常用於關係數據庫或數據流管理系統中。

3.10 Other programming languages e.g. Python, R, Kotlin, Swift, etc.
其他程式語言如Python，R，Kotlin，Swift等

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its built-in data structures, combined with dynamic typing and dynamic binding, make it attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. There are many Python libraries around, Python is getting popular in machine learning, image processing, natural language processing and other areas of Artificial Intelligence etc.
R is a language and environment for statistical computing and graphics. R language is widely used among statisticians and data miners for developing statistical software and data analysis.
Kotlin is a cross-platform, statically typed, general-purpose programming language with type inference. Kotlin is designed to interoperate fully with Java, and the JVM version of Kotlin's standard library depends on the Java Class Library, but type inference allows its syntax to be more concise. Kotlin mainly targets the JVM, but also compiles to JavaScript.
Swift is a general-purpose, multi-paradigm, compiled programming language developed by Apple. and the open-source community. First released in 2014, Swift was developed as a replacement for Objective-C. On Apple platforms, it uses the Objective-C runtime library which allows C, Objective-C, C++ and Swift code to run within one program.
Python 是一種直譯語言、物件導向程式的高級編程語言。它的內置數據結構與動態類型和動態綁定相結合，使其對於快速應用程序開發以及用作將現有組件連接在一起的腳本或粘合語言非常有吸引力。目前有不少的Python 庫，有助Python 於機器學習、圖像處理、自然語言處理和其它人工智能領域更爲流行。

R 是用於統計計算和圖形的語言和環境。R 語言在統計學家和數據挖掘者中廣泛用於開發統計軟件和數據分析。
Kotlin是一種在Java虛擬機上執行的靜態型別程式語言，它也可以被編譯成為JavaScript原始碼。雖然與Java語法並不相容，但在JVM環境中Kotlin被設計成可以和Java程式碼相互運作，並可以重複使用如Java集合框架等的現有Java參照的函式庫。
Swift程式語言，支援多編程範式和編譯式。蘋果公司於2014年發布了Swift程式語言。從設計上蘋果公司讓Swift與Objective-C共存在蘋果公司的作業系統上。

4 Object-Oriented Technology (OO)
物件導向技術

Object-oriented technology is used in developing a software product that is highly modular, reusable and also the data and the software used to interpret or act upon can be treated as one entity.
物件導向（或面向對像）技術則用於開發高度模組化、可再用的軟件產品；當中具詮釋和執行作用的資料及軟件會視為一個實體。

5 Service-Oriented Architecture (SOA)
服務導向架構

Service-Oriented Architecture (SOA) expresses a perspective of software architectural design that defines the use of 'services' to support the requirements of software users. In a SOA environment, resources on a network are made available as independent 'services' that can be accessed without knowledge of their underlying technologies and implementation details.
服務導向架構（或面向服務架構） SOA 是指針對用戶對軟件使用的個別要求，提供服務，以一組軟體元 件透過設計以建構適合的應用程式。在服務導向架構的環境下，網站服務技術將會視為獨立和標準化的元件，用戶毋需明瞭有關的基本技術和執行細節。

6 Linux/Unix and Open Source
Linux/ Unix 及源碼開放程式

Open source refers to any program whose source code is made available for use or modification as users or other developers see fit. Open source software is usually developed as a public collaboration and made freely available (such as Linux/Unix operating system).
源碼開放程式的特點是其源碼公開，可供運用或修改。源碼開放軟件多由公眾共同開發，同時免費供人使用，例子有 Linux/ Unix 操作系統。

7 Windows Platform Technology
視窗平台技術

Windows platform technology is designed for small business and professional users as well as to the more technical and larger business market. A significant feature is Microsoft's Active Directory, which among other capabilities enables a company to set up virtual private networks, to encrypt data locally or on the network, and to give users access to shared files in a consistent way from any network computer.
視窗平台技術除針對小型企業及專業用家外，亦適合技術要求高、規模較大的機構。這項技術提供的重要功能之一，是微軟動態目錄（ Microsoft' s Active Directory）。利用這個功能，機構可建立虛擬私有網絡，在本機或網絡進行資料加密，以及容許網絡上的電腦使用者，以一致的方式存取共用檔案。

8 Web Services,XML and JSON Development
網上服務、 XML 與 JSON 開發

Web Services (sometimes called application services) are services (usually including some combination of programming and data) that are made available from a business's Web server for Web users or other Web-connected programs. Besides the standardisation and wide availability to users and businesses of the Internet itself, Web services are also increasingly enabled by the use of the Extensible Markup Language (XML) as a means of standardising data formats and exchanging data. XML is the foundation for the Web Services Description Language (WSDL). JSON (JavaScript Object Notation) is also often being used as the standardised file format for exchanging data in recent years.
網上服務（ 又稱應用服務）指機構的服務器向網絡使用者或其他接連網絡程式提供的服 務（通常結合了編程和資料）。除了提供規範和廣為互聯網使用者及網上業務機構使用外，這類服務亦運用Extensible Markup Language（ XML） 程式加入了有關功能，作為釐訂資料格式和交換資料用途。欲學習 Web Services Description Language（ WSDL），先要掌握基礎程度的 XML。近年開發人員廣為採用 JSON (JavaScript Object Notation) 格式。

9 Multimedia and Computer Graphics
多媒體及電腦圖像

Multimedia and computer graphics involves the use of computer hardware and software to integrate texts, animated graphic images, sound and motion video for presentation of information and other applications. The technologies include digital video, virtual reality/3D image, voice recognition, real-time streaming audio & video, real-time audio & video multicast and broadcast.
多媒體及電腦圖像借助電腦軟、硬件，結合文字、動態圖像、影、音，供陳述資料或其他用途。這類技術有數碼影

像、虛擬真實／ 三維圖像、話音辨識技術、實時影音串流技術，實時影音組播及廣播。

10 Interactive Game Design/Development
互動遊戲設計／開發

This category includes game theory; the design and development cycle of computer-based games; current game delivery systems and software; game development systems and standards; files structure and conversion issues; human-computer interface issues; intellectual property rights; ethical issues including the current game rating system; and emerging technical developments and trends.
這個範疇涉及以下項目： 遊戲理論； 電腦遊戲設計及開發周期； 現行遊戲傳送系統及軟件； 遊戲開發系統及標準； 檔案結構及轉換； 人機合一介面； 知識產權； 道德問題，如現行的遊戲評級制度；技術發展及趨勢。

11 Internet/Intranet/Web Development
互聯網／內聯網／網絡開發

This category includes web development and programming (such as using JSP, EJB, XML, Java Servlets, PHP scripting, .NET).
此類別包括網絡開發與編程（ 如使用 JSP 、 EJB 、 XML 、 Java Servlets 、 PHP 語言編寫、. NET）。

12 IT Applications in Customer Relationship Management / Customer Engagement
資訊科技在客戶關係管理/客戶參與度的應用

Customer Relationship Management (CRM) or Customer Engagement (CE) is an information industry term for methodologies, software, and usually Internet capabilities that help an enterprise manages customer relationships in an organised way. IT applications systems have been widely developed and adopted in various aspects of the CRM products/services, which include sales force automation, call centres, help desks, and prospect and customer information databases. The latter are often integrated with “data-mining” technology to allow personalised customer services, adaptive and one-to-one marketing.
這範疇指企業利用某種方法、軟件及互聯網功能，有系統地維繫客戶關係。已開發的資訊科技應用系統已廣泛應用在各客戶關係管理的產品或服務功能 中，包括銷售業務自動化、電話諮詢中心、求助台、前景分析及客戶數據庫。最後一項通常會結合「 數據開採」技術，為客戶提供調節式、一對一營銷、及個人化的服務。

13 Digital Marketing and E-Commerce
數碼市場推廣及電子商貿

Digital marketing is the promotion of brands to connect with potential customers using the internet and other forms of digital communication. In a broader sense, digital marketing uses digital channels (e.g. search engine optimisation (SEO), email, social media, web-based advertising, etc.) to promote or market products and services to consumers and businesses. E-Commerce (Electronic Commerce) is the process of buying or selling products or services over the internet. It encompasses online marketplaces, eCommerce platforms and a wide variety of data, systems, and tools for online buyers and sellers.
數碼市場推廣是通過互聯網和其他形式的數碼傳訊促進品牌與潛在客戶建立聯繫。廣義來說，數碼市場推廣利用數碼渠道（例如搜索引擎優化、電子郵件、社交媒體、網絡廣告等）向顧客和商界推廣產品或服務。電子商務（Electronic Commerce）則是通過互聯網購買或銷售產品或服務的過程。它包括在線市場、電子商務平台以及面向在線買家和賣家的各種數據、系統和工具。

14 Information and System Security
資訊及系統保安

This category comprises technologies for Internet Commerce security (such as encryption standards, authentication, public key scheme, and digital signature), anti-virus protection for Windows systems, security for Wireless LAN and servers.
此範疇包括互聯網業務保安（如加密標準、核實、公鑰方案、數碼簽名等）、視窗系統防病毒技術、無線 LAN 及服務器的保安。

15 Database
數據庫

This category includes database design, database connection and Database Administration (DBA). It covers the RDBMS (Relational Database Management System) like Oracle, MS SQL Server, MySQL and DB2 as well as NoSQL database like MongoDB.
此類別包括數據庫設計、 數據庫連接和數據庫管理。包括關係數據庫管理系統如 Oracle, MS SQL Server、 MySQL、 DB2 和 NoSQL 數據庫如 MongoDB。

16 Networking/Data Communications
網絡／數據通訊

This category includes Broadband Networks, Network System Administration, Router/Switch Technology, TCP/IP Communication Protocol, Cable Modem, Asymmetric Digital Subscriber Line (ADSL), Wireless LAN, Bluetooth, 3G/4G Mobile Communications, Near Field Communication (NFC) and Internet of Things (IoT).

此類別包括寬頻網絡、網絡系統管理、路由器／交換器技術、TCP／IP 通訊協定、電纜數據機、不對稱數碼用戶線路（ ADSL）、無線區域網絡、藍芽及 3G／ 4G 流動通訊、近場通訊（ NFC）及物聯網（ Io T）。

17 Web Tools and Related Applications
萬維網工具及其相關應用

The Web offers rich interaction and collaboration among the users, and rich choices of effective tools. The skills in this area can include overview and features of Web tools and their impact on people, such as blog, wiki, podcasting, video sharing websites and social networking websites, real time collaboration using free on-line tools, etc.
萬維網賦予使用者之間豐富的互動和協作，並且具有豐富和有效的工具以供選擇。這方面的技能包括萬 維網各種工具的特點及其對人類帶來的衝擊;工具例如「 網誌 」 blog ）、「 維基」（ wiki）、「 播客」（ podcasting ）、視頻分享網站及社交網站、使用免費網上工具以作實時協作等。

18 Mobile Computing
流動電腦應用

Mobile computing includes wireless and cellular technologies on handheld electronics and portable computer systems. New versions of standards are being continuously developed in an effort to provide higher data rates for advanced mobile services. With the widespread use of smart phones and tablet computers, mobile applications commonly known as Apps become popular as a means to provide entertainment or as a communication tool between corporations and customers.
這範疇包括用於掌上電子裝置及手提電腦的無線及蜂窩式技 術。為配合新流動服務的高速傳輸要求，流動電話標準將不斷開發新的版本。隨著智能手機和平板電腦的廣泛使用，受歡迎的流動應用程式俗稱「 Apps」 已成為一種能提供娛樂或作為企業和客戶之間溝通的工具。

19 IT Infrastructure Library
資訊科技基礎架構標準庫（ ITIL）

IT Infrastructure Library (ITIL) was developed by the Office of Government Commerce (OGC) in the U.K., and is recognised as the best practices in IT Service Management worldwide. Many IT operations management tools and processes are now built on ITIL, and its adoption is picking up in Asia.
資訊科技基礎架構標準庫（ ITIL）是英國政府商務辦公室（ OGC）所制定，及被全球公認為最佳實踐的資訊科技服務管理架 構。現在很多的資訊科 技操作管理工具及運作是建基於 ITIL，及其架構亦迅速地被亞洲各國所採用。

20 Radio Frequency Identification (RFID) Technologies
射頻識別（ RFID） 科技

RFID has been proposed to identify the goods being handled. The commonly used barcode scanning has difficulties in identification of products packed in high density within a tolerable time frame while RFID technology can resolve this problem. The applications of RFID technologies for business applications (including management of supply chains or demand chains, and logistics services chains - collectively referred to as business chains) in corporations of different business natures within the company boundary have been widely adopted.
射頻識別科技能夠辨別正在處理中的物 品，並能解決一般條碼掃瞄系統無法在 短時間內識別嚴密裝箱貨品的問題。RFID 科技已融入於各種商業應用系統中（包括供應鏈、需求鏈及物流服務鏈（統稱為商業鏈）的管理），並廣為不同行業工商機構所採用。

21 IT Applications in Supply Chain Management (e-Logistics, e-Procurement)
資訊科技在供應鏈管理的應用（ 電子物流、電子採購）

Supply Chain Management (SCM) is the monitoring and control of materials, information, and finances as they move in a process from supplier to manufacturer to wholesaler to retailer to consumer. SCM involves coordinating and integrating these flows both within and among companies. As a solution for successful SCM, sophisticated IT application systems with web interfaces are developed and applied for the e-Logistics and e-Procurement which provide part or all of the SCM services for the companies.
供應鏈管 理（ SCM）是監控在運作過程中（從供應商到製造商，批發商，販商及消費者）的物料、資訊及財務得到適當的處理。SCM 亦參與協調和整合公司內部及各公司之間的運作流程。SCM 得以成功，有賴開發以網上作為介面的資訊科技應用系統提供電子物流及電子採購等功能，而該等系統現已為各公司提供部份或全部的 SCM 服務。

22 IT Applications in Product Design
資訊科技在產品設計的應用

IT applications are widely used in many design and manufacturing industries like jewellery design, interior design, furniture design, construction industry, etc. This skills helps the traditional industry professionals and IT practitioners to pick up the latest design tools available in the market to speed up their design process and enhance the quality of the product.
資訊科技已在各設計和製造行業中被廣泛地應用，如在珠寶設計、室內設計、家具設計及建造業等。這方面的技能，能幫助傳統行業的專業人士和資訊科技從業員掌握在市場上最新的設計工具，以加快他們的設計程序，及提升產品的質量。

23 e-Learning Technology and Development
網上教學科技及開發

Delivery of e-Learning requires an integrated technology system of hardware, software, and human resources. This category covers the fundamentals of electronic information delivery, including content development and delivery, licensing, managing external contents, address access and intellectual property issues with an online delivery system.
網上教學是電腦軟、硬件及人力資源結合的成果。當中涉及電子訊息傳送基礎理論，如內容開發及傳送、授權使用、外間內容管理、與網上傳送系統有關的位址存取和知識產權事宜。

24 Project Management and Design
項目管理及設計

The project management and design process cover gathering requirements, managing project design process, defining team responsibilities, identifying milestones, scoping timelines, and staging deliverables.
這項技能包括以下環節： 收集所需資料；管理項目設計過程；釐清小組權責；確定發展重點；製訂時間表；分階段完成目標。

25 Software Quality (Capability Maturity Model Integration)
軟件質素（能力成熟度模型（ CMMI））

This category includes the processes and types of tools that can be used during the implementation of the Capability Maturity Model Integration (CMMI); the cost of quality; the use of several statistical quality tools for process design, analysis, and measurement; risk management plan to control expected risks; and the application of different types of testing and planning that contributing to software product quality.
此項目包括推行「 能力成熟度模型」（ CMMI） 所使用程序及工具種類； 質素要求所涉及成本； 運用不同質素統計工具作程序設計、分析及評估； 監察預計風險的風險管理計劃；提高軟件質素所需測試及規劃。

26 Understanding IT Practice in the Chinese Mainland
中國內地資訊科技業概況

Understanding IT Practice in the Mainland of China provides IT and practical legal advice to those doing business in the Mainland of China. It brings in-depth related IT knowledge and practical experience to assisting companies in their expansion and operation in the Mainland of China.
這類課程可讓在中國內地營商人士，了解資訊科技及有關法律的情況。深入了解這方面的情況，有助中國內地業務的發展。

27 Virtualisation and Cloud Computing
虛擬化及雲端運算

Virtualisation is an emerging IT paradigm that separates computing functions and technology implementations from physical hardware. Cloud computing, for example, is the virtualisation of computer programs through an Internet connection rather than installing applications on every office computer.
虛擬化是一種新興的資訊科技範式，將有形硬件的計算功能從技術實現中分離。例如，雲端運算是電腦程序通過互聯網的連接虛擬 化，而不是每一個辦公室的電腦上安裝應用程序。

28 Data Science and Data Analytics
數據科學和數據分析

Data Science and Data Analytics refer to the use of a combination of processes, methods, systems and enabling technologies to facilitate the extraction of knowledge or insights for business intelligence, data mining, data warehouse, data visualisation and other purposes.
數據科學和數據分析是指結合過 程、方 法、系統和賦能技術，促進提取知識和得到啟發，供商業智能、 數據開採、數據倉庫及數據視像化和其他領域使用。

29 3D printing
3D 打印

With the ever-improving price-performance ratio of 3D printers, 3D printing is rapidly revolutionising the way of production and self-actualisation. 3D objects can be “printed” based on digital 3D-models, either by scanning a set of 3D images or drawing using a CAD software. With 3D printing, companies can experiment with new ideas and proof of product concepts with minimal expenses. In fact, 3D printing is going to impact many industries such as medical, automobile and consumer-product industries. It can also allow hobbyists or personal manufacturers to produce personalised prototypes and products with craftsmanship and imaginations.
隨著 3D 打印機的性價比不斷提高，3D 打印正在迅速及徹底地改變着生產和自我實現的方式。3D 物體的「 打印」需要根據掃描一組 3D 圖像或以 CAD 軟件繪製而成的電子 3D 模型。隨著 3D 打印的發展，企業可以用最少的成本測試新的構思和驗證產品概念。事實上，3D 打印將影響許多行業，例如醫療，汽車和消費品行業。它也可以讓業餘愛好者或個人製造商，以工藝精神與想像力，生產出個性化的樣版和產品。

30 Extended Reality
延展實境

Extended Reality includes technologies such as Augmented reality (AR), Virtual Reality (VR) and Mixed Reality (MR). AR is the integration of digital information with the user's environment in real time by merging the real world with virtual objects to support realistic, intelligent, and personalized experiences. VR is the use of computer technology to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual or imaginary environment in such a way that the user suspends belief and accepts it as a real environment. MR combines elements of both AR and VR, real-world and digital objects interact.
擴展現實包括擴增實境（AR）、虛擬實境（VR）和混合實境（MR）等技術。AR結合現實和虛擬，在真實實世界的景觀上增添並結合各種虛擬物件、圖像與資訊來加強使用者的視覺經驗。VR利用電腦模擬技術產生一個三維空間的虛擬世界，提供使用者關於視覺、聲音等感官的模擬，產生臨場感，創造出一個可體驗的虛擬空間，讓使用者感覺彷彿身歷其境。MR 結合了 AR 和 VR 的元素，現實世界和數字對象相互交流。

31 Artificial Intelligence (AI)
人工智能

Hong Kong enterprises have been catching up on AI development and many servicing companies have continued to explore the opportunity to enhance their operation efficiencies by deploying AI solutions. Skills include how to master fundamental concepts of Machine Learning and Deep Learning and how to utilize popular Machine Learning and Deep Learning libraries such as SciPy, ScikitLearn, Keras, PyTorch, and Tensorflow applied to industry problems involving object recognition and computer vision, image and video processing, text analytics, Natural Language Processing, recommender systems, and other types of classifiers.
香港企業已趕上人工智能發展趨勢，不少服務公司持續利用人工智能方案，探討提高營運效益的機會。技能包括如何掌握機器學習和深度學習的基本概念以及如何利用流行的機器學習和深度學習庫（例如 SciPy，Scikit Learn，Keras，Py Torch 和 Tensorflow） 協助行業解決問題，如涉及對象識別和計算機視覺、圖像和視頻的，文字分析，自然語言處理，推薦系統和其他類型的分類器。

32 Internet of Things
物聯網

Internet of Things (IoT) is an emerging technology which enables the provision of communications platforms and services for interconnected devices to generate, exchange and consume data with minimal human intervention. Experts are able to plan, design and maintain IoT systems with a special focus on applications, and adopting IoT solutions.
物聯網是新興技術，提供通訊平台及服務讓各式各樣的互聯智能裝置，無須經人手操作而能自動產生、交換和處理數據。專家能夠計劃，設計和維護 Io T 系統及其應用，並採用 IoT 解決方案。

33 Financial Technology
金融科技

Financial Technology (FinTech), the application of information technology to the provision of financial services, has surged in recent years, spurred by dramatic advances in technology along with post-crisis regulatory changes. Blockchain is a software platform which uses advanced cryptographic techniques and peer-to-peer networks to enable the creation of secure, collaborative and trustworthy applications in a cost-effective and reliable fashion. This technology has strong significance to various applications such as crypto-currency and payment systems, digital rights management, and health records management. It is considered a disruptive FinTech that can potentially disintermediate some expensive overheads in legacy financial computer systems and also promote automation and digitalisation.
金融科技乃透過資訊科技的應用來提供金融服務。隨着金融危機後監管制度的改革，加上新科技發展迅 速，金融科技近年急速冒起。區塊鏈是利用先進加密技術和點對點網路構建的軟件平台，透過既合乎成本效益又可靠的方式，提供安全、可靠及可互相協作的應用。這項科技已在不同領域帶來重大影響，例如： 加密電子貨幣、支付系統、數碼版權保護和健康檔案管理等。區塊鏈金融技術更有可能顛覆傳統金 融系統，減低中間人的昂貴營運費用，並逐步推進數碼化及無紙化。

34 Robotic Process Automation
機器人流程自動化

Robotic Process Automation is the technology that allows anyone today to configure computer software, or a “robot” to emulate and integrate the actions of a human interacting within digital systems to execute a business process. RPA robots utilize the user interface to capture data and manipulate applications just like humans do. They interpret, trigger responses and communicate with other systems in order to perform on a vast variety of repetitive tasks.
機器人流程自動化是一種技術，它使當今任何人都可以通過配置計算機軟件或“ 機器人” 來模仿和集成人與數字系統之間的交互行為，從而自動化業務流程。RPA 機器人使用用戶界面來捕獲數據並模仿人操縱應用程序。他們能夠識別、觸發響應並與其他系統進行通信，以執行各種重複性任務。

35 Business Process Management
業務流程管理

Business process management (BPM) uses various methods to discover, model, analyse, measure, improve and optimise business processes. A business process coordinates the behavior of people, systems, information and things to produce business outcomes in support of a business strategy. Technologies are often used with BPM and it is key to align IT investments to business strategy.
業務流程管理(BPM)使用各種方法來發現、建模、分析、衡量、改進和優化業務流程。業務流程協調人員、系統、信息和事物的行為，以產生業務成果以支持業務戰略。科技經常與 BPM 一起使用，這是使 IT 投資與業務戰略保持一致的關鍵。

36 Methodology and Approach involving Agile, DevOps, Docker and Containers
涉及敏捷(Agile)、開發營運 (DevOps)、應用容器引擎 (Docker) 和容器 (Containers) 的方法

Agile methodology allows companies to response swiftly and accurately to the imminent changes in today's competitive business environment. Agile focuses on software development while docker approach focuses on how to deploy the created software applications effectively on the number of servers with containers. Integration of Agile methodology and docker approach allows employees to perform rapid deployments without hardware barriers. There is also a trend that team of developers are connecting with the operations staff to make sure that the software has run smoothly and such latest trend are commonly referred as DevOps.
Agile 方法讓企業在面對現今激烈競爭的 商業環境中快捷而準確地應對將至的轉變，並提高適應能力及靈活度，帶來更佳利潤和更快的投資回報。Agile 集中軟件開發，容器模式側重在如何有效調度軟件在 設有容器的伺服器上的應用。Agile 科技結合容器模式，讓員工不受硬件限制，迅速調度。另外，開發團隊會與營運人員更緊密連繫，確保軟件順利運作，此趨勢普遍稱為 DevOps。

Soft-skills 軟性技能:

37 Strategic Management
策略管理

Strategic Management involves formulating innovation and technology strategies to align with existing organization's objectives and suggesting new strategies to increase organization's competitiveness. It may also involve adopting appropriate information and communication technologies and ideas in product development management and innovation and technology management. This also includes developing and involving the innovation and technology organisation, people and process in support of the business strategy.
策略管理包括制定創新及科技業行業策略，以配合機構現在的目的及建議新的創新及科技業行業策略，增加機構的競爭力；亦包括採納適當的創新及科技技術、 產品開發管理和創新及科技管理的計劃；也包括發展及聯繫創新及科技組織、人員及方法以支持業務策略。

38 Marketing Management
市場營銷管理

With the emergence of digital technologies, marketing has gone through major transformation from the traditional media to new media. The new business environment calls for new competencies particularly those concerning digital marketing and social media marketing. This area focuses mainly on digital marketing competencies as well as the management of digital marketing campaigns.
隨著數碼技術的出現，市場營銷經歷了從傳統媒體到新媒體的重大轉變。新的商業環境需要新的能力，尤其是涉及數碼營銷和社交媒體營銷的能力。該領域主要關注數碼營銷能力以及數碼媒體科技產品數碼營銷活動的管理。

39 Quality Assurance Skills
質素保證技能

Quality Assurance skills (QA) refers to the knowledge and skills required for assuring the quality of the software products developed by the organizations and / or software services provided by them. The purpose of QA is to provide an independent evaluation of software products/services with respect to the adherence to the intended objectives, processes and standards. QA activities refer to those activities that are used to assure the quality of software products/services are of appropriate standards subject to the quality, scope, cost and time requirements/constraints of the project. Some prime QA skills include knowledge of quality standards, such as ISO 27001 Information Security Management Systems and ISO IEC 20000-1 Information Technology Service Management, attention to detail, time management and multitasking, etc.
質素保證指由組織開發的軟件產品及／ 或提供軟件服務時，質素保證所需的知識及技能。按預定目標、 程序和標準，質素保證提供一個對軟件 產品／ 服務的獨立評價。質素保證活動指保證軟件產品/ 服務之質素達到適當標準的一切活動。依據項目的質素、 範圍、 成本及時間要求／限制 來衡量。一些主要的質素保證技能包括質量標準知識如 ISO 27001 信息安全管理系統和 ISO IEC 20000 - 1 信息技術服務管理、 注意細節、時間管理及同時兼顧多項任務等。

40 Ethics and Professionalism
道德操守及專業精神

Ethics and professionalism include lifelong learning, continuous professional development, and issues related to data privacy, copyright laws as well as intellectual property. It involves the ability to protect intellectual property rights and data privacy,

and observe relevant laws.
道德操守及專業精神包括終生學習、持續專業發展及有關數據隱私、版權問題以及知識產權事項。當中包括保護知識產權和資料保密性的能力，並遵守有關法律。

41 Management skills and leadership skills
管理技能及領導技能

Lead and motivate a team in the context of managing and leading an organisation in accomplishing unprecedented and extraordinary goals and task.
在處於機構的管理和領導地位時，帶領和激發隊員完成嶄新和非凡的目標和任務。

42 Business Communication Skills in Technology Sector
技術領域的商務溝通技能

Business communication skills in technology sector include interpersonal communication abilities to understand different communication styles, collaboration, and written and verbal communication. The writing skills include creating user manuals and system requirements for new programmes and projects.
技術領域的商務溝通技巧包括人際溝通能力，以了解不同的溝通方式，協作以及書面和語言交流的能力。其中書寫能力包括為新程式和項目建立用戶手冊和系統要求。

43 Problem Solving Skills
解決問題的技能

Problem solving skills include active listening, ability to gather and analyse facts, clearly define the problem to be solved, creatively formulate different approaches in solving the problem, communicate the ideas to other clearly, make decision objectively, work dependably with others in implementing the agreed solutions and evaluate the outcome of the solution.
解決問題的技能包括積極聆聽，收集和分析事實的能力，清楚地定義要解決的問題，創造性地制定解決問題的不同方法，清晰地將想法傳達給其他人，客觀地做出決定，可靠地執行已協商之解決方案及評估解決方案的結果。

44 Other IT-related Skills
其他與資訊科技有關的技能

Research and Development
研究與開發

45 Technical Skills
專業技能

Technical skills are the knowledge and abilities needed to accomplish mathematical, engineering, scientific or computer-related duties, as well as other specific tasks relating to technology.
專業技能是指完成數學、工程、科學或電腦相關的職務； 以及與科技有關的其他特定工
作所需具備的知識和能力。

46 Management Skills
管理技能

Relevant skills of people management and leadership including problem solving, decision making, planning, delegation and communication, etc.
人事管理與領導的相關技能，包括解難、決策、規劃、授權和溝通等。

47 Knowledge related to licensing and patent application
專利受權及註冊申請知識

Knowledge related to a patent, a personal property right granted to an inventor under the law through the relevant Patent and Trademark Office. To obtain a patent, the inventor must apply to the Office with a detailed technical description of the invention. The inventor may license the patent to other users, granting them the right to use the technology.
與專利相關的知識，通過相關專利及商標監管機構授予發明人依法享有的個人財產權。要獲得專利，發明人必須向監管機構申請其發明的詳細技術說明。發明人可以將專利授權給其他用戶，授予他們使用該技術的權利。

48 Research Methodology
研究方法

Research methodology is the specific procedures or techniques used to identify, select, process, and analyse information about a topic. It is to discover new knowledge or to find a new perspective in the understanding of problems, events or to give explanation to observations. In many cases, the ultimate goal is to find solutions to these problems in the form of new procedures, new products and services.
研究方法是用於識別、選擇、處理和分析信息的特定過程或技術。發現新知識或尋找新的觀點以理解問題、事件或

解釋觀察結果。在許多情況下，最終目標是以新程序、新產品和服務的形式找到解決這些問題的方法。

49 Design Thinking
設計思維

Design thinking is the non-linear, iterative process that researchers and developers use to understand user behaviour, user expectation, challenge different assumptions, redefine problems and create innovative solutions to prototype and test. In general, it involves the five phases—Empathize, Define, Ideate, Prototype and Test.
設計思維是研究人員和開發人員用來理解用戶行為，用戶期望，挑戰不同假設，重新定義問題並創建用於原型和測試的創新解決方案的非線性迭代過程。通常，它涉及五個階段包括同理心、定義、構思、 原型和測試。

50 Other R&D Skills
其他研究與開發技能

Appendix 6

Quality Control Measures

Prior to fieldwork preparation

- Collect contact information of the sampled companies
- Group sampled companies to the same business organisation

Thorough training of fieldwork staff

- Industry briefing workshop by VTC
- Intensive briefing and training session by MSA in consultation with VTC

Monitoring of the fieldwork execution

- Well-trained enumerators who are experienced in conducting establishment surveys
- Closely monitor fieldwork progress and work of enumerators
- Debriefing sessions twice a week

Measures to increase the response rate

- Strategic directions given by VTC
- Assistance from the Training Board and trade associations, etc.

Checking of the completed questionnaires

- Sample check of completed questionnaires by an independent team of QC checkers
- 100% vetting of the completed questionnaires by VTC

Double data entry and data validation

- Double data entry system
- Validation of collected data via computer programming and systems

Data analysis by VTC

- Comparison of survey findings with last round
- Benchmarking with relevant manpower information (if deemed appropriate)

Appendix 7

Response Profile

Type of Organisation	(a) No. of Valid Cases*	(b) No. of Companies Successfully Enumerated	(b)/(a) Effective Response Rate
IT and Communications Services Organisations *(incl. 6 industry sectors, mainly:* - *IT products & services suppliers;* - *Wholesale, retail & I/E trades of computer products & software packages;* - *Communications services;* - *etc.)*	**458**	**417**	**91.0%**
IT Users Organisations *(incl. 11 industry sectors, mainly:* - *Community, social & personal services;* - *Government bureaux / departments;* - *Financing, insurance, real estate & business services;* - *Transport & storage services;* - *Innovative products & services (non-IT);* - *etc.)*	**471**	**390**	**82.8%**
Total	**929**	**807**	**86.9%**

Note: * Invalid cases were referred as those companies which had been ceased operation, closed, had not employed any IT and R&D staff, etc.

Appendix 8

Manpower Projection Methodology

Manpower Projection Methodology

Adaptive Filtering Method

1. The Adaptive Filtering Method is a forecasting method which rested on the principle of "Weighted Exponential Smoothing". In this method, past manpower data are weighted and heavier weightings are given to the more recent data. The forecast is more dependent on the recent manpower information. The degree of emphasis on the more recent survey data can be varied by adjusting the weighting factor (A). Thus, the higher the value of 'A', the heavier the weightings of the more recent data.

2. The forecast may also be optimised to suit the decisions made by the Training Boards based on the factors such as the market trends, technological developments, social-economic factors, future expectations, etc. The method is illustrated in Figure 1 below.

Figure 1 Adaptive Filtering Method

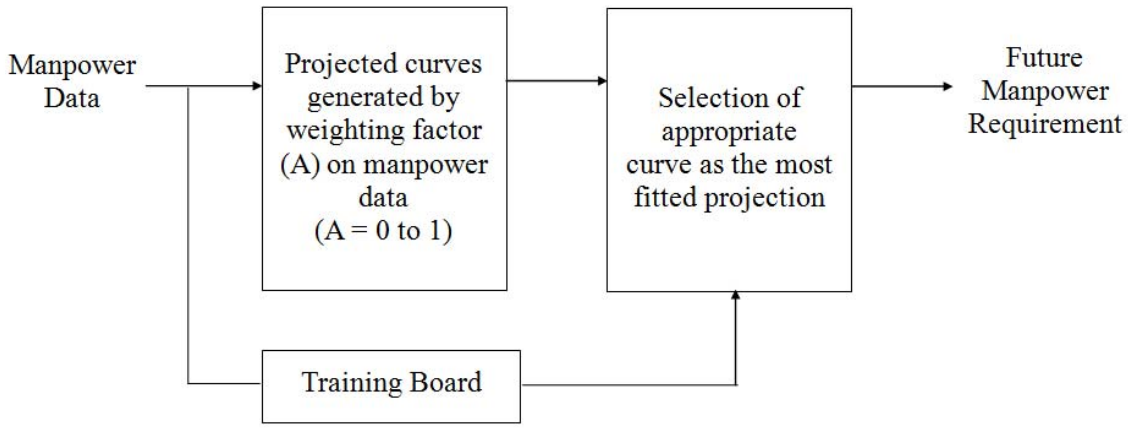

Table 9.1: Manpower statistics by principal job
表9.1：按主要職務劃分的人力統計

(a) Research and Development 研究與開發

Job category 技能類別	Principal Job 主要職務		Number of staff as at Survey Reference Date 在統計日期的員工人數			Number of Vacancies as at Survey Reference Date 在統計日期的空缺額
			Total 總計	Full-time employees 全職僱員	Freelancers 自由工作者	
Research and Development (Non-IT related) 研究與開發(與資訊科技不相關)	001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	8645	8642	3	432
	002	R&D Technician 研發技術員	3254	3254	0	138
	003	R&D Assistant 研發助理	1362	1362	0	113
		Sub-total 小計	13261	13258	3	683
Research and Development (IT related) 研究與開發(與資訊科技相關)	051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	5862	5858	4	391
	052	R&D Technician 研發技術員	1906	1906	0	126
	053	R&D Assistant 研發助理	1083	1083	0	10
		Sub-total 小計	8851	8847	4	527
Overall 總計			22112	22105	7	1210

(b) Information Technology 資訊科技

Job category 技能類別		Principal Job 主要職務	Number of staff as at Survey Reference Date 在統計日期的員工人數			Number of Vacancies as at Survey Reference Date 在統計日期的空缺額
			Total 總計	Full-time employees 全職僱員	Freelancers 自由工作者	
Research and Development (IT related) 研究與開發(與資訊科技相關)	051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	5862	5858	4	391
	052	R&D Technician 研發技術員	1906	1906	0	126
	053	R&D Assistant 研發助理	1083	1083	0	10
		Sub-total 小計	8851	8847	4	527
General IT Management 一般資訊科技管理	101	Head of IT 資訊科技主管	1094	1094	0	46
	102	Chief Technology Officer (CTO) 首席技術總監	433	433	0	2
		Sub-total 小計	1527	1527	0	48
Software Development 軟件開發	201	Systems Development Manager 系統開發經理	1518	1518	-	48
	202	Systems Architect 系統架構師	524	523	1	21
	203	Project Manager 項目經理	3942	3942	-	140
	212	Systems Analyst 系統分析師	3674	3672	2	305
	213	Business Analyst 業務分析師	321	321	-	50
	214	Analyst Programmer 分析程式員	5435	5391	44	308
	205	Programmer 程式編製員	15715	15011	704	806
	204	UI/UX Designer 用戶界面、用戶體驗設計師	3235	3192	43	137
	207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	523	523	-	51
	208	Software Product Engineer 軟件產品工程師	1110	1110	-	19
	210	Technical Writer 技術撰稿員	87	87	-	6
	211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	1709	1523	186	55
		Sub-total 小計	37793	36813	980	1946
Communications and Networks 通訊及網絡	301	Network Manager 網絡經理	500	500	0	34
	302	Mobile Network Engineer 流動網路工程師	327	327	0	4
	303	Network Engineer 網絡工程師	2731	2731	0	161
	304	Network Administrator 網絡管理員	2417	2417	0	48
		Sub-total 小計	5975	5975	0	247
IT Security 資訊保安	401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	808	808	0	37
	407	Cybersecurity Specialist 網絡安全專責專家	779	779	0	44
		Sub-total 小計	1587	1587	0	81
Technical Services 技術服務	403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	1003	1003	0	74
	404	Services Support Manager 服務支援經理	858	858	0	12
	405	Service Engineer 服務工程師	1850	1850	0	186
	406	Service Technician 服務技術員	6390	6387	3	349
		Sub-total 小計	10101	10098	3	621

Job category 技能類別	Principal Job 主要職務		Number of staff as at Survey Reference Date 在統計日期的員工人數			Number of Vacancies as at Survey Reference Date 在統計日期的空缺額
			Total 總計	Full-time employees 全職僱員	Freelancers 自由工作者	
Data Management 數據管理	801	Data Scientist 數據科學家	287	284	3	26
	802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	537	530	7	16
		Sub-total 小計	824	814	10	42
Infrastructure and Operations Support 基建和操作支援	501	IT Operations Manager 資訊科技操作經理	1121	1121	0	9
	504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	2436	2436	0	78
	505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	2562	2558	4	100
	506	User Support 用戶支援	24998	18593	6405	894
		Sub-total 小計	31117	24708	6409	1081
IT Education and Training 資訊科技教育及訓練	601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	2464	2464	0	19
	602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	1414	1414	0	21
		Sub-total 小計	3878	3878	0	40
IT Sales and Marketing 資訊科技銷售及市場推廣	701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	1634	1634	0	12
	702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	6510	6510	0	217
	703	IT Product Promotion Representative 資訊科技產品推廣代表	2628	2628	0	84
		Sub-total 小計	10772	10772	0	313
Overall 總計			112425	105019	7406	4946

Table 9.2: Number of full-time employees + freelancers by type of organisations & sector

(a) Research and Development

Principal Job 主要職務		Innovative products and services 創新產品及服務	IT Products and Services Suppliers 資訊科技產品及服務供應商	Universities and post-secondary colleges; Research and scientific institutes 大學及專上學院、科研機構	Others 其他	Total 總計
Research And Development (Non-IT related) 研究與開發(與資訊科技不相關)						
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	2622	2	5658	363	**8645**
002	R&D Technician 研發技術員	1325	4	1674	251	**3254**
003	R&D Assistant 研發助理	253	0	1024	85	**1362**
	Sub-total *小計*	*4200*	*6*	*8356*	*699*	***13261***
Research And Development (IT related) 研究與開發(與資訊科技相關)						
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	1077	3200	1415	170	**5862**
052	R&D Technician 研發技術員	299	1207	200	200	**1906**
053	R&D Assistant 研發助理	221	581	123	158	**1083**
	Sub-total *小計*	*1597*	*4988*	*1738*	*528*	***8851***
Total 總計		**5797**	**4994**	**10094**	**1227**	**22112**

(b) Information Technology

(i) IT & Communications Services Organizations
資訊科技及通訊服務機構

- Research and Development (IT related)
  研究與開發(與資訊科技相關)

	Principal Job 主要職務	Innovative products and services (IT) 創新產品及服務（資訊科技）	IT Products and Services Suppliers 資訊科技產品及服務供應商	Others 其他	Total 總計
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	771	3200	125	**4096**
052	R&D Technician 研發技術員	203	1207	154	**1564**
053	R&D Assistant 研發助理	144	581	158	**883**
Total 總計		**1118**	**4988**	**437**	**6543**

- Information Technology (excl. Research and Development (IT related))
  資訊科技(研究與開發 (與資訊科技相關)除外)

	Principal Job 主要職務	Innovative products and services (IT) 創新產品及服務（資訊科技）	IT Products and Services Suppliers 資訊科技產品及服務供應商	Manufacturing (IT products) 製造業（資訊科技產品）	Wholesale, Retail and Import/Export Trades of the Computer Products and Software Packages 零售批發及出入口貿易、飲食業及酒店業	Communications Services 通訊服務業	Digital Creative 數碼創意業	Total 總計
General Management 一般資訊科技管理								
101	Head of IT 資訊科技主管	11	544	0	17	34	6	**612**
102	Chief Technology Officer (CTO) 首席技術總監	9	309	0	36	3	1	**358**
	Sub-total 小計	*20*	*853*	*0*	*53*	*37*	*7*	***970***
Software Development 軟件開發								
201	Systems Development Manager 系統開發經理	11	658	1	13	84	3	**770**
202	Systems Architect 系統架構師	2	276	0	3	36	1	**318**
203	Project Manager 項目經理	93	2063	1	87	260	14	**2518**
212	Systems Analyst 系統分析師	40	1454	2	80	237	1	**1814**
213	Business Analyst 業務分析師	15	172	0	20	33	0	**240**
214	Analyst Programmer 分析程式員	146	4037	0	79	87	0	**4349**
205	Programmer 程式編製員	208	9830	70	223	342	90	**10763**
204	UI/UX Designer 用戶界面、用戶體驗設計師	40	2002	0	3	38	18	**2101**
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	22	325	0	3	65	1	**416**
208	Software Product Engineer 軟件產品工程師	63	718	0	78	172	6	**1037**
210	Technical Writer 技術撰稿員	1	46	0	0	1	2	**50**
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	49	829	0	10	0	269	**1157**
	Sub-total 小計	*690*	*22410*	*74*	*599*	*1355*	*405*	***25533***

	Principal Job 主要職務	Innovative products and services (IT) 創新產品及服務（資訊科技）	IT Products and Services Suppliers 資訊科技產品及服務供應商	Manufacturing (IT products) 製造業（資訊科技產品）	Wholesale, Retail and Import/Export Trades of the Computer Products and Software Packages 零售批發及出入口貿易、飲食業及酒店業	Communications Services 通訊服務業	Digital Creative 數碼創意業	Total 總計
Communications And Networks 通訊及網絡								
301	Network Manager 網絡經理	1	180	0	17	208	0	**406**
302	Mobile Network Engineer 流動網路工程師Network Engineer	0	56	0	79	176	0	**311**
303	Network Engineer 網絡工程師	7	816	30	120	1692	0	**2665**
304	Network Administrator 網絡管理員	1	1898	0	5	356	0	**2260**
	Sub-total *小計*	*9*	*2950*	*30*	*221*	*2432*	*0*	***5642***
IT Security 資訊保安								
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	1	469	0	23	45	1	**539**
407	Cybersecurity Specialist 網絡安全專責專家	20	464	0	0	6	0	**490**
	Sub-total *小計*	*21*	*933*	*0*	*23*	*51*	*1*	***1029***
Technical Services 技術服務								
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	42	545	6	26	37	0	**656**
404	Services Support Manager 服務支援經理	10	541	3	62	168	0	**784**
405	Service Engineer 服務工程師	52	980	25	312	390	3	**1762**
406	Service Technician 服務技術員	2	3623	444	856	1241	0	**6166**
	Sub-total *小計*	*106*	*5689*	*478*	*1256*	*1836*	*3*	***9368***
Data Management 數據管理								
801	Data Scientist 數據科學家	15	131	0	1	125	0	**272**
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	2	313	0	13	11	0	**339**
	Sub-total *小計*	*17*	*444*	*0*	*14*	*136*	*0*	***611***
Infrastructure And Operations Support 基建和操作支援								
501	IT Operations Manager 資訊科技操作經理	4	93	5	5	59	6	**172**
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	7	436	1	211	47	1	**703**
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	6	244	0	13	42	1	**306**
506	User Support 用戶支援	27	2266	443	223	496	14	**3469**
	Sub-total *小計*	*44*	*3039*	*449*	*452*	*644*	*22*	***4650***
IT Education And Training 資訊科技教育及訓練								
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	1	0	0	0	0	0	**1**
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	5	57	0	0	0	0	**62**
	Sub-total *小計*	*6*	*57*	*0*	*0*	*0*	*0*	***63***
IT Sales and Marketing 資訊科技銷售及市場推廣								
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	44	742	37	503	219	4	**1549**
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	122	2647	24	2804	607	28	**6232**
703	IT Product Promotion Representative 資訊科技產品推廣代表	3	354	22	2047	48	87	**2561**
	Sub-total *小計*	*169*	*3743*	*83*	*5354*	*874*	*119*	***10342***
Total 總計		**1082**	**40118**	**1114**	**7972**	**7365**	**557**	**58208**

(ii) IT Users Organisations
資訊科技用戶機構

- Research and Development (IT related)
研究與開發(與資訊科技相關)

	Principal Job 主要職務	Innovative products and services (Non-IT) 創新產品及服務（非資訊科技）	Universities and post-secondary colleges; Research and scientific institutes 大學及專上學院；科研機構	Others 其他	Total 總計
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	306	1415	45	**1766**
052	R&D Technician 研發技術員	96	200	46	**342**
053	R&D Assistant 研發助理	77	123	0	**200**
	Total 總計	**479**	**1738**	**91**	**2308**

- Information Technology (excl. Research and Development (IT related))
資訊科技(與資訊科技相關除外)

	Principal Job 主要職務	Innovative products and services (Non-IT) 創新產品及服務（非資訊科技）	Universities and post-secondary colleges; Research and scientific institutes 大學及專上學院；科研機構	Manufacturing (non-IT products) 製造業（非資訊科技產品）	Electricity, Gas and Water 電力、氣體燃料及水務	Construction 建造業	Wholesale, Retail and Import/ Export Trades, Catering and Hotels 零售批發及出入口貿易、飲食業及酒店業	Transport and Storage Services 運輸及貨倉服務業	Financing, Insurance, Real Estate and Business Services 金融、保險、房地產及商業服務業	Medical and Health Care Services 醫療及保健服務	Community, Social and Personal Services 社區、社會及個人服務業	Government Bureaux/ Departments 政府部門	Total 總計
General Management 一般資訊科技管理													
101	Head of IT 資訊科技主管	6	26	16	10	2	41	16	207	8	26	124	**482**
102	Chief Technology Officer (CTO) 首席技術總監	10	8	2	0	0	38	12	0	0	0	5	**75**
	Sub-total 小計	*16*	*34*	*18*	*10*	*2*	*79*	*28*	*207*	*8*	*26*	*129*	***557***
Software Development 軟件開發													
201	Systems Development Manager 系統開發經理	35	109	8	15	0	76	79	151	72	19	184	**748**
202	Systems Architect 系統架構師	32	16	2	36	0	38	0	46	8	18	10	**206**
203	Project Manager 項目經理	105	63	22	32	8	97	18	727	4	85	263	**1424**
212	Systems Analyst 系統分析師	54	67	55	24	4	129	145	552	17	52	761	**1860**
213	Business Analyst 業務分析師	55	0	0	0	0	0	4	8	0	12	2	**81**
214	Analyst Programmer 分析程式員	107	61	12	36	0	0	80	18	26	54	692	**1086**
205	Programmer 程式編製員	330	380	133	58	62	242	112	2556	419	152	508	**4952**
204	UI/UX Designer 用戶界面、用戶體驗設計師	38	55	100	0	0	78	20	509	309	6	19	**1134**
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	21	4	0	0	0	0	0	76	0	6	0	**107**
208	Software Product Engineer 軟件產品工程師	39	1	0	0	0	0	0	31	0	0	2	**73**
210	Technical Writer 技術撰稿員	19	3	0	0	0	0	0	15	0	0	0	**37**
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	97	12	0	0	0	57	0	14	0	370	2	**552**
	Sub-total 小計	*932*	*771*	*332*	*201*	*74*	*717*	*458*	*4703*	*855*	*774*	*2443*	***12260***
Communications And Networks 通訊及網絡													
301	Network Manager 網絡經理	20	16	0	3	0	0	1	35	0	12	7	**94**
302	Mobile Network Engineer 流動網路工程師	5	5	0	0	0	0	1	4	0	0	1	**16**
303	Network Engineer 網絡工程師	0	15	0	8	0	0	1	1	2	5	34	**66**
304	Network Administrator 網絡管理員	19	37	0	0	0	0	1	39	2	8	51	**157**
	Sub-total 小計	*44*	*73*	*0*	*11*	*0*	*0*	*4*	*79*	*4*	*25*	*93*	***333***
IT Security 資訊保安													
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	25	22	0	13	0	4	7	154	0	8	36	**269**
407	Cybersecurity Specialist 網絡安全專責專家	0	21	0	0	0	0	4	264	0	0	0	**289**
	Sub-total 小計	*25*	*43*	*0*	*13*	*0*	*4*	*11*	*418*	*0*	*8*	*36*	***558***

	Principal Job 主要職務	Innovative products and services (Non-IT) 創新產品及服務（非資訊科技）	Universities and post-secondary colleges; Research and scientific institutes 大學及專上學院；科研機構	Manufacturing (non-IT products) 製造業（非資訊科技產品）	Electricity, Gas and Water 電力、氣體燃料及水務	Construction 建造業	Wholesale, Retail and Import/Export Trades, Catering and Hotels 零售批發及出入口貿易、飲食業及酒店業	Transport and Storage Services 運輸及貨倉服務業	Financing, Insurance, Real Estate and Business Services 金融、保險、房地產及商業服務業	Medical and Health Care Services 醫療及保健服務	Community, Social and Personal Services 社區、社會及個人服務業	Government Bureaux/ Departments 政府部門	Total 總計
Technical Services 技術服務													
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	2	42	4	11	0	0	65	182	0	4	37	**347**
404	Services Support Manager 服務支援經理	19	23	0	15	0	4	1	5	0	3	4	**74**
405	Service Engineer 服務工程師	20	28	0	6	0	0	2	0	0	12	20	**88**
406	Service Technician 服務技術員	59	52	0	0	0	4	0	83	0	7	19	**224**
	Sub-total 小計	*100*	*145*	*4*	*32*	*0*	*8*	*68*	*270*	*0*	*26*	*80*	***733***
Data Management 數據管理													
801	Data Scientist 數據科學家	5	2	0	0	0	0	6	0	0	2	0	**15**
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	38	10	0	8	0	0	3	120	0	12	7	**198**
	Sub-total 小計	*43*	*12*	*0*	*8*	*0*	*0*	*9*	*120*	*0*	*14*	*7*	***213***
Infrastructure And Operations Support基建和操作支援													
501	IT Operations Manager 資訊科技操作經理	30	56	21	4	47	336	56	126	9	225	39	**949**
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	66	169	36	13	47	362	41	483	46	350	120	**1733**
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	43	291	109	34	46	112	118	486	26	418	573	**2256**
506	User Support 用戶支援	134	246	726	17	578	8634	1360	5775	234	3634	191	**21529**
	Sub-total 小計	*273*	*762*	*892*	*68*	*718*	*9444*	*1575*	*6870*	*315*	*4627*	*923*	***26467***
IT Education And Training資訊科技教育及訓													
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	1	983	0	0	0	0	0	0	0	1479	0	**2463**
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	1	367	0	0	0	0	0	0	0	984	0	**1352**
	Sub-total 小計	*2*	*1350*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2463*	*0*	***3815***
IT Sales and Marketing 資訊科技銷售及市場推廣													
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	55	0	0	0	0	3	0	24	0	3	0	**85**
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	179	0	0	0	0	6	0	93	0	0	0	**278**
703	IT Product Promotion Representative 資訊科技產品推廣代表	61	0	0	0	0	6	0	0	0	0	0	**67**
	Sub-total 小計	*295*	*0*	*0*	*0*	*0*	*15*	*0*	*117*	*0*	*3*	*0*	***430***
Total 總計		**1730**	**3190**	**1246**	**343**	**794**	**10267**	**2153**	**12784**	**1182**	**7966**	**3711**	**45366**

Table 9.3: Number of full-time IT employees + freelancers by branch

	Principal Job 主要職務	Overall 總計	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
General Management一般資訊科技管理																											
101	Head of IT 資訊科技主管	1094	-	16	17	10	2	17	-	41	2	6	2	6	1	33	133	6	68	544	8	26	3	2	21	6	124
102	Chief Technology Officer (CTO) 首席技術總監	433	-	2	19	-	-	36	-	38	6	6	-	-	-	3	-	-	-	309	-	8	-	-	-	1	5
	Sub-total 小計	*1527*	*-*	*18*	*36*	*10*	*2*	*53*	*-*	*79*	*8*	*12*	*2*	*6*	*1*	*36*	*133*	*6*	*68*	*853*	*8*	*34*	*3*	*2*	*21*	*7*	*129*
IT/Software Development資訊科技／軟件開發																											
201	Systems Development Manager 系統開發經理	1518	1	8	46	15	-	13	-	76	33	28	8	10	1	83	147	-	4	658	72	109	3	5	11	3	184
202	Systems Architect 系統架構師	524	-	2	34	36	-	3	-	38	-	-	-	-	-	36	35	3	8	276	8	16	-	8	10	1	10
203	Project Manager 項目經理	3942	1	22	198	32	8	87	-	97	-	4	14	-	2	258	548	10	169	2063	4	63	-	55	30	14	263
212	Systems Analyst 系統分析師	3674	2	55	94	24	4	80	-	129	34	37	6	68	-	237	549	3	-	1454	17	67	-	36	16	1	761
213	Business Analyst 業務分析師	321	-	-	70	-	-	20	-	-	-	2	2	-	-	33	3	5	-	172	-	-	-	-	12	-	2
214	Analyst Programmer 分析程式員	5435	-	12	253	36	-	79	-	-	27	32	7	14	-	87	12	6	-	4037	26	61	12	2	40	-	692
205	Programmer 程式編製員	15715	70	133	538	58	62	223	-	242	70	6	24	12	1	341	1534	115	907	9830	419	380	-	46	106	90	508
204	UI/UX Designer 用戶界面、用戶體驗設計師	3235	-	100	78	-	-	3	40	38	19	1	-	-	-	38	468	41	-	2002	309	55	-	6	-	18	19
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	523	-	-	43	-	-	3	-	-	-	-	-	-	-	65	76	-	-	325	-	4	-	6	-	1	-
208	Software Product Engineer 軟件產品工程師	1110	-	-	102	-	-	78	-	-	-	-	-	-	-	172	25	6	-	718	-	1	-	-	-	6	2
210	Technical Writer 技術撰稿員	87	-	-	20	-	-	-	-	-	-	-	-	-	-	1	15	-	-	46	-	3	-	-	-	2	-
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	1709	-	-	146	-	-	10	-	57	-	-	-	-	-	-	-	1	13	829	-	12	-	370	-	269	2
	Sub-total 小計	*37793*	*74*	*332*	*1622*	*201*	*74*	*599*	*40*	*677*	*183*	*110*	*61*	*104*	*4*	*1351*	*3412*	*190*	*1101*	*22410*	*855*	*771*	*15*	*534*	*225*	*405*	*2443*
Communications And Networks 通訊及網絡																											
301	Network Manager 網絡經理	500	-	-	21	3	-	17	-	-	-	1	-	-	6	202	35	-	-	180	-	16	3	5	4	-	7
302	Mobile Network Engineer 流動網路工程師	327	-	-	5	-	-	79	-	-	-	1	-	-	1	175	4	-	-	56	-	5	-	-	-	-	1
303	Network Engineer 網絡工程師	2731	30	-	7	8	-	120	-	-	-	1	-	-	28	1664	1	-	-	816	2	15	-	5	-	-	34
304	Network Administrator 網絡管理員	2417	-	-	20	-	-	5	-	-	-	1	-	-	74	282	39	-	-	1898	2	37	3	5	-	-	51
	Sub-total 小計	*5975*	*30*	*-*	*53*	*11*	*-*	*221*	*-*	*-*	*-*	*4*	*-*	*-*	*109*	*2323*	*79*	*-*	*-*	*2950*	*4*	*73*	*6*	*15*	*4*	*-*	*93*
IT Security資訊保安																											
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	808	-	-	26	13	-	23	-	4	3	4	-	-	1	44	134	-	20	469	-	22	3	-	5	1	36
407	Cybersecurity Specialist 網絡安全專責專家	779	-	-	20	-	-	-	-	-	2	2	-	-	-	6	144	-	120	464	-	21	-	-	-	-	-
	Sub-total 小計	*1587*	*-*	*-*	*46*	*13*	*-*	*23*	*-*	*4*	*5*	*6*	*-*	*-*	*1*	*50*	*278*	*-*	*140*	*933*	*-*	*43*	*3*	*-*	*5*	*1*	*36*
Technical Services技術服務																											
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	1003	6	4	44	11	-	26	-	-	-	-	65	-	7	30	182	-	-	545	-	42	-	2	2	-	37
404	Services Support Manager 服務支援經理	858	3	-	29	15	-	62	-	4	-	1	-	-	31	137	1	-	4	541	-	23	-	-	3	-	4
405	Service Engineer 服務工程師	1850	25	-	72	6	-	312	-	-	1	1	-	-	171	219	-	-	-	980	-	28	-	-	12	3	20
406	Service Technician 服務技術員	6390	444	-	61	-	-	856	-	4	-	-	-	-	237	1004	-	-	83	3623	-	52	7	-	-	-	19
	Sub-total 小計	*10101*	*478*	*4*	*206*	*32*	*-*	*1256*	*-*	*8*	*1*	*2*	*65*	*-*	*446*	*1390*	*183*	*-*	*87*	*5689*	*-*	*145*	*7*	*2*	*17*	*3*	*80*
Data Management 數據管理																											
801	Data Scientist 數據科學家	287	-	-	20	-	-	1	-	-	3	3	-	-	-	125	-	-	-	131	-	2	-	2	-	-	-
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	537	-	-	40	8	-	13	-	-	-	3	-	-	4	7	97	3	20	313	-	10	-	10	2	-	7
	Sub-total 小計	*824*	*-*	*-*	*60*	*8*	*-*	*14*	*-*	*-*	*3*	*6*	*-*	*-*	*4*	*132*	*97*	*3*	*20*	*444*	*-*	*12*	*-*	*12*	*2*	*-*	*7*
Infrastructure And Operations Support基建和操作支援																											
501	IT Operations Manager 資訊科技操作經理	1121	5	21	34	4	47	5	130	206	-	7	15	34	1	58	110	-	16	93	9	56	121	3	101	6	39
504	IT Operations Supervisor Operations Support Supervisor 資訊科技操作主任、操作支援主任	2436	1	36	73	13	47	211	216	146	2	2	21	16	3	44	293	18	172	436	46	169	236	24	90	1	120
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	2562	-	109	49	34	46	13	18	94	10	24	36	48	3	39	366	51	69	244	26	291	379	6	33	1	573
506	User Support 用戶支援	24998	443	726	161	17	578	223	5504	3130	48	34	376	902	39	457	923	251	4601	2266	234	246	2237	123	1274	14	191
	Sub-total 小計	*31117*	*449*	*892*	*317*	*68*	*718*	*452*	*5868*	*3576*	*60*	*67*	*448*	*1000*	*46*	*598*	*1692*	*320*	*4858*	*3039*	*315*	*762*	*2973*	*156*	*1498*	*22*	*923*

	Principal Job 主要職務	Overall 總計	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
IT Education and Training資訊科技教育及訓練																											
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	2464	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	983	1479	-	-	-	-
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導	1414	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57	-	367	978	-	6	-	-
	Sub-total 小計	*3878*	-	-	*8*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*57*	-	*1350*	*2457*	-	*6*	-	-
IT Sales and Marketing資訊科技銷售及市場推廣																											
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	1634	37	-	99	-	-	503	3	-	-	-	-	-	9	210	-	-	24	742	-	-	-	-	3	4	-
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	6510	24	-	301	-	-	2804	6	-	-	-	-	-	24	583	-	-	93	2647	-	-	-	-	-	28	-
703	IT Product Promotion Representative 資訊科技產品推廣代表	2628	22	-	64	-	-	2047	6	-	-	-	-	-	8	40	-	-	-	354	-	-	-	-	-	87	-
	Sub-total 小計	*10772*	*83*	-	*464*	-	-	*5354*	*15*	-	-	-	-	-	*41*	*833*	-	-	*117*	*3743*	-	-	-	-	*3*	*119*	-
Total (excl. R&D(IT)) 總計 (研究與開發 (與資訊科技相關)除外)		**103574**	**1114**	**1246**	**2812**	**343**	**794**	**7972**	**5923**	**4344**	**260**	**207**	**576**	**1110**	**652**	**6713**	**5874**	**519**	**6391**	**40118**	**1182**	**3190**	**5464**	**721**	**1781**	**557**	**3711**

Note: R&D(IT) employees are not included.

Branch 1: Manufacture and rep*air of computers and peripheral equipment; Manufacture of electronic parts and components for computer and* telecommunications equipment
電腦及周邊設備的製造及修理；電腦及電訊設備電子零件及組件的製造

Branch 2: Other manufacturing (non-IT products)
其他製造業（非資訊科技產品）

Branch 3: Innovative products and services
創新產品及服務

Branch 4: Electricity, gas and water supply
電力、燃氣及自來水供應

Branch 5: Construction
建造

Branch 6: Export trading, import for wholesale, wholesale and retail sale of computers, computer peripheral equipment and computer software packages
電腦、電腦周邊設備及套裝軟件的出口貿易、進口批發、批發及零售

Branch 7: Other import and export trades (except import and export trades of computers, computer peripherals and software packages)
其他出入口貿易（電腦、電腦周邊設備及套裝軟件的出入口貿易除外）

Branch 8: Other wholesale and retail (except wholesale and retail sales of computers, computer peripherals and software packages); Accommodation and food service activities
其他批發及零售（電腦、電腦周邊設備及套裝軟件的批發及零售除外）；住宿及膳食服務活動

Branch 9: Airline companies
航空公司

Branch 10: Railway and cable transport; Public bus services; Licensed and franchised ferry services; Vehicular tunnel, bridge and highway operators
鐵路及纜索運輸；公共巴士服務；持牌及專營渡輪服務；汽車隧道、橋樑及高速公路營運者

Branch 11: Air cargo forwarding services
航空貨運代理服務

Branch 12: Other transport and storage services
其他運輸及貨倉服務

Branch 13: Internet access services
互聯網接駁服務

Branch 14: Communication services
通訊服務

Branch 15: Domestic banking units
本地銀行單位

Branch 16: Real estate brokerage and agency
地產經紀及代理

Branch 17: Others (Financing, Insurance, Real Estate and Business Services)
其他（金融、保險、房地產及商業服務）

Branch 18: IT related products and services
與資訊科技相關的產品及服務

Branch 19: Medical, dental, and other health care services
醫療、牙科及其他保健服務

Branch 20: Universities and post-secondary colleges; Research and scientific institutes
大學及專上學院； 科研機構

Branch 21: Educational institutes other than universities, post-secondary
其他院校（大學及專上學院除外）

Branch 22: Motion pictures and other entertainment services; and Television / Radio Stations & Studios
電影及其他娛樂服務；電視台 、電台及製作室

Branch 23: Others (Community, Social and Personal Services)
其他（社區、社會及個人服務 ）

Branch 24: Digital Creative
數碼創意

Branch 25: Government Bureaux/Departments
政府部門

Table 9.4: Average monthly remuneration package of full-time employees by principal job
表9.4：按主要職務劃分的全職僱員每月平均薪酬

(a) Research and Development 研究與開發

Principal Job 主要職務		Average Monthly Remuneration Package 每月平均薪酬						Total no. of full-time employees 全職僱員總數
		$90,001 or more 或以上	$50,001-$90,000	$30,001-$50,000	$20,001-$30,000	$10,001-$20,000	$10,000 or below 或以下	
Research and Development (Non-IT related) 研究與開發(與資訊科技不相關)								
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	23.6%	65.4%	10.0%	1.0%	0.0%	0.0%	8642
002	R&D Technician 研發技術員	0.0%	0.0%	33.1%	59.9%	7.0%	0.0%	3254
003	R&D Assistant 研發助理	0.0%	0.0%	45.1%	26.4%	28.4%	0.0%	1362
	Sub-total 小計	15.2%	42.2%	19.4%	18.4%	4.7%	0.0%	13258
Research and Development (IT related) 研究與開發(與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	19.4%	52.8%	26.5%	1.3%	0.0%	0.0%	5858
052	R&D Technician 研發技術員	0.0%	0.4%	51.5%	45.1%	2.9%	0.0%	1906
053	R&D Assistant 研發助理	0.0%	0.0%	7.2%	20.4%	72.5%	0.0%	1083
	Sub-total 小計	13.0%	35.3%	29.4%	12.9%	9.5%	0.0%	8847
Overall 總計		14.3%	39.4%	23.5%	16.1%	6.7%	0.0%	22105

(b) Information Technology 資訊科技

Principal Job 主要職務		Average Monthly Remuneration Package 每月平均薪酬						Total no. of full-time employees 全職僱員總數
		$90,001 or more 或以上	$50,001-$90,000	$30,001-$50,000	$20,001-$30,000	$10,001-$20,000	$10,000 or below 或以下	
Research and Development (IT related) 研究與開發(與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	19.4%	52.8%	26.5%	1.3%	0.0%	0.0%	5858
052	R&D Technician 研發技術員	0.0%	0.4%	51.5%	45.1%	2.9%	0.0%	1906
053	R&D Assistant 研發助理	0.0%	0.0%	7.2%	20.4%	72.5%	0.0%	1083
	Sub-total 小計	13.0%	35.3%	29.4%	12.9%	9.5%	0.0%	8847
General IT Management 一般資訊科技管理								
101	Head of IT 資訊科技主管	27.1%	57.1%	15.7%	0.1%	0.0%	0.0%	**1094**
102	Chief Technology Officer (CTO) 首席技術總監	16.9%	68.6%	14.5%	0.0%	0.0%	0.0%	433
	Sub-total 小計	24.1%	60.4%	15.4%	0.1%	0.0%	0.0%	1527
Software Development 軟件開發								
201	Systems Development Manager 系統開發經理	11.6%	66.3%	22.1%	0.1%	0.0%	0.0%	**1518**
202	Systems Architect 系統架構師	2.5%	43.6%	51.9%	2.1%	0.0%	0.0%	523
203	Project Manager 項目經理	5.9%	41.3%	48.6%	4.2%	0.0%	0.0%	3942
212	Systems Analyst 系統分析師	0.0%	27.1%	61.5%	11.5%	0.0%	0.0%	3672
213	Business Analyst 業務分析師	0.0%	7.3%	61.8%	28.6%	2.3%	0.0%	321
214	Analyst Programmer 分析程式員	0.0%	1.2%	19.9%	74.2%	4.7%	0.0%	5391
205	Programmer 程式編製員	0.0%	4.0%	17.5%	45.5%	33.0%	0.0%	15011
204	UI/UX Designer 用戶界面、用戶體驗設計師	0.0%	10.9%	16.6%	45.9%	26.6%	0.0%	3192
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	0.0%	8.1%	48.8%	39.4%	3.8%	0.0%	523
208	Software Product Engineer 軟件產品工程師	0.0%	38.3%	34.4%	26.8%	0.5%	0.0%	1110
210	Technical Writer 技術撰稿員	0.0%	0.0%	77.0%	23.0%	0.0%	0.0%	87
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	0.0%	0.0%	4.3%	56.0%	39.6%	0.0%	1523
	Sub-total 小計	1.1%	14.6%	27.3%	39.1%	17.9%	0.0%	36813
Communications and Networks 通訊及網絡								
301	Network Manager 網絡經理	3.2%	39.4%	52.3%	1.5%	3.7%	0.0%	**500**
302	Mobile Network Engineer 流動網路工程師	0.0%	21.4%	72.4%	6.1%	0.0%	0.0%	327
303	Network Engineer 網絡工程師	0.0%	2.1%	54.0%	43.4%	0.5%	0.0%	2731
304	Network Administrator 網絡管理員	0.0%	0.5%	2.6%	64.7%	32.1%	0.0%	2417
	Sub-total 小計	0.3%	5.5%	33.3%	47.0%	14.0%	0.0%	5975
IT Security 資訊保安								
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	0.7%	41.8%	51.6%	6.0%	0.0%	0.0%	**808**
407	Cybersecurity Specialist 網絡安全專責專家	0.3%	28.1%	18.9%	52.8%	0.0%	0.0%	779
	Sub-total 小計	0.5%	34.9%	35.1%	29.5%	0.0%	0.0%	1587

Principal Job 主要職務		Average Monthly Remuneration Package 每月平均薪酬						Total no. of full-time employees 全職僱員總數
		$90,001 or more 或以上	$50,001-$90,000	$30,001-$50,000	$20,001-$30,000	$10,001-$20,000	$10,000 or below 或以下	
Technical Services 技術服務								
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	0.0%	6.4%	72.2%	19.7%	1.7%	0.0%	**1003**
404	Services Support Manager 服務支援經理	0.7%	37.7%	53.8%	7.7%	0.0%	0.0%	858
405	Service Engineer 服務工程師	0.0%	1.1%	38.7%	56.3%	3.9%	0.0%	1850
406	Service Technician 服務技術員	0.0%	0.0%	0.5%	27.1%	71.7%	0.7%	6387
	Sub-total 小計	0.1%	4.3%	19.9%	30.3%	45.0%	0.4%	10098
Data Management 數據管理								
801	Data Scientist 數據科學家	0.4%	35.9%	62.3%	1.4%	0.0%	0.0%	**284**
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	0.0%	5.4%	36.0%	58.7%	0.0%	0.0%	530
	Sub-total 小計	0.1%	16.2%	45.3%	38.4%	0.0%	0.0%	814
Infrastructure and Operations Support 基建和操作支援								
501	IT Operations Manager 資訊科技操作經理	1.6%	37.3%	57.8%	3.4%	0.0%	0.0%	**1121**
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	0.0%	3.8%	59.2%	36.2%	0.7%	0.0%	2436
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	0.0%	0.8%	16.8%	57.0%	25.4%	0.0%	2558
506	User Support 用戶支援	0.0%	0.0%	2.5%	42.3%	54.0%	1.2%	18593
	Sub-total 小計	0.1%	2.2%	12.1%	41.3%	43.4%	0.9%	24708
IT Education and Training 資訊科技教育及訓練								
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	13.9%	25.1%	53.2%	7.8%	0.0%	0.0%	**2464**
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	0.0%	0.0%	80.6%	19.4%	0.0%	0.0%	1414
	Sub-total 小計	9.0%	16.2%	62.9%	11.9%	0.0%	0.0%	3878
IT Sales and Marketing 資訊科技銷售及市場推廣								
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	6.3%	15.7%	66.3%	11.6%	0.1%	0.0%	**1634**
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	0.0%	2.6%	13.4%	66.5%	17.5%	0.0%	6510
703	IT Product Promotion Representative 資訊科技產品推廣代表	0.0%	0.0%	0.2%	26.4%	70.1%	3.2%	2628
	Sub-total 小計	0.9%	3.8%	17.5%	48.3%	28.6%	0.8%	10772
Overall 總計		2.4%	12.0%	24.1%	36.1%	25.1%	0.3%	105019

Table 9.5: Preferred level of education of full-time employees by principal job
表9.5：按主要職務劃分的全職僱員宜有教育程度

(a) Research and Development 研究與開發

Principal Job 主要職務		Preferred Level of Education 僱員宜有的教育程度						Total no. of full-time employees 全職僱員總數
		Postgraduate Degree 研究生學位	First Degree 學士學位	Sub-degree 副學位	Diploma/ Certificate 文憑/證書	Secondary 4 to 7 中四至中七	Secondary 3 or below 中三或以下	
Research and Development (Non-IT related) 研究與開發(與資訊科技不相關)								
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	78.7%	21.0%	0.3%	0.0%	0.0%	0.0%	8642
002	R&D Technician 研發技術員	9.0%	80.5%	5.8%	4.7%	0.0%	0.0%	3254
003	R&D Assistant 研發助理	0.0%	66.6%	18.7%	11.4%	3.3%	0.0%	1362
	Sub-total 小計	53.4%	40.3%	3.6%	2.3%	0.3%	0.0%	13258
Research and Development (IT related) 研究與開發(與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	42.9%	57.1%	0.0%	0.1%	0.0%	0.0%	5858
052	R&D Technician 研發技術員	1.6%	56.4%	39.8%	2.2%	0.0%	0.0%	1906
053	R&D Assistant 研發助理	0.0%	19.9%	40.8%	39.2%	0.0%	0.0%	1083
	Sub-total 小計	28.8%	52.4%	13.5%	5.3%	0.0%	0.0%	8847
Overall 總計		43.6%	45.1%	7.5%	3.5%	0.2%	0.0%	22105

(b) Information Technology 資訊科技

Principal Job 主要職務		Preferred Level of Education 僱員宜有的教育程度						Total no. of full-time employees 全職僱員總數
		Postgraduate Degree 研究生學位	First Degree 學士學位	Sub-degree 副學位	Diploma/ Certificate 文憑/證書	Secondary 4 to 7 中四至中七	Secondary 3 or below 中三或以下	
Research and Development (IT related) 研究與開發(與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	42.9%	57.1%	0.0%	0.1%	0.0%	0.0%	5858
052	R&D Technician 研發技術員	1.6%	56.4%	39.8%	2.2%	0.0%	0.0%	1906
053	R&D Assistant 研發助理	0.0%	19.9%	40.8%	39.2%	0.0%	0.0%	1083
	Sub-total 小計	28.8%	52.4%	13.5%	5.3%	0.0%	0.0%	8847
General IT Management 一般資訊科技管理								
101	Head of IT 資訊科技主管	18.6%	81.3%	0.1%	0.0%	0.0%	0.0%	**1094**
102	Chief Technology Officer (CTO) 首席技術總監	14.3%	84.1%	1.6%	0.0%	0.0%	0.0%	433
	Sub-total 小計	17.4%	82.1%	0.5%	0.0%	0.0%	0.0%	1527
Software Development 軟件開發								
201	Systems Development Manager 系統開發經理	3.0%	96.6%	0.4%	0.0%	0.0%	0.0%	**1518**
202	Systems Architect 系統架構師	6.7%	88.8%	4.5%	0.0%	0.0%	0.0%	523
203	Project Manager 項目經理	1.9%	94.9%	2.7%	0.6%	0.0%	0.0%	3942
212	Systems Analyst 系統分析師	1.8%	86.1%	9.3%	2.9%	0.0%	0.0%	3672
213	Business Analyst 業務分析師	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	321
214	Analyst Programmer 分析程式員	0.0%	41.7%	37.8%	20.5%	0.0%	0.0%	5391
205	Programmer 程式編製員	0.0%	28.9%	41.4%	29.6%	0.1%	0.0%	15011
204	UI/UX Designer 用戶界面、用戶體驗設計師	0.4%	54.4%	36.7%	8.5%	0.0%	0.0%	3192
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	4.0%	67.9%	24.8%	3.3%	0.0%	0.0%	523
208	Software Product Engineer 軟件產品工程師	1.7%	71.4%	26.1%	0.8%	0.0%	0.0%	1110
210	Technical Writer 技術撰稿員	0.0%	97.7%	1.1%	1.1%	0.0%	0.0%	87
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	0.0%	33.0%	26.4%	40.5%	0.1%	0.0%	1523
	Sub-total 小計	0.7%	52.5%	29.0%	17.7%	0.1%	0.0%	36813
Communications And Networks 通訊及網絡								
301	Network Manager 網絡經理	5.0%	84.3%	6.0%	4.8%	0.0%	0.0%	**500**
302	Mobile Network Engineer 流動網路工程師	0.0%	58.7%	41.3%	0.0%	0.0%	0.0%	327
303	Network Engineer 網絡工程師	0.0%	63.3%	35.3%	1.3%	0.0%	0.0%	2731
304	Network Administrator 網絡管理員	0.0%	2.8%	36.9%	60.2%	0.2%	0.0%	2417
	Sub-total 小計	0.4%	39.9%	33.9%	25.7%	0.1%	0.0%	5975
IT Security 資訊保安								
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	1.3%	86.6%	7.8%	4.3%	0.0%	0.0%	**808**
407	Cybersecurity Specialist 網絡安全專責專家	0.1%	45.7%	53.9%	0.3%	0.0%	0.0%	779
	Sub-total 小計	0.7%	66.2%	30.8%	2.3%	0.0%	0.0%	1587

Principal Job 主要職務		Preferred Level of Education 僱員宜有的教育程度						Total no. of full-time employees 全職僱員總數
		Postgraduate Degree 研究生學位	First Degree 學士學位	Sub-degree 副學位	Diploma/ Certificate 文憑/證書	Secondary 4 to 7 中四至中七	Secondary 3 or below 中三或以下	
Technical Services 技術服務								
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	0.0%	86.2%	9.7%	4.0%	0.0%	0.0%	**1003**
404	Services Support Manager 服務支援經理	0.0%	76.6%	7.3%	16.0%	0.1%	0.0%	858
405	Service Engineer 服務工程師	0.0%	44.5%	19.1%	35.7%	0.8%	0.0%	1850
406	Service Technician 服務技術員	0.0%	1.8%	3.8%	80.5%	9.3%	4.6%	6387
	Sub-total 小計	0.0%	25.7%	7.7%	58.0%	5.8%	2.8%	10098
Data Management 數據管理								
801	Data Scientist 數據科學家	1.8%	97.2%	1.1%	0.0%	0.0%	0.0%	**284**
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	0.0%	56.2%	43.2%	0.6%	0.0%	0.0%	530
	Sub-total 小計	0.6%	70.5%	28.5%	0.4%	0.0%	0.0%	814
Infrastructure And Operations Support 基建和操作支援								
501	IT Operations Manager 資訊科技操作經理	0.6%	96.7%	2.4%	0.1%	0.3%	0.0%	**1121**
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	0.0%	58.0%	32.3%	7.4%	2.4%	0.0%	2436
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	0.0%	17.0%	22.1%	38.6%	22.3%	0.0%	2558
506	User Support 用戶支援	0.0%	3.1%	25.3%	56.4%	15.2%	0.0%	18593
	Sub-total 小計	0.0%	14.3%	24.7%	47.1%	13.9%	0.0%	24708
IT Education And Training 資訊科技教育及訓練								
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	28.7%	71.3%	0.0%	0.0%	0.0%	0.0%	**2464**
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	0.5%	98.1%	1.4%	0.0%	0.0%	0.0%	1414
	Sub-total 小計	18.7%	80.9%	0.5%	0.0%	0.0%	0.0%	3878
It Sales And Marketing 資訊科技銷售及市場推廣								
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	3.0%	85.7%	7.6%	3.1%	0.6%	0.0%	**1634**
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	0.0%	24.7%	29.4%	42.7%	3.2%	0.0%	6510
703	IT Product Promotion Representative 資訊科技產品推廣代表	0.0%	2.8%	5.8%	40.3%	44.8%	6.3%	2628
	Sub-total 小計	0.4%	27.9%	20.4%	36.5%	13.2%	1.6%	10772
Overall 總計		3.8%	39.7%	22.6%	28.3%	5.2%	0.4%	105019

Table 9.6: Preferred years of experience of full-time employees by principal job
表9.6：按主要職務劃分的全職僱員宜有相關年資

(a) Research and Development 研究與開發

Principal Job 主要職務		Preferred Years of Relevant Experience 僱員宜有的相關年資						Total no. of full-time employees 全職僱員總數
		10 yrs or above 十年或以上	6 yrs to less than 10 yrs 六年至十年以下	3 yrs to less than 6 yrs 三年至十年以下	1 yr to less than 3 yrs 一年至三年以下	Less than 1 yr 一年以下	No experience 無須經驗	
Research And Development (Non-IT related) 研究與開發(與資訊科技不相關)								
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	47.2%	21.5%	26.8%	4.4%	0.0%	0.1%	8642
002	R&D Technician 研發技術員	0.0%	26.7%	44.5%	27.7%	0.2%	0.9%	3254
003	R&D Assistant 研發助理	0.0%	51.3%	4.2%	21.1%	20.3%	3.1%	1362
	Sub-total 小計	28.3%	27.1%	28.2%	12.8%	2.9%	0.7%	13258
Research And Development (IT related) 研究與開發(與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	10.7%	57.5%	29.3%	2.1%	0.3%	0.0%	5858
052	R&D Technician 研發技術員	0.0%	10.0%	70.5%	12.1%	7.3%	0.0%	1906
053	R&D Assistant 研發助理	0.0%	6.2%	4.7%	33.6%	52.9%	2.6%	1083
	Sub-total 小計	7.2%	41.2%	34.6%	8.2%	8.5%	0.3%	8847
Overall 總計		18.5%	33.7%	31.1%	10.6%	5.5%	0.6%	22105

(b) Information Technology 資訊科技

Principal Job 主要職務		Preferred Years of Relevant Experience 僱員宜有的教育程度						Total no. of full-time employees 全職僱員總數
		10 yrs or above 十年或以上	6 yrs to less than 10 yrs 六年至十年以下	3 yrs to less than 6 yrs 三年至十年以下	1 yr to less than 3 yrs 一年至三年以下	Less than 1 yr 一年以下	No experience 無須經驗	
Research And Development (IT related) 研究與開發(與資訊科技相關)								
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	10.7%	57.5%	29.3%	2.1%	0.3%	0.0%	5858
052	R&D Technician 研發技術員	0.0%	10.0%	70.5%	12.1%	7.3%	0.0%	1906
053	R&D Assistant 研發助理	0.0%	6.2%	4.7%	33.6%	52.9%	2.6%	1083
	Sub-total 小計	7.2%	41.2%	34.6%	8.2%	8.5%	0.3%	8847
General Management 一般資訊科技管理								
101	Head of IT 資訊科技主管	47.0%	18.0%	27.6%	7.4%	0.0%	0.0%	1094
102	Chief Technology Officer (CTO) 首席技術總監	30.9%	44.1%	24.9%	0.0%	0.0%	0.0%	433
	Sub-total 小計	42.4%	25.5%	26.8%	5.3%	0.0%	0.0%	1527
Software Development 軟件開發								
201	Systems Development Manager 系統開發經理	11.9%	44.0%	37.8%	5.1%	1.3%	0.0%	1518
202	Systems Architect 系統架構師	16.0%	18.1%	41.7%	20.3%	3.5%	0.4%	523
203	Project Manager 項目經理	6.5%	22.4%	64.4%	5.1%	1.6%	0.0%	3942
212	Systems Analyst 系統分析師	0.4%	15.5%	52.2%	31.4%	0.5%	0.0%	3672
213	Business Analyst 業務分析師	0.0%	11.3%	35.5%	39.9%	13.3%	0.0%	321
214	Analyst Programmer 分析程式員	0.2%	1.1%	37.6%	58.6%	1.0%	1.6%	5391
205	Programmer 程式編製員	0.1%	0.1%	10.4%	68.7%	16.0%	4.8%	15011
204	UI/UX Designer 用戶界面、用戶體驗設計師	0.0%	1.9%	18.6%	65.6%	13.9%	0.0%	3192
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	0.4%	7.7%	47.7%	42.5%	1.7%	0.0%	523
208	Software Product Engineer 軟件產品工程師	35.6%	8.7%	26.6%	29.0%	0.0%	0.1%	1110
210	Technical Writer 技術撰稿員	0.0%	51.7%	18.4%	29.9%	0.0%	0.0%	87
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	0.0%	1.0%	9.0%	75.2%	12.9%	1.8%	1523
	Sub-total 小計	2.6%	7.1%	28.1%	51.3%	8.7%	2.2%	36813
Communications And Networks 通訊及網絡								
301	Network Manager 網絡經理	3.5%	59.1%	27.3%	6.6%	0.0%	3.5%	500
302	Mobile Network Engineer 流動網路工程師	0.0%	19.3%	41.0%	39.8%	0.0%	0.0%	327
303	Network Engineer 網絡工程師	0.2%	3.4%	21.2%	40.9%	34.3%	0.0%	2731
304	Network Administrator 網絡管理員	0.1%	0.0%	35.0%	45.3%	11.7%	7.9%	2417
	Sub-total 小計	0.4%	7.6%	28.5%	39.8%	20.2%	3.5%	5975
IT Security 資訊保安								
401	IT Security Specialist ; Information Security Specialist 資訊科技保安專家、資訊/信息安全專家	2.7%	7.3%	79.0%	10.5%	0.4%	0.0%	808
407	Cybersecurity Specialist 網絡安全專責專家	0.8%	3.0%	68.4%	27.9%	0.0%	0.0%	779
	Sub-total 小計	1.7%	5.1%	73.7%	19.2%	0.2%	0.0%	1587

Principal Job 主要職務		Preferred Years of Relevant Experience 僱員宜有的教育程度						Total no. of full-time employees 全職僱員總數
		10 yrs or above 十年或以上	6 yrs to less than 10 yrs 六年至十年以下	3 yrs to less than 6 yrs 三年至十年以下	1 yr to less than 3 yrs 一年至三年以下	Less than 1 yr 一年以下	No experience 無須經驗	
Technical Services 技術服務								
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	4.6%	14.8%	48.9%	28.1%	3.5%	0.0%	1003
404	Services Support Manager 服務支援經理	5.8%	18.0%	29.2%	31.8%	15.2%	0.0%	858
405	Service Engineer 服務工程師	0.0%	6.3%	40.6%	29.8%	1.9%	21.5%	1850
406	Service Technician 服務技術員	0.0%	0.0%	0.1%	62.5%	10.3%	27.1%	6387
	Sub-total 小計	1.0%	4.4%	15.5%	49.9%	8.4%	20.8%	10098
Data Management 數據管理								
801	Data Scientist 數據科學家	0.4%	34.2%	59.5%	6.0%	0.0%	0.0%	284
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	2.6%	1.5%	57.9%	37.7%	0.2%	0.0%	530
	Sub-total 小計	1.8%	12.9%	58.5%	26.7%	0.1%	0.0%	814
Infrastructure And Operations Support 基建和操作支援								
501	IT Operations Manager 資訊科技操作經理	10.7%	37.2%	42.5%	9.6%	0.0%	0.0%	1121
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	0.6%	17.5%	56.9%	24.1%	0.8%	0.0%	2436
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	0.0%	2.0%	23.5%	65.1%	8.0%	1.4%	2558
506	User Support 用戶支援	0.0%	0.1%	6.6%	60.9%	29.5%	3.0%	18593
	Sub-total 小計	0.6%	3.7%	14.9%	55.3%	23.2%	2.4%	24708
IT Education And Training 資訊科技教育及訓練								
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	14.8%	14.2%	26.8%	9.9%	34.2%	0.0%	2464
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	0.0%	1.0%	27.8%	33.9%	37.0%	0.3%	1414
	Sub-total 小計	9.3%	9.3%	27.1%	18.9%	35.3%	0.1%	3878
It Sales And Marketing 資訊科技銷售及市場推廣								
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	8.6%	28.3%	50.9%	10.9%	1.3%	0.0%	1634
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	1.5%	0.5%	40.9%	44.8%	10.1%	2.2%	6510
703	IT Product Promotion Representative 資訊科技產品推廣代表	0.0%	0.0%	2.6%	56.1%	35.7%	5.5%	2628
	Sub-total 小計	2.1%	4.3%	32.7%	42.9%	15.3%	2.7%	10772
Overall 總計		3.0%	9.0%	25.7%	44.4%	14.0%	3.8%	105019

Table 9.7: Top 3 training needs of full-time employees in the next 12 months by principal job表9.7：未來12 個月資訊科技僱員的首選3 項訓練需求（按主要職務劃分）

(a) Research and Development 研究與開發

		Rank *(Employers are asked to select **at most** 3 training areas that are regarded as important for their employees. Rank 1 refers to the training area with the highest % of companies regarded it as top 3, and so on.)*		
Principal Job 主要職務		**Top 1 首位**	**Top 2 第二位**	**Top 3 第三位**
Research and Development (Non-IT related) 研究與開發(與資訊科技不相關)				
001	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	Technical Skills	Design Thinking	Knowledge related to licensing and patent application
002	R&D Technician 研發技術員	Design Thinking	Technical Skills	Research Methodology
003	R&D Assistant 研發助理	Information and System Security	IT Infrastructure Library	Research Methodology
Research and Development (IT related) 研究與開發(與資訊科技相關)				
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	Research Methodology	Design Thinking	Management Skills
052	R&D Technician 研發技術員	Design Thinking	Technical Skills	Research Methodology
053	R&D Assistant 研發助理	Technical Skills	Design Thinking	Research Methodology

(b) Information Technology 資訊科技

		Rank *(Employers are asked to select **at most** 3 training areas that are regarded as important for their employees. Rank 1 refers to the training area with the highest % of companies regarded it as top 3, and so on.)*		
Principal Job 主要職務		**Top 1 首位**	**Top 2 第二位**	**Top 3 第三位**
Research and Development (IT related) 研究與開發(與資訊科技相關)				
051	R&D Researcher ; R&D Scientist ; R&D Engineer 研發研究員、研發科學家、研發工程師	Research Methodology	Design Thinking	Management Skills
052	R&D Technician 研發技術員	Design Thinking	Technical Skills	Research Methodology
053	R&D Assistant 研發助理	Technical Skills	Design Thinking	Research Methodology
General IT Management 一般資訊科技管理				
101	Head of IT 資訊科技主管	Strategic Management	Management skills and leadership Skills	Project Management and Design
102	Chief Technology Officer (CTO) 首席技術總監	Management skills and leadership Skills	Strategic Management	Problem Solving Skills
Software Development 軟件開發				
201	Systems Development Manager 系統開發經理	Information and System Security	Mobile Computing	Application Development Tools/ Programming Languages
202	Systems Architect 系統架構師	Service-Oriented Architecture (SOA)	Virtualisation and Cloud Computing	Networking/Data Communications ; Mobile Computing
213	Business Analyst 業務分析師	Project Management and Design	Digital Marketing and E-Commerce	Information and System Security
203	Project Manager 項目經理	Application Development Tools/ Programming Languages	Information and System Security	Data Science and Data Analytics
212	Systems Analyst 系統分析師	Business Communication Skills in Technology Sector	Application Development Tools/ Programming Languages	Business Process Management
214	Analyst Programmer 分析程式員	Application Development Tools/ Programming Languages	Internet of Things	Multimedia and Computer Graphics
205	Programmer 程式編製員	Application Development Tools/ Programming Languages	Virtualisation and Cloud Computing	Mobile Computing
204	UI/UX Designer 用戶界面、用戶體驗設計師	Application Development Tools/ Programming Languages	Mobile Computing	Interactive Game Design/Development
207	Software Quality Assurance Specialist ; Software Quality Assurance Engineer 軟件品質檢查專責專家、軟件品質檢查工程師	Software Quality (Capability Maturity Model Integration)	Networking/Data Communications	Mobile Computing
208	Software Product Engineer 軟件產品工程師	Software Quality (Capability Maturity Model Integration)	Project Management and Design	Artificial Intelligence (AI)
210	Technical Writer 技術撰稿員	Business Communication Skills in Technology Sector ; Understanding IT Practice in the Chinese Mainland	-	-
211	Computer Game Designer / Artist / Developer ; Computer Graphic Designer / Artist ; Computer Animator ; Web Graphic Designer ; Visual Effects Designer 電腦遊戲設計員／美術員／開發員、電腦圖像設計員／美術員；電腦動畫設計師、網頁圖像設計師、視覺效果設計師	Multimedia and Computer Graphics	Application Development Tools/ Programming Languages	Interactive Game Design/Development
Communications and Networks 通訊及網絡				
301	Network Manager 網絡經理	Networking/Data Communications	Information and System Security	Management skills and leadership Skills
302	Mobile Network Engineer 流動網路工程師	Networking/Data Communications	Mobile Computing	Internet of Things
303	Network Engineer 網絡工程師	Networking/Data Communications	Information and System Security	Artificial Intelligence (AI)
304	Network Administrator 網絡管理員	Problem Solving Skills	Networking/Data Communications	Information and System Security
IT Security 資訊保安				
401	IT Security Specialist ; Information Security Specialist	Information and System Security	Networking/Data Communications	Virtualisation and Cloud Computing
407	Cybersecurity Specialist 網絡安全專責專家	Problem Solving Skills	Virtualisation and Cloud Computing	Information and System Security

		Rank *(Employers are asked to select **at most** 3 training areas that are regarded as important for their employees. Rank 1 refers to the training area with the highest % of companies regarded it as top 3, and so on.)*		
Principal Job 主要職務		**Top 1 首位**	**Top 2 第二位**	**Top 3 第三位**
Technical Services 技術服務				
403	Systems Programmer (Servers) ; Cloud Engineer 系統程式編製員（服務器）、雲計算工程師	Virtualisation and Cloud Computing	Application Development Tools/ Programming	Radio Frequency Identification (RFID) Technologies
404	Services Support Manager 服務支援經理	Application Development Tools/ Programming	Information and System Security	Business Process Management
405	Service Engineer 服務工程師	Business Process Management	Applied Basic IT Tools for Business Processes	Information and System Security
406	Service Technician 服務技術員	Applied Basic IT Tools for Business Processes	Information and System Security	Virtualisation and Cloud Computing
Data Management 數據管理				
801	Data Scientist 數據科學家	Data Science and Data Analytics	Management skills and leadership Skills	Software Quality (Capability Maturity Model Integration)
802	Database Administrator ; Data Warehouse Specialist ; Database Designer 數據庫管理員、數據倉庫專家、數據庫設計員	Database	Internet/Intranet/Web Development	Data Science and Data Analytics
Infrastructure and Operations Support 基建和操作支援				
501	IT Operations Manager 資訊科技操作經理	Problem Solving Skills	Information and System Security	Applied Basic IT Tools for Business Processes
504	IT Operations Supervisor ; Operations Support Supervisor 資訊科技操作主任、操作支援主任	Information and System Security	Networking/Data Communications	Problem Solving Skills
505	Computer Operator ; Systems Operator 電腦操作員、系統操作員	Linux/Unix & Open Source	IT Infrastructure Library	Windows Platform Technology
506	User Support 用戶支援	Information and System Security	Problem Solving Skills	Windows Platform Technology
IT Education and Training 資訊科技教育及訓練				
601	Professor ; Lecturer ; Training Officer 教授、講師、訓練主任	e-Learning Technology and Development	IT Applications in Product Design	Project Management and Design ; Understanding IT Practice in
602	IT Trainer ; IT Instructor 資訊科技訓練員、資訊科技教導員	IT Applications in Product Design	e-Learning Technology and Development	Project Management and Design ; Management skills and
IT Sales and Marketing 資訊科技銷售及市場推廣				
701	IT Sales Director / Manager ; IT Marketing Director / Manager 資訊科技銷售總監／經理、資訊科技市場總監／經理	Business Communication Skills in Technology Sector	Digital Marketing and E-Commerce	Marketing Management
702	IT Sales Representative ; IT Marketing Representative 資訊科技銷售代表、資訊科技市場代表	Digital Marketing and E-Commerce	Business Communication Skills in Technology Sector	Marketing Management
703	IT Product Promotion Representative 資訊科技產品推廣代表	IT Applications in Customer Relationship Management / Customer Engagement	Networking/Data Communications	Digital Marketing and E-Commerce