ANNUAL SURVEY ON INFOCOMM MANPOWER FOR 2014

Infocomm Development Authority of Singapore
10 Pasir Panjang Road
#10-01 Mapletree Business City
Singapore 117438
Republic of Singapore
Tel: (65) 6211-0888
Fax: (65) 6211-2222
Website: www.ida.gov.sg

CONTENTS

TABLES

CHARTS

PART I: SURVEY COVERAGE AND METHODOLOGY

1. INTRODUCTION

Infocomm manpower surveys have been carried out by IDA annually since 1999. This is the 16th in the series.

An infocomm manpower[1] is a person engaged primarily in infocomm-related work including infocomm data analytics work either in an ICT or telecommunication equipment and/or services provider, or user organisation (such as in a bank). He/She must be employed by the Singapore-based enterprise on a full time/part-time/casual/temporary basis either as a permanent or direct contract staff to work in Singapore or to station overseas.

The work of the person may include the development, distribution, implementation, support, operation, sales or marketing of telecommunication, computer hardware/software, IT services or multimedia contents.

2. SURVEY OBJECTIVES

The objective of the Survey is to assess the infocomm manpower pool and its profile in Singapore as at 1 Jun 2014.

3. METHODOLOGY

The sample, covering all industrial sectors, was selected from the Establishment Sampling Frame maintained by the Department of Statistics. The sample was stratified by the Singapore Standard Industrial Classification (SSIC). Data collection (via self-administered questionnaires by mail/email/Internet submission) and processing for the Survey was carried out from Nov 2014 to May 2015.

4. NOTES ON DATA

Past years' data are included for comparison purposes where available. Due to the rounding of figures, the sum of individual figures may not add up to the total or 100%.

1 Respondents were requested to exclude infocomm manpower hired through third-party recruitment agencies, to avoid possible double counting errors as recruitment agencies are also part of the survey sample coverage.

PART II: SURVEY FINDINGS

1. SUMMARY

Growing demand for ICT professionals

- The number of infocomm manpower employed grew by 2.4% to reach 150,200 in 2014. Together with 14,600 infocomm job vacancies, total demand of infocomm manpower increased by 2.3% to reach 164,800 in 2014.

Technical ICT specialist job roles accounted for more than 6 in 10 jobs demanded and demand for these jobs are expected to grow by 14,800 in the next 3 years

- Technical ICT specialist job roles - Development, Network & Systems, Data Analytics, IT Security & Infocomm Research and Development - are most demanded and expected to grow by about 14,800 in the next three years.

i. **Development roles**

a. Development roles include *Software & application manager*; *Software/application developer*; *Website, mobile & social media software/app developer*; *Multimedia & computer games developer*; *IT business analyst*; *Systems analyst*; *IT business process engineers*; *Enterprise/Systems Architect*; *Database administrator*; *IT service manager/IT project manager*.

b. Accounted for 41.2% of the total demand for infocomm professionals, with software development job roles being the most demanded.

c. As at 1 Jun 2014, about 60,800 professionals were employed in Development roles and 7,100 roles were vacant.

d. Employers estimated demand for Development roles to increase another 10,800 in the next three years.

ii. Network & Systems related job roles

a. Networks & Systems related roles include *Network & communications manager/IT infrastructure manager*; *Network, servers & computer systems administrator*; *Network engineer/Telecommunications engineer*; *Virtualisation specialist/cloud operations specialist.*

b. Accounted for 19.8% of the total demand for infocomm professionals.

c. As at 1 Jun 2014, about 30,200 professionals were employed in such roles and 2,400 roles were vacant.

d. Employers estimated demand for Networks & Systems related roles to increase by 2,350 in the next three years.

iii. Critical Emerging Tech job roles (Data scientists, IT Security specialists and Infocomm R&D)

a. Accounted for 4.6% of total demand for infocomm professionals.

b. As at 1 Jun 2014, about 7,300 professionals were employed in such roles and an additional 280 roles were vacant.

c. Employers estimated demand to increase by 1,700 headcounts in the next three years.

Singapore Residents continue to form majority of infocomm manpower

- Infocomm manpower were predominantly Singapore Residents[2] (73%); male (70%); tertiary educated[3] (88%) and below the age of 40 years old (68%).

[2] Singapore residents comprise of Singapore Citizens and Permanent Residents.
[3] Tertiary educated infocomm manpower refers to manpower having at least diploma qualifications.

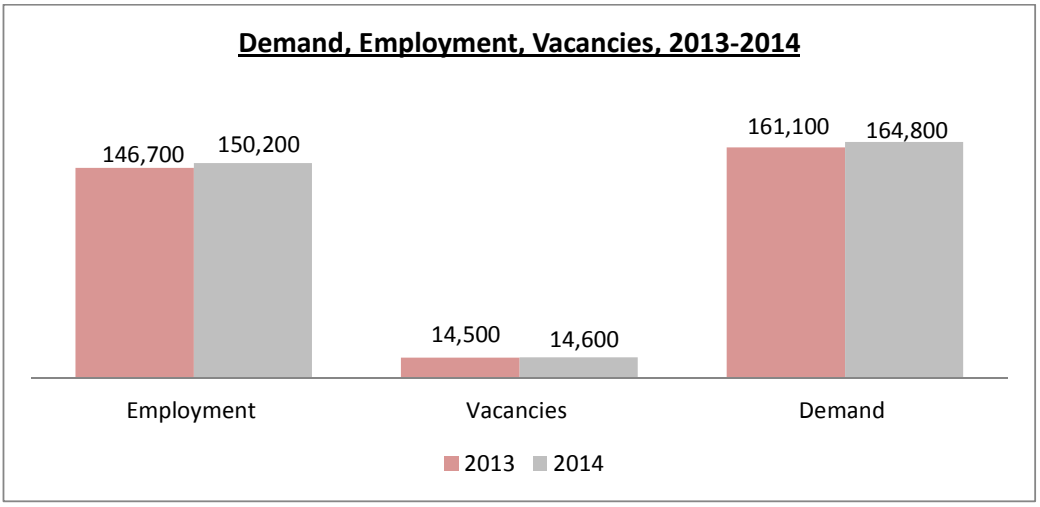
2. EMPLOYMENT

2.1. AN OVERVIEW OF 2014 MANPOWER DEMAND

Growing demand for ICT professionals

Total demand of infocomm manpower increased by 3,600 or 2.3% to 164,800 in 2014 (Chart 2.1). The growth in demand was largely supported by employment which grew by 2.4% from 2013 to 150,200 in 2014. Vacancies also increased by about 130 or 0.9% to reach 14,600.

Chart 2.1: Infocomm Manpower Demand, Employment and Vacancies, 2013- 2014

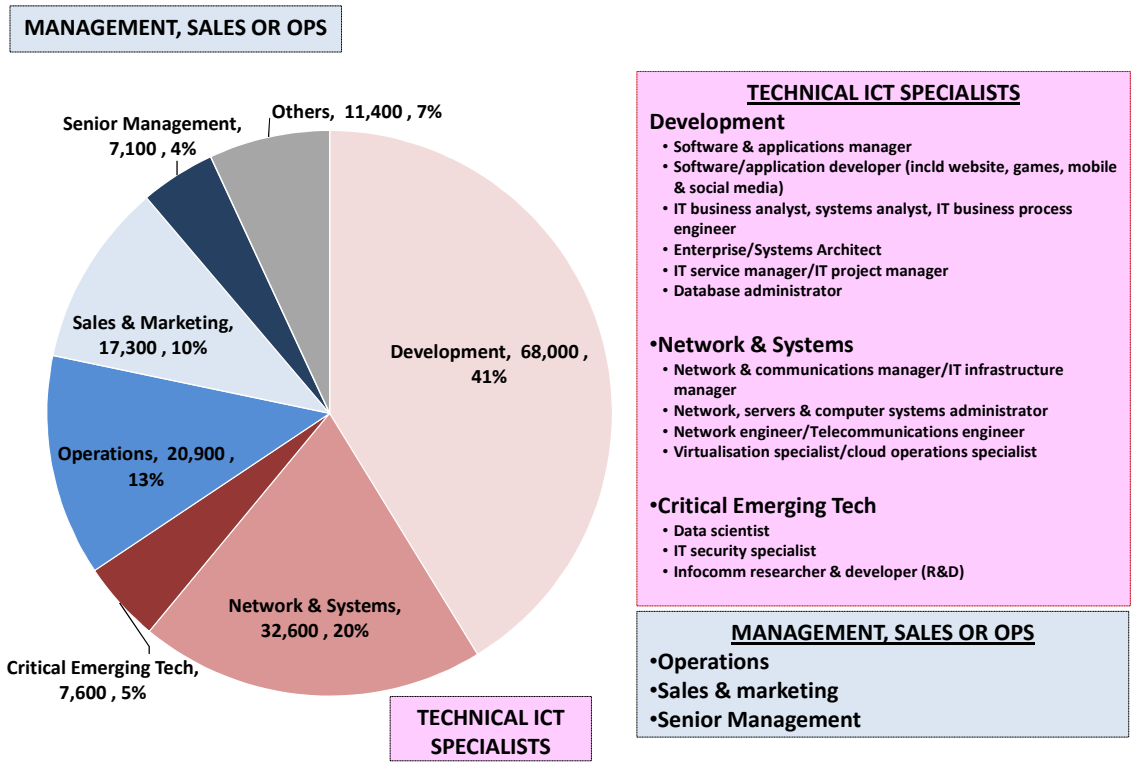


2.2. AN OVERVIEW OF TECHNICAL ICT SPECIALISTS

Technical ICT specialist job roles - Development, Network & Systems, Data Analytics, IT Security & Infocomm Research and Development - accounted for more than 6 in 10 jobs demanded and demand for these jobs are expected to grow by 14,800 in the next 3 years

In total, technical ICT specialist job roles such as *Development*, *Network & Systems* and *Critical Emerging Tech* accounted for 66% or 108,200 of the total infocomm manpower demanded in 2014 (Chart 2.2).

Chart 2.2: Infocomm Manpower Demand as at June 2014



Development

Development roles are the most demanded and accounted for 41.2% or 68,000 of the total demand[4] for infocomm professionals (Chart 2.2). As at 1 Jun 2014, about 60,800 professionals were employed in *Development* roles and an additional 7,100 roles were vacant. Employers estimated demand to increase by another 10,800 for these job roles in the next three years (Chart 2.3).

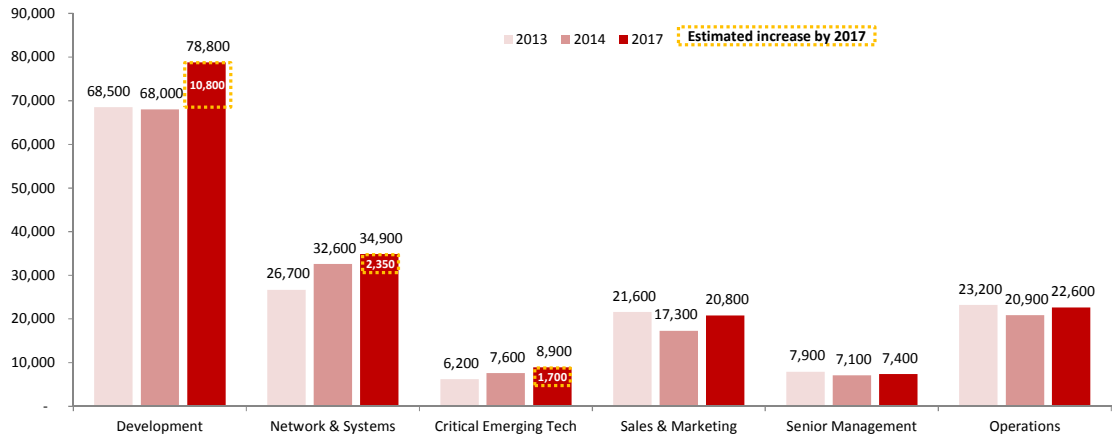
Network & Systems

The next most demanded group of professionals were those working in *Network & Systems* related job roles. They accounted for 20% or 32,600 of the total demand for infocomm professionals(Chart 2.2). As at 1 Jun 2014, about 30,200 professionals were employed in *Network & Systems* related job roles and an additional 2,400 positions were vacant. Employers estimated demand to increase by another 2,350 for these job roles in the next three years (Chart 2.3).

Other Critical Emerging Tech specialists

Other Critical Emerging Tech specialists such as *Data scientists, IT Security specialists* and *Infocomm R&D* accounted for 5% or 7,600 of total demand for infocomm professionals (Chart 2.2). As at 1 Jun 2014, about 7,300 professionals were employed in such roles and an additional 280 roles were vacant. Employers estimated demand to increase by another 1,700 for these job roles in the next three years (Chart 2.3).

Chart 2.3: Employers' Estimation of Additional Manpower Demand in next three years



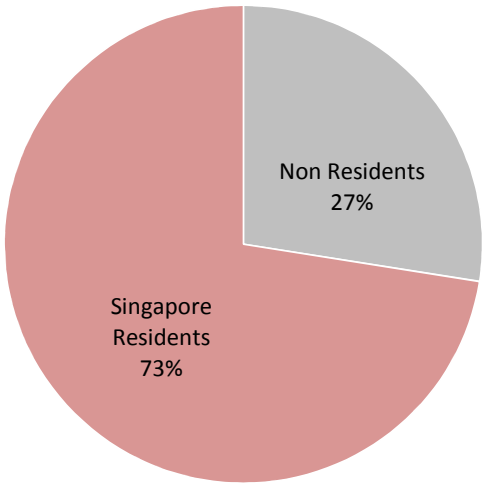
[4] Total infocomm demand refers to the sum of employed infocomm manpower and vacancies.

3. DEMOGRAPHIC PROFILE

Singapore Residents continue to form majority of infocomm manpower

Singapore residents (Singapore citizens and permanent residents) made up about 73% of infocomm manpower in 2014 (Chart 3.1).

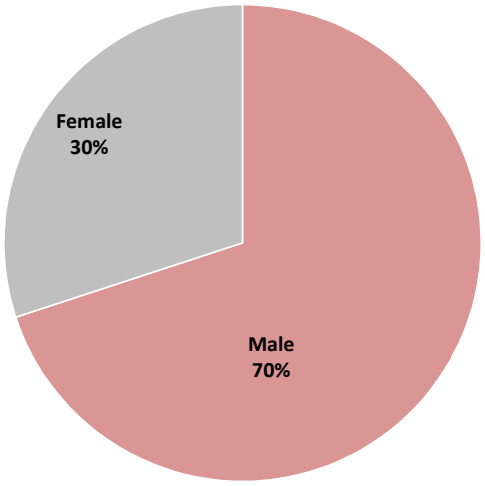
Chart 3.1: Infocomm Manpower by Residential Status, 2014



Males outnumber females in 2014

Males outnumber females in 2014, with females making up 3 out of every 10 infocomm manpower (Chart 3.2).

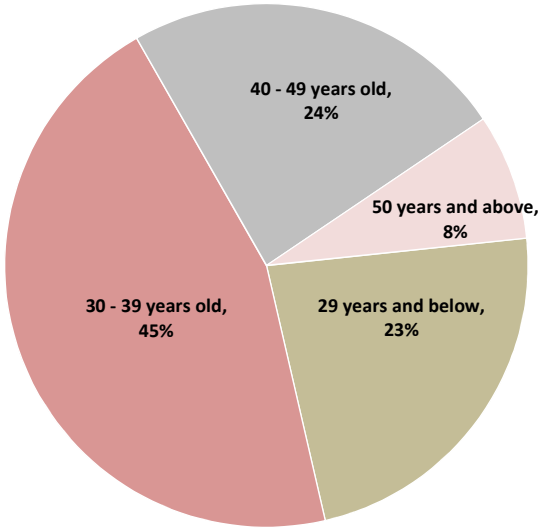
Chart 3.2: Infocomm Manpower by Gender, 2014



About 7 in 10 infocomm manpower are below 40 years old in 2014

About 7 in 10 infocomm manpower are below the age of 40 (Chart 3.3) in 2014. The largest proportion of infocomm manpower continued to be those aged between 30 to 39 years old.

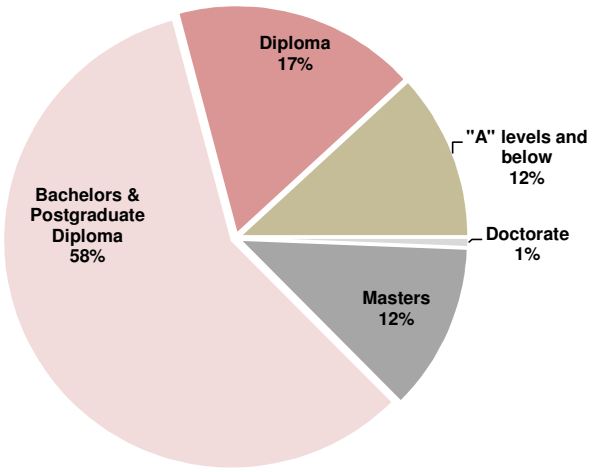
Chart 3.3: Infocomm Manpower by Age, 2014



About 8 in 10 Infocomm manpower were minimally tertiary educated in 2014

More than 8 in 10 of the infocomm manpower had tertiary education (i.e., had at least diploma qualifications) in 2014 (Chart 3.4).

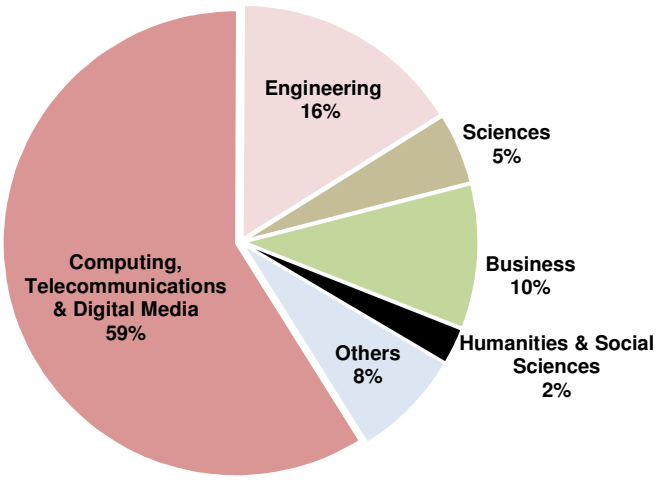
Chart 3.4: Infocomm Manpower by Highest Qualification Attained, 2014



More than half of the infocomm manpower with tertiary education had computing related qualifications

Computing, Telecommunications & Digital Media is the dominant discipline of study among infocomm manpower with tertiary education in 2014. More than half of tertiary qualified infocomm manpower held computing related educational qualifications (Chart 3.5).

Chart 3.5: Infocomm Manpower by Discipline of Study as at June 2014



Base: Infocomm manpower with tertiary education

PART III: ANNEX

ANNEX: Infocomm Job Categories

Table A1: Infocomm Manpower Job Categories Descriptions

No.	Job role	Description
1.	Infocomm Senior Management Roles (E.g. CIOs, CTOs, Chief IT security officer, Chief Data Officer)	They are members of the senior management/executive management team in an IT role, and with at least three managers reporting to them. They include the following roles: • Chief Information Officer (CIO) leads the Information Technology (IT) function in providing strategic directions, solutions and policies to support business goals. • Chief Technology Officer (CTO) is responsible for establishing the company's technical vision and leading all aspects of the company's technology development. He is the company's top technology executive, playing an integral role in the company's strategic direction, development, and future growth. • Chief IT Security Officer is responsible for the planning, development and implementation of security strategy and related policies. • Chief Data Officer is responsible for enterprise-wide governance and utilisation of information as an asset via data processing, analysis, data mining information trading and other means.
2.	Infocomm Startup Founder	Infocomm Startup founders are founding members of an information communications firm: • registered in Singapore in the past five years; • employs at least 1 full-time-equivalent worker; • majority owned by individual founders (i.e. individual founding members should own more than 50% of the company's shares in total); • involved in the creation of new information communications products/services (i.e. the company developed and owns the intellectual property rights for new products/services, it should not be a reseller/distributor of existing products and services from other companies).
3.	Software & applications manager	The software and applications manager leads a team of developers on the analysis, development and deployment of business solutions and software applications. The manager will work with other teams to translate the clients' needs to technical specifications required for system development and deployment.
4.	Software/application developer (excluding website, games, mobile and social media)	They research, analyse and evaluate requirements for existing or new software. They also design, develop, test and maintain software to meet the requirements. Job scope: • researching, analysing and evaluating requirements for software • designing and developing computer software • consulting with engineering staff to evaluate interface between hardware and software • developing and directing software testing and validation procedures • modifying existing software to correct errors, to adapt it to new hardware or to upgrade interfaces and improve performance • directing software programming and development of documentation • assessing, developing, upgrading and documenting maintenance procedures for software • consulting with customers concerning maintenance of software.

No.	Job role	Description
5.	Multimedia & computer games developer & designer	They research, analyse and evaluate requirements for existing or new games and multimedia applications. They also design, develop, test and maintain games and multimedia solutions to meet the requirements. They may also create special effects, animation, or other visual images for use in computer games, movies, music videos and advertisements. Job scope: • researching and identifying the purpose, functionalities and content of games and multimedia applications • consulting with customers concerning maintenance of games and multimedia applications • designing, coding and testing of games and multimedia applications • designing and developing digital animations, imaging, presentations, games, audio and video clips, and internet applications using multimedia software, tools and utilities, interactive graphics and programming languages • assessing, developing, upgrading and documenting maintenance procedures for games and multimedia applications • designing complex graphics and animation to satisfy functional, aesthetic and creative requirements of the design brief • creating simulation of movement by displaying a series of pictures, or frames creating two-dimensional and three-dimensional images depicting objects in motion or illustrating a process, using computer animation and modelling programmes.
6.	Website, mobile and social media software/application developer (excluding games)	They research, analyse and evaluate requirements for existing or new websites, and applications on social media and mobile platforms. They also design, develop, test and maintain websites, and applications on social media and mobile platforms to meet the requirements. Job scope: • researching and identifying the purpose, functionalities and content of the website, and applications on social media and mobile platforms • consulting with customers concerning maintenance of website, and applications on social media and mobile platforms • designing, coding and testing of website, and applications on social media and mobile platforms • assessing, developing, upgrading and documenting maintenance procedures for website, and applications on social media and mobile platforms.
7.	Enterprise/Systems Architect	They define a high level enterprise-wide IT systems architecture focusing on the mapping of IT capabilities to business needs. Job scope: • designing business, information, application and technology architecture which will address the needs of all departments in an organisation • articulating the solution and strategies to the top management to secure buy-in • planning enterprise systems architecture development • developing IT transition plan and preparing the organisation for any changes that may be associated with the implementation • designing IT governance.

No.	Job role	Description
8.	IT business analyst, systems analyst, IT business process engineer	They conduct research, analyse and evaluate client business processes and requirements, information technology requirements, procedures or problems, and develop and implement proposals, recommendations, and plans to improve current or future information systems. Job scope: • consulting with users to formulate and document requirements and with management to ensure agreement on systems principles • identifying and analysing business processes, procedures and work practices • identifying and evaluating inefficiencies and recommending optimal business practices, and system functionality and behaviour • taking responsibility for deploying functional solutions, such as creating, adopting and implementing system test plans • developing functional specifications for use by systems developers • expanding or modifying systems to improve work flow or serve new purposes • coordinating and linking the computer systems within an organisation to increase compatibility.
9.	Database administrator	They develop, control, maintain and support the optimal performance and security of databases. Job scope: • developing database architecture, data structures, tables, dictionaries and naming conventions for information systems projects • constructing, modifying, integrating, implementing and testing database management systems • conducting research and providing advice on the selection, application and implementation of database management tools • developing and implementing data administration policy, documentation, standards and models • developing policies and procedures for database access and usage and for the backup and recovery of data • performing the operational establishment and preventive maintenance of backups, recovery procedures, and enforcing security and integrity controls.
10.	IT service manager/IT project manager	The IT service manager and IT project manager plan, direct and coordinate information technology projects, and provisioning of IT services. Job scope: • consulting with users, to assess computing needs and system requirements and specifying technology to meet those needs • formulating and directing infocomm strategies and plans • directing the selection and installation of infocomm resources and the provision of user training • directing infocomm operations, analysing workflow, establishing priorities, developing standards and setting deadlines • establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources transitioning new services/projects into operation.

No.	Job role	Description
11.	Network & communications manager/ IT infrastructure manager	The network and communications manager, and IT infrastructure manager are responsible for performing long-term strategic planning to ensure that network and IT infrastructure capacity meets current and future requirements. They are also responsible for developing, planning, and implementing the overall strategic goals of an organisation's network and communications system, and IT infrastructure.
12.	Network, servers & computer systems administrator	They develop, control, maintain and support the optimal performance and security of information technology systems. Job scope: • maintaining and administering computer networks and related computing environments including computer network, servers, systems software, applications software and all configurations • recommending changes to improve systems and network configurations, and determining hardware or software requirements related to such changes • diagnosing network and system problems • performing data backups and disaster recovery operations • operating master consoles to monitor the performance of servers, computer systems and networks, and to coordinate computer network access and use.
13.	Network engineer/ Telecommunications engineer	They plan, manage and evaluate the technical planning and installation of LANs/WANs, and other telecommunication systems and equipment. They also manage, maintain and support the enterprise network, and other telecommunication systems and equipment, and ensure network availability, security and capacity monitoring. Job scope: • planning and designing communications networks based on wired, fibre optical and wireless communication media, evaluating and monitoring network infrastructure to ensure networks are configured to operate at optimal performance • researching, designing and advising on telecommunications equipment, and radio and television distribution systems, including both cable and over the air • specifying production or installation methods, materials, quality and safety standards and directing production or installation work of telecommunications products and systems • installing, configuring, testing, maintaining and administering new and upgraded networks, and other telecommunication systems and equipment • preparing and maintaining procedures and documentation for network inventory, and recording diagnosis and resolution of network faults, enhancements and modifications to networks, and maintenance instructions • monitoring network traffic, and activity, capacity and usage and recommending improvements to ensure continued integrity and optimal network performance • providing specialist skills in supporting and troubleshooting network problems and emergencies.
14.	Virtualisation specialist/cloud operations specialist	They are responsible for the administration of the virtualised environment or cloud environment including the design, installation, operation, deployment, automation, monitoring, troubleshooting, and its support. They also specialise in system storage, network, virtualisation and/or data centre automation solutions.

No.	Job role	Description
15.	IT security specialist	They specialise in providing security assurance of information technology systems. Job scope: • developing plans to safeguard data and information against accidental or unauthorised modification, destruction, or disclosure • training users and promoting security awareness to ensure system security and to promote good security practices • conferring with users to discuss issues such as computer data access needs, security violations, and access control requirements • monitoring use of data files and regulate access to safeguard information in computer files • performing risk assessments and executing tests of data processing system to ensure functioning of data processing activities and security measures • encrypting data transmissions and erecting firewalls to conceal confidential information as it is being transmitted and to keep out tainted digital transfers • create good security policies so that the organisation can be adequately protected from any cyber security risks • monitor network traffic and web server logs to watch for any suspicious activities on the network • respond to cyber security incidents, assess the damage done and quickly recover from it • possess specialised skill sets like penetration testing, malware analysis, forensics.
16.	Data Scientist	Data Scientists apply computing and statistical research methods to analyse and model complex data to achieve business objectives (performance improvement, optimisation, cost cutting etc). They also conduct simulation and study of solutions, visualisation of large data sets and present them to management for further actions. They are required to: • parse and manipulate raw, complex data streams to prepare for loading into an analytical tool • data conditioning - transform data into a usable state using appropriate tools and techniques • data integration, combining different data sets to improve the usability and the quality of the data • evolve and enhance systems and tools for data analysis and visualisation • recommend and implement data models to enable or speed up the analysis of data, and query databases or data structures effectively to retrieve data for analysis • explore data sets to identify and understand patterns, develop hypotheses and verify them based on analysis of data, using statistical, algorithmic and other mathematical techniques for the purpose of describing a problem or predicting an outcome • research new ways for modelling and predicting behaviour of customers, urban systems, machine systems or any other domain • implement a set of techniques within computer code for the analysis of data, using relevant programming languages and processing techniques • work with IT teams to define the analytics environment to deliver relevant solutions for key business needs and growth • articulate findings in written, verbal form or computer programs, so as to help others understand the insights from the data • measure, observe and analyze the effects of implementation of prior analytics insights, and devise methods for the improvement of an analytical model.

No.	Job role	Description
17.	Infocomm research & development (R&D)	They plan, direct and coordinate infocomm research and development activities of an enterprise or organisation or of enterprises that provide infocomm related services to other enterprises and organisations. Job scope: • planning, directing and coordinating infocomm research and development activities, in-house or commissioned from external research organisations • to develop new or improved technical processes, products or utilisation of materials.
18.	Infocomm marketing & sales manager	The infocomm marketing and sales manager is responsible for meeting sales quota and developing sales strategies that maximise sales opportunities and achieve higher growth. They are also tasked with the critical role of overseeing the generation of sufficient leads to achieve sales goals and ensure desired outcomes. They are responsible for the overall resource management and deployment of the sales teams.
19.	IT/Software product manager	The IT/Software product manager manages software that is built and implemented as a turnkey product. They will develop benchmark against competitors' product offering to improve product features, pricing plan and business processes for new and/or existing services to ensure market competitiveness.
20.	Infocomm marketing & sales representative	They represent companies to sell various infocomm goods and services to businesses and other organisations and provide specific information as required. Job scope: • soliciting orders and selling goods to retail, industrial, wholesale and other establishments • selling equipment, supplies and related services to business establishments or individuals • obtaining and updating knowledge of market conditions and of employer's and competitors' goods and services • providing prospective customers with information about the characteristics and functions of the products and equipment for sale, and demonstrating its use or qualities • quoting prices and credit terms, recording orders and arranging deliveries • reporting customers' reactions and requirements to suppliers and manufacturers • following up with clients to ensure satisfaction with products purchased.
21.	IT testing/quality assurance specialist/IT auditor	They specialise in quality assurance including software testing. Job scope: • developing and documenting software testing plans • installing software and hardware and configuring operating system software in preparation for testing • verifying that programmes function according to user requirements and established guidelines • executing, analysing and documenting results of software application tests and information and telecommunication systems tests • developing and implementing software and information system testing policies, procedures and scripts.
22.	Infocomm trainer/educator	They teach or train people in infocomm skills/courses. Infocomm skills/courses include handling information technology and communications equipment, using software/design applications and Internet-based applications.

23. Infocomm operations roles		
23a	Website administration	They maintain, monitor and support the optimal functioning of Internet and Intranet website and web server hardware and software. Job scope: • installing, monitoring and supporting the reliability and usability of Internet and Intranet websites or web server hardware or software • developing and maintaining documentation, policies and instructions, recording operational procedures and system logs • developing, coordinating, implementing and monitoring security measures • analysing and making recommendations to enhance performance, including upgrading and acquiring new systems • liaising with, and providing guidance to, clients and users • modifying web pages • performing web server backup and recovery operations.
23b	Computer systems operator	They support the day-to-day processing, operation and monitoring of information and communications technology systems, including local and wide area networks (LANs and WANs), and hardware, software and related computer equipment to ensure optimal performance and identify any problems. Job scope: • operating and controlling peripheral and related computer equipment • entering commands, using computer terminal, and activating controls on computer and peripheral equipment to integrate and operate equipment • monitoring systems for equipment failure or errors in performance • notifying supervisor or maintenance technicians of equipment malfunctions • responding to programme error messages by finding and correcting problems, escalating the problem to other staff or terminating the programme • reading job set-up instructions to determine equipment to be used, order of use, material such as disks and paper to be loaded, and control settings • retrieving, separating and sorting programme output as needed, and sending data to specified users • loading peripheral equipment, such as printers, with selected materials for operating runs, or oversee loading of peripheral equipment by peripheral equipment operators.

No.	Job role	Description
23c	Computer technician (including IT user helpdesk technician)	They provide technical assistance to users, either directly or by telephone, e-mail or other electronic means, including diagnosing and resolving issues and problems with software, hardware, computer peripheral equipment, networks, databases and the Internet, and providing guidance and support in the deployment, installation and maintenance of systems. Job scope: • answering user inquiries regarding software or hardware operation to resolve problems • entering commands and observing system functioning to verify correct operations and detect errors • installing and performing minor repairs to hardware, software, or peripheral equipment, following design or installation specifications • overseeing the daily performance of communications and computer system • setting up equipment for employee use, performing or ensuring proper installation of cables, operating systems, or appropriate software • maintaining records of daily data communication transactions, problems and remedial actions taken, or installation activities • emulating or reproducing technical problems encountered by users • consulting user guides, technical manuals and other documents to research and implement solutions.
23d	Computer and related electronic equipment mechanic	They install, repair and maintain telecommunications equipment, data transmission equipment, cables, antennae and conduits and repair, fit and maintain computers. Job scope: • maintaining, troubleshooting, testing and repairing computers, data transmission equipment and computer peripherals • fitting and adjusting computer hardware • installing, maintaining, repairing, and diagnosing malfunctions of microwave, telemetry, multiplexing, satellite and other radio and electromagnetic wave communications systems • providing technical advice and information, and monitoring the performance of complex telecommunications networks and equipment • installing and repairing cabling for computer, radio, telephone and television transmission • joining telecommunications and data cables and sealing sheathes • installing, maintaining and repairing antennae used in communications.