

# ANNUAL SURVEY ON INFOCOMM MEDIA MANPOWER FOR 2016

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

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# **PART I: SURVEY COVERAGE AND METHODOLOGY**

## **1. INTRODUCTION**

The inaugural Annual Survey on Infocomm Media (ICM) Manpower was carried out following the formation of IMDA, with media job roles included in the survey. This survey's predecessor is the Annual Survey on Infocomm (ICT) Manpower, which had been conducted for 17 cycles since 1999.

### **Definition of Infocomm Media Professional<sup>1</sup>**

An infocomm professional is a person engaged primarily in infocomm-related work, including infocomm data analytics, either in an IT or telecommunication equipment and/or services provider, or user organisation (such as in a bank). The scope of work may include the development, distribution, implementation, support, operation, sales or marketing of telecommunication, computer hardware/software, IT services or multimedia contents. Examples include software developer, software product manager and computer system administrator.

A media professional is a person with specific media content job roles employed in a company across sectors including relevant media ones. Media content job roles cover development, production, operation, distribution, sales and/or marketing of media content. Examples include editor, writer, games designer or games artist, and technical crew.

He/She must be employed by a 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 overseas.

## **2. SURVEY OBJECTIVES**

The objective of the Survey is to assess the profile of infocomm media professionals in Singapore as at 1<sup>st</sup> June 2016.

## **3. METHODOLOGY**

The survey covers both private sector enterprises and agencies from the public sector. The sample for private sector enterprises, covering all industrial sectors, was selected from the Establishment Sampling Frame maintained by the Department of

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

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 January 2017 to May 2017.

#### **4. NOTES ON THE DATA**

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

## **PART II: SURVEY FINDINGS**

# 1. OVERVIEW

## (A) Infocomm Media professionals

- An infocomm media professional refers to a person engaged in infocomm-related work or a person with specific media content job roles employed in a company across sectors.
- The number of infocomm media professionals employed was 199,800 in 2016. Together with 21,300 infocomm media job vacancies, the total demand<sup>2</sup> of Infocomm media professionals was 221,100 in 2016. Demand for infocomm media professionals is projected to grow by another 52,800 in the next three years (2017 – 2019).

### ***Singapore Residents formed majority of Infocomm media professionals***

- Infocomm media professionals constituted predominantly Singapore Residents<sup>3</sup> (69%), males (70%) and those who were at least tertiary educated<sup>4</sup> (83%).

## (B) Infocomm professionals

- The number of infocomm professionals employed grew by 4.2% from 2015 to reach 180,000 in 2016. Together with 18,200 infocomm job vacancies, total demand of infocomm professionals increased by 2.8% to reach 198,200 in 2016. Demand for infocomm professionals is projected to grow by another 42,300 in the next three years (2017 – 2019).

### ***Technical IT specialists accounted for more than 7 in 10 infocomm jobs in 2016***

- Technical IT specialists in the following areas - IT Development, Network & Infrastructure, Data Analytics, Cyber Security & Infocomm Research and Development - were *most in demand* and expected to grow by about 33,400 in the next three years.

#### **i. IT Development roles**

- a. IT Development roles include *Software & application manager; Software/application developer (excluding website, games, mobile & social media; Multimedia & games developer; Website, mobile & social media software/app developer (excluding games); User Interface (UI) User Experience (UX) designer; Enterprise/Systems Architect, IT*

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<sup>2</sup> Total demand refers to the sum of employed manpower and vacancies.

<sup>3</sup> Singapore residents comprise of Singapore Citizens and Permanent Residents.

<sup>4</sup> Tertiary educated Infocomm media manpower refers to manpower having at least diploma qualifications.

*business analyst; Systems analyst; IT business process engineers; Database administrator; IT service manager/IT project manager; IT/Software product manager and IT testing/quality assurance specialist/IT auditor.*

- b. Accounted for more than half (51%) of the total demand for infocomm professionals, with software development job roles being the most in demand.
- c. As at 1<sup>st</sup> Jun 2016, about 90,800 professionals were employed in IT Development roles and 10,000 roles remained vacant.
- d. **Enterprises have projected the demand for IT Development roles to grow by 27,400 in the next three years (2017 – 2019).**

ii. **Network & Infrastructure related job roles**

- a. Network & 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 16% of the total demand for infocomm professionals.
- c. As at 1<sup>st</sup> Jun 2016, about 29,400 professionals were employed in such roles and 2,900 roles remained vacant.
- d. **Enterprises have projected the demand for Networks & Infrastructure-related roles to grow by another 3,400 in the next three years (2017 – 2019).**

iii. **Other Critical Emerging Tech specialists**

- a. Other Critical Emerging Tech specialist roles include *Data analysts/Data scientists, IT Security specialists, IT Security Operations Analysts/Engineers and Infocomm R&D.*
- b. Accounted for 6% of total demand for infocomm professionals.
- c. As at 1<sup>st</sup> Jun 2016, about 11,100 professionals were employed in such roles and an additional 700 roles remained vacant.
- d. **Enterprises have projected the demand to grow by another 2,700 headcounts in the next three years (2017 – 2019).**



## (C) Media professionals

- The number of media professionals employed was 19,800 in 2016. Together with 3,100 media job vacancies, total demand for media professionals was 22,900 in 2016. Demand for media professionals is projected to grow by another 10,500 in the next 3 years (2017 – 2019).

### ***Creative media specialists accounted for more than 5 in 10 media jobs in 2016***

#### **i. Creative Media specialists**

- a. Creative roles include *Writer; Production management; Transmedia strategist/Transmedia producer/Narrative Architect; Television/Film/Casting director; Editor; Data wrangler; Television/Film/Camera crew; Games artist; Games designer; Visual effects artist; Augmented Reality (AR)/Virtual Reality (VR) designer.*
- b. Accounted for 50% of the total demand for media professionals, with editor job roles being the most in demand.
- c. As at 1<sup>st</sup> Jun 2016, about 10,100 professionals were employed in creative roles and 2,000 roles remained vacant.
- d. **Enterprises have projected the demand for Creative Media specialists to grow by another 4,500 in the next three years (2017 – 2019).**

#### **ii. Other Media specialists**

- a. *Other Media specialist roles include Games operation; Community Manager/Game Master and Digital/Social media marketing & sales manager*
- b. Accounted for 17% of total demand for media professionals.
- c. As at 1<sup>st</sup> Jun 2016, about 3,100 professionals were employed in such roles and an additional 900 roles remained vacant.
- d. **Enterprises have projected demand to increase by 5,500 headcounts in the next three years (2017 – 2019).**

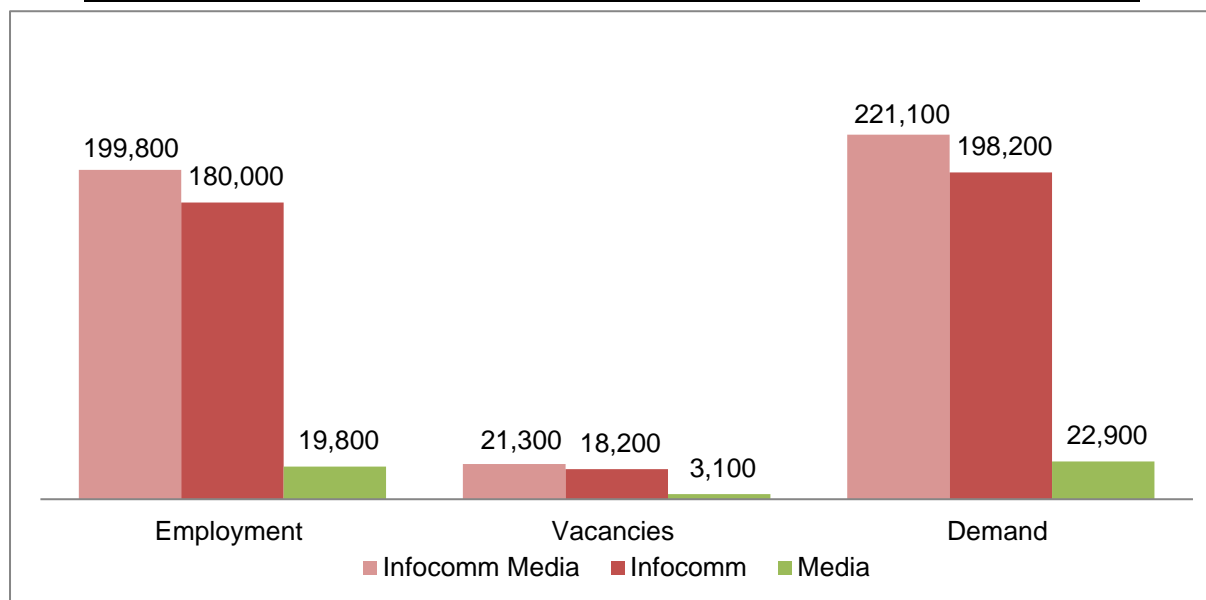
## 2. EMPLOYMENT

### A. AN OVERVIEW OF 2016 INFOCOMM MEDIA MANPOWER DEMAND

#### *Infocomm professionals made up 90% of Infocomm Media employment*

Total employment for infocomm media professionals was 199,800, of which infocomm professionals made up 90% of Infocomm media manpower. Together with 21,300 infocomm media job vacancies, the total demand for Infocomm media professionals was 221,100 in 2016 ([Chart 1](#)).

**Chart 1: Infocomm Media Professionals Demand, Employment and Vacancies, 2016**

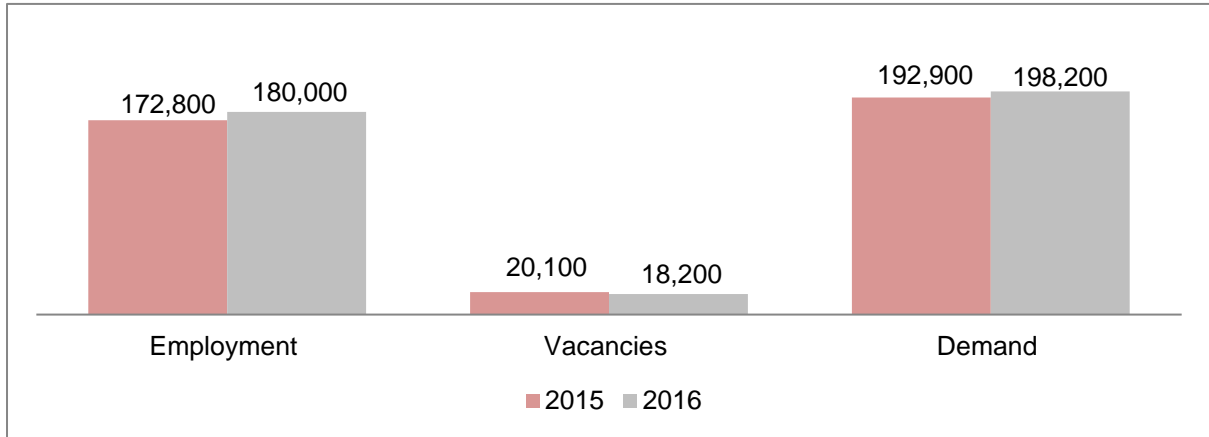


Notes:

- 1) Total infocomm media professionals refers to the sum of infocomm professionals and media professionals.
- 2) Total infocomm media demand refers to the sum of employed infocomm media professionals and vacancies. (Demand = Employment + Vacancies)

Total demand for infocomm professionals increased by 5,300 or 2.8% to 198,200 in 2016 ([Chart 2](#)). The growth in demand was supported by employment which grew by 4.2% from 2015 to 180,000 in 2016. Vacancies dropped by about 1,900 or 9.7% from 2015 to 18,200 in 2016.

**Chart 2: Infocomm Professionals Demand, Employment and Vacancies, 2015 – 2016**



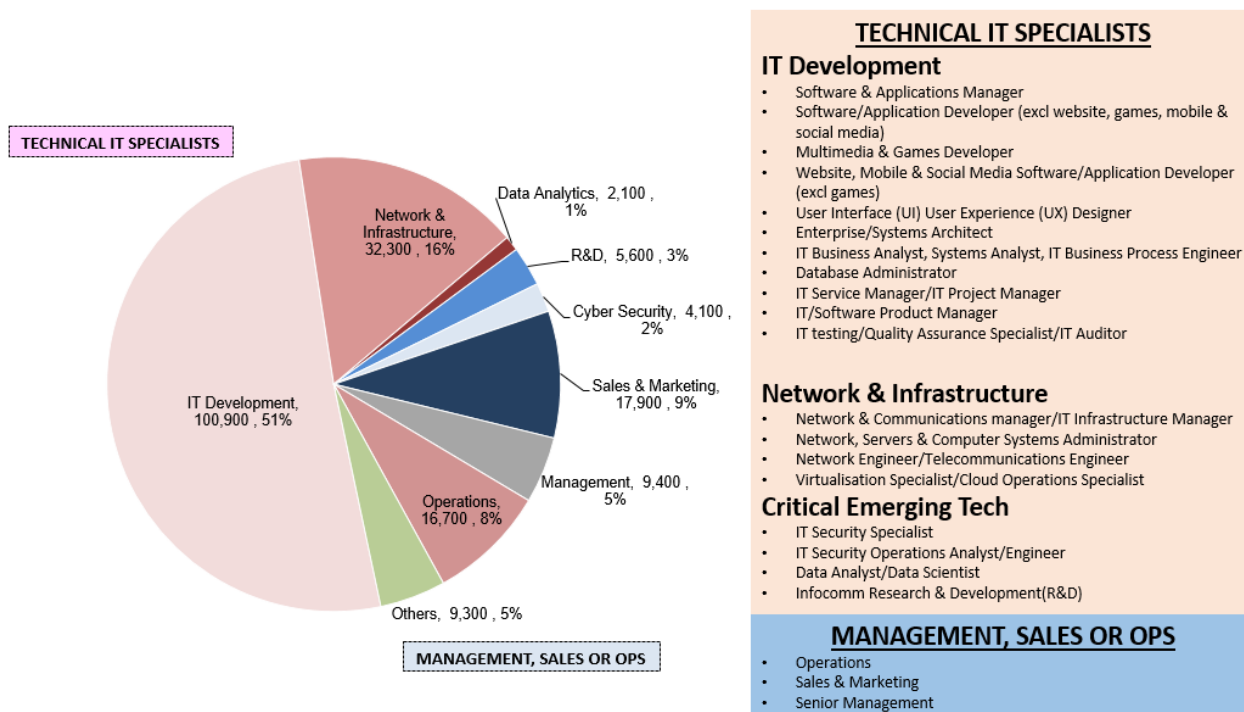
Note: Total infocomm demand refers to the sum of employed infocomm professionals and vacancies. (Demand = Employment + Vacancies)

## B. AN OVERVIEW OF TECHNICAL IT SPECIALISTS

***Demand for Technical IT specialists are expected to grow by 33,400 in the next 3 years (2017 – 2019)***

In total, technical IT specialists in areas such as *IT Development, Network & Infrastructure, Data Analytics, Infocomm R&D and Cyber Security* accounted for 73% or 145,000 of the total infocomm professionals in demand in 2016 (Chart 3).

**Chart 3: Infocomm Professionals Demand as at June 2016**



### i. IT Development

- IT Development* roles were the most in demand and accounted for more than half (51%) or 100,900 of the total demand for infocomm professionals (Chart 3).
- As at 1<sup>st</sup> Jun 2016, about 90,800 professionals were employed in IT Development roles and an additional 10,000 roles remained vacant.
- Enterprises have projected the demand for IT Development roles to grow by another 27,400 in the next three years (2017 – 2019) (Chart 4).

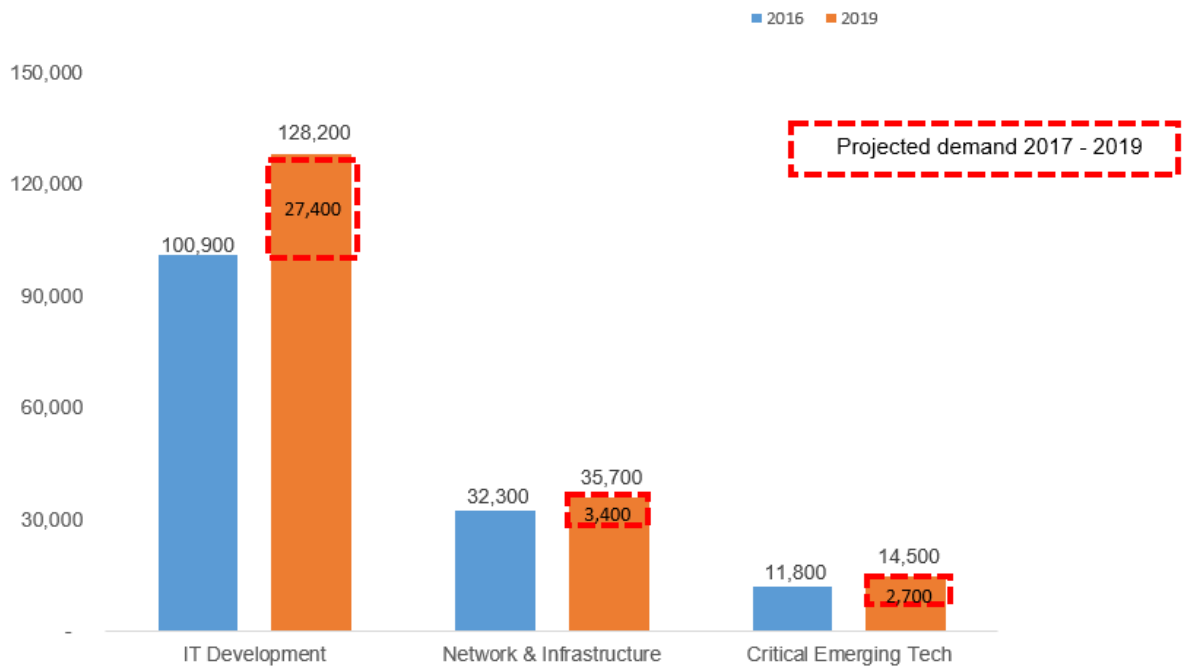
**ii. Network & Infrastructure**

- a. The next most sought after group of professionals were those working in Network & Infrastructure related job roles. They accounted for 16% or 32,300 of the total demand for infocomm professionals (Chart 3).
- b. As at 1<sup>st</sup> Jun 2016, about 29,400 professionals were employed in the Network & Infrastructure roles and an additional 2,900 positions remained vacant.
- c. Enterprises have projected demand to increase by another 3,400 for these job roles in the next three years (2017 – 2019) (Chart 4).

**iii. Other Critical Emerging Tech specialists**

- a. Other Critical Emerging Tech specialists in areas such as Data Analytics, Infocomm R&D and Cyber Security accounted for 6% or 11,800 of total demand for infocomm professionals (Chart 3).
- b. Enterprises have projected demand to increase by another 2,700 for these job roles in the next three years (2017 – 2019) (Chart 4).

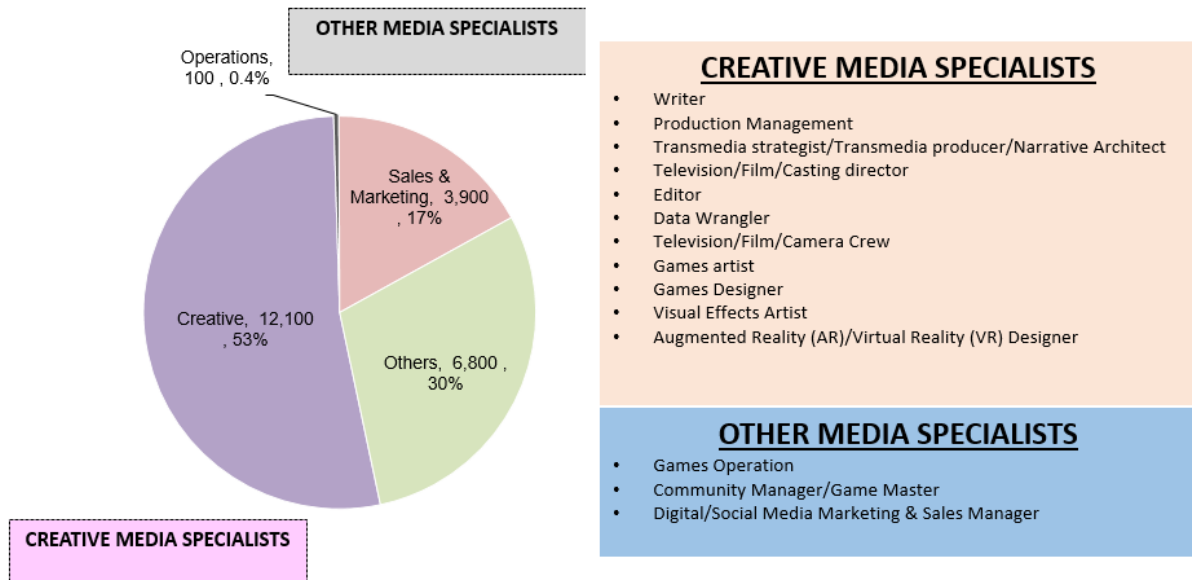
**Chart 4: Enterprises' current and projected demand for Infocomm Professionals in next three years**



## C. AN OVERVIEW OF MEDIA PROFESSIONALS

The number of media professionals employed was 19,800 in 2016. Together with 3,100 media job vacancies, total demand of media professionals was 22,900 in 2016. ([Chart 5](#))

**Chart 5: Media Professionals Demand as at June 2016**



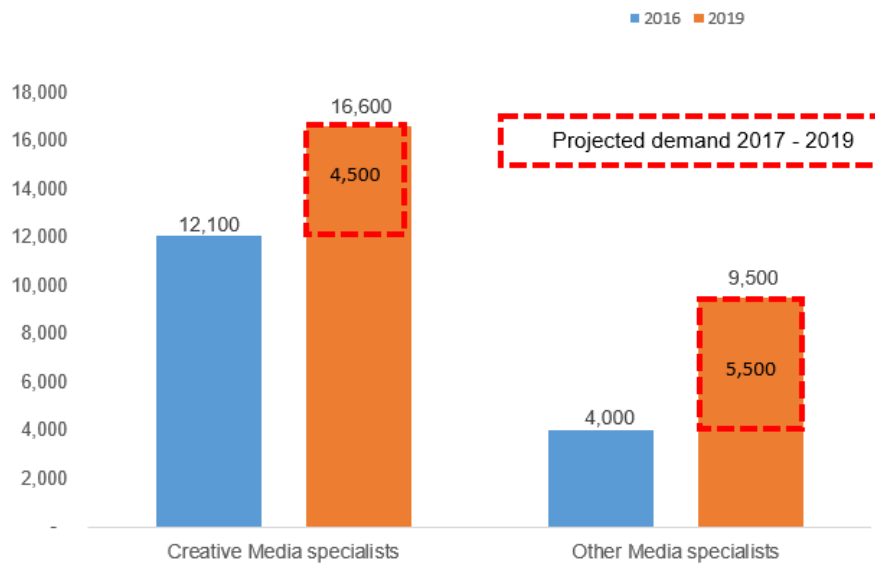
### iii. Creative Media specialists

- Accounted for 50% of the total demand for media professionals, with editor job roles being the most in demand ([Chart 5](#)).
- As at 1<sup>st</sup> Jun 2016, about 10,100 professionals were employed in creative roles and 2,000 roles remained vacant.
- Enterprises have projected the demand for Creative Media specialists to grow by another 4,500 in the next three years (2017 – 2019) ([Chart 6](#)).

### iv. Other Media specialists

- Accounted for 17% of total demand for media professionals ([Chart 5](#)).
- As at 1<sup>st</sup> Jun 2016, about 3,100 professionals were employed in such roles and an additional 900 roles remained vacant.
- Enterprises have projected demand to increase by 5,500 headcounts in the next three years (2017 – 2019) ([Chart 6](#)).

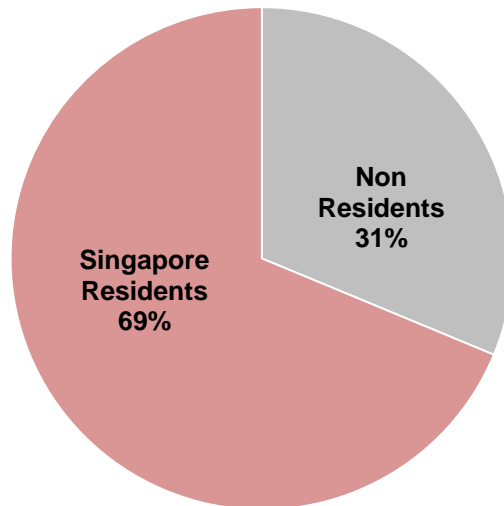
**Chart 6: Enterprises' current and projected demand for Media Professionals in next three years**



### 3. DEMOGRAPHIC PROFILE

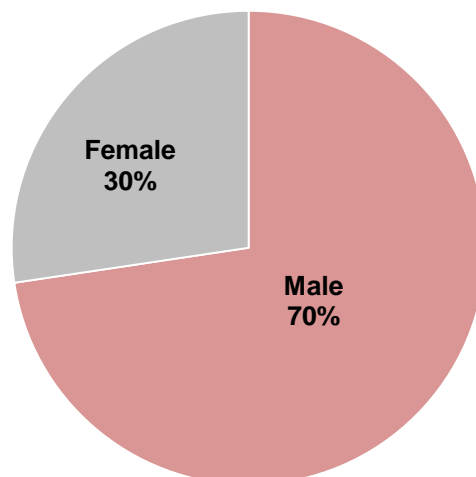
Singapore residents (Singapore citizens and permanent residents) continued to form majority of infocomm media professionals at about 69% in 2016 ([Chart 7](#)).

**Chart 7: Infocomm Media Professionals by Residential Status, 2016**



Males outnumbered females in 2016 with males making up 70% of Infocomm media professionals ([Chart 8](#)).

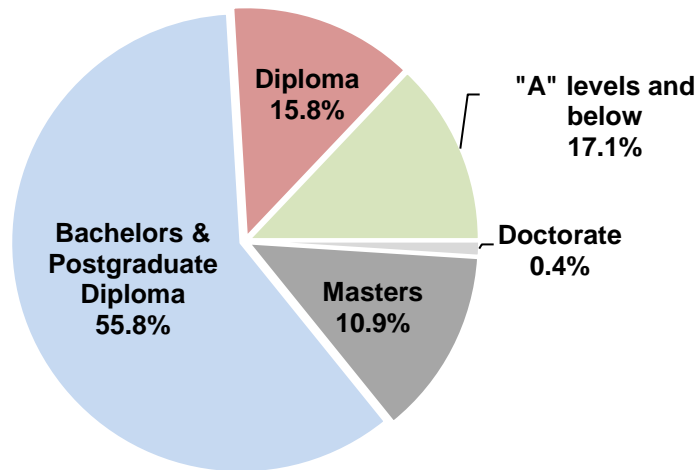
**Chart 8: Infocomm Media Professionals by Gender, 2016**





More than 8 in 10 Infocomm media professionals were minimally tertiary educated in 2016 (i.e., had at least diploma qualifications) (Chart 9).

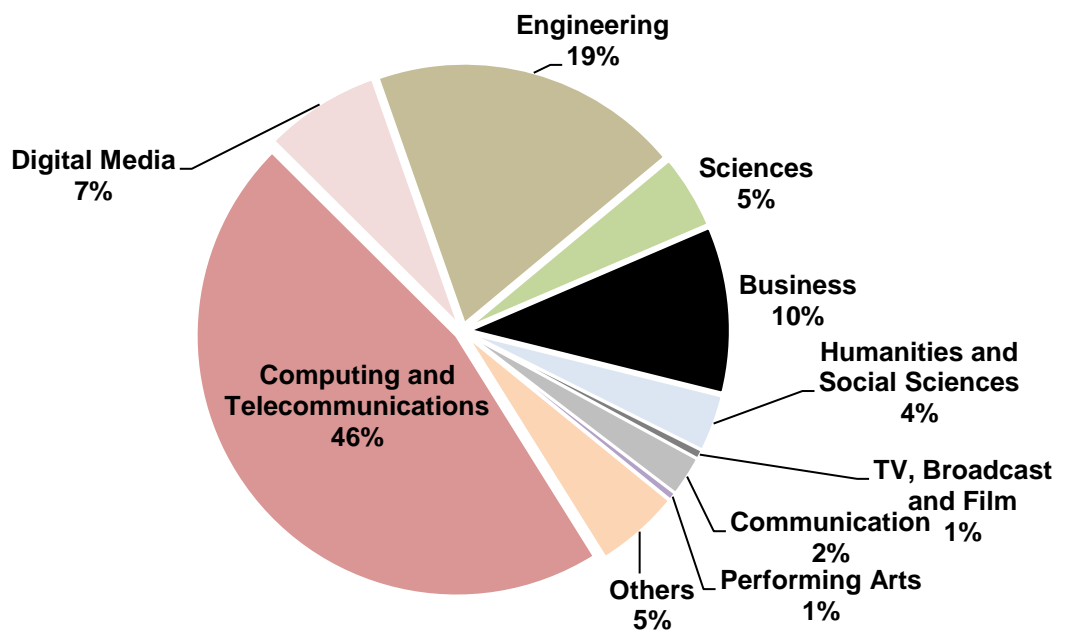
**Chart 9: Infocomm Media Professionals by Highest Qualification Attained, 2016**



More than 4 in 10 infocomm media professionals with tertiary education had computing-related qualifications.

Computing and Telecommunications was the dominant discipline of study among Infocomm media professionals with tertiary education in 2016 (Chart 10).

**Chart 10: Infocomm Media Professionals by Discipline of Study as at June 2016**



Base: Infocomm media professionals with tertiary education

## **PART III: ANNEX**

## Annex A: Description of Infocomm media job roles

**Table 1: Infocomm Media Professionals Job Categories Descriptions**

No.	Job role	Description
1.	Infocomm Senior Management Roles (E.g. CIOs, CTOs, Chief IT security officer, Chief Data Officer)	<p>They are members of the senior management/executive management team in an IT role, and with <u>at least three managers reporting to them</u>. They include the following roles:</p> <ul style="list-style-type: none"> <li>• Chief Information Officer (CIO) leads the Information Technology (IT) function in providing strategic directions, solutions and policies to support business goals.</li> <li>• 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.</li> <li>• Chief IT Security Officer is responsible for the planning, development and implementation of security strategy and related policies.</li> <li>• 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.</li> </ul>
2.	Infocomm Startup Founder	<p>They are the founding members of an information communications firm:</p> <ul style="list-style-type: none"> <li>• registered in Singapore in the past five years;</li> <li>• employs at least 1 full-time-equivalent worker;</li> <li>• majority owned by individual founders (i.e. individual founding members should own more than 50% of the company's shares in total);</li> <li>• 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 <u>should not</u> be a reseller/distributor of existing products and services from other companies).</li> </ul>
3.	Software & applications manager	<p>They are leading 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.</p>
4.	Software/application developer (excluding website, games, mobile and social media)	<p>They research, analyse and evaluate requirements for existing or new software. They also design, develop, test and maintain software to meet the requirements.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• researching, analysing and evaluating requirements for software</li> <li>• designing and developing computer software</li> <li>• consulting with engineering staff to evaluate interface between hardware and software</li> <li>• developing and directing software testing and validation procedures</li> <li>• modifying existing software to correct errors, to adapt it to new hardware or to upgrade interfaces and improve performance</li> <li>• directing software programming and development of documentation</li> <li>• assessing, developing, upgrading and documenting maintenance procedures for software</li> <li>• consulting with users concerning maintenance of software.</li> </ul>
5.	Multimedia & games developer	<p>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 requirement. They are responsible for establishing a link between the artistic vision of the game and its technical implementation. Thereafter they play-test the game in a systematic way, analysing the game's performance against the designer's intentions, identifying problems and suggesting improvements.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• Researching and identifying the purpose, functionalities and content of games and multimedia applications</li> <li>• Visualising, designing and codifying how systems work to run the game and multimedia applications, incorporating and adapting any ready-made code libraries and writing custom code as required</li> <li>• 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</li> <li>• Testing the code and fix bugs, and also develop customised tools for use by other members of the development team.</li> </ul>

		<ul style="list-style-type: none"> <li>• Consulting with users concerning maintenance of games and multimedia applications</li> <li>• Assessing, developing, upgrading and documenting maintenance procedures for games and multimedia applications.</li> </ul>
6.	Website, mobile and social media software/applications developers (excluding games)	<p>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.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• researching and identifying the purpose, functionalities and content of the website, and applications on social media and mobile platforms.</li> <li>• consulting with users concerning maintenance of website, and applications on social media and mobile platforms</li> <li>• designing, coding and testing of website, and applications on social media and mobile platforms</li> <li>• assessing, developing, upgrading and documenting maintenance procedures for website, and applications on social media and mobile platforms.</li> </ul>
7.	User Interface (UI) User Experience (UX) Designer	They design and shape unique, user-centric products and experiences. They will be needed to make deliberate design decisions and to translate given user-experience journey into a smooth and intuitive interaction.
8.	Enterprise/System s Architect	<p>They define a high level enterprise-wide IT systems architecture focusing on the mapping of IT capabilities to business needs.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• designing business, information, application and technology architecture which will address the needs of all departments in an organisation</li> <li>• articulating the solution and strategies to the top management to secure buy-in</li> <li>• planning enterprise systems architecture development</li> <li>• developing IT transition plan and preparing the organisation for any changes that may be associated with the implementation</li> <li>• designing IT governance.</li> </ul>
9.	IT business analyst, systems analyst, IT business process engineer	<p>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.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• consulting with users to formulate and document requirements and with management to ensure agreement on systems principles</li> <li>• identifying and analysing business processes, procedures and work practices</li> <li>• identifying and evaluating inefficiencies and recommending optimal business practices, and system functionality and behaviour</li> <li>• taking responsibility for deploying functional solutions, such as creating, adopting and implementing system test plans</li> <li>• developing functional specifications for use by systems developers</li> <li>• expanding or modifying systems to improve work flow or serve new purposes</li> <li>• coordinating and linking the computer systems within an organisation to increase compatibility.</li> </ul>
10.	Database administrator	<p>They develop, control, maintain and support the optimal performance and security of databases.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• developing database architecture, data structures, tables, dictionaries and naming conventions for information systems projects</li> <li>• constructing, modifying, integrating, implementing and testing database management systems</li> <li>• conducting research and providing advice on the selection, application and implementation of database management tools</li> <li>• developing and implementing data administration policy, documentation, standards and models</li> <li>• developing policies and procedures for database access and usage and for the backup and recovery of data</li> <li>• performing the operational establishment and preventive maintenance of backups, recovery procedures, and enforcing security and integrity controls.</li> </ul>

11.	IT service manager/IT project manager	<p>They plan, direct and coordinate information technology projects, and provisioning of IT services.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• consulting with users, to assess computing needs and system requirements and specifying technology to meet those needs</li> <li>• formulating and directing infocomm strategies and plans</li> <li>• directing the selection and installation of infocomm resources and the provision of user training</li> <li>• directing infocomm operations, analysing workflow, establishing priorities, developing standards and setting deadlines</li> <li>• establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources</li> <li>• transitioning new services/projects into operation.</li> </ul>
12.	IT/Software product manager	<p>They manage 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.</p>
13.	IT testing/quality assurance specialist/IT auditor	<p>They specialise in quality assurance including games and software testing.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• developing and documenting software testing plans</li> <li>• Play-testing games and report on its playability and programme bugs and identifying refinement areas</li> <li>• installing software and hardware and configuring operating system software in preparation for testing</li> <li>• verifying that programmes function according to user requirements, designer's intention and established guidelines</li> <li>• executing, analysing and documenting results of software application tests and information and telecommunication systems tests</li> </ul> <p>developing and implementing software and information system testing policies, procedures and scripts.</p>
14.	Network & communications manager/IT infrastructure manager	<p>They 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.</p>
15.	Network, servers & computer systems administrator	<p>They develop, control, maintain and support the optimal performance and security of information technology systems.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• maintaining and administering computer networks and related computing environments including computer network, servers, systems software, applications software and all configurations</li> <li>• recommending changes to improve systems and network configurations, and determining hardware or software requirements related to such changes</li> <li>• diagnosing network and system problems</li> <li>• performing data backups and disaster recovery operations</li> <li>• operating master consoles to monitor the performance of servers, computer systems and networks, and to coordinate computer network access and use.</li> </ul>
16.	Network engineer/Telecommunications engineer	<p>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.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• researching, designing and advising on telecommunications equipment, and radio and television distribution systems, including both cable and over the air</li> <li>• specifying production or installation methods, materials, quality and safety standards and directing production or installation work of telecommunications products and systems</li> <li>• installing, configuring, testing, maintaining and administering new and upgraded networks, and other telecommunication systems and equipment</li> <li>• preparing and maintaining procedures and documentation for network inventory, and</li> </ul>

		<p>recording diagnosis and resolution of network faults, enhancements and modifications to networks, and maintenance instructions</p> <ul style="list-style-type: none"> <li>• monitoring network traffic, and activity, capacity and usage and recommending improvements to ensure continued integrity and optimal network performance</li> <li>• providing specialist skills in supporting and troubleshooting network problems and emergencies.</li> </ul>
17.	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.
18.	IT security specialist	They specialise in providing security assurance of information technology systems. Job scope: <ul style="list-style-type: none"> <li>• developing plans to safeguard data and information against accidental or unauthorised modification, destruction, or disclosure</li> <li>• training users and promoting security awareness to ensure system security and to promote good security practices</li> <li>• conferring with users to discuss issues such as computer data access needs, security violations, and access control requirements</li> <li>• monitoring use of data files and regulate access to safeguard information in computer files</li> <li>• performing risk assessments and executing tests of data processing system to ensure functioning of data processing activities and security measures</li> <li>• encrypting data transmissions and erecting firewalls to conceal confidential information as it is being transmitted and to keep out tainted digital transfers</li> <li>• create good security policies so that the organisation can be adequately protected from any cyber security risks</li> <li>• respond to cyber security incidents, assess the damage done and quickly recover from it</li> </ul> <p>They possess specialised skill sets like penetration testing, malware analysis, forensics</p>
19.	IT security operations analyst/engineer	They perform operational tasks for the processes and subordinate procedures of Security Operational Centres (SOCs). Job scope include: <ul style="list-style-type: none"> <li>• monitor the SOC main channel for security events and close or escalate security events where necessary</li> <li>• monitor network traffic and web server logs to watch for any suspicious activities on the network</li> </ul>
20.	Data analyst/Data scientist	They 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: <ul style="list-style-type: none"> <li>• parse and manipulate raw, complex data streams to prepare for loading into an analytical tool</li> <li>• data conditioning - transform data into a usable state using appropriate tools and techniques</li> <li>• data integration, combining different data sets to improve the usability and the quality of the data</li> <li>• evolve and enhance systems and tools for data analysis and visualisation</li> <li>• 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</li> <li>• 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</li> <li>• research new ways for modelling and predicting behaviour of customers, urban systems, machine systems or any other domain</li> <li>• implement a set of techniques within computer code for the analysis of data, using relevant programming languages and processing techniques</li> <li>• work with IT teams to define the analytics environment to deliver relevant solutions for key business needs and growth</li> <li>• interpret and articulate findings in written, verbal, visual form or computer programs, so as to help internal and/or external stakeholders understand the insights from the data</li> <li>• measure, observe and analyse the effects of implementation of prior analytics insights, and devise methods for the improvement of an analytical model.</li> </ul>

21.	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: <ul style="list-style-type: none"> <li>• planning, directing and coordinating infocomm research and development activities, in-house or commissioned from external research organisations</li> <li>• to develop new or improved technical processes, products or utilisation of materials.</li> </ul>
22.	Infocomm marketing & sales manager	They are 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.
23.	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: <ul style="list-style-type: none"> <li>• soliciting orders and selling goods to retail, industrial, wholesale and other establishments</li> <li>• selling equipment, supplies and related services to business establishments or individuals</li> <li>• obtaining and updating knowledge of market conditions and of employer's and competitors' goods and services</li> <li>• providing prospective customers with information about the characteristics and functions of the products and equipment for sale, and demonstrating its use or qualities</li> <li>• quoting prices and credit terms, recording orders and arranging deliveries</li> <li>• reporting customers' reactions and requirements to suppliers and manufacturers</li> <li>• following up with clients to ensure satisfaction with products purchased.</li> </ul>
24.	Digital/social media marketing & sales manager	They monitor consumer trends such as what is being viewed, how often and for how long, sales conversions, what content works and does not work, etc. They use information of customer preferences and expectations across all channels. Job scope: <ul style="list-style-type: none"> <li>• Web, social media, mobile, direct mail, point of sale, etc. to create and anticipate consistent, coordinate customer experiences that will move customers along in the buying cycle</li> </ul>
25.	Writer (e.g. Screenwriter, Film Scriptwriter, writer-researcher, Game story writer, narrative copywriter, continuity writer)	They originate ideas, create characters, craft dialogue and write an engaging plot which acts as the skeleton and blueprint of the creative vision for the story.
26.	Production management (e.g. Production coordinator, Assistant Producer, Production Manager, Line Producer, Producer, Executive Producer, Digital Media Producer)	They are responsible in all aspects of the production of a television programme or feature film, from concept to post-production phase of the project. Duties can range from administration, production scheduling and budgeting, coordination to supervision and quality control (meeting commissioner's specifications).
27.	Transmedia Strategist/ Transmedia Producer/Narrative Architect	They are responsible for a significant portion of a project's long-term planning, development, production, and/or maintenance of narrative continuity across different platforms, and creation of original storylines for new platforms. Job Scope: <ul style="list-style-type: none"> <li>• oversee the development of narrative extensions</li> <li>• conceptualising, analysing and designing interactive experiences while bridging narratives at the macro level across media forms</li> </ul>

28.	Director (e.g. Television/Film Director, Casting Director)	They are responsible for the look and sound of a production and its technical standards. During pre-production, Directors make crucial decisions, such as selecting the right cast, crew and locations for the film. They work closely with Producers and/or Writers, enhancing, refining and realising original ideas into finished programmes. They then direct rehearsals and the performances of the cast during production. They are responsible for ensuring that the final programme is faithful to the original concept. They must be able to push boundaries while remaining in total control of their material.
29.	Editor	Editors are responsible for assembling recorded raw material into a finished product that's suitable for broadcasting. They are often backed by Assistant Editors who help with spotting and correcting mistakes in the Post Production process.
30.	Data wrangler	Data wranglers are responsible for gathering, securing and organising all the digital data acquired on-set via the digital cinematography cameras.
31.	Television/Film Camera crew (e.g. Camera operators, Cinematographer and Director of Photography)	Their role is to provide the visual identity, or look to the media content (film/ television), using a variety of source material including stills photography, painting and other films, other than on-site shoots. They are responsible in deciding on lighting, framing and camera movement in line with the chosen visual style and will collaborate closely with the camera crew, the gaffer and their lighting team, the production designer, costume designer, and the hair and make-up department to this end.
32.	Games Artist (including Storyboard artist, Animator, 3D modeller and Creative Director)	Game artists specialised within the art department to visualise stories into frames and models, including 3D object modelling, character design, textures, and environments. They are responsible for the overall look of the game and devises the game's visual style and directs the production of all visual material throughout the game's development.
33.	Games Designer	They devise what a game consists of and how it plays. They plan and define all the elements of a game: its setting; structure; rules; story flow; characters; the objects, props, vehicles, and devices available to the characters; interface design; and modes of play.
34.	Visual Effects Artist (e.g. 3D Stereographer, Composer, Technical Artist)	They analyse the descriptions in the original content blueprint and must produce striking illustrations using the art and techniques of graphics, animation, special effects software, stereo photography, 3D photography, or stereoscopic 3D film to supplement live-action footage.
35.	Augmented Reality (AR)/ Virtual Reality (VR) designer	With an understanding of AR/VR, AR/VR designers contribute to the overall vision and strategy for AR/VR content, from concept exploration through implementation. Job Scope: <ul style="list-style-type: none"> <li>• create compelling concepts, storyboards, sketches, wireframes, flow diagrams, 2D mock-ups, 3D models and prototypes.</li> <li>• rationalize and effectively communicate the design decisions in compelling visual and verbal ways on VR and AR interfaces and experiences.</li> <li>• work closely with researchers to better inform designs and focus on our users.</li> <li>• interpret and translate complex technologies into simple and beautiful products and user experiences.</li> <li>• work closely with UX/UI teams to conceptualise/ test/ play new ideas for VR/AR experiences.</li> <li>• guide and support development team through project delivery and beyond.</li> </ul>



No.	Job role	Description
36.	Infocomm operations roles	<p><b>Website administration</b>  They maintain, monitor and support the optimal functioning of Internet and Intranet website and web server hardware and software.  Job scope:</p> <ul style="list-style-type: none"> <li>• installing, monitoring and supporting the reliability and usability of Internet and Intranet websites or web server hardware or software</li> <li>• developing and maintaining documentation, policies and instructions, recording operational procedures and system logs</li> <li>• developing, coordinating, implementing and monitoring security measures</li> <li>• analysing and making recommendations to enhance performance, including upgrading and acquiring new systems</li> <li>• liaising with, and providing guidance to, clients and users</li> <li>• modifying web pages</li> <li>• performing web server backup and recovery operations.</li> </ul> <p><b>Computer systems operator</b>  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:</p> <ul style="list-style-type: none"> <li>• operating and controlling peripheral and related computer equipment</li> <li>• entering commands, using computer terminal, and activating controls on computer and peripheral equipment to integrate and operate equipment</li> <li>• monitoring systems for equipment failure or errors in performance</li> <li>• notifying supervisor or maintenance technicians of equipment malfunctions</li> <li>• responding to programme error messages by finding and correcting problems, escalating the problem to other staff or terminating the programme</li> <li>• 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</li> <li>• retrieving, separating and sorting programme output as needed, and sending data to specified users</li> <li>• loading peripheral equipment, such as printers, with selected materials for operating runs, or oversee loading of peripheral equipment by peripheral equipment operators.</li> </ul> <p><b>Computer technician (including IT user helpdesk technician)</b>  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:</p> <ul style="list-style-type: none"> <li>• answering user inquiries regarding software or hardware operation to resolve problems</li> <li>• entering commands and observing system functioning to verify correct operations and detect errors</li> <li>• installing and performing minor repairs to hardware, software, or peripheral equipment, following design or installation specifications</li> <li>• overseeing the daily performance of communications and computer system</li> <li>• setting up equipment for employee use, performing or ensuring proper installation of cables, operating systems, or appropriate software</li> <li>• maintaining records of daily data communication transactions, problems and remedial actions taken, or installation activities</li> <li>• emulating or reproducing technical problems encountered by users</li> <li>• consulting user guides, technical manuals and other documents to research and implement solutions.</li> </ul> <p><b>Computer and related electronic equipment mechanic</b>  They install, repair and maintain telecommunications equipment, data transmission equipment, cables, antennae and conduits and repair, fit and maintain computers.  Job scope:</p> <ul style="list-style-type: none"> <li>• maintaining, troubleshooting, testing and repairing computers, data transmission equipment and computer peripherals</li> <li>• fitting and adjusting computer hardware</li> <li>• installing, maintaining, repairing, and diagnosing malfunctions of microwave, telemetry, multiplexing, satellite and other radio and electromagnetic wave communications systems</li> </ul>

		<ul style="list-style-type: none"> <li>• providing technical advice and information, and monitoring the performance of complex telecommunications networks and equipment</li> <li>• installing and repairing cabling for computer, radio, telephone and television transmission</li> <li>• joining telecommunications and data cables and sealing sheathes</li> <li>• installing, maintaining and repairing antennae used in communications.</li> </ul>
37.	Games Operation	<p>They oversee and plan the operation and technical system specifications for the running of the game.</p> <p>Job scope:</p> <ul style="list-style-type: none"> <li>• review and analyse the key game metrics on a daily basis</li> <li>• coordinate and set up the various in-game communication tools (assets creation, push notifications, etc)</li> <li>• report business progress with quantitative data regularly</li> <li>• monitor the gaming trends, patterns and discussions; contribute to operation strategy setting</li> <li>• plan and organize in-game and offline promotional events\</li> <li>• communicate directly with gamers and provide feedback internally on behalf of them</li> <li>• test new product content to identify bugs and provide constructive feedback</li> <li>• analyse competitors and perform benchmarking</li> </ul>
38.	Community Manager/ game Master	<p>They act as the link between the community, and the publisher and/or development team. They are in charge of the direct communication in times of crisis, but more important: it means that the CM is the first person bearing the image of the company and contributes to building it.</p> <p>Job Scope:</p> <ul style="list-style-type: none"> <li>• fostering meaningful and long-lasting relationships with the player base, including fans, content creators, event organizers and cosplayers.</li> <li>• understand the needs and sentiment of the community to identify emerging issues or opportunities to improve their overall experience</li> <li>• recruit and manage a network of passionate game ambassadors that would assist in organizing fun grassroots level tournaments and events</li> <li>• plan online and offline programs that brings the game closer to the community</li> </ul>