Talent Gap Study for the Communications Sector in Malaysia

Final Report

Limitations of the Study

This Study was prepared based on the information obtained via desktop research and inputs supplied to the project team by key stakeholders via surveys, focus interviews and other means as highlighted in the Report. Hence, there are some limitations associated with the findings presented in this Study. The limitations are as follows:

1. **Comprehensiveness and relevance of information gathered through focus interviews, surveys and validation workshops**
   - Information obtained from key stakeholders through focus interviews, surveys and validation workshops may not be comprehensive and may not be fully representative of the entire industry as it is dependent on the stakeholder's industry experience and willingness to share. Additionally such views, opinions and information may be subject to change depending upon changing business priorities and trends
   - Where different talent issues and support requirements might be raised by industry representatives during the focus interviews, surveys and validation workshops, only those identified to be common to a fair proportion of the key stakeholders will be considered when developing the two (2) year strategy

2. **Availability of information/data for top-down analysis**
   - The availability of data for talent-related information for the Telecommunications sector provided by the Department of Statistics Malaysia (DOSM), Ministry of Education (MoE) and Economic Planning Unit (EPU) was limited
   - The project team relied on the available information received where reasonable to support the Study, utilised the findings obtained from focus interviews and survey outputs

3. **Limitations in response rate for survey deployed**
   - As with most surveys, the survey response rate is subject to respondents' willingness to engage and share information. The project team will diligently follow up with the target list key stakeholders on a best-effort basis within the allowable time frame to complete the surveys

4. **Accuracy and reliability of sources**
   - The project team is very dependent on the oral and written representations provided by participants and the quality of the responses may not be accurate and complete

Moreover, this Study have covered numerous steps namely focus interviews, surveys and validation workshops to ensure that the Study was able to set the direction of insights obtained from the industry and educational institutions. Likewise, all outcomes and findings were derived from the analysis of the provided information is based on best-effort basis, and therefore may not be fully representative of the industry and educational institutions expectations. Additionally, the outcomes and findings obtained from the industry and educational institutions are analysed and validated by Subject Matter Experts.

Contents

Glossary

Glossary

Terms	Definition
AAA	Authentication, Authorisation and Accounting
ADSL	Asymmetric Digital Subscriber Line
ASEAN	Association of Southeast Asian Nations
ATM	Asynchronous Transfer Mode
BBGP	Broadband for General Population
BDA	Big Data Analytics
BSS	Business Support System
CASP	Content Application Services Provider
CCI	Communications Content and Infrastructure
CCPS	Communications Convergence Professional Society
CEO	Chief Executive Officer
CSR	Corporate Social Responsibility
DOSM	Department Statistics of Malaysia
DPI	Deep Packet Inspection
DSL	Digital Subscriber Line
DWDM	Dense Wavelength Division Multiplexing
ETP	Economic Transformation Programme
EPC	Engineering, Procurement and Construction
EPU	Economic Planning Unit
FLM	Front Line Maintenance
FTTH	Fibre-To-The-Home
GDP	Gross Domestic Product
GEMS	Graduate Employability Management Scheme
GLIF	Global Lambda Integrated Facility
GNI	Gross National Income
GPON	Gigabit-capable Passive Optical Networks
GSM	Global Systems Mobile
GST	Good and Services Tax
GVA	Gross Value Added
HRDF	Human Resources Development Fund
HSBB	High Speed Broadband
ICT	Information and Communications Technology
IHLs	Institute of Higher Learnings
ILMIA	Institute of Labour Market Information and Analysis
IMS	IP Multimedia System
Industry	A collective group that represent Telecommunications organisations in Malaysia
INSEAD	Institut Européen d'Administration des Affaires
IoE	Internet of Everything

Glossary (cont'd)

Terms	Definition
IoT	Internet of Things
IP	Internet Protocol
ISIS	Intermediate System to Intermediate System
ISP	Inside Plant
IT	Information Technology
ITIL	Information Technology Infrastructure Library
KPI	Key Performance Indicators
LDAP	Light Weight Directory Access Protocol
LTE	Long-Term Evolution
M2M	Machine-to-Machine
MACEE	Malaysian – American Commission on Educational Exchange
MASCO	Malaysia Standard Classifications of Occupations
MCMC	Malaysian Communications and Multimedia Commission
MDeC	Multimedia Development Corporation
MMU	Multimedia University
MNCs	Multinational Companies
MoE	Ministry of Education
MoHE	Ministry of Higher Education
MoHR	Ministry of Human Resources
MPLS	Multiprotocol Label Switching
MQA	Malaysian Qualifications Agency
NAT	Network Address Translation
NFC	Near Field Communications
NFP	Network Facilities Provider
NFV	Network Function Virtualisation
NGN	Next Generation Network
NMEICT	National Mission on Education through Information and Communication Technology
NSP	Network Service Provider
N/A	Not Available
NoSQL	Not only Structured Query Language
NOC	Network Operation Centre
OEM	Original Equipment Manufacturers
OSP	Outside Plant
OSPF	Open Shortest Path First
OSS	Operations Support System
PCF	Product Development and Commercialisation Funds
PDH	Plesiochronous Digital Hierarchy
PIKOM	The National ICT Associations of Malaysia
PKI	Public Key Infrastructure

Glossary (cont'd)

Terms	Definition
PON	Passive Optical Networks
PTN	Private Telecommunications Network
RAN	Radio Access Network
RCS	Revision Control System
R&D	Research & Development
RF	Radio Frequency
SAR	Specific Absorption Rate
SDH	Synchronous Digital Hierarchy
SDN	Software Defined Network
SLA	Service Level Agreement
SMEs	Small and Medium Enterprises
SOAP	Simple Object Access Protocol
SSL	Secure Sockets Layer
SQL	Structured Query Language
TalentCorp	Talent Corporation Malaysia Berhad
TM	Telekom Malaysia
TSCC	Telecom Sector Skill Council
TVET	Technical and Vocational Education and Training
UK	United Kingdom
UMTS	Universal Mobile Telecommunications Systems
USA	United States of America
USD	United States Dollar
UTM	Universiti Teknologi Malaysia
VAS	Value Added Services
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
WCC	Wireless Communication Centre
WIE	Wireless Industry Emission
WiMAX	Worldwide Interoperability for Microwave Access

Executive summary

Foreword

A dynamic and fast paced sector

Worldwide, the Telecommunications sector is considered as a dynamic and fast paced sector and continues to grow strength to strength. The key trends impacting the sector like digitisation and new technological trends to name a few will change the business landscape for Telecommunications organisations across the entire value chain of the sector.

Such change to the business landscape can only be supported by the right set of talent. In Malaysia, Telecommunications organisations are currently coping with several challenges in attracting and retaining the right talent. Additionally, they are required to focus on developing the existing talent to meet the industry requirements currently and in the next 3-5 years.

Therefore, this Study have been conducted to determine and understand the unique talent requirements in Malaysia and help define the talent strategy for the sector.

Content of the Report

This Report contains a few sections and are highlighted below:

Introduction

- This section covers the background of the Talent Gap Study, key content of the Report and summary of the Study approach and methodology

Study findings

- This section details the key trends observed in the Telecommunications sector, future talent needs in the sector, talent management practices, challenges faced by educational institutions to produce industry ready graduates, capability of graduates coming into the sector, and challenges to fulfill industry requirements

Action plans

- This final section highlights the recommended key action plans and the benefit of these action plan to support the talent pipeline in the sector

In the following pages, the Report presents the executive summary of key information to be highlighted.

This Report highlights key findings from the Study on talent and skills requirements for the Telecommunications sector and key action plans to support talent growth.

Executive Summary

Background of the Talent Gap Study

Under the National Key Economic Areas (NKEAs) Communications, Content and Infrastructure (CCI) spans content, network applications, services and devices which contributed RM 22 billion of Malaysia's Gross National Income (GNI) where Telecommunications it is accounted for the bulk of it[1]. Furthermore, the Government aspires to raise the CCI sector's GNI contribution to RM 57.7 billion by 2020[1]. Therefore, the sector is crucial to Malaysia's development into a high-income nation as it is both a growth industry and an enabler of an accelerated economic expansion. As a result, having the right human capital is critical and the positive outcome of this NKEA is driven greatly by the level of qualifications and skills that the sector attracts and develops.

This Study is a collaborative effort between the Malaysian Communications and Multimedia Commission (MCMC) and Institute of Labour Market Information and Analysis (ILMIA). The MCMC is the regulator for converging Communications and Multimedia industry, where it regulates converging industries such as Broadcasting, Telecommunications and online services in accordance with the national policy objectives as set out in the Communications and Multimedia Act (1998). ILMIA under the Ministry of Human Resources, provides labour market information to ultimately establish a centralised labour market database that contains information on trends, imbalances, and future talent requirements for priority economic sectors such as the Communications sector.

This Talent Gap Study ("Study") aims to identify and analyse the talent demand and supply in the Communications sector focussing **on the Telecommunications sector** to better understand the unique talent requirements in Malaysia and help define the talent strategy for the sector. The intent of the Study is to identify the gaps in the sector and recommend actionable plans to address identified gaps in the sector. The four (4) focus areas covered in the Study are defined in the diagram below:

Infrastructure – Wireless Technology and Network

Infrastructure – Fixed Line Technology and Network

Focus Areas

Information and Network Security

Emerging technologies – Cloud Computing and Big Data Analytics

These focus areas are the key drivers of growth in the sector and represent current and future industry needs

Executive Summary

This Study comprises of three (3) reports, each of which contains a unique set of content that makes up the Study. The first report that has been developed is the **Inception Report** which provides an overview of the focused approach adopted for the talent gap study. In addition, the second report of the Study is the **Interim report** which provides key insights on the findings of the Study based on the supply and demand perspectives as well as the labour market database. The Interim Report also contains an executive summary of the benchmarking analysis on the talent landscape, talent drivers and innovative approaches on talent development in the sector for the selected countries. Finally, to end the Study, a **Final Report** is developed to provide key findings observed in the Telecommunications sector and key recommended action plans to support talent growth in the Malaysian Telecommunications sector. For further information on the Inception Report and Interim Report, please reach out to the MCMC. The key highlights of the previous two (2) reports are depicted in the following diagram:

Key Highlights

Inception Report

1. The parameters of the talent gap study
2. Findings of the initial research that serves as the study foundation
3. The study approach and methodology

Interim Report

1. Findings and analysis from both the demand and supply side
2. Findings from the benchmarking analysis
3. Outcomes of the labour market database

The content of this Final Report differs from the previous two (2) reports. The previous two reports sets up the foundation of the Study and presents a detailed analysis of the findings obtained from the industry, educational institutions and government agencies. In contrast, the Final Report presents the key findings of the study and recommended action plants to overcome the challenges identified in relation to talent-related issues in the sector. The diagram below illustrates the key outcomes of the sections found in this Final Report.

Section 1
Introduction

Section 2
Study findings

Section 3
Developed action plans

- This section covers the background of the talent gap study which includes the justification of selecting the four (4) focus areas
- Highlights the key activities that have been carried out through this Study and the summary of the Study methodology

- This section provides a closer look on the trends observed in the Telecommunications sector and how they impact talent needs in the future
- Examines the talent management practices established by organisations to attract, retain and develop talent
- Highlights student intake trends and capability of graduates
- Presents analysis of the challenge to fulfill industry requirements and identifies impact areas

- This section highlights the key action plans recommended based on the four pillars identified (e.g. industry, government, educational institutions, including hybrid collaborative efforts)
- Presents rationale for recommendations and anticipated benefits of action plans
- Indicative roadmap for implementation of action plans and a model in measuring and ensuring the sustainability of outcomes
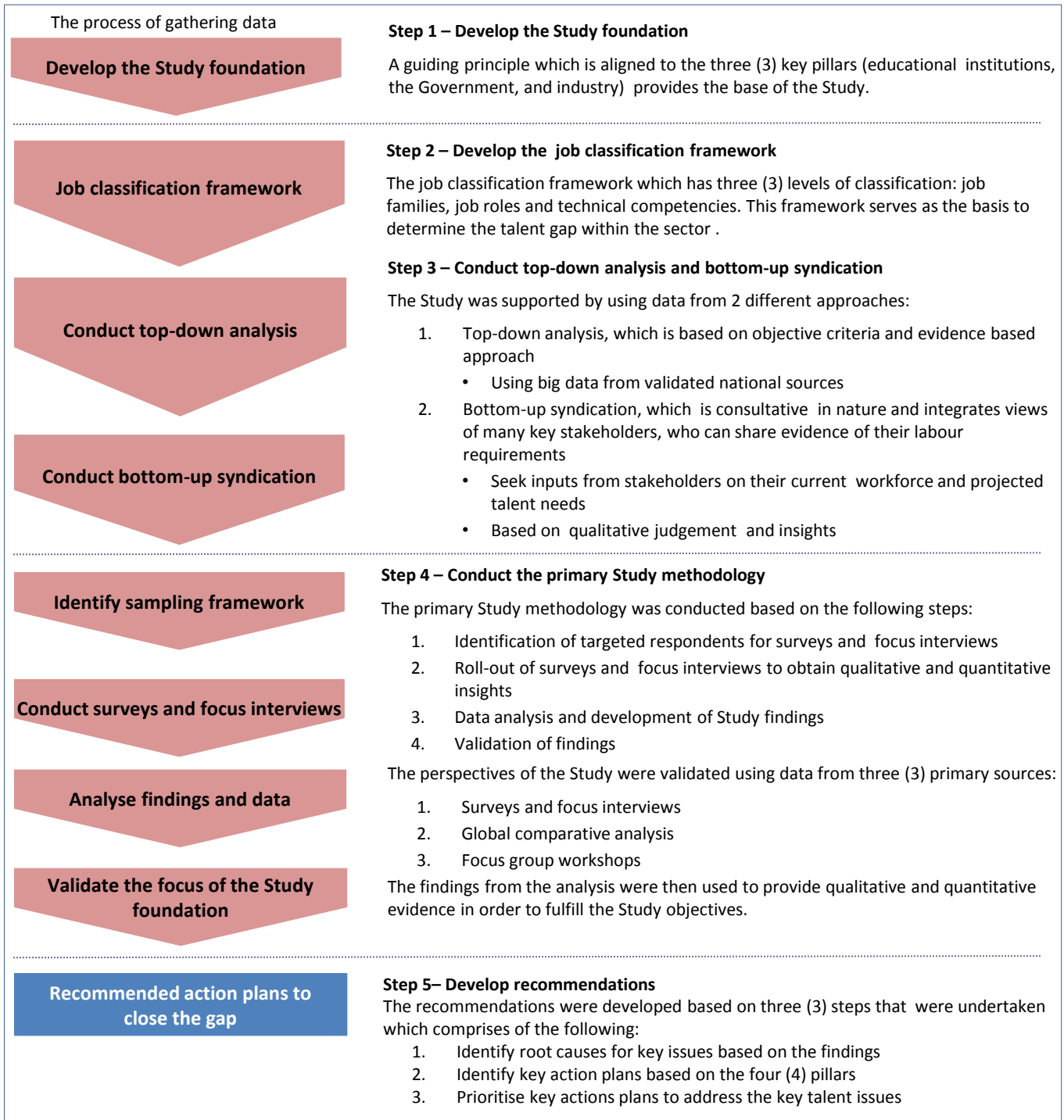
Executive Summary

Summary of the Study Approach and Methodology

There are five (5) key steps were taken in the approach of this Study. Referring to the diagram below, the description of the key steps undertaken are illustrated.

The process of gathering data

Develop the Study foundation

Job classification framework

Conduct top-down analysis

Conduct bottom-up syndication

Identify sampling framework

Conduct surveys and focus interviews

Analyse findings and data

Validate the focus of the Study foundation

Recommended action plans to close the gap

Step 1 – Develop the Study foundation

A guiding principle which is aligned to the three (3) key pillars (educational institutions, the Government, and industry) provides the base of the Study.

Step 2 – Develop the job classification framework

The job classification framework which has three (3) levels of classification: job families, job roles and technical competencies. This framework serves as the basis to determine the talent gap within the sector .

Step 3 – Conduct top-down analysis and bottom-up syndication

The Study was supported by using data from 2 different approaches:

1. Top-down analysis, which is based on objective criteria and evidence based approach
   • Using big data from validated national sources
2. Bottom-up syndication, which is consultative in nature and integrates views of many key stakeholders, who can share evidence of their labour requirements
   • Seek inputs from stakeholders on their current workforce and projected talent needs
   • Based on qualitative judgement and insights

Step 4 – Conduct the primary Study methodology

The primary Study methodology was conducted based on the following steps:

1. Identification of targeted respondents for surveys and focus interviews
2. Roll-out of surveys and focus interviews to obtain qualitative and quantitative insights
3. Data analysis and development of Study findings
4. Validation of findings

The perspectives of the Study were validated using data from three (3) primary sources:

1. Surveys and focus interviews
2. Global comparative analysis
3. Focus group workshops

The findings from the analysis were then used to provide qualitative and quantitative evidence in order to fulfill the Study objectives.

Step 5– Develop recommendations

The recommendations were developed based on three (3) steps that were undertaken which comprises of the following:

1. Identify root causes for key issues based on the findings
2. Identify key action plans based on the four (4) pillars
3. Prioritise key actions plans to address the key talent issues

Executive Summary

Key Trends observed in the Telecommunications Sector

The Malaysian Telecommunications sector has grown strongly over the past decade and is expected to continue this growth in the future, the mobile market in particular. In 2000, there were only 6 million mobile subscribers, in 2014, this number had risen to 45 million, thus placing Malaysia as a nation with one of the highest mobile penetration rates in the region with an estimated 146.2% cellular coverage[1]. Additionally, based on the insights obtained from the industry and subject matter experts, the Malaysian Telecommunications sector is poised to grow rapidly with several key trends expected to drive growth. An important factor necessary to support this anticipated growth is the availability of qualified and experienced personnel. The diagram below depicts the four (4) key trends observed in the sector impacting the talent needs for the next 3-5 years.

1 Digitisation

Digitisation — the mass adoption of connected digital services by consumers, enterprises, and governments — has emerged as a key economic driver that accelerates growth and facilitates job creation. By the year 2020, an entire generation, Generation C (for "connected") will have grown up in a primarily digital world. Computers, the Internet, mobile phones, texting – all are second nature to members of this group[2]. Consequently telecommunications players must provide attractive portfolios of new digital products and services to meet the demands of these connected users. Digitisation will spur the need for talents to understand and possess creativity to innovate on these technologies to maximise potential benefits.

2 *Technological trends changing the business landscape*

The main emerging technologies that will be impacting the sector are Internet of Things (IoT), Internet of Everything (IoE), data analytics, cloud computing and security services. In the next 3-5 years, these emerging technologies will play a pivotal role in changing the business landscape of the sector as more organisations will develop products and provide services associated with the mentioned technologies. Talent needs for the future will definitely focus on the skill sets on data analytics, data mining and mobile applications development with relations to IoT/IoE.

3 *Demographic shifts*

As the population comprises of more younger generation; there will be a great demand in a diverse range of products and services which are cost-effective and accessible through online and mobile channels. As a result, talent will need to have the ability to apply new technologies and innovate them as well as commercialise their ideas to cater to the growing requirements of the young and technology-savvy generation.

4 *The need for connectivity*

The Government will focus on developing ubiquitous broadband, sensor networks and applications to enable connectivity and seamless integration of services[3]. As a result of the Government's increasing need to build network infrastructure throughout the whole of Malaysia, skill sets involve in network deployment are in demand. Simultaneously, there is also a requirement for network engineers to posses skill sets for optical fibre planning and installation to meet the Government's aspiration.
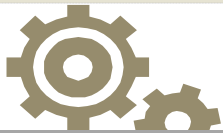
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The trends observed in the Telecommunications Sector will have a significant influence and impact on the talent requirements for the sector. The existing workforce is required to be adaptable and agile to meet the ever changing trends in the sector. Therefore, Telecommunications organisations are more focused in re-skilling their current workforce. The focus areas within the Telecommunications sector have varied talent needs and job opportunities for the next 3-5 years.

There will be re-skilling involved in areas for network infrastructure in relation to Fourth-Generation (4G)/Long Term Evolution (LTE) in wireless. In the fixed line sector, in the short term there will be jobs creation for network engineers who are experts in optical fibre planning and installation due to the deployment of High Speed Broadband Phase 2 carried out by the Government. In addition, jobs creation pertaining to emerging technologies namely cloud computing and data analytics will not be significant in the near future as the sector will only require a few experts with in-depth knowledge.

Based on the inputs received from the focus interviews, surveys and validation workshops, it was concluded that Telecommunications organisations across the value chain of the sector have dissimilar future talent needs. Thus, the diagram below shows the different talent requirements for the next 3-5 years categorised into the type of Telecommunications organisations found in the sector.

	SMEs	MNCs	Network Operators & Service Providers
Indicative Critical Job Roles	• Network strategists • Network engineers • Network operations	• Data scientists • Solutions architect, programmers • Data modellers	• Network engineers and network strategist both in fixed line and wireless technology focus areas
Indicative Critical Technical Competencies	• Network provisioning • Systems integration • Programme coding and configuration • Optical fibre planning and installing	• Data mining • Customer analytics • Predictive analytics	• Network engineer which possess skill sets involving a combination of network knowledge, IT skills and entrepreneurial skills

Top **5 indicative critical job roles** that are difficult to hire:

1. Network strategist
2. Wireless network engineer
3. Network designer
4. Data mining analyst
5. Network security engineer

Top **5 indicative critical technical competencies** in the next 3-5 years are:

1. Core network design and planning
2. Technology and solution evaluation
3. Network function virtualisation
4. Network security
5. Data mining

Executive Summary

Talent Management Practices

Attract & Retain

1. Exposure to new technologies to increase their knowledge
Organisations are regularly exposing their employees to technical training on new technologies to upskill their employees.

2. Holistic approach in rewarding talent
The network operators and MNCs do not face a challenge in attracting talents as they can provide an attractive compensation package to attract the required talents for their organisations.
Typically MNCs and network operators spend a fair bit of time in ensuring they attract the top talent for their organisations, sometimes even bringing talent from other countries.

3. Providing an innovative environment
One of the key factors that makes the Telecommunications sector an interesting sector is that it is one of the sectors that promotes innovation and creativity. Talents who are joining the Telecommunications sector will be able to utilise their innovation and creativity to develop products and services that are unique and caters to the requirements of their customers.

4. Structured career pathway
MNCs in particular have established a structured development programme for fresh graduates to fast track their career growth.

Develop

1. Technical training
MNCs have established in-house training facility and academy to train their employees in new technologies, new equipment and solutions on a yearly basis. Other notable organisations also provide specialised technical training to harness their employees skill sets in information and network security related areas. SMEs provide their employees technical training to a certain extent. The technical training involves in leveraging on foreign subject matter experts to train their employees in adopting new technologies for their business activity. Furthermore, Telecommunications organisation generally are spending more time in providing technical training in emerging technological areas as employees still lack the respective skills and knowledge.

2. Non-technical training
In general, the primary focus for network operators and service providers is to providing training to harness their employees' managerial skills. MNCs also develop non-technical programmes that target on business management, financial management and leadership development. Non-technical competencies can also be harnessed through mentoring programme that develop leadership skills and communications skills especially for SMEs.

Executive Summary

Challenges Faced by Educational Institutions

The student intake trends for Telecommunications-related courses is generally increasing across all educational institutions, with most public institutions sharing that available seats are usually oversubscribed by qualified applicants. However the rate of students intake increase is not as high it was in the past.

Local educational institutions also face challenges in producing industry ready graduates. Based on the focus interviews, survey and validation workshop the key challenges highlighted below.

Insufficient interaction between educational institutions and the industry

In general, educational institutions would welcome stronger industry participation and support with a view to ensuring that syllabi are relevant to current and future market requirements. It has been suggested that there should be more frequent industry visits/collaboration with educational institutions to assist them with the information on the latest trends in the industry and communicate industry expectations on talent.

Difficulties to provide the institutions with the latest machines and equipment

The lack of proper telecommunications equipment is a challenge for educational institutions to provide a conducive learning environment for students to be interested in pursuing a Telecommunications-related programme.

Educational institutions also request high speed broadband internet connections and packages for students and educational institutions to allow students to carry out their e-learnings and others such activities.

Lack of financial and philanthropic support from the industry

Educational institutions welcomes industry participation predicated on philanthropic principles, This includes obtaining industry speakers at a no or low cost basis.

With 81% of the educational institutions finding it difficult to equip the institutions with the latest and modern learning and technological infrastructure due to funding difficulties, there exists opportunities for industry to fund technology labs, donate or sell used equipment, or allow some form of access to current equipment in use by industry. Apart from laboratories and equipment, opportunities for industry participation includes sponsored professorships, and endowments.

Ensure changes of the syllabus and teaching approach impact the quality of graduates meeting industry needs

As mandated by the Malaysian Qualifications Agency (MQA) public institutions review their course syllabus every two (2) years. Despite these regular reviews and the participation of industry in these exercises, changes does not ensure that graduates are ready for the high demands and requirements of the Telecommunications sector,

The problem therefore is not necessarily how closely aligned syllabi are to industry requirements but a question of the ability of teaching staff to be able to put students in a position and context where they are closer to being ready for industry. Suggested approaches to address this gap include cross collaborations where both academic teaching staff undergo attachments with industry and the same for industry staff being embedded at educational institutions.

Executive Summary

Capability of Graduates

Basic technical skills are sufficient, but the ability to communicate and think strategically is scarce

Local graduates who obtained employment still require some kind of training to develop their skill sets. Other than the scarcity in skill sets in emerging areas, local graduates also lack the relevant behavioural competencies to perform effectively in industry setting.

Harnessing innovative and creative mind-set needs to begin at young age

A majority of industry players agreed that there is a need to invest time and training to develop local graduates to harness their communication skills and innovative mind-set.

The main concern in terms of the quality of graduates is the lack of innovation and creativity mind-set. Universities feel that the journey to inculcate innovative and creative mind-set is an on-going process (pre-school, primary, secondary and tertiary). In Malaysia, there are insufficient platforms to harness innovation and creativity among the local talents.

Challenges To Fulfill The Industry Requirements

The challenge to fulfill the industry requirements

Purpose of analysing and understanding the overall talent gap and requirements in the Malaysia's Telecommunications sector

Thus, this Study has been conducted to analyse and understand the overall talent gap and requirements in the Malaysia's Telecommunications sector. Moreover, it is critical to determine the number of jobs that needs to be filled and identify which focus areas and job families are impacted the most in order for the Government to develop a cohesive talent strategy plan for talent development towards these areas and job families.

For this Study, there are three (3) key areas that talent requirements is analysed.

Labour market database	Top-down analysis	Analysis on impact of talent gap
The labour market database information is conducted to forecast the human capital requirements at an aggregate level of the industry. This determines the talent supply of the industry and indicates whether there will be a talent gap in the sector.	The top-down analysis is conducted to determine the number of total workforce currently employed in the Malaysian Telecommunications sector and understand the trends of the overall workforce in the sector.	Analysis on the impact of talent gap towards the key focus areas of the Study and the job families affected the most.

Executive Summary

Challenges To Fulfill The Industry Requirements

Labour market database

In order to understand the human capital requirement in the Telecommunications industry, in the near and long term future, talent demand and talent supply is analysed at an aggregate level for the industry. This section presents the forecasted human capital requirement figures in the near term (i.e. year 2016). For forecasting the human capital requirement numbers the following three factors have been considered, which is explained in the subsequent sections:

Talent Demand

It is defined as the demand of the headcount for a job area in Telecommunications for a particular year (e.g. 2017).

- **Talent Demand for the baseline year:** The assumed baseline year for the Talent Demand is based on the 6% expected growth of the industry's employment every year until the year 2017
- **Talent Demand growth rate for the future years:** The demand of headcount in the industry is assumed to directly impact by the output produced by the industry. Therefore a varied output growth rate have been used to assess the demand of headcount by creating one (1) different scenario of demand, which are as follows:
  - Scenario 1 (Base Case Scenario): Where the employment growth in Telecommunications industry will grow at a constant rate of 6% up to year 2020 as forecasted by the industry players (i.e. will not exceed Malaysia's GDP)

Talent Supply

It is defined as the supply of students headcount available for joining Telecommunications for a particular year (e.g. 2017).

- **Talent Supply for the baseline year***:* For calculating the headcount number for the current year (i.e. 2015) the primary information was gathered from MOE on student intakes and graduates from public universities

- **Talent Supply growth rate:** For calculating the growth rate of the Talent Supply on a year on year basis the average labour force growth rate of 2% CAGR was used for students graduates in Telecommunications-related courses in local public universities, private universities and polytechnic

Executive Summary

Telecommunications industry overview – Base case forecasting human capital requirements

As stated in the previous section, the labour market database entails the talent forecast based on demand and supply for talents. This database answers the question "Is there sufficient pipeline of talents to meet the demands from the industry?". The diagram below illustrates the labour market forecasting based on the Base Case scenario from 2015 to 2017.

Base Case Scenario Forecasting

The considerations in the labour market database for Telecommunications industry are:

- Based on previous trends, the annual industry and employment growth stands at an average of 6%[1]
- Based on previous trends, the annual graduates growth rate stands at 2% annually
- The first scenario provides a view of talent forecast where only 10% of engineering graduates enter the sector, while the second scenario provides a view of the same, with 20% of engineering graduates enter the sector

Scenario 1: Assumption is taken where 10% of engineering graduates would be employed in the industry

Scenario 1	Supply/Demand	2015	2016	2017
Base Case	Talent Demand new jobs created *(Industry growth rate at 6%)*	2,968	3,146	3,335
	Talent Supply *(Supply CAGR at 2%)*	2,533	2,562	2,596
(Demand – Supply)%		Shortage of 15%	Shortage of 19%	Shortage of 22%

Scenario 2: Assumption is taken where 20% of engineering graduates would be employed in the industry

Scenario 2	Supply/Demand	2015	2016	2017
Base Case	Talent Demand new jobs created *(Industry growth rate at 6%)*	2,968	3,146	3,335
	Talent Supply *(Supply CAGR at 2%)*	5,067	5,124	5,193
(Demand – Supply)%		Surplus of 71%	Surplus of 61%	Surplus of 56%

Based on the forecasting above, if 10% of engineering graduates work in the sector, the result shows that there will be shortage of talents in the Telecommunications industry between 2015 to 2017. Factors such as attractiveness of the sector and high requirements of the industry result to the shortage of talents in this case.

However, if 20% of engineering graduates work in the sector, the result shows that talent demand will be met in the industry in terms of headcount. From 2015 to 2017, there will be an excess of graduates targeted to join the industry. This shows that there will be more than sufficient amount of graduates and talents produced by the universities and polytechnics for the Telecommunications industry. This talent supply may be able to fill the number of jobs available, however this talent supply represents graduates who do not have the relevant and sufficient capabilities to match the high-skilled technical areas.

Executive Summary

Challenges To Fulfill The Industry Requirements

Top-down analysis

Based on the Labour Force Survey obtained from the Department of Statistics Malaysia, there are 50,800 people employed in the Telecommunications sector for the year 2013. From the total number, there are 27,700 employees at the Managerial and Professional levels. In turn, this number represents employees at all positions and roles which includes: support (i.e. HR, marketing, sales), content development, etc. which are not in scope of the Study.

Data from the top-down approach is used to have an understanding of the size of the workforce employed in the Malaysian Telecommunications sector. This number is used as a baseline to ensure that the data captured from the survey is representative of the workforce in the sector.

Focus areas that are high demand for talents

Based on the survey findings, the majority of the Telecommunications sector workforce are employed in focus areas related to infrastructure of wireless and fixed line technology. Additionally, only a small number of employees employed in the focus areas of network security and the emerging technologies such as big data analytics and cloud computing. Furthermore, insights obtained from the industry players have indicated that jobs in emerging areas will require minimal headcounts as they are highly specialised. For network security, despite the small numbers of workers employed, employees feel that their security requirements are met by current and planned numbers of network security personnel.

Majority of the jobs creation in the future will be in the infrastructure area for wireless and fixed line technology.

Therefore, the talent gap will impact these focus areas for infrastructure of wireless and fixed line technology the most. Related to these focus areas, the study has further identified which job families are impacted to understand the talent issues that are faced by Telecommunications organisations in Malaysia.

Focus areas of this Study

1 Infrastructure – Wireless Technology and Network

2 Infrastructure – Fixed Line Technology and Network

3 Information and Network Security

4 Emerging technologies – Cloud Computing and Big Data Analytics

Legend

	Focus areas most impacted
	Focus areas least impacted

Executive Summary

Challenges To Fulfill The Industry Requirements

Focus areas and top three (3) job families impacted by the talent gap

Infrastructure – Wireless Technology and Network

Network Operators & Service Providers

Most Impact

- Network Engineering
- IT
- Network Strategy & Architecture
- Network Roll-out
- Performance & Quality Management

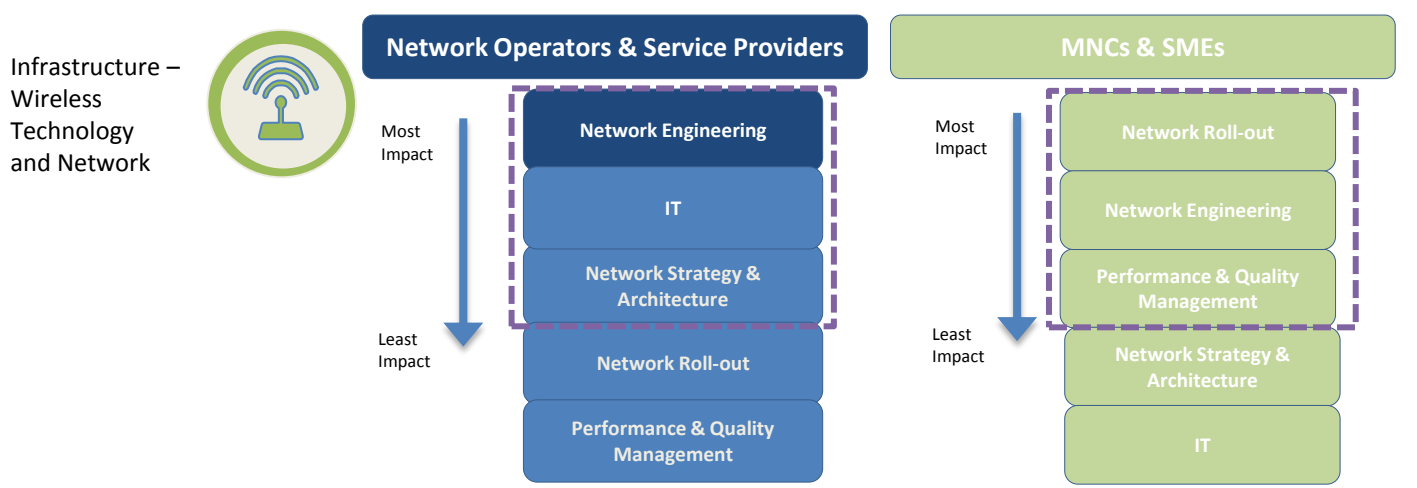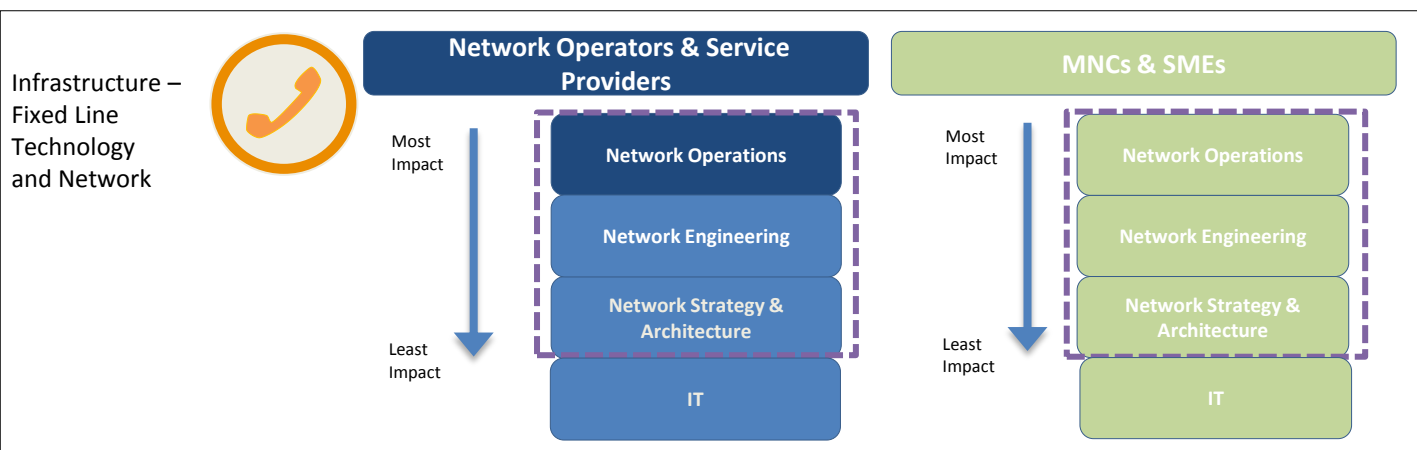Least Impact

MNCs & SMEs

Most Impact

- Network Roll-out
- Network Engineering
- Performance & Quality Management
- Network Strategy & Architecture
- IT

Least Impact

The above diagram shows that there are five (5) indicative critical job families which are required over the next 3 to 5 years. Out of these five (5) indicative critical job families, the top three (3) families that are impacted from the talent gap for network operators and service providers are network engineering which represent >40% of the workforce in the focus area, followed by IT and network strategy & architecture. The top three (3) job families for SMEs & MNCs are network roll-out which represent >35% of the workforce for the focus area, followed by network engineering and performance & quality management job families.

Infrastructure – Fixed Line Technology and Network

Network Operators & Service Providers

Most Impact

- Network Operations
- Network Engineering
- Network Strategy & Architecture
- IT

Least Impact

MNCs & SMEs

Most Impact

- Network Operations
- Network Engineering
- Network Strategy & Architecture
- IT

Least Impact

The diagram above shows four (4) indicative critical job families that are required for the next 3-5 years. Out of these four (4) indicative critical job families, the top three (3) families that are impacted from the talent gap for network operators and service providers are network operations which represent >40% of the workforce in the focus area, followed by network engineering and network strategy & architecture. The top three (3) job families for SMEs & MNCs are network operations which represent >40% of the workforce for the focus area, followed by network engineering and network strategy & architecture job families.
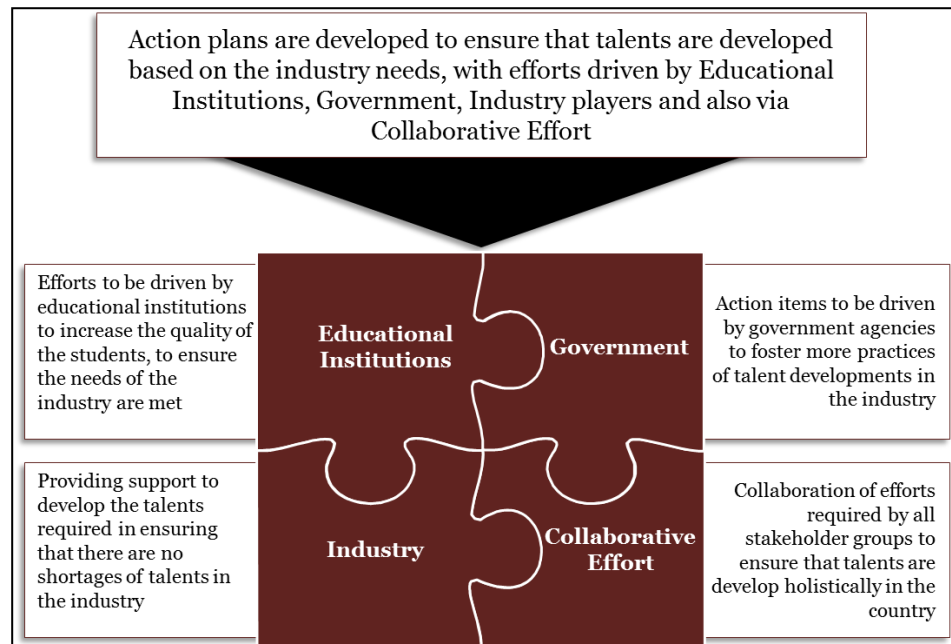
Executive Summary

Action Plans

In developing the action plans for the study, a few steps were taken to ensure that the action plans developed are comprehensive, relevant and fulfill the needs of the industry today. In total, there are 27 action plans which have been identified. Various discussions, validations and desktop research were done to understand the best practices which can be implemented by various parties to develop the talents in the industry.

Source of Input For The Development of Action Plans

Action Plans For The Talent Gap Study for the Communications Sector in Malaysia

1 Survey Analysis
Providing quantitative view of the human capital landscape of the industry at Network Operators, MNCs and SMEs level

2 Industry Interview
Providing qualitative views, insights and wishlists from the industry leaders on how talent should be developed and their views on talent development practices

3 Benchmarking And Comparative Analysis
Providing a view of best practices on talent development across the world, from the perspective of regulators, industry players and education institutions

4 Validation Session
Providing a detailed view of how the industry should be developing talents from the perspective of industry players and educational institutions

The Four Pillars of Ownership

Based on the analysis of the inputs obtained, each of the inputs are mapped to a stakeholder group which should drive the action items to ensure full ownership. The stakeholder groups are defined as "Pillars". The four pillars which will drive the action items are Educational Institutions, Government, Industry and Collaborative Effort. The ownership of these pillars are expected to drive the completion of the suggested action items to achieve the maximum impact possible in developing talents.

Action plans are developed to ensure that talents are developed based on the industry needs, with efforts driven by Educational Institutions, Government, Industry players and also via Collaborative Effort

Educational Institutions
Efforts to be driven by educational institutions to increase the quality of the students, to ensure the needs of the industry are met

Government
Action items to be driven by government agencies to foster more practices of talent developments in the industry

Industry
Providing support to develop the talents required in ensuring that there are no shortages of talents in the industry

Collaborative Effort
Collaboration of efforts required by all stakeholder groups to ensure that talents are develop holistically in the country

Executive Summary

Challenges faced in talent issues

The sector is facing several challenges in ensuring a talent pool that will meet the demands of the industry. These challenges will be the driving force in recommending action plans to solve the talent issues faced in the sector. The key challenges are as follows:

Demand (Industry) Perspective

- **Technological trends changing the needs for talents** – Emerging technologies in the sector cause the need for talents to be adaptable and agile to meet the industry needs. Talents related with IoT/IoE and big data analytics will be in demand.

- **Demographic shift calls for talents with ability to innovate** – Most of the subscribers in the future will comprise of millennials. Thus, talents in the sector are expected to innovate and customise products and services to cater to the diverse requirements of their customers. Innovative mind-set still lacks in local talents.

- **Digitisation will demand for talents to have a combination of hardware and software skill sets** – Talents in the future will be greatly influenced by the digital economy. They are required to possess competencies whereby a network engineer will require programming skills.

- **The sector is perceived as unattractive** – Talent pool coming into the sector is limited as the sector is perceived as not exciting to pursue a career for young talents.

Supply (Educational Institutions) Perspective

- **Talents coming from tertiary education do not meet the industry demands** – The Telecommunications sector requires talents who are knowledgeable on emerging technologies (i.e. 4G, 5G technologies) and core basic technical skills (i.e. basic engineering and mathematics skills) in the sector.

- **Limited collaboration between industry and educational institutions** – There is a lack of strong partnership between these two stakeholders in ensuring that graduates are ready to be employed in the sector.

- **Inadequacy of the latest infrastructure and facilities to promote competency development** – Educational institutions face a challenge in providing students with the proper facilities to develop their skills in the latest technology.

- **Lack of proper instructors to respond to the change of the syllabi** - The lack of right instructors to respond to change of syllabus impact the quality of the graduates. Additionally, the lecturers lack the exposure of actual working experience in the industry and they may not be able to share the understanding of the latest technology to their students.

Executive Summary

Action Plans

As stated above, there are key challenges in developing talents to meet the sector's needs. Henceforth, these challenges are identified and act as a purpose to recommend action plans in order to minimise the challenges faced. Additionally, these recommended action plans are meticulously deliberated to ensure that they are beneficial to develop the right set of talents to meet the requirements of the sector. Overall benefits of the recommended action plans are as follows:

Industry

- **Developing industry ready graduates who are competent with the latest technologies** – Graduates will be equipped with knowledge of the emerging technologies and core basic technical skills in order for them to ready to be employed in the sector. Simultaneously, employability of graduates will be higher as they possess professional certification even before they have graduated.

- **Enabling the sector to attract and develop the right set of talents** – Talents comprising of graduates and experienced hires are more attracted to join the sector and current workforce will be able to up-skill themselves via availability of technical training programmes.

Educational Institutions

- **Developing the right curriculum will assist in bridging the gap between university courses and what is required by the sector** – Educational institutions are able to equip students with the relevant skills for the sector and fostering a strong collaboration between the academia and industry.

- **Fostering an innovative environment and encourage more research & development on Telecommunications-related areas** – Talents will be more innovative in developing products to cater to the future requirements of the subscribers. Moreover, research & development will be more prominent and sustainable to create new products and technologies.
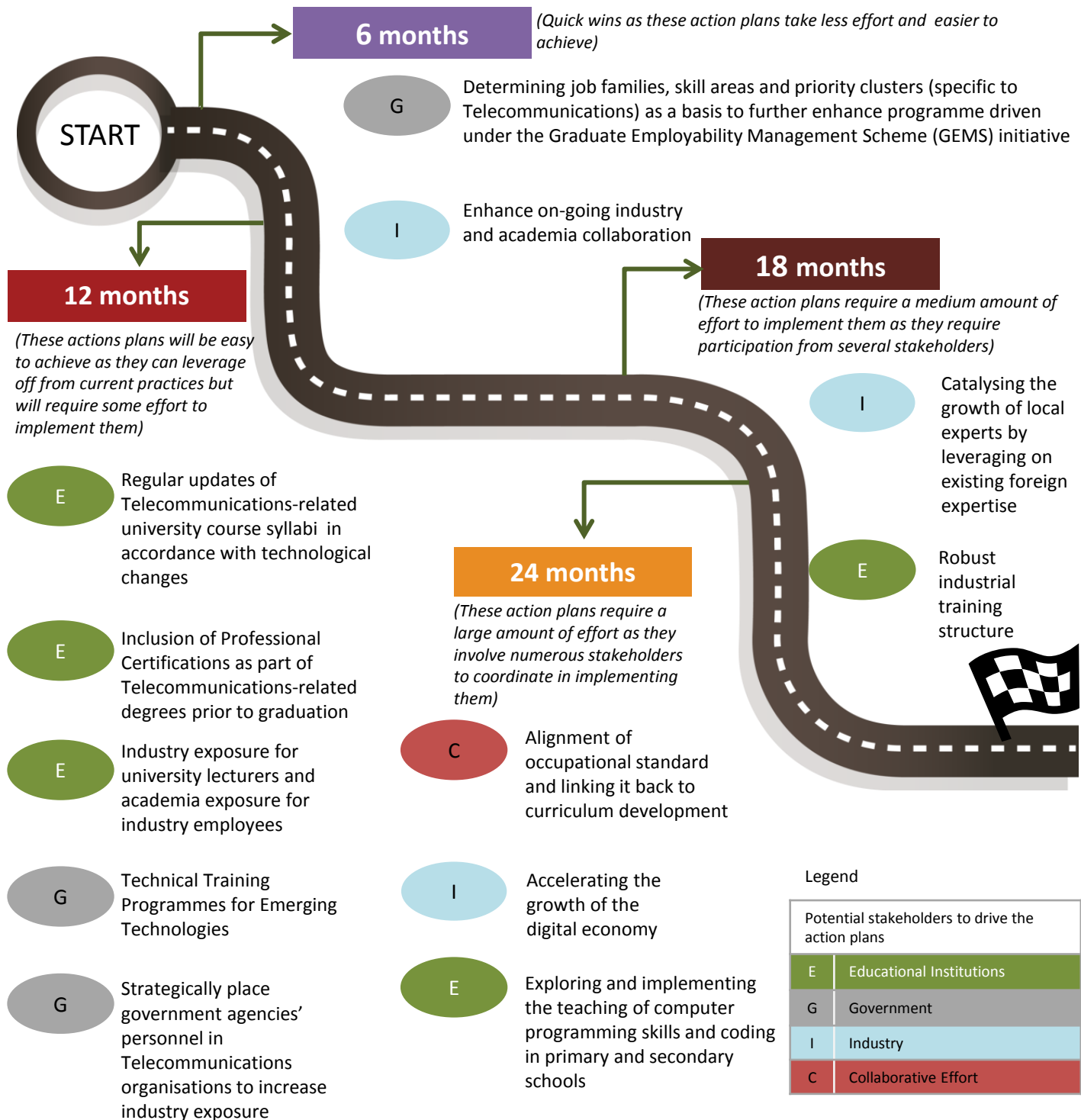
Government

- **Strengthening partnership between government agencies, industry players and educational institutions** –Enhancing collaborations between these three (3) stakeholders will ensure that talent development initiatives are purposeful, and sustainable in the long term.

- **Sharing of data sets to encourage development of innovative products** – The availability of data sets and sharing these data sets to the public allow for crowd-sourcing ideas and co-creation of applications with the wider community to encourage development of innovative products.

- **Standardisation of the cluster of job families and assist in curriculum development** – Aligning the job roles and technical competencies required will be beneficial to determine which areas are critical for the industry and link it back to the learning content of educational institutions.

Executive Summary

Action Plans

A set of prioritised action plans have been developed via a prioritisation matrix. Below depicts the visual roadmap of the prioritised 12 action plans to strengthen the human capital development in the Malaysian's Telecommunications sector. The roadmap depicts a certain period (6 months till 24 months) to implement these key action plans.
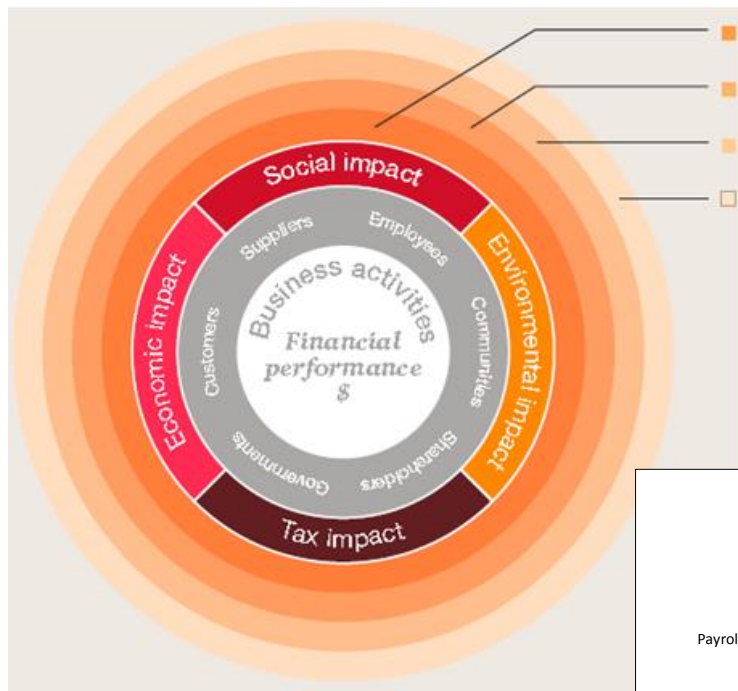
6 months

(Quick wins as these action plans take less effort and easier to achieve)

START

G — Determining job families, skill areas and priority clusters (specific to Telecommunications) as a basis to further enhance programme driven under the Graduate Employability Management Scheme (GEMS) initiative

I — Enhance on-going industry and academia collaboration

18 months

(These action plans require a medium amount of effort to implement them as they require participation from several stakeholders)

12 months

(These actions plans will be easy to achieve as they can leverage off from current practices but will require some effort to implement them)

I — Catalysing the growth of local experts by leveraging on existing foreign expertise

E — Regular updates of Telecommunications-related university course syllabi in accordance with technological changes

E — Inclusion of Professional Certifications as part of Telecommunications-related degrees prior to graduation

E — Industry exposure for university lecturers and academia exposure for industry employees

24 months

(These action plans require a large amount of effort as they involve numerous stakeholders to coordinate in implementing them)

E — Robust industrial training structure

C — Alignment of occupational standard and linking it back to curriculum development

G — Technical Training Programmes for Emerging Technologies

G — Strategically place government agencies' personnel in Telecommunications organisations to increase industry exposure

I — Accelerating the growth of the digital economy

E — Exploring and implementing the teaching of computer programming skills and coding in primary and secondary schools

Legend

Potential stakeholders to drive the action plans	
E	Educational Institutions
G	Government
I	Industry
C	Collaborative Effort

Executive Summary

Measuring and Ensuring the Sustainability of Outcomes

Measuring the impacts of action plans and ensuring the sustainability of these action plans
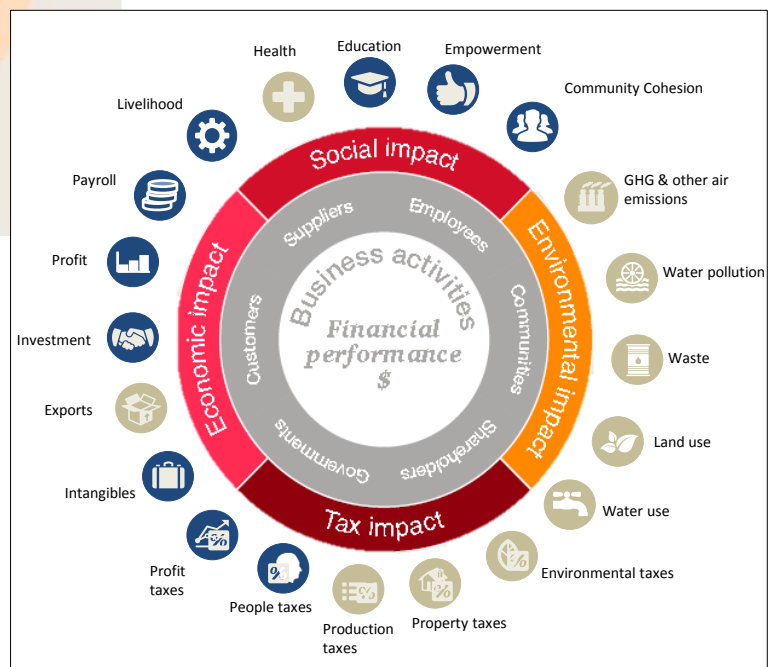
Elements of sustainability are critical in every activities or initiatives that are to be carried out. It is imperative that any actions plans that are recommended needs to go beyond just the outcome but how they impact the society, environmental and economic. There are a few models that are available to manage outcomes in totality to determine the actual value of the action plans recommended. One notable model that can be adopted is total impact measurement which provides a new 'language of decision making' that generates hard numbers equivalent to the new ways of evaluating national output and wellbeing developed and used within governments. This measurement of totality examines the impacts that arise directly through the effect of the action plans and indirectly through their effects on the participating individuals in the ecosystem, and other stakeholders (for e.g., through the impact on local communities).

The suggested model to measure sustainability of outcomes

- As a direct result of the action plan
- From the participating sides (e.g. educational institutions & industry players)
- From other organisations who are involved in the ecosystem (e.g. Government agencies)
- From outside the ecosystem and communities the action plan affects

Scope of impacts addressed

Executive Summary

Traditional output reporting

Total impact measurement

Input
What resources have been used for the action plans?

Output
What action plans have been done?

Outcome
What has changed as a result of the action plans?

Impact
How much of that outcome is attributable to the action plans?

Value of impact
What is the value of impact?

Measuring and managing what matters

By valuing social, environmental, tax and economic impacts the Government is now able to compare the total impacts of their strategies and investment choices and manage the trade-offs. Moreover, conventional measurement techniques mainly focus on inputs and outputs. However, total impact measurement develop an understanding of the relationship between the action plans' inputs and activities, their outputs and their longer term outcomes and associated impacts. Once the associated impacts are identified, the value of the impact is determined and decide whether these action plans are significant to support the growth of the Telecommunications sector.

Effective total impact measurement helps the Government to make better decisions by enabling them to understand how their activities create, or destroy, social, fiscal, environment and economic value while still, of course making a profit for their stakeholders. In this way, it gives management the ability to test its strategies and make important decisions such as investment choices.

Equipping the Government to generate good growth

Key benefits include the ability to understand the risks and identify new opportunities by examining critical trade-offs and developing plans capable of generating maximum value to society and the country. It also transforms stakeholder engagement by providing a structured, comparable and meaningful basis for reporting and communications.

It is imperative that the Government, industry players and educational institutions are able to adopt the model of measuring outcomes in totality to ensure a sustainable approach to support technology and talent growth in the Telecommunications sector.

Introduction

1

1. Introduction

1.1 Objective of the talent gap study

Under the National Key Economic Area (NKEA) Communications, Content and Infrastructure (CCI) spans content, network applications, services and devices which contributed RM 22 billion of Malaysia's Gross National Income (GNI) where Telecommunications it is accounted for the bulk of it[1]. Furthermore, the Government aspires to raise the CCI sector's GNI contribution to RM 57.7 billion by 2020[1]. Therefore, the sector is crucial to Malaysia's development into a high-income nation as it is both a growth industry and an enabler of an accelerated economic expansion. As a result, having the right human capital is critical and the positive outcome of this NKEA is driven greatly by the level of qualifications and skills that the sector attracts and develops.

This Study is a collaborative effort between the Malaysian Communications and Multimedia Commission (MCMC) and Institute of Labour Market Information and Analysis (ILMIA).

Focus of the Study

The Communications sector is by nature broad and diverse. For the purpose of the Study, four (4) focus areas of the Telecommunications sector are being prioritised:

1. Infrastructure for wireless technology;
2. Infrastructure for fixed line technology;
3. Information and network security; and
4. Emerging technologies namely cloud computing and big data analytics.

The identified focus areas have been mapped to the Communications Content and Infrastructure (CCI) ecosystem. The CCI ecosystem is comprehensive and includes content, network applications, services, and devices. The mapping of the CCI ecosystem illustrates that areas such as aggregation, network, transaction and services and applications are in scope for this Study. However, it is important to note that areas such as content, devices, logistics and fulfillment are not part of the scope for this Study.

Additionally, mapping of the areas in the CCI ecosystem against definitions of the Information and Communications Technology (ICT) sector from the MCMC, Department of Statistics Malaysia (DOSM), Multimedia Development Corporation (MDeC), Ministry of Human Resources (MoHR) and Ministry of Education (MoE) have also been done. The purpose of the mapping was to ensure that all definitions are aligned to the Study.

Rational for selecting the four (4) focus areas

The Study prioritises the four focus areas based on their relative importance to support current and future growth within the sector. The rationale for selecting the focus areas is described below:

1. Infrastructure – Wireless Technology and Network

International Data Corporation has predicted that fourth generation (4G)/ long term evolution (LTE) subscribers in Malaysia will grow exponentially from 265,000 in 2013 to 7.6 million in 2018[2]. In addition to that it is projected that by 2019, there will be a coverage of 60% for 4G/LTE in South East Asia and a Compound Annual Growth Rate (CAGR) of the Internet of Things (IoT) in Asia Pacific at 44.2%[3,4]. Globally the mobile market will continue to grow in the next few years and new technologies developed will be directly or indirectly connected to wireless technology and networks;

Sources:
1. Economic Transformation Programme– A Roadmap for Malaysia Chapter 13, 2011
2. http://www.idc.com/getdoc.jsp?containerId=prMY25004314
3. Mobility Report Appendix: South East Asia and Oceania, Ericsson
4. Asia-Pacific Data centre and Cloud Computing Outlook 2014, Frost and Sullivan

1. Introduction
1.1 Objective of the Talent Gap Study

2.   Infrastructure – Fixed Line Technology and Network

Based on the MCMC's 2013 Industry Performance Report, 125,880 new subscribers were recorded[1]. Furthermore, the value of global submarine fiber cable market grew to US$3,560 million in 2014 and is expected to reach US$4,990 million by 2019[2]. The Government of Malaysia is aggressively implementing initiatives which include roll-out of broadband and fiber optic infrastructure to encourage more usage of fixed broadband;

3.   Information and Network security

According to the Global State of Information Security Survey 2014, Communications companies globally are boosting their information security budgets significantly[3]. The findings indicates that information and network security is an area of concern given the rapid development of services and infrastructure that are vulnerable to cyber attacks and spams within the network; and

4.   Emerging Technologies – Cloud Computing and Big Data Analytics

Global mega trends for the Telecommunications sector show that companies are embracing shared infrastructure via cloud adoption. Additionally, these companies are utilising the large amount of data available in order to predict the consumer behaviour to ensure services are tailored to the consumers' demand[5]. In Malaysia, this is evident based on reported CAGR of 32.6% and 30.6 % respectively for cloud computing and big data analytics [6].

These focus areas are the key drivers of growth in the sector and represent current and future industry needs

Sources:
1.   Industry Performance Report 2013, MCMC
2.   Industry Assessment Submarine Cable Market, Exim Bank,
3.   The Global State of Information Security Survey 2014,
4.   http://nitc.kkmm.gov.my/images/stories/ictpolicies/myicms.pdf
5.   http://www.rcrwireless.com/20130503/internet-of-things/telecom-analytics-cloud-social-big-data-internet-things-can-drive-revenue-carriers
6.   http://ww2.frost.com/news/press-releases/frost-sullivan-increasing-data-consumption-will-drive-malaysia-telecom-revenues/

1.2 Study Approach

Approach of this Study

The Study covers **three (3) phases** as elaborated in Diagram 1.1 below. After the completion of Interim Report, this Final Report is the final of four (4) reports during the course of the Study.
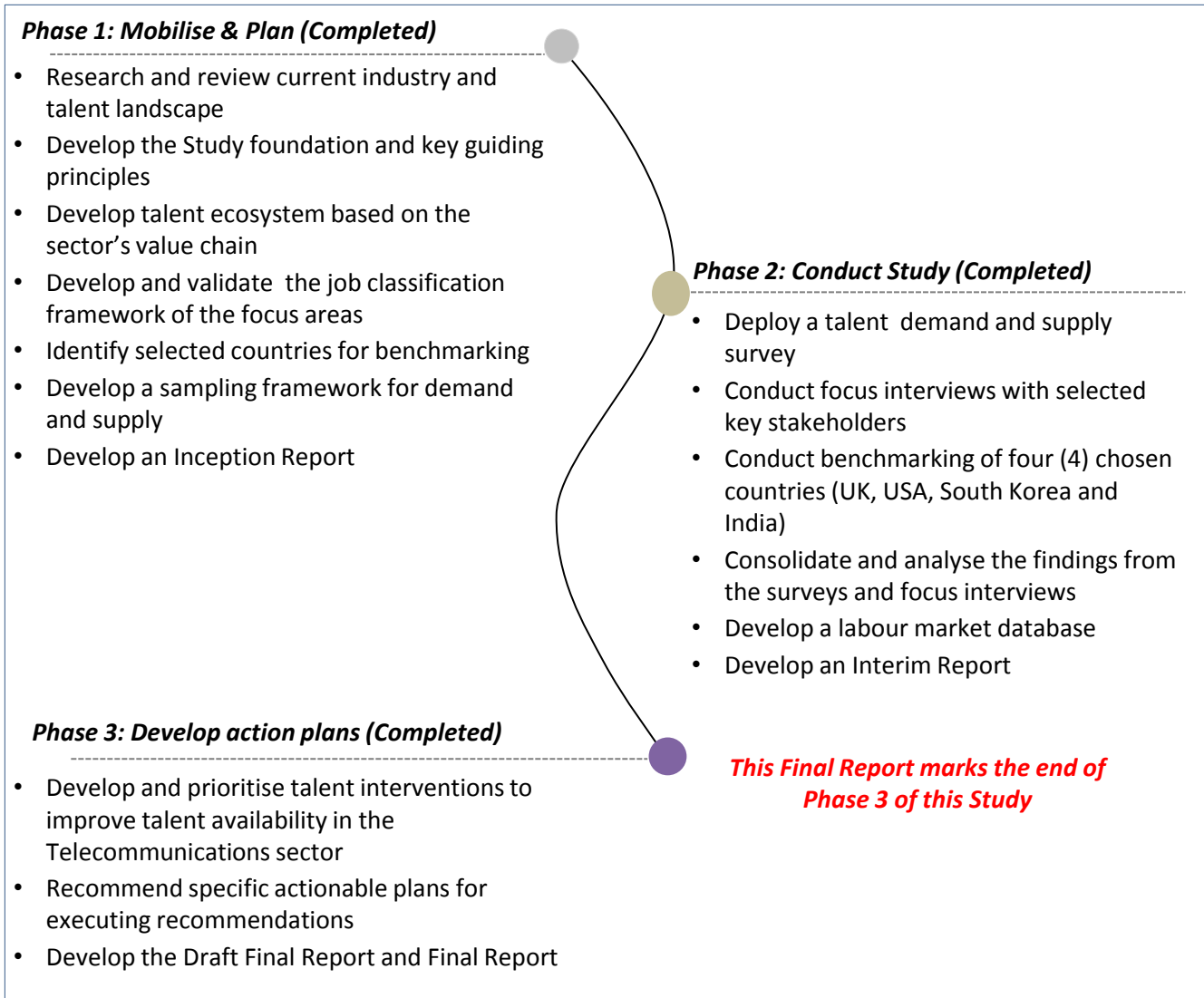
Phase 1: Mobilise & Plan (Completed)

- Research and review current industry and talent landscape
- Develop the Study foundation and key guiding principles
- Develop talent ecosystem based on the sector's value chain
- Develop and validate the job classification framework of the focus areas
- Identify selected countries for benchmarking
- Develop a sampling framework for demand and supply
- Develop an Inception Report

Phase 2: Conduct Study (Completed)

- Deploy a talent demand and supply survey
- Conduct focus interviews with selected key stakeholders
- Conduct benchmarking of four (4) chosen countries (UK, USA, South Korea and India)
- Consolidate and analyse the findings from the surveys and focus interviews
- Develop a labour market database
- Develop an Interim Report

Phase 3: Develop action plans (Completed)

- Develop and prioritise talent interventions to improve talent availability in the Telecommunications sector
- Recommend specific actionable plans for executing recommendations
- Develop the Draft Final Report and Final Report

This Final Report marks the end of Phase 3 of this Study

Diagram 1.1: Overall approach of the Study

The final outcome of this Study is to develop a collaborative framework for Industry, the Government and Educational Institutions to support talent growth in the Telecommunications sector

1.3 Recap on key outcomes of the Inception Report and Interim Report

Recap of Key Outcomes of Phase 1 and Phase 2

Job Classification Framework

The job classification framework contains a total of 29 key job families, 139 job roles and 316 technical competencies that are relevant to the selected focus areas. An industry engagement session was held on 16 March 2015 with selected industry players to validate the developed job classification framework to ensure that key job families, job roles and technical competencies have been captured.

Mapping of the Job Classification Framework

The mapping of the job families and job roles to ensure that the job roles are aligned with existing framework, the current MASCO 2013 (Malaysia Standard Classifications of Occupations) document was referenced. Based on the general job description provided in MASCO, the 139 job roles developed in job classification framework were then mapped against the relevant 4-digit unit groups as well as the relevant example of job titles in the 6-digit minor unit groups. The Inception Report has also listed the job roles that are unable to be mapped against MASCO as additional job titles in the mapping exercise.

Talent Ecosystem

The talent ecosystem was developed to define job families and job roles that fall under each sector component that makes up the value chain. By developing the talent ecosystem, gaps within the value chain can be identified. It comprises of sector components, key activities, job families and job roles, existing talent pool, graduate talent pool and key influencers.

Benchmarking analysis

The benchmarking analysis was carried out to provide insights on key human capital strategies, good practices and key initiatives that can be considered by the MCMC as part of recommendations to the industry players, educational institutions and relevant government agencies. The countries selected for the benchmarking analysis are United Kingdom (UK), United States of America (USA), India and South Korea. Besides that, a comparative analysis was conducted to identify good practices implemented in the four (4) countries selected in measuring the gap of the Communications sector in Malaysia at a macro level. A set of three (3) key focus areas were used for the comparative analysis which are talent landscape, talent drivers and innovative approach.

Study findings and analysis

The findings and analysis were divided into the supply and demand perspectives. Insights were gathered via surveys, focus interviews and validation workshops from the selected educational institutions (e.g. public universities, private universities, polytechnics, community colleges & training providers) and industry players (Top 4 network operators, large Malaysian Telecommunications organisations (more than 100 employees), Multinational Companies (MNC) and Small Medium Enterprises (SME)). Details of the survey findings can be found in **Appendix 5** of this Report.

Labour Market Database

The Labour Market Database was developed to understand the human capital requirements in the Telecommunications sector for the next 3-5 years. This talent demand and talent supply was analysed at an aggregate level for the industry. In addition, indicative critical technical competencies associated with relevant job families have been identified to determine the talent requirement gaps.

1.4 Objective and key contents of the Final Report

This Report provides an overview of the findings of the Study and detailed information on actionable plans recommended . To demonstrate this, the Report is governed by two (2) objectives that provide the final insights gathered and key actionable plans recommended to support talent growth in the Telecommunications sector.

Objectives	Key Areas Addressed	

1
 	
Study Findings
	Study findings
	• **Demand (Industry) Perspective**
	   • Trends observed in the Telecommunications sector
	   • Future talent needs
	   • Talent management practices
	   • Understanding the indicative critical job roles and technical competencies
	• **Supply (Educational Institutions) Perspective**
	   • Overview of student intake trends
	   • Challenges faced to produce industry ready graduates
	   • Capability of graduates
	• **Challenges to Fulfill the Industry Requirements**
		Section 2:
		Study Findings

2 Key Recommendations and Action Plans	• Current challenges on talent issues and benefits of action plans • Approach of developing key recommendations • Key action plans and other action plans to consider • Measuring and ensuring the sustainability of outcomes	**Section 3:** Moving Forward – Action Plans

Diagram 1.2: Contents of the Final Report

Study findings

2

2.1 Overview of the section

This section highlights the findings of the study based on two (2) perspectives which are demand (industry) perspective and supply (educational institutions) perspective. The findings in detail are available in the Interim Report.

The demand perspective comprises of an overview of trends observed in the Telecommunication sector and how these trends impact the future talent needs. It also includes an overview of talent management practices which entails attracting, retaining and developing talent within the Telecommunications organisations. Finally, this section also contains the understanding of indicative critical job roles and technical competencies.

The supply perspective entails an overview of student intake trends, challenges faced to produce industry ready graduates and capability of the graduates coming into the sector.

The final part of this section covers the analysis on the talent requirements based on the industry needs.

1 Demand (industry) perspective	**2** Supply (educational institutions) perspective	**3** Challenges to fulfill the industry requirements

• Trends observed in the Telecommunications sector
• Summary of future talent needs
• Overview of talent management practices
• Detailed analysis
  ✓ Talent needs on SMEs & MNCs
  ✓ Talent needs on network operators and service providers
• Understanding indicative critical job roles and technical competencies
	• Overview of the student intake trends for Telecommunications-related courses
	• Challenges faced in producing industry ready graduates
	• Capability of graduates
		• Labour market database in terms of talent demand and talent supply at an aggregate level of the industry
		• Top-down analysis of the number of employed persons in the Telecommunications sector from 2010-2013
		• Analysis on the number of jobs that needs to be filled in 2015
		• Impact of talent gap

Diagram 2.1: Contents of the Study findings

2.2 *Macroeconomic view*

Malaysian's GDP Growth

Malaysia's economy has grown steadily over the past few years. However, in 2015, the World Bank predicted that Malaysia's GDP growth would not be as much as it was the preceding years as a direct result of the GST implementation. Nonetheless, the forthcoming years are predicted to continue to show an increase in Malaysia's GDP as can be seen in Diagram 2.2.

Malaysia's Workforce Growth

As Malaysia's population has reached the 30 million mark in 2014, the country's workforce is also bound to increase. On annual basis, the workforce has grown steadily by 2.6%[1] since 2010, and this trend is expected to continue in the future. Despite the Malaysia's GDP and workforce are both growing and the unemployment rate is as low as 2.9%, there are still 400,000 Malaysians without a job, of which 161,000 are fresh graduates[2].

5.1%	2017
5.0%	2016
4.7%	2015
6.0%	2014
4.7%	2013

Diagram 2.2: Malaysia's GDP Growth Past And Present
Source: World Bank Data for 2014

GDP

01

USD $326.9 billion

Source: World Bank Data for 2014

Population

02

30.19 million

Source: World Bank Data for 2014

Total Workforce

03

13,931,600

Source: Labour Force Survey for 2014, Department of Statistics Malaysia

Diagram 2.3: Macroeconomics data for 2014

Sources:
1. World Bank Data 2014; 2. Labour Force Survey for 2014, Department of Statistics Malaysia;

2.3 *Malaysian Telecommunications sector*

How is the Malaysian Communications sector so far?

Malaysia has built an advanced Communications network with widespread application of modern technologies such as fibre optics, wireless transmission, digitisation and satellite services[1]. The existence of advanced Communications infrastructure is a result of the Government's foresight to deliver economic and social growth[1]. This is realised through the increase in Gross National Income (GNI) contribution, which enables infusion of technology and increasing usage to uplift quality of life.

The Government of Malaysia has invested and formulated several strategies and initiatives to drive the growth of the Communications sector as presented below:

1. Launch of a High Speed Broadband (HSBB) project via the National Broadband Initiative (NBI) was announced in 2006 with a national strategy that will bring broadband to the whole nation. There will be the subsequent launch of HSBB Phase 2 project in Q3 2015[2]; and

2. Establishment of the Economic Transformation Programme (ETP) focusing on National Key Economic Areas (NKEAs) of the CCI sector to increase GNI and create additional key value jobs for the sector namely business managers and Communication-related engineers[2].

Based on the Service Statistics 2013 from the Department of Statistics Malaysia, although the GDP growth rate declined from 2011 to 2013, **the total revenue generated by the Communications sector has increased steadily year on year.**
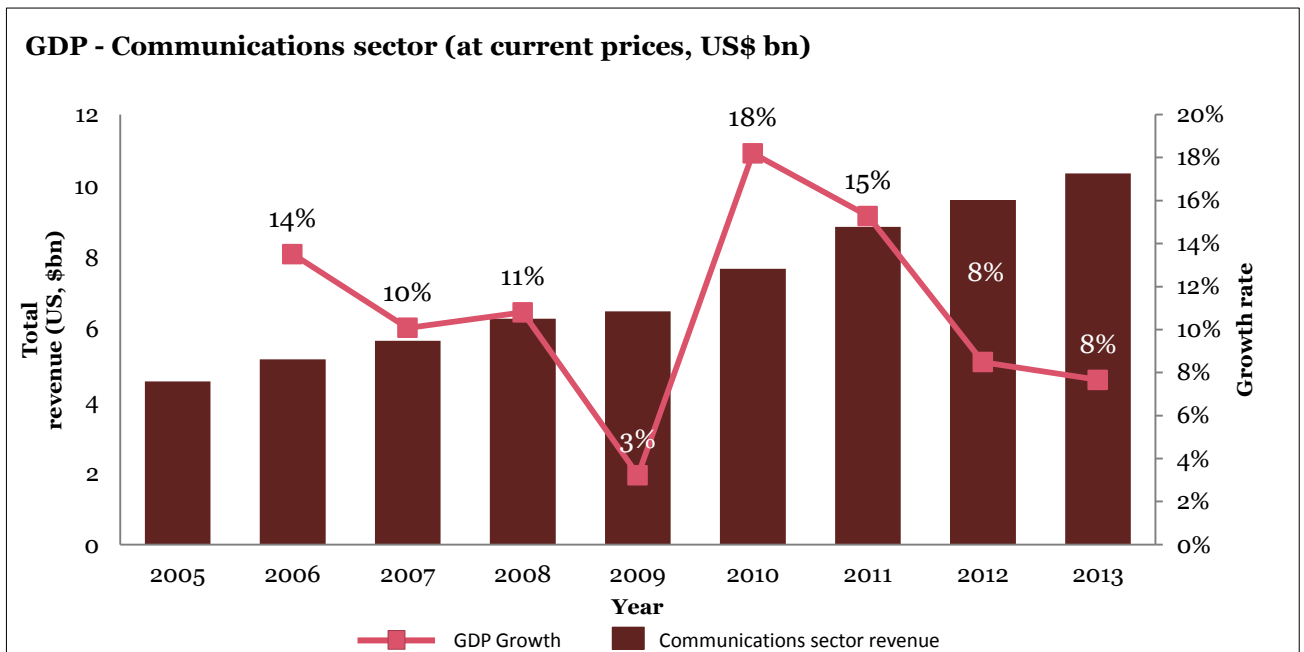
GDP - Communications sector (at current prices, US$ bn)

Diagram 2.4: Communications sector GDP
Source: Service Statistics 2013, Department of Statistics Malaysia

Source:
1. Budde: Key Statistics, Telecoms Market Overview, Infrastructure and Forecasts
2. Industry Capacity and Capability in Communications & Multimedia Convergence, MCMC's HR Professionals Conference 2014

2. Study findings
2.3 Malaysian Telecommunications sector

Major players in the Telecommunications sector

The telecommunications sector is a **major revenue contributor at 84.8% (RM45.3 billion) in 2013**, while the broadcasting sector contributed 10.9% (RM5.8 billion) and postal at 2.4% (RM1.3 billion)[1]. There is an array of Applications Service Provider (ASP), Content Applications Service Provider (CASP), Network Facilities Provider (NFP) and Network Service Provider (NSP) which play a vital part in the growth of the Telecommunications sector in providing services to fulfil consumer needs. In 2013, Axiata was the largest player which contributed around 23.0% of the total revenue of RM 45.3 billion. Other major players that contributed to the revenue of the Communications sector are Telekom Malaysia (TM), Maxis, Celcom, Digi and TIME. In addition, there are a small number of emerging Telecommunications organisations which have been successfully competing with major industry players. At the same time, SMEs also play a vital role in supporting major industry players, namely those involved in providing network components, related wireless and fiber services. These industry players have been increasingly expanding their network infrastructure and developing new types of services to meet the demands of the ever increasing subscribers base.

Mobile penetration in comparison to other ASEAN countries

Furthermore, the Government has taken measures to build a competitive sector and achieved high penetration rates[2]. The National Broadband Plan implemented in 2006 has improved the average broadband penetration rate as a step towards driving Malaysia into a knowledge-based society[2]. As a result, In comparison to other Association of South East Asian Nations (ASEAN) countries, Malaysia has registered significant advancement in internet usage and mobile cellular subscribers and is a strong leader amongst ASEAN countries in providing access to computers and the internet.
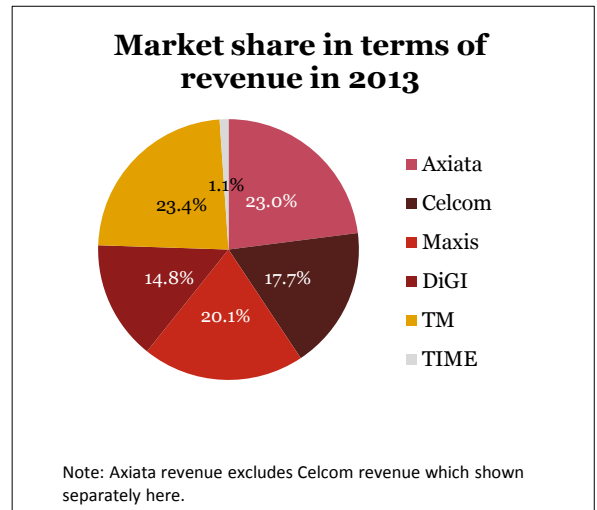

Market share in terms of revenue in 2013

- Axiata — 23.0%
- Celcom — 17.7%
- Maxis — 20.1%
- DiGI — 14.8%
- TM — 23.4%
- TIME — 1.1%

Note: Axiata revenue excludes Celcom revenue which shown separately here.

Diagram 2.5: Revenue market share of major players in Malaysia's Communications sector
Source: MCMC's Industry Performance Report 2013
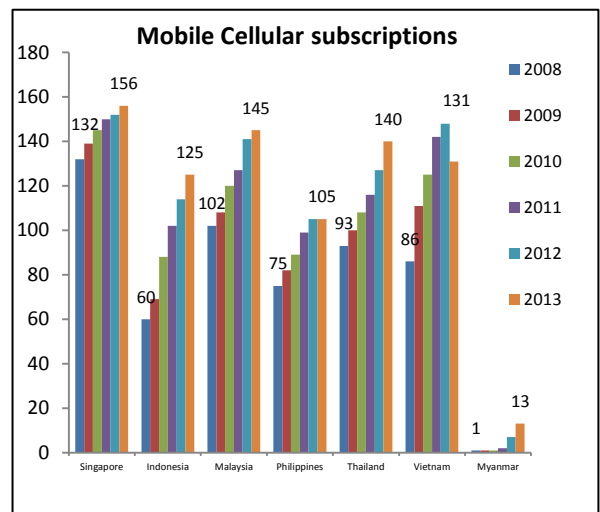

Mobile Cellular subscriptions

Diagram 2.6: Mobile cellular subscriptions for ASEAN countries
Source: Communications and Media Outlook

Source:
1. Industry Performance Report 2013, MCMC
2. Economic Transformation Programme– A Roadmap for Malaysia Chapter 13, 2011

2. Study findings

2.4 Talent supply overview

Overview of student intake at primary and secondary schools

As of 2014, based on the data obtained from the Ministry of Education (MoE)*, there are close to five (5) million Malaysians currently attending primary or secondary school, which constitute 16% of the population in Malaysia. These numbers are promising in ensuring that all sector in Malaysia receive sufficient talent supply. However, it is a concern for sectors which require talents that have capability in science knowledge. This is because the top-down analysis showed that based on the total number of secondary students in Form 4 and Form 5 in 2014, only 31% of the students studied in science stream. Consequently, the decrease in number of science stream students will impact the student intake for science-related courses at university level.

General decrease in Engineering, Science, Mathematics and Computers graduates

From the top down data provided, in 2013, there was an overall decline for graduates from Engineering (all streams) and Science, Mathematics & Computers. However, when analysed further, there was a steady increase of graduates studying in public universities for Engineering courses, as well as, public universities & polytechnic for Science, Mathematics & Computers courses.

	2011	2012	2013	
Public Universities	22,779	25,647	27,332	⬆
Private Universities	7,311	28,445	12,274	⬇
Polytechnic	23,203	18,392	15,941	⬇
Total	53,293	72,484	55,547	⬇

Table 2.1: Graduates from Engineering (all streams)
Source: Indicators of Higher Institute of Learning 2013, MoE*

	2011	2012	2013	
Public Universities	14,694	15,754	15,897	⬆
Private Universities	7,413	14,282	11,393	⬇
Polytechnic	1,916	1,869	2,145	⬆
Total	24,023	31,905	29,435	⬇

Table 2.2: Graduates from Science, Mathematics & Computers
Source: Indicators of Higher Institute of Learning 2013, MoE*

Study findings - Demand (industry) perspective

2.5 Trends observed in the Telecommunications sector

Digitisation

By the year 2020, an entire generation, Generation C (for "connected") will have grown up in a primarily digital world. Computers, the Internet, mobile phones, texting – all are second nature to members of this group[1]. Their familiarity with the technology and dependency on mobile communications will drive the growth in the Telecommunications sector.

The Telecommunications sector has been significant to the process of digitisation across a range of other sectors. From financial services to retailers, organisations depend on telecommunications networks to provide customers with online and mobile services designed to capture their interest and keep them coming back[1].

The financial service sector in particular is aggressively investing in a robust digital offerings as customers' attitudes and behaviours are changing as they expect more seamless end-to-end experience with their banks via interactive mobile channels in making payment[2].

One of the key offerings is banks are offering mobile applications that encourage purchases for common products like credit cards or saving accounts[2]. Therefore, the network operators are changing to offer an integrated, a multichannel user experience: on the desktop, on mobile devices, on the phones, and in stores.

Additionally, many Telecommunications organisations have made efforts to digitise their relations with customer, developing Internet-based sales channels, offering online customer care and boosting their social media presence[3].

However, consumers are driving the demand for more powerful devices, ubiquitous connectivity, more and better information and entertainment, and closer interactions with friends and family anytime and anywhere[3]. Therefore, Telecommunications organisations must provide the most attractive portfolio of new digital products and services to meet these demands.

With that, talents for the sector will also be impacted. Digitisation will cause the need for talents to understand the new technology but also possess creativity to innovate on these new technologies to maximise their potential benefits.

Sources:
1. The digitisation megatrend by Strategy&
2. The new digital tipping point by
3. Becoming a digital telecom by Strategy&

2. Study findings
2.5 Trends observed in the Telecommunications sector

Technological trends will change the business landscape

Malaysian Telecommunication organisations are very reliant on the adoption of emerging technologies within the sector. These emerging technologies are an essential part of a Telecommunications company's strategic planning as they impact the way they operate, develop products and interact with consumers.

Most of the top management in Telecommunications organisation agreed that emerging technological trends is one of the key factors that drive growth in the Malaysian Telecommunications sector. Based on the interviews, the main emerging technologies that will be impacting the sector are Internet of Things (IoT), Internet of Everything (IoE), data analytics, cloud computing and security services.

In the next 3-5 years, these emerging technologies will play a pivotal role in changing the business landscape of the sector as more organisations will develop products and provide services associated with the mentioned technologies. This will impact the talent requirements as such skill sets will also differ in the future. There is a need for talent to adapt and become agile to ensure they meet the industry requirements

Talent needs for the future will definitely focus on the skill sets on data analytics, data mining and mobile applications development with relations to IoT/IoE. Moreover, IoT plays a larger part in people's daily lives, secure and reliable networks and data storage will become increasingly important[1]. Consequently, there is an increasing demand for talents to possess competencies in network security. In addition, there is a need for talent to be innovative and creative to develop new products and new services that caters to the emerging technological trends.

Demographic shifts

The world as everyone know is constantly changing and evolving. The greatest influence on this change is demography; the changing dynamics of world populations and their impact on society[2].

As the population comprises of more millennials; there will be a greater demand in a diverse range of products and services which are cost-effective and accessible through online and mobile channels. As millennials are more familiar with digital products, they expect Telecommunications organisations to come up with a better and more interesting content and devices to retain them as subscribers.

Besides that, millennials represent a highly important subscriber segment for Telecommunications organisation, as they are starting to reach the peak age of mobile consumption and will be an important source of value for Telecommunications organisation.

As a result, talent will need to have the ability to apply new technologies and innovate them as well as commercialise their ideas to cater to the growing requirements of the young and technology-savvy generation.

65%

Of survey respondents and interviewees agreed that emerging technological trends will drive growth in the Malaysian Telecommunications sector

Sources:
1. http://media.ofcom.org.uk/news/2015/iot-next-steps/
2. Demography – Challenges and Opportunities in a Changing World by Dexia

2. Study findings
2.5 Trends observed in the Telecommunications sector

The need for connectivity

In the 10th Malaysia Plan, the Government of Malaysia was committed to enhance the broadband infrastructure by rolling out the High Speed Broad Band (HSBB) and the Broadband for General Population (BBGP) in several states, raising the national broadband penetration rate from 55.6% in 2010 to 70.2% in 2014[1]. Moreover, the Government also launched the 1BestariNet programme to provide connectivity to schools to support teaching and learning. A total of 10,132 schools were connected via fibre, WiMAX, Asymmetric Digital Subscriber Line (ADSL) and Very Small Aperture Terminal (VSAT)[1].

In the 11th Malaysia Plan, one of the aspirations for the Government is to strengthen infrastructure for smart cities[1]. To achieve their aspiration, the Ministry of Communications and Multimedia will focus on developing ubiquitous broadband, sensor networks and applications to enable connectivity and seamless integration of services.

As a result of the Government's increasing need to build network infrastructure throughout the whole of Malaysia, skill sets involve in network deployment are in demand. Simultaneously, there is also a requirement for network engineers to possess skill sets for optical fibre planning and installation to meet the Government's aspiration.

In addition, Telecommunications organisations need to meet the requirement of the customers who are digitally savvy and more mobile ---as they want an-always connected experience, faster download speeds, and more (and more interesting) content. Therefore, talent with the skill sets on network strategy and M2M (machine-to-machine) applications with relations to IoT are sought after.

> *"The key drivers for growth are demand for data/internet, demand for connectivity and the digital economy"*
>
> *- Interview findings*

> *"IoE/IoT will drive connectivity and it will also be an important growth driver for the Communications sector"*
>
> *- Interview findings*

Source:
1. 11th Malaysia Plan

2. Study findings

2.6 Value chain of the Telecommunications sector

Value chain of the Telecommunications sector

The Telecommunications sector predominantly comprises of organisations involved in the provision of Telecommunications-related services such as data, voice, and internet services. This has led to an emergence of other supporting telecommunications industry players such as **network equipment providers, device manufacturers, service providers, and developers of content and application**[1]. Given the rapid growth of the sector, a large pool of skilled talent is required to support its growth. The value chain of the Telecommunications sector is depicted in the following Diagram 2.7.
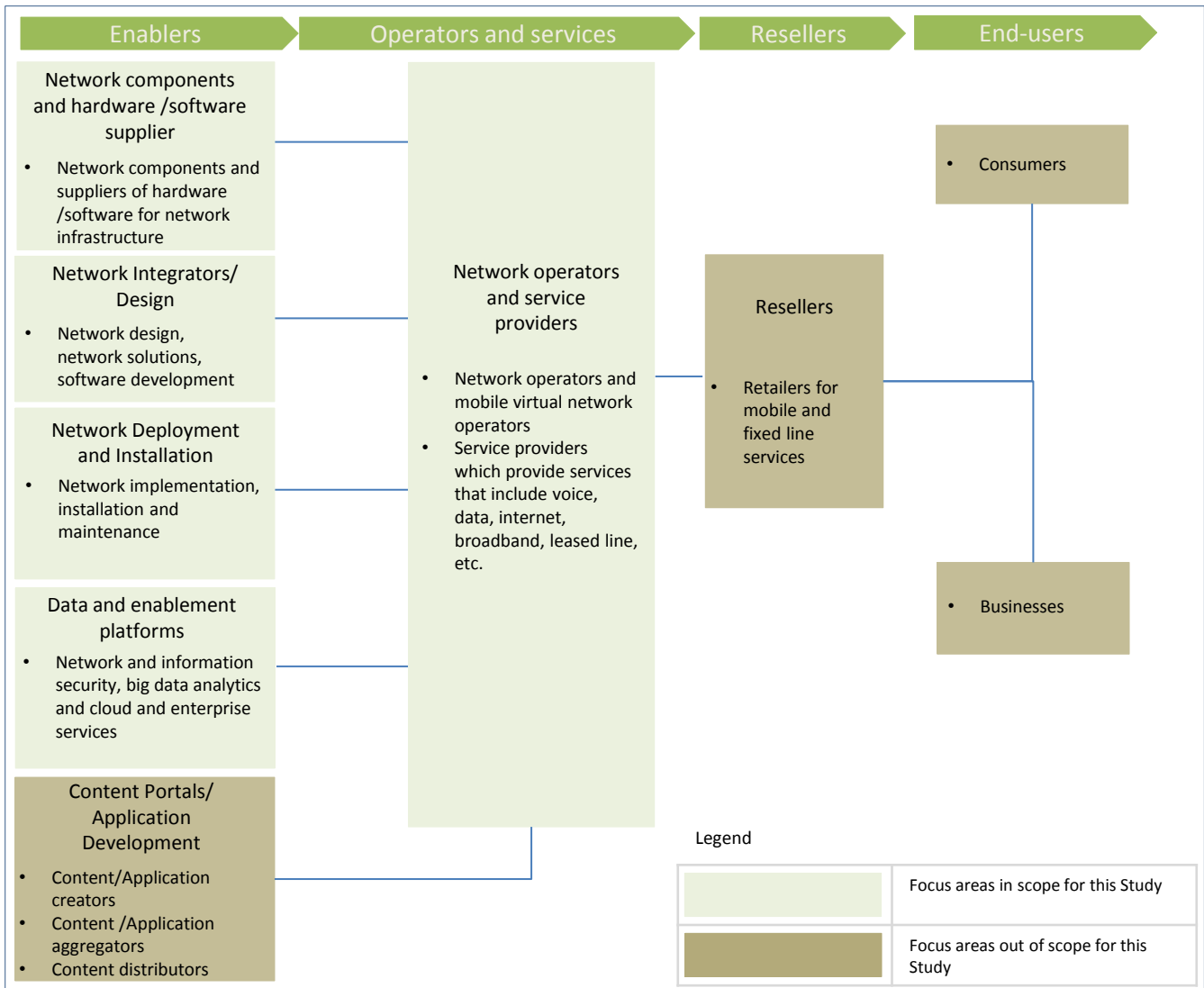
Enablers	Operators and services	Resellers	End-users

Network components and hardware /software supplier
- Network components and suppliers of hardware /software for network infrastructure

Network Integrators/ Design
- Network design, network solutions, software development

Network Deployment and Installation
- Network implementation, installation and maintenance

Data and enablement platforms
- Network and information security, big data analytics and cloud and enterprise services

Content Portals/ Application Development
- Content/Application creators
- Content /Application aggregators
- Content distributors

Network operators and service providers
- Network operators and mobile virtual network operators
- Service providers which provide services that include voice, data, internet, broadband, leased line, etc.

Resellers
- Retailers for mobile and fixed line services

- Consumers

- Businesses

Legend

	Focus areas in scope for this Study
	Focus areas out of scope for this Study

Diagram 2.7:Value chain of the Telecommunications sector

(For the purpose of this Study, the focus is within the Telecommunications sector, which is a subset of the Communications Industry)

2.7 *Future talent needs*

Overview of future talent needs

The trends observed in the Telecommunications Sector will have a significant influence and impact on the talent requirements for the sector. The existing workforce is required to be adaptable and agile to meet the ever changing trends in the sector. Thus, Telecommunications organisations are continuously focused on re-skilling their current workforce.

The focus areas within the Telecommunications sector have varied talent needs in the near future. Additionally, with the ever increasing demand for software defined network; there will be a shift from hardware-centric to software-centric (driving the need for combination of hardware and software skills e.g. network engineers with software development and programming skills). Technological trends and the need for connectivity have caused the demand for talents to be in areas of big data analytics, cloud computing, IoT, systems integration and security services. But it should be highlighted that jobs creation pertaining to emerging technologies namely cloud computing and data analytics will not be significant in the near future as the sector will only require a few experts with in-depth knowledge.

Other areas of talent needs are certified optical fibre and LTE infrastructure network engineers. These skill sets will be in demand in a short term, as to support the Government's initiative to deploy the HSBB phase 2 and LTE infrastructure.
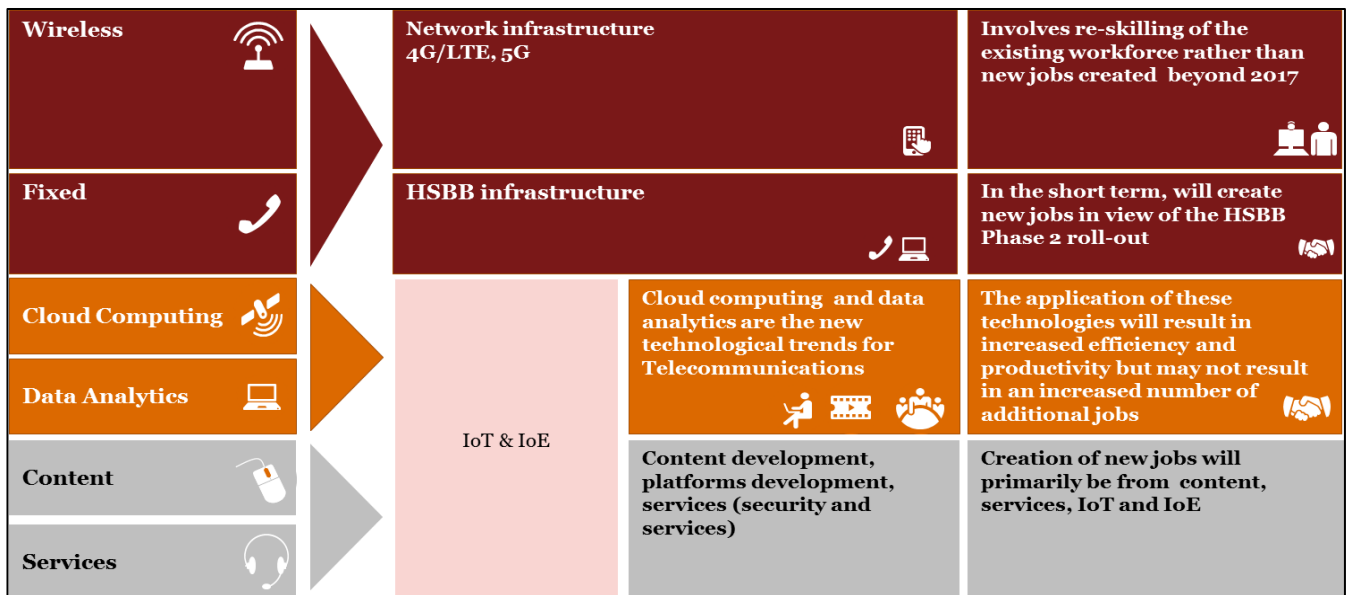
Wireless	**Network infrastructure 4G/LTE, 5G**	**Involves re-skilling of the existing workforce rather than new jobs created beyond 2017**
Fixed	**HSBB infrastructure**	**In the short term, will create new jobs in view of the HSBB Phase 2 roll-out**
Cloud Computing **Data Analytics**	IoT & IoE	**Cloud computing and data analytics are the new technological trends for Telecommunications**	**The application of these technologies will result in increased efficiency and productivity but may not result in an increased number of additional jobs**
Content **Services**		**Content development, platforms development, services (security and services)**	**Creation of new jobs will primarily be from content, services, IoT and IoE**

Diagram 2.8: Description of job growth in each focus areas

Source: Internal analysis

2. Study findings
2.7 Future talent needs

The framework to understand the different type of talent required in the Telecommunications sector

From the insights gathered from the surveys, interviews and validation workshops, the talent needs and critical job roles that are difficult to hire varies among the Small Medium Enterprises (SMEs), Multinational Companies (MNCs), network operators and service providers.

In general, the type of talent needed by the Telecommunications sector is largely dependent on the services and products to cater to the end-users. Therefore, the analysis of this Study findings examine the talent needs for different areas of the value chain of the Telecommunications sector, followed by the capability of talents produced by educational institutions. The framework below depicts the different type of talent that is required in the Telecommunications sector and shows the talent needs for different industry players in the sector.

Talents and Graduates	Providers of 'Enablers' Type Services	Operators and services	End Users
Graduates	**MNCs and SMEs**	**Network operators and service providers**	**Subscribers**
University (Public + Private universities and colleges) generates talents.	In serving the top network operators and service providers, MNCs and SMEs talent needs are related to technical areas.	In serving the subscribers, network operators and service providers talent needs are related to managing the subscribers requirements.	Subscribers are expecting a unique and different kind of services offered by network operators and service providers.

Diagram 2.9: The framework for the talent needs by different type of industry players in the Telecommunications sector

2.8 Talent management practices

This section highlights the key talent management initiatives adopted from the following perspectives:
- Attracting and retaining the right talent
- Develop talent within the organisations

2.8.1 Talent attraction and retention

Talent attraction and retention
(Based on survey output and focus interviews analysis)

1 Opportunities to explore new and advanced technologies

2 Attractive compensation and benefits

3 Opportunities to inculcate an innovative mind-set

Talent attraction and retention in the Telecommunications sector varies among the different types of organisations found in the sector's value chain. As stated by various industry players, the Telecommunications sector will be growing in the next 3-5 years. Simultaneously, many have mentioned that they will need more talent with relevant skills to support their business growth.

Based on the Study, the top three (3) factors that attract talent to the Telecommunications sector are opportunities to explore new and advanced technologies, attractive salaries and benefits as well as opportunities to inculcate an innovative mind-set.

Exposure to new technologies to increase their knowledge

As mentioned before, the Telecommunications sector is a dynamic sector and evolves very quickly. The development of new and advanced technologies is one of the key factors that ensure talents will continuously work in this sector. Thus, organisations are regularly exposing their employees to technical training on new technologies to upskill their employees. They also send their employees overseas to attend trainings or import foreign expertise to expose their local talent to any new and advanced technologies.

Holistic approach in rewarding talent

The network operators and MNCs do not face a challenge in attracting talents as they can provide an attractive compensation package to attract the required talent to their organisations.

Typically, MNCs and network operators spend a fair bit of time in ensuring they attract the top talents for their organisations, sometimes even bringing talents from other countries. Apart from competitive salaries and benefits, there are also performance-linked bonus being provided as part of the overall remuneration package.

However, for SMEs it is difficult to attract talents especially for experienced hires. They face competition to retain talents from the top Telecommunications organisations as generally talents are brand-conscious and thus prefer to work in well-established organisations.

> *"We have technical programmes which trains people in technical areas, new technologies, new equipment and solutions on a yearly basis"*
>
> *- Interview findings*

Providing an innovative environment

One of the key factors that makes the Telecommunications sector an interesting sector is that it is one of the sectors that promotes innovation and creativity. With the ever increasing demand for more data and imaginative ideas for the utilisation of mobile devices, there is a growing increase for Telecommunications organisations to produce exciting products that will meet the requirements of their digitally savvy subscribers.

Therefore, talents who are joining the Telecommunications sector should be able to utilise their innovation and creativity to develop products and services that are unique and caters to the requirements of their customers.

Other talent attraction and retention factor: Structured career pathway

Apart from the talent attraction and retention factors mentioned previously, Telecommunications organisations and educational institutions have agreed that the sector provides a structured career pathway for talents who want to work in the sector.

In general, MNCs in particular have established a structured development programme for fresh graduates to fast track their career growth. Additionally, the network operators and service providers give their talents options of either being on the specialist track or the management track.

77 %

Of survey respondents and interviewees agreed exposure to the latest technology and trends is one of the key factors to attract and retain talents in their organisations

62 %

Of survey respondents cited that attractive salaries and benefits is one of factor that attract individuals to join the Telecommunications sector

"There is a global war on talent, e.g. many companies are willing to attract and pay for the top required skill sets from different geographies"

- Interview findings

"We send our employees to overseas training to learn new technology adopted for our business"

- Interview findings

2.8.2 Talent development

Talent development

(Based on survey output and focus interviews analysis)

1 Technical training

2 Non-technical training

Recruiting talents with sufficient and relevant skills has become more challenging for Telecommunications organisations due to the scarcity of skilled and experienced talents in the market. Therefore, organisations are investing in training and development to nurture and harness talent internally and build a talent pipeline for future talent requirements.

The key components for talent development are technical training and non-technical training

Robust technical training programme

Many organisations are investing to provide technical training programme for their existing employees to re-skill and up-skill their talent. In particular, MNCs have established in-house training facility and academy to train their employees in new technologies, new equipment and solutions on a yearly basis.

Other notable organisations also provide specialised technical training to harness their employees skill sets in information and network security related areas.

SMEs do not have a robust technical training programme as compared to the top Telecommunications organisations. Nonetheless, they still provide their employees technical training to a certain extent. Some SMEs, as part of Original Equipment Manufacturers (OEM) arrangement, leverage on the principal vendors providing the technical training to their employees (i.e. new equipment technologies).

In addition, Telecommunications organisation generally are spending more time in providing technical training in emerging technological areas as talents still lack the respective skills and knowledge. There is a need for re-skilling or up-skilling as technical competencies namely data mining, network function virtualisation and predictive modelling will be one of many critical competencies that will be in demand in the next 3-5 years.

Non-technical training programme focusing on leadership

Non-technical competencies are considered as one of the key attributes local talents lack. The key development area is the ability to communicate effectively and think strategically.

2. Study findings
2.8.2 Talent development

In general, the network operators and service providers are focus more on providing training to harness their employees' managerial skills. The aim is to develop managers to build leadership skills in driving the success of the business at all levels.

MNCs also develop non-technical programme that target on business management, financial management and leadership related-competencies. They enroll their top talents for prominent leadership programme such as the INSEAD programme as part of talent development programme.

Non-technical competencies can also be harnessed through mentoring programme that develop leadership skills and communications skills especially for SMEs. The mentoring programme allow for their young talents to adopt and learn specific non-technical competencies from their seniors.

85 %

Of survey respondents and interviewees agreed they provide specialised technical training in up-skilling and re-skilling their talent

"We have a training facility and embedded in-house development programme which helps to develop employees"

- Interview findings

"We bring in capable engineers who are innovative and the leader will train the subordinates, the right skills set for that particular job areas"

- Interview findings

Detailed analysis on the demand (industry) perspective

2.9 *Details of this section*

This section covers the detailed analysis of the demand (industry) perspective based on the framework for talent needs by the different type of industry players in the Telecommunications sector. As mentioned previously, the talent needs across the value chain of the Telecommunications sector varies between the SMEs, MNCs, network operators and service providers.

The three (3) key areas that entails this detailed analysis are shown below:

01 *Sector overview and growth*

This part presents the current sector overview and looks at key jobs driver of the Telecommunications sector as well as the expected future growth.

02 *Future talent needs*

This part explains the current and future job roles as well as technical competencies that are in demand by the industry.

03 *Talent management*

This part highlights the challenges in **recruiting** and **retaining** talents and **developing** existing employees, by identifying technical competencies required to up-skill the workforce.

Detailed analysis on the demand (industry) perspective

Overview of SMEs and MNCs

In the value chain of the Telecommunications sector, MNCs and SMEs act as the enablers to the network operators and service providers. They are typically called the vendors and mostly comprise of network equipment providers, device manufacturers, service providers, developers of content and application and data enablement platforms which provide services such as network security, big data analytics and cloud computing.
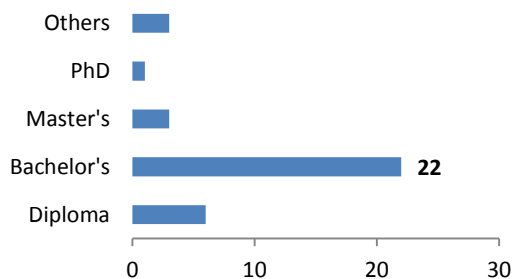
The role of SMEs in the Telecommunications sector

The SMEs core business activities are mainly wireless network integrators, wireless providers and fiber providers.

Core business activities for SMEs

- Wireless network integrators
- Wireless Providers
- Mobile application providers
- Mobile Operators and service providers
- Fiber providers
- Information network security
- Satellite operators
- Network equipment provider

19% 19% 13% 6% 19% 6% 6% 13%

Average number of employees based on qualifications for SMEs

Bachelor's: 22

The role of MNCs in the Telecommunications sector

The MNCs core business activities are mainly wireless network integrators and emerging areas namely big data analytics and cloud computing.

Core business activities for MNCs

- Wireless network integrators
- Wireless Providers
- Information network security
- Cloud computing
- Big Data Analytics
- Network equipment provider

13% 25% 13% 13% 25% 13%

Average number of employees based on qualifications for MNCs

Bachelor's: 135

Diagram 2.10
Source: Analysis- Talent Study survey results

Sector overview and growth

Mobile market will grow similarly with fixed line market

The Malaysian Telecommunications sector will grow but it will not exceed the GDP growth (4.7% in 2015)[1] of Malaysia. The mobile market will grow as mobile usage will increase given the mobile market penetration currently stands at 146.2%.

Similarly, the fixed line market will grow together with the mobile market as the launch of HSBB2 and fiber to the home (FTTH)will impact the positive growth.

The growth areas for mobile market will be more in content and application as more users are more comfortable using mobile phones.

Growth is driven by the demand for data, the need for connectivity and the digital economy

The emerging technologies that will drive the growth of Telecommunications sector are IoT, IoE, cloud computing, data analytics, information security and smart communication. Moreover, based on the workshop attendees, 94% of attendees from SMEs agreed big data analytics and cloud computing have significant impact on their organisations.

Feedback received from the survey showed that the key factors driving growth in the Malaysian Telecommunications sector for SMEs and MNCs are emerging technological trends, information exchange/convergence and content and use of digital media.
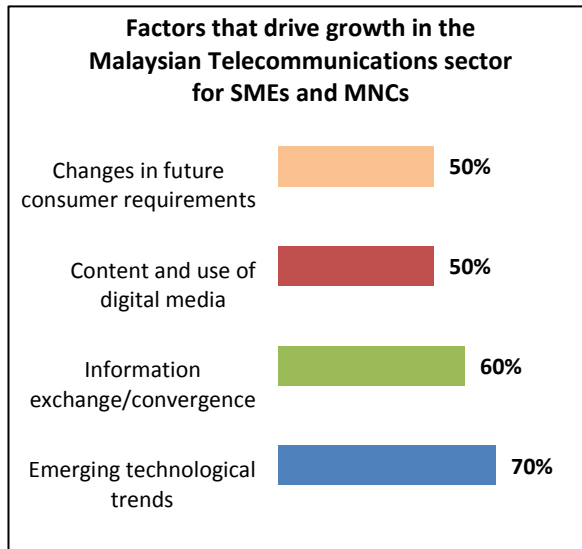
Factors that drive growth in the Malaysian Telecommunications sector for SMEs and MNCs

Factor	Percentage
Changes in future consumer requirements	50%
Content and use of digital media	50%
Information exchange/convergence	60%
Emerging technological trends	70%

Diagram 2.11

Source: Analysis- Talent Study survey results

"One of the emerging areas is cloud services which provide services to enterprise customers"

- Interview findings from MNC's top leader

2. Study findings
2.9 Detailed analysis on demand (industry) perspective

SMEs

Job growth is stable and new jobs creation will not be significant

Majority of the SMEs plan to hire more people, however the number of new jobs created will not be significant. SMEs are optimising costs at all levels which include recruiting the right talents for their organisations. Organisations are moving towards a leaner structure as technological growth will result in increased efficiency and productivity.

One of the key drivers for job growth for SMEs is the development of network infrastructure in remote areas with the roll out of HSBB phase 2 in the coming years. Other than that, new job roles that will be created are network operations centre managers and network engineers who have expertise in network optimisation across multiple technologies (3G/4G) and multiple network players (RAN, Core).

"Managers will have multiple departments to manage and we are planning to hire more project leaders"

- Interview findings from SME's top leader

MNCs

Less jobs creation and there will be more re-skilling

There will not be a significant number of new jobs creation for MNCs involved in the area of network integration. Additionally, one of the interviewees have cited that job growth at the network equipment providers will be relatively stable.

In general, many have commented that there will be a shift towards outsourcing and managed services in the network areas. Majority of the MNCs are more focus in up-skilling the current workforce (e.g. skill sets in emerging areas namely data analytics) than expanding it.

"Job growth in the "network domain" at the operators and network equipment providers will be relatively stable"

-Interview findings from MNC's top leader

Future talent needs

Indicative critical job roles that are difficult to hire

SMEs	MNCs
SMEs are facing difficulty in hiring talents that have expertise in network related areas such as network strategist, network engineers and network operations. Moreover, there will be high demand for technicians and engineers in network roll-out and operations, e.g. optical fibre technicians and LTE engineers.	MNCs will require solutions architect, programmers and data modellers in the future. There will also be high demand for talents who are network engineers with the knowledge of the operating systems software.
In general, SMEs are more focused on maintaining and optimising the existing network infrastructure. Therefore, they will require talents particularly in network operations.	Furthermore, MNCs are very much focussed on hiring talents for emerging technologies namely big data analytics. Indicative critical job roles are database specialist, data mining analyst and data scientist.

Indicative Critical Job Families	Indicative Critical Job Roles	Indicative Critical Job Families	Indicative Critical Job Roles
Network strategy and architecture (wireless)	• **Network strategist**	Network strategy and architecture (wireless)	• **Network architect**
Network engineering (wireless)	• **Wireless network engineer**	Database warehousing	• **Database specialist** • **Business intelligence specialist**
Network roll-out	• **Site & construction engineer** • **Network deployment manager**	Statistics and mining	• **Data specialist** • **Data mining analyst**
Network operations (fixed line)	• **Network operations engineer**	Analytics /Data science	• **Data scientist** • **Analytical programmers**

Diagram 2.12
Source: Talent Study - Survey

Indicative critical technical competencies for the next 3-5 years

SMEs

•SMEs are looking for talent who possess skill sets in optimising and maintaining the existing network infrastructure. They are also looking at technical competencies involving in network provisioning, systems integration, programme coding and configuration.

Additionally, SMEs which are involve in the last mile issue for network deployment; are looking for talent who possess skill sets for site identification, site acquisition and optical fibre planning and installing. Other than that, network designer and planner with skill sets in designing open access network would also be in demand in the future.

"We will require talents with skills in deploying and installation of fibre infrastructure"

- Interview findings from SME's top leader

Indicative Critical Technical Competencies

- **Radio and spectrum planning**

- **Site identification & acquisition**

- **Site design & site survey**

- **Optical fibre planning & installation (RF equipment installation)**

- **Site build process end-to-end**

- **Trouble ticket management**

- **Network operations centre management**

- **Front line maintenance management**

- **IP networking**

Diagram 2.13
Source: Talent Study - Survey

Indicative critical technical competencies for the next 3-5 years

MNCs

The future technical competencies that are critical for MNCs are network optimisation, network provisioning and system integration. Talents that work for MNCs will additionally need to have skill sets that are related to data scientism and data mining.

MNCs are planning to invest more in emerging areas such as cloud computing and data analytics for the future. Therefore, they are aggressively searching for talent in data mining, customer analytics, and predictive analytics.

"Hot skills are data mining, customer analytics, predictive analytics, programming and business skills"

- Interview findings from MNC's top leader

Indicative Critical Technical Competencies

- **Data mining**

- **Database management technologies, e.g. SQL and NoSQL**

- **Predictive modelling**

- **Spatial analysis**

- **Regression analysis**

- **Advanced analytical tools**

- **Data architecture**

Diagram 2.14
Source: Talent Study - Survey

Talent management

Talent attraction and retention

SMEs	MNCs

SMEs

Competition to retain talents with top Telecommunications companies

SMEs are faced with a challenge in attracting experienced hires as their remuneration packages are not as attractive as the ones from top Telecommunications companies. Furthermore, talents are brand-conscious; therefore, they prefer to work in reputable companies. As a consequence, SMEs find it hard to retain talents due to stiff competition between companies.

Talents are more interested in joining the network operators, service providers and MNCs. This is a constant problem faced by SMEs as they experience difficulties in retaining their top talents, who join top Telecommunications companies after gaining sufficient experience with SMEs.

Lack of adequately skilled graduates

In general, many respondents have cited that graduates have basic technical knowledge however lack the knowledge of the latest technologies. Graduates may require specific skills (e.g. latest technology skills) that might not be taught during their undergraduate courses.

Even after recruiting talents from relevant fields (e.g. engineers or technicians) organisations need to heavily invest in training and development.

MNCs

Graduates are not up to par with industry requirements

Majority of the MNCs state that local fresh graduates they hire lack the knowledge of the latest technologies.

Additionally, local graduates may have the basic technical knowledge but additional training needs be provided to meet to industry requirements (e.g. knowledge on the specific technologies used by MNCs).

From the survey results, 67% of MNCs face difficulty in recruiting talents with sufficient and relevant non-technical competencies namely communications skills, innovative mind-set and presentation skills.

Talent attraction initiatives

There is no surprise, MNCs do not face difficulty in attracting talents to join their organisations. This is due largely because they have been investing in ensuring that they have a strong brand in the sector and continuously projecting the attractiveness and benefits of working in the Telecommunications sector to entice local talents to join their organisations.

This brand image is very effective to millennials especially as local graduates are keen to join MNCs as they promote a vibrant work culture and a good place for career development.

Talent development

SMEs

MNCs

Training focus on exposure to the latest technologies

To further develop the current talents, more trainings that focus on up-skilling are provided. Based on the survey, 100% of the respondents cited that they provide technical training for their employees to up-skill them.

Talent development depends on the business strategy of the respective SMEs as there is a desire to grow talent, but realistically it can be expensive and time consuming. One of the main efforts of SMEs to up-skill their talents is sending their employees for overseas training in order for them to be exposed to the latest technologies.

Other efforts include leveraging on OEM experts to train local talents.

Talent mentoring

Most of the top management for SMEs have clearly stated that they constantly mentor their employees via formal or on the job feedback. They are more hands-on with their employees and generally allow for their junior employees the opportunity to manage certain projects. As a result top management for SMEs tend to have a more closer relationship with their employees and are willing to share their knowledge with the junior employees.

Provide structured training and development programme

MNCs have established a prominent talent development programmes such as in-house training facility and academy to up-skill employees and further train the talents in new technologies. Non-technical training specifically focused on business acumen, financial management and leadership development are also included in the development programme.

Majority of the MNCs have a development track for their employees by pillars, e.g. Sales, Technical and Industry/Subject Matter experts. Other than that, they also conduct talent development programmes for graduates to fast track career growth and mentoring opportunities.

"We have initiatives like the leadership INSEAD training programmes to groom future leaders"

- Interview findings from MNC's top leader

Analysis of the talent needs for network operators and service providers

Sector overview and job growth

Growth will predominantly come from emerging areas and services based on insights obtained

Based on the findings from the focus interviews, growth opportunities would come from the enterprise market in cloud, e.g. data centres with Malaysia being the hub in the region. IoT, cloud and big data analytics are the emerging areas in the Telecommunications sector . Simultaneously, the mobile and fixed line market will grow similarly as they are complimentary of each other.

Growth in the mobile market will particularly be in areas such as network services and mobile Internet. The positive growth in the Telecommunications market will impact talents especially for experienced hires as compared to fresh graduates.

Job growth is stable and new creation of jobs will be on higher value jobs in the emerging areas

In the short term, majority of the new creation of jobs will occur in the fixed line infrastructure due to the roll-out of HSBB phase 2.

There will be minimal new job creation for the emerging areas namely cloud computing and data analytics as these emerging areas will result in increased efficiency and productivity but may not result in an exponential increase in the number of additional jobs.

It is cited that there will be new jobs creation in content and services e.g. security services. The creation of jobs in IoT specifically for Telecommunications sector will not be significant as IoT will create jobs across several sectors.

52%

Of the workshop attendees felt that growth of the Telecommunications sector is trailing the GDP growth

"Hiring will stay relatively stable in terms of total employees, i.e. there will be a shift in competencies being hired"

- Interview findings from network operator's top leader

Future talent needs

"We will require innovators and individuals who have an understanding of network engineering"

Interview findings from network operator's top leader

"We need data scientists who understand how to deal with all the new trends and emerging technologies"

Interview findings from network operator's top leader

Indicative critical job roles that are difficult to hire

Network operators and service providers are facing a challenge in hiring data scientists and data specialists which understand how to deal with the new trends and emerging technologies. Other critical job roles that are in demand are network engineers and network strategists for both fixed line and wireless technology. There is also a need in hiring for core areas for example optical fibre certified technicians and LTE capability engineers due to the deployment of LTE infrastructure that has just begun in Malaysia.

Indicative Critical Job Roles

- **Core network service assurance engineer**

- **Data network engineer**

- **Network designer**

- **Radio optimisation & capacity engineer**

- **Database specialist**

- **Data scientist**

- **Data architect**

- **Business intelligence specialist**

Diagram 2.14

Future talent needs (cont'd)

> *"There is a transition from network equipment/hardware only skill sets towards **a combination of skill sets for both hardware and software**, e.g. network engineers are expected to have programming skills as well."*
>
> *- Interview findings from network operator's top leader*

Indicative critical technical competencies for the next 3-5 years

The network operators and service providers are more strategic in their talent needs. Their main objective in finding talents is not technical competencies related to operations but the ability to be innovative and creative in developing products that could meet the demand of the new age of subscribers. Therefore, they would require talents with "Digital" product and services skills. Although they still need the traditional technical competencies that are associated with a network engineer, however their engineers are expected to possess skill sets involving a combination of network knowledge, IT skills and entrepreneurial skills.

Indicative Critical Technical Competencies

- **Access network design and planning**

- **Backbone network design and planning**

- **IPv4 to IPv6 evolution and migration**

- **Data mining**

- **Predictive analytics**

- **Advanced analytical statistical tools**

Diagram 2.15

Talent management practices

Talent attraction and retention

Talent development

Challenges in recruiting experienced hires

The growth of the Telecommunications sector in emerging areas namely data analytics and IoT is impacting the type of talents required to meet the industry needs. Therefore, network operators and service providers face a challenge in recruiting experienced hires with skill sets that involve the combination of IT related competencies and understanding of the network infrastructure. Additionally, the current workforce would require the need for talents to be agile and adapt to the latest technology.

Movement of talents within the industry

From the interviews, most talents in the Telecommunications sector would move within the top network operators and the vendors. Moreover, poaching of top talents between the top network operators and service providers occur frequently.

Lack of industry ready graduates

Industry feedback showed that graduates possess the basic theoretical knowledge, however they lack the understanding of the latest technologies (e.g. LTE knowledge). There is a need to increase the duration of the industrial training placements as the on-going training would serve the graduates well in learning the necessary non-technical competencies before they enter the workforce.

Structured development programme

Generally, the network operators and service providers have put in place a very structured development programme to develop their talents. The development programme that has been established are career models for high potentials that covers both technical and management tracks.

Based on the survey, 80% of the respondents agreed that they provide job rotation within their companies to allow for their talents to be multi-skilled e.g. talent with an IT background would have an opportunity to work in the network department.

More interesting, network operators and service providers are more focused in providing training on managerial skills for their employees. The aim is to develop managers to build leadership skills in driving the success of the business at all levels. For instance, they enroll their top talents for the INSEAD programme to build their leadership competencies.

> *"We carry out job rotational programme with our sister company, i.e. subsidiaries within the same Group of companies"*
>
> *- Interview findings from network operator's top leader*

Understanding the indicative critical job roles and technical competencies

2. Study findings

Understanding the indicative critical job roles and technical competencies that industry needs in the future

In developing the list of the indicative critical job roles and technical competencies for the Study, a few steps were taken to ensure that the list is comprehensive (on best-effort basis), relevant and fulfill the needs of the industry today. Various inputs for instance industry interviews, survey output, validation workshops and 's internal analysis by subject matter experts have been consolidated and analysed to ensure the list of indicative critical job roles and technical competencies is representative of the current and future needs of the industry.

Mapped to the four (4) focus areas of the Study, job families, job roles and technical competencies are obtained from the survey and validated by the industry. This section seeks to identify the indicative critical technical competencies required by the industry in the near future based on the defined focus areas and job families.

The list is divided into levels based on the four (4) focus areas of this Study and it is illustrated in the following diagram.
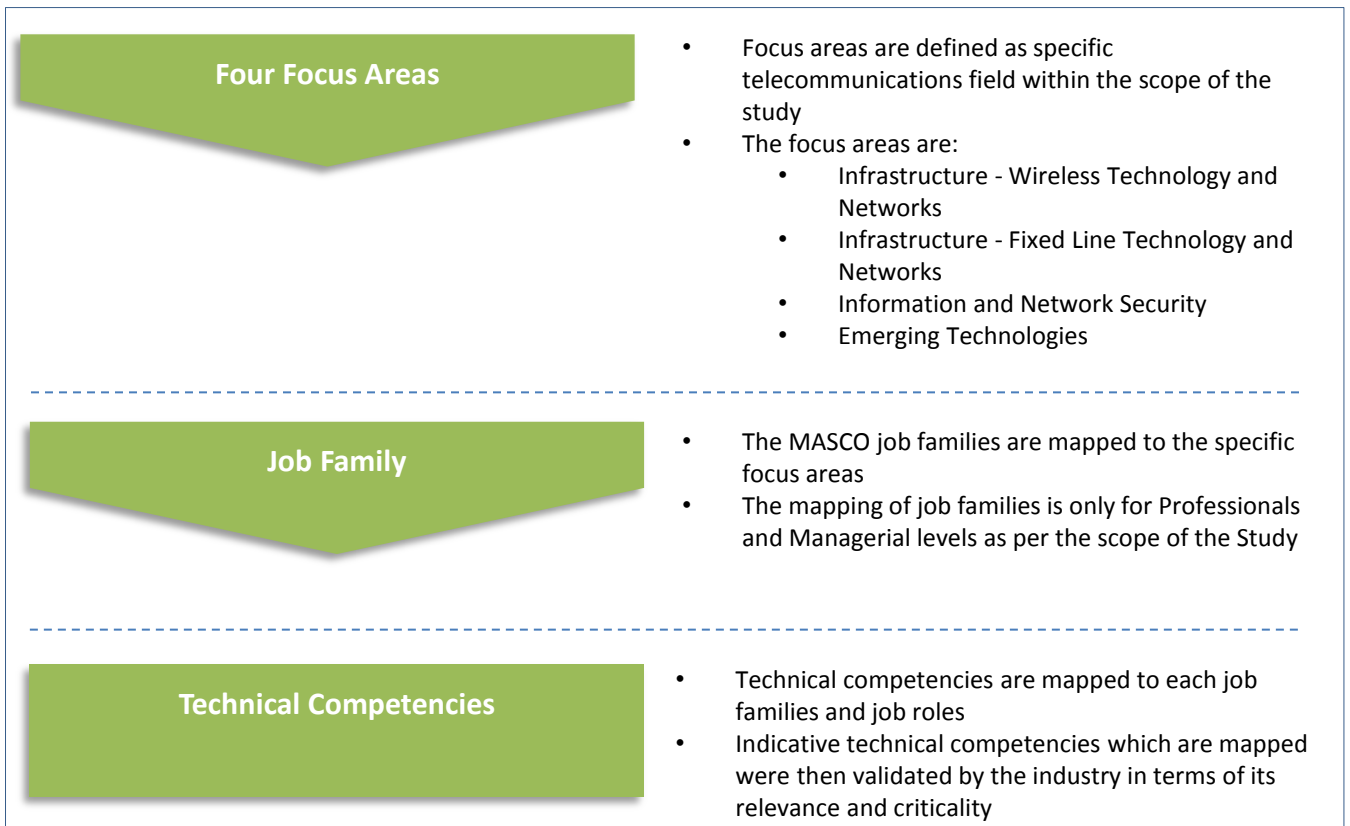
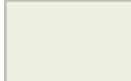|	
Four Focus Areas	• Focus areas are defined as specific telecommunications field within the scope of the study • The focus areas are: 　　• Infrastructure - Wireless Technology and Networks 　　• Infrastructure - Fixed Line Technology and Networks 　　• Information and Network Security 　　• Emerging Technologies
Job Family	• The MASCO job families are mapped to the specific focus areas • The mapping of job families is only for Professionals and Managerial levels as per the scope of the Study
Technical Competencies	• Technical competencies are mapped to each job families and job roles • Indicative technical competencies which are mapped were then validated by the industry in terms of its relevance and criticality

Diagram 2.16
Source: Talent Study - Survey

Wireless Technology and Networks – Indicative critical job families, job roles and technical competencies

Infrastructure – Wireless technology and network

Job Families	Definitions
Network strategy and architecture	*Responsible for providing direction and strategy to design the infrastructure network , generating high-level network design in response to business requirements*
Network engineering	*Responsible for planning and designing a more detailed network infrastructure*
Network roll-out	*Responsible for constructing and implementing the infrastructure network*
IT	*Responsible in IT related activities that can be divided into IT architectures, IT operations and IT infrastructures*
Performance and quality management	*Responsible for monitoring of the infrastructure network*
Operations	*Responsible for operation and maintenance of the infrastructure network*
Programme and vendor management	*Responsible for organising programs with the Government such as technical roll-out etc. and communicating between vendors, reviewing vendor services, determining the best fit for the company's network service needs*
Internet of Things	*Responsible in advanced connectivity of devices, systems and services similar to M2M and covers a variety of protocols, domains and applications*

Source: analysis

Legend

	Indicative critical job families
	Non-critical job families

1.1 Network Strategy And Architecture

Job Roles	Technical Competencies
Network strategist	1. Technology and solution evaluation
Technology strategist	2. 2G, 3G, 4G , 5G, IMT- Advanced, technologies, standards, interfaces & protocols
Network architect	3. Technical, operational, cost & investment analysis
Enterprise convergence strategist	4. Radio and spectrum planning
	5. IP routing technologies, standards, interfaces & protocols
	6. Network Function Virtualisation (NFV)

7. Circuit switching technologies, standards, interfaces & protocols
8. Packet switching technologies, standards, interfaces & protocols
9. Plesiochronous Digital Hierarchy (PDH), Synchronous Digital Hierarchy (SDH), Asynchronous Transfer Mode (ATM), Multiprotocol Label Switching (MPLS), Dense Wavelength Division Multiplexing (DWDM) technologies & standards
10. IMS and NGN technologies & standards
11. Software defined networking
12. Optical network elements
13. Policy control
14. Data services
15. Convergence technologies: standards, interfaces, protocols and topologies
16. Radio and spectrum planning
17. OSS & tools
18. Revision Control System (RCS)
19. VoWiFi, Video over Long Term Evolution (LTE), VoLTE
20. Content delivery optimisation
21. Cloud Radio Access Network (RAN)
22. Mobile front haul

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

1.2 Network Engineering

Job Roles	Technical Competencies
Network designer	1. Core network design and planning
Network planner	2. Core network optimization
Wireless network engineer	3. IP MPLS Network design and planning
Radio optimization & capacity engineer	4. IP MPLS Optimization
	5. Radio Frequency (RF) design and planning
	6. Voice network optimization
	7. Performance and capacity solutions
	8. Provisioning and configuration management
Core network service assurance engineer	9. RF optimization
Data network engineer	10. RAN network optimization
Core network engineer	11. Transmission design and planning
Transmission network engineer	12. Data network design and planning
Switching/ routing engineer	13. Data network optimization
Access network engineer	14. Quality of service and traffic engineering
	15. Traffic forecasting
	16. Network security
	17. Domain name system
	18. IPv6
	19. Planning and optimization of converged network
	20. Traffic management and optimisation across 4G and 3G
	21. Troubleshooting product features and capabilities
	22. Call flow logic and end-to-end architecture
	23. Information Technology Infrastructure Library (ITIL)
	24. Network virtualisation function
	25. Software Defined Network (SDN)
	26. Cloud computing

Source: analysis

Legend	
	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

1.5 Performance and Quality Management

Job Roles
Network performance manager
Network performance engineer
Network quality engineer

Technical Competencies
1. Complaint analysis 2. Root cause analysis 3. End-to-end service analysis 4. Issue resolution 5. Performance trending
6. (Quarterly) drive tests 7. Key Performance Indicators (KPI) target setting and dash-boarding 8. Management reporting

1.6 Programme and Vendor Management

Job Roles
Vendors & contract manager
SLA manager
Programme manager

Technical Competencies
1. Service Level Agreement (SLA) / KPI sign offs management 2. Vendor governance monitoring and escalation 3. Rewards / Penalties management 4. Setting SLA / KPI thresholds 5. Vendor negotiations and discussions 6. Network budget planning 7. Programme and project management 8. Governance management 9. Risk and compliance management 10. Energy management

Source: analysis

Legend	
	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

1.8 Internet of Things

Job Roles	Technical Competencies
M2M product manager	1. Vertical, industry knowledge, e.g. public, healthcare, transport, manufacturing
M2M architect	2. Mobile & wireless technologies, e.g. 3G, 4G, Wifi, Bluetooth, Near Field Communications (NFC)
Application designer/developer	3. Application design and development (Java, J2EE) 4. Real time Communications architecture
M2M solutions engineer	5. Messaging architecture, e.g. HornetQ 6. Middleware architecture, e.g. JBOSS
M2M platform engineer	7. Platform technologies and web application framework, e.g. JavaScript, J2EE, Struts, Groovy Script, Spring
M2M implementation engineer	8. User interface layer standards, e.g. SharePoint, Liferay 9. Database technologies, e.g. SQL, Oracle, Solaris, Unix 10. Coding 11. Computational thinking 12. IPv6

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

1.7 Information Technology (IT)

Job Roles	Technical Competencies
VAS engineer	1. Systems implementation
	2. Systems integration
Software developer	3. Service provisioning
	4. Billing systems design and architecture
Billing specialist	5. Value Added Services (VAS) systems
	6. Database technologies
IT architect	7. Information security
Enterprise applications architect	8. Operations Support System (OSS) architecture
	9. OSS implementation and enhancements
Web and mobility developer	10. Business Support System (BSS) architecture
	11. BSS implementation and enhancements
IT test engineer	12. Value Added Services (VAS) systems
	13. NOC monitoring systems
IT project manager	14. Systems testing
	15. Systems programming, e.g. XML, Java
IT system administrator	16. Infrastructure design
	17. Database administration
Database specialist	18. Operating systems
	19. Policy control
Database administrator	20. IT framework (e.g.. ITIL)
	21. Web mobility development
Infrastructure specialist	22. SOA architecture
	23. SOA systems
Web and mobility architect	
SOA Architect	
SOA Developer	

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

Fixed Line Technology and Networks – Indicative critical job families, job roles and technical competencies

Infrastructure – Fixed Line Technology and Network

Job Families	Definitions
Network strategy and architecture	*Responsible for providing direction and strategy to design the infrastructure network, generating high-level network design in response to business requirements)*
Network engineering	*Responsible for planning and designing a more detailed network infrastructure*
Operations	*Responsible for operation and maintenance of the infrastructure network*
IT	*Responsible in IT related activities that can be divided into IT architectures, IT operations and IT infrastructures*
Performance and quality management	*Responsible for monitoring of the infrastructure network*
Programme and vendor management	*Responsible for organising programs with the Government such as technical roll-out etc. and communicating between vendors, reviewing vendor services, determining the best fit for the company's network service needs*

Source: analysis

Legend

	Indicative critical job families
	Non-critical job families

2.1 Network Strategy And Architecture

Job Roles	Technical Competencies
Network strategist Technology strategist Network architect	1. Technology and solution evaluation 2. Circuit switching technologies, standards, interfaces & protocols 3. IP Multimedia System (IMS) and Next Generation Network (NGN) technologies and standards 4. Passive optical networking – add standards, interfaces & protocols 5. Core network – Network Address Translation (NAT), Authentication, Authorization And Accounting (AAA), Deep Packet Inspection (DPI), Domain Name Server (DNS)
	6. IP routing technologies, standards, interfaces & protocols 7. PDH, SDH, ATM, MPLS, DWDM technologies & standards 8. Network access technologies & standards, e.g. digital subscriber line (xDSL), fiber to the (FTTx), metro ethernet 9. Software defined networking 10. NFV 11. Packet switching technology – add standards, interfaces & protocols 12. Data services 13. OSS & tools 14. Content delivery optimisation technologies and standards 15. Video caching and compression techniques

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

2.2 Network Engineering

Job Roles	Technical Competencies
Network designer	1. Access network design and planning
Network planner	2. Backbone network design and planning
Transmission network engineer	3. NFI (Outside plant (OSP), Inside plant (ISP),
Network optimisation engineer	4. Optical fibre planning & installation
IP engineer	5. IPv4 to IPv6 evolution and migration

Technical Competencies
6. Marketing and demand forecast conversions to network elements
7. Transmission design and planning
8. IP MPLS network design and planning
9. Installation design
10. Access network optimization
11. Backbone network optimization
12. Quality of service and traffic engineering
13. Circuit switching technologies, standards, interfaces & protocols
14. IP routing technologies, standards, interfaces & protocols
15. PDH, SDH, ATM, MPLS, DWDM technologies & standards
16. Optical network elements
17. Network access technologies and standards, e.g. xDSL, FTTx, metro ethernet
18. IMS and NGN technologies and standards
19. xPON
20. Interior Gateway Protocol (eg. Intermediate System to Intermediate System (ISIS), Open Shortest Path First (OSPF))
21. Border gateway protocol (external routing)
22. Ethernet switching
23. Site acquisition
24. Network security
25. Synchronisation
26. DNS
27. IP address management
28. Call flow logic and end-to-end architecture

Job Roles (non-critical):
- Installation technician/engineer
- Site & construction engineer
- Network logistic planning engineer
- Network implementation & construction engineer

Source: analysis

Legend	
	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

2.3 Operations

Job Roles	Technical Competencies
Network & system engineer	1. Trouble ticket management
Network operations manager	2. NOC management
NOC operator	3. FLM management
Technical support engineer	4. IP networking
Network tester	5. NOC monitoring
Field technician	6. Field force management
Contract manager	7. Work flow management
	8. Site maintenance
	9. Alarm configurations
	10. EMS design and configuration
	11. Preventive maintenance
	12. Risk management
	13. Tools/systems optimization
	14. Information Technology Infrastructure Library (ITIL) – change management and control
	15. CS/PS/IP/Transport/Fixed network technology standards
	16. GPON/ADSL/Fixed network field maintenance and product description
	17. Transmission planning, maintenance, optimization (ATM/fiber/GPON/Metro E/SDH/PDH/PTN/ASL)
	18. VSAT
	19. Network and service end-to-end troubleshooting skill

2.4 Performance And Quality Management

Job Roles	Technical Competencies
Network performance manager	1. KPI target setting and dash-boarding
Network performance engineer	2. Complaint analysis
Network quality engineer	3. Root cause analysis
	4. End- to-end service analysis
	5. Issue resolution
	6. Management reporting
	7. Performance trending
	8. Monitoring/Assess – Remotely (Eyes in the cloud)

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

2.5 Programme And Vendor Management

Job Roles	Technical Competencies
Vendors & contract manager	1. SLA / KPI sign offs management
SLA manager	2. Vendor governance monitoring and escalation
Programme manager	3. Rewards / Penalties management
	4. Setting SLA / KPI thresholds
	5. Vendor negotiations and discussions
	6. Network budget planning
	7. Programme and project management
	8. Governance management
	9. Risk and compliance management

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

2.6 Information Technology (IT)

Job Roles	Technical Competencies
VAS engineer	1. NOC monitoring systems
Software developer	2. Information security
IT architect	3. Data centre
Enterprise applications architect	4. Service provisioning
IT project management manager	5. Operating systems
Web and mobility developer	6. OSS architecture
Software tester	7. OSS implementation and enhancements
Billing specialist	8. BSS architecture
IT test engineer	9. BSS implementation and enhancements
Infrastructure specialist	10. VAS systems
IT system administrator	11. Billing systems design and architecture
Database specialist	12. Systems implementation
Database administrator	13. Systems integration
Web and mobility architect	14. Systems testing
SOA Architect	15. Systems programming, e.g. XML, Java
	16. Infrastructure design
	17. Database technologies
	18. Database administration
	19. Cloud computing
	20. Database management
	21. Database architecture
	22. IT frameworks (e.g. ITIL)
	23. Automated reporting and data mining principles
	24. Web mobility development
	25. SOA architectures
	26. SOA systems

Source: analysis

Legend	
	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

Information and network security– Indicative critical job families, job roles and technical competencies

Information and Network Security

Job Families	Definitions
Security architecture	*Define Information Security strategic direction, develop and maintain policies*
Communications and operations management (including network security)	*Responsible for the implementation, maintenance and administration of network security, protect the integrity of software and information and ensure the security of electronic commerce services, and their secure use*
Access control	*Responsible for controlling access to information, information processing facilities, and business processes on the basis of business and security requirements*
Information, systems acquisition, development and maintenance	*Undertake system security requirement analysis, ensure the defined security requirements are embedded to the system and outline the specifications for the applications*
Security software development	*Design software that ensures information is secure and properly encrypted*
Programme and vendor management	*Responsible for organising programs with the Government such as technical roll-out etc. and communicating between vendors, reviewing vendor services, determining the best fit for the company's network service needs*
Information security incident management	*Manage security incidents by understanding common attack techniques, vectors and tools, undertake preventive actions as well as defending against and responding to such attacks when they occur*
Information security audit and compliance	*Responsible for verification of compliance against security policies, standards, legal and regulatory requirement as well as reviewing the legal, regulatory, and contractual requirements as well as to evaluate compliance issues/ concerns within the organisation*

Source: analysis

Legend

	Indicative critical job families
	Non-critical job families

3.1 Security Architecture

Job Roles	Technical Competencies
Security technology specialist	1. Strategic system planning
	2. Security protocols/terminologies/jargons
Security architect	3. Technical requirements definition
	4. Public key infrastructure (PKI)
Chief Information Security Officer (CISO)	5. Operating systems
	6. Business & security requirements analysis
Security strategist	7. Infrastructure security technologies including intrusion prevention, virus detection, firewalls, DMZ's, IP, cryptography, Secure Sockets Layer (SSL), Light Weight Directory Access Protocol (LDAP), active directory
Security designer	6. Knowledge on security governance, information risk management and compliance.
	7. Understanding of Communications infrastructure and network
	8. Networking

3.2 Communications And Operation Management

Job Roles	Technical Competencies
Network penetration tester	1. Basic network protocol (TCP IP, OSI Seven layers. IPv4 and IPv6)
	2. Network security threat and vulnerabilities, controls to protect
Network security engineer	3. Network security architecture and design
	4. Firewall, routers and switches rules and security configuration
Application security specialist	5. Monitoring of server / desktop security
Ethical hacker	6. First responder network security incident management
	7. Monitoring of network security
	8. Patch management
	9. Managing operating system security, database security, application security
	10. Managing security for system interfaces
	11. Batch processing
	12. Backup and media handling
	13. Patch management
	14. System hardening
	15. Endpoint security
	16. Content security
	17. Email and web security, DNS
	18. Applications Security
	19. Operating Systems

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

3.3 Access Control

Job Roles	Technical Competencies
Access control specialist	1. User registration 2. PKI 3. Database layer 4. Applications layer 5. Operating systems layer
	6. Privilege management 7. User password management 8. Review of user access rights 9. Networking 10. Operating systems

3.4 Information Systems Acquisition, Development And Maintenance

Job Roles	Technical Competencies
Acquisition analyst Information systems maintenance engineer	1. Security of system development and support processes including change control procedures and security management of internal and outsourced software development 2. Operating systems 3. Data migration, software testing, application security, systems security and related fields 4. Operating system hardening
	5. Security requirements for information system development 6. Security control of applications including input data validation, control of internal processing and output data validations 7. Management of security of system files including protection of system test data and access control to program source code 8. Networking 9. Application hardening

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

3.5 Information Security Incident Management

Job Roles	Technical Competencies
Security operations specialist	1. Security monitoring 2. Security and data log analysis 3. Network traffic analysis 4. Incident response & mitigation planning 5. Information security incident reporting 6. Collecting and preservation of digital evidence 7. Information security incident root cause analysis 8. Corrective and preventive action for continual improvement 9. Forensic investigation 10. Operating systems 11. Networking

3.6 Security Software Development

Job Roles	Technical Competencies
Cryptographer Network security software developer	1. Encryption algorithms 2. Application Security 3. PKI 4. Operating Systems 5. Software implementation & integration 6. Anti-virus algorithms 7. Cryptography technologies 8. Networking

3.7 Programme and Vendor Management

Job Roles	Technical Competencies
Vendors & contract manager SLA manager Programme manager	1. SLA / KPI sign offs management 2. Vendor governance monitoring and escalation 3. Rewards / Penalties management 4. Setting SLA / KPI thresholds 5. Vendor negotiations and discussions 6. Programme and project management

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

3.8 Information security audit and compliance

Job Roles	Technical Competencies
Security manager	1. Information security standards
Security governance officer	2. Security governance
Compliance officer	3. Risk and compliance requirements
Privacy officer	4. Security audit
Risk manager	5. Legal requirements
Internal auditors	6. Budget and finance
	7. Crisis management

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

2. Study findings
   2.9 Detailed analysis on demand (industry) perspective

Emerging Technologies (Cloud Computing) – Indicative critical job families, job roles and technical competencies

Emerging Technologies – Cloud Computing

Job Families	Definitions
Cloud computing architecture	*Spearhead the development and implementation of cloud-based initiatives to ensure that systems are scalable, reliable, secure, supportable and achieve business objectives*
Programme and vendor management	*Responsible for organising programs with the Government such as technical roll-out etc. and communicating between vendors, reviewing vendor services, determining the best fit for the company's network service needs*
Cloud network engineering	*Perform the implementation, operational support, maintenance and optimisation of network hardware, software and Communications links of the cloud infrastructure*
Service management	*Responsible for designing, building and operationalising additional cloud services*

Source: analysis

Legend

	Indicative critical job families
	Non-critical job families

4.1 Cloud Computing Architecture

Job Roles	Technical Competencies
Cloud computing solution architect	1. Requirements analysis & definition
Cloud technology specialist	2. (Enterprise) application architecture design
Cloud planner	3. Integration of infrastructure virtualisation with other platform technologies
	4. Cloud technologies and application platform standards
	5. Optimisation (Hardware)
	6. NFV
	7. Operating systems
	8. Wide Area Network (WAN) architecture design
	9. Infrastructure / data centre design
	10. Web services oriented architecture standards
	11. Storage and back up solutions
	12. Servers
	13. Understanding of Communications infrastructure and network
	14. Networking
	15. IPv6

4.2 Cloud Network Engineering

Job Roles	Technical Competencies
Cloud network engineer	1. Network security standards - switching, routing, firewalls
Cloud security specialist	2. Server virtualization
	3. Data exchange interfaces
	4. Network hardware, both wired and wireless
	5. Database administration SQL, MySQL, MS Access, RDMS, OCAP
	6. Cloud system engineering principles
	7. Simple Object Access Protocol (SOAP) knowledge
	8. Operating systems
	9. Networking
	10. IPv6

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

4.3 Service management

Job Roles	Technical Competencies
Cloud service manager	1. Performance monitoring
Cloud governance manager	2. Utilisation measurements
	3. Workload analytics
Cloud capacity planner	4. Capacity planning
	5. Security and compliance auditing
	6. Disaster recovery
	7. Contingency planning
	8. IT Frameworks (e.g. ITIL, CoBIT, etc.)

4.4 Programme and vendor management

Job Roles	Technical Competencies
Vendors & contract manager	1. SLA / KPI sign offs management
	2. Rewards / Penalties management
SLA manager	3. Setting SLA / KPI thresholds
	4. Risk and compliance management
Programme manager	5. Vendor governance monitoring and escalation
	6. Vendor negotiations and discussions
	7. Programme and project management

Source: analysis

Legend	
	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

2.9 Detailed analysis on demand (industry) perspective

Emerging Technologies (Big Data Analytics) – Indicative critical job families, job roles and technical competencies

Emerging Technologies – Big Data Analytics

Job Families	Definitions
4.5 Database warehousing	*Responsible for the successful delivery of business intelligence information to the entire organisation*
4.6 Analytics/Data scientism	*Gathers and analyses data to solve and address highly complex business problems and evaluates scenarios to make predictions on future outcomes and support decision making*
4.7 Statistics and Mining	*Analyse, identify and assess data attributes using statistical software packages, develop recommendations and processes to improve operational performance*

Source: analysis

Legend

	Indicative critical job families
	Non-critical job families

4.5 Database Warehousing

Job Roles	Technical Competencies
Business intelligence specialist	1. Data architecture
Database specialist	2. Data modelling
Data architect	3. Database technologies (ETL, OLAP, DBMS, etc)
	4. Database management technologies, e.g. SQL and NoSQL
	5. Data warehousing solutions
Database administrator	6. Reporting systems, tools & processes
	7. Analytical applications

4.6 Analytics/Data Scientism

Job Roles	Technical Competencies
Data scientist	1. Advanced analytical statistical tools
Business data analyst	2. Predictive analytics
Analytical programmers	3. Analytical algorithms
	4. Data mining
	5. Natural language processing
	6. Machine learning
	7. Conceptual modelling
	8. Statistical analysis
	9. Predictive modelling
	10. Hypothesis testing
	11. Programming languages, e.g. C++, Perl, Java, SQL, Python, Clojure
	12. Statistical programming languages, e.g. R, S
	13. Massive dataset programming models, e.g. MapReduce, Hadoop, Hive

4.7 Statistics and Mining

Job Roles	Technical Competencies
Data specialist	1. Machine learning
Data mining analyst	2. Data mining
Data analytical programmers	3. Predictive modelling
	4. Regression
	5. Spatial analysis
	6. Statistical programming languages, e.g. R, S

Source: analysis

Legend

	Indicative critical job roles and technical competencies
	Non-critical job roles and technical competencies

Mapping of MASCO Job Roles

Based on the surveys, interviews and the validation workshops, critical job roles have been identified which correspond to the focus areas of the Study. These critical job roles are mapped against the MASCO 4-digit unit groups to determine the categories and unit groups created in MASCO associated with the critical job roles.

The table below depicts the mapping of the critical job roles against the MASCO 4-digit unit groups and major categories associated:

Infrastructure – Wireless Technology and Network

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
1	Manager	1511	Information and Communications Technology managers	• Network Strategist • Technology Strategist • Enterprise Convergence Strategist • IT Project Manager • Infrastructure Specialist • Database Specialist • Software Developer • Network Performance Manager • Network Operations Manager • Network Deployment Manager

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Infrastructure – Wireless Technology and Network

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2153	Telecommunications Engineer	• Network Architect • Network Designer • Network Planner • Wireless Network Engineer • Radio Optimisation & Capacity Engineer • Core Network Service Assurance Engineer • Data Network Engineer • Network Deployment Manager • Site & Construction Engineer • Network Implementation & Construction Engineer • Network Performance Manager • Network Performance Engineer • Network Quality Engineer • VAS Engineer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Infrastructure – Wireless Technology and Network

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2522	Information Technology System Administrators	• VAS Engineer • Software Developer • Billing Specialist • IT Architect • Enterprise Applications Architect • Web And Mobility Developer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Infrastructure – Fixed Line Technology and Network

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
1	Manager	1511	Information and Communications Technology Managers	• Network Strategist • Technology Strategist • Network Operations Manager

Source: analysis

2. Study findings
   2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Infrastructure – Fixed Line Technology and Network

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2153	Telecommunications Engineer	• Network Architect • Network Designer • Network Planner • Transmission Network Engineer • Network Optimisation Engineer • IP Engineer • Network & System Engineer • Network Tester • Network Performance Engineer • VAS Engineer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

<u>Infrastructure – Fixed Line Technology and Network</u>

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2522	Information Technology System Administrators	• VAS Engineer • Software Developer • IT Architect • Enterprise Applications Architect • Web And Mobility Developer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Information and Network Security

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
1	Manager	1511	Information Communications Technology and Manager	• Chief Information Security Officer • Network Security Engineer • Information Systems Maintenance Engineer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Information and Network Security

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2522	Information Technology System Administrators	• Chief Information Security Officer • Access Control Specialist • Information Systems Maintenance Engineer • Network Security Software Developer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Information and Network Security

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2529	Database and Network Professionals Not Elsewhere Classified	• Security Technology Specialist • Security Architect • Chief Information Security Officer (CISO) • Security Strategist • Network Penetration Tester • Network Security Engineer • Application Security Specialist • Access Control Specialist • Network Security Software Developer

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Emerging Technologies – Cloud Computing

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2522	Information Technology System Administrators	• Cloud Computing Solution Architect • Cloud Technology Specialist • Cloud Planner

Source: analysis

2. Study findings
    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Emerging Technologies – Big Data Analytics

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
1	Manager	1511	Information Communications Technology Managers	• Database Specialist • Data Architect • Business Data Analyst

Source: analysis

2. Study findings

    2.9 Detailed analysis on demand (industry) perspective

The table below depicts the mapping the indicative critical job roles against the MASCO 4-digit unit groups and major categories associated:

Emerging Technologies – Big Data Analytics

Major group		Unit Group		Indicative Critical Job Roles (Talent Study)
2	Professionals	2521	Database Designers and Administrators	• Database Specialist • Data Architect • Data Scientist • Business Data Analyst

Source: analysis

Study findings – Supply (educational institutions) perspective

2.10 Details of this section

This section covers the detailed analysis of the supply (educational institutions) perspective based on talents and graduates at the tertiary educational institutions level.

The three (3) key areas that entails this detailed analysis are shown below:

01 Student intake trends

This part discusses on student intake trends in Telecommunication-related courses over the past few years in local educational institutions. This translates into employability of graduates upon graduation, and their ability to fill job needs within the Telecommunications sector.

02 Challenges faced by educational institutions

This part explains the numerous challenges faced by educational institutions to produce industry ready graduates.

03 Capability of graduates

This part looks into the capability of graduates in relation to their technical and non-technical competencies in particular their creativity and innovative mind-set.

Overview

Malaysia is expected to create an additional 43,162 jobs with more than 75 % being high-skilled and paying more than RM48,000 per annum within the CCI ecosystem [1]. To support this aspiration, various strategic initiatives have been implemented by building an advanced Communications network with widespread application of modern technologies such as fibre optics, wireless transmission, digitisation and satellite services [2]. Along with robust communications infrastructure, a pool of human capital that is capable of delivering the future of Telecommunications sector is just as important. Two significant efforts that have been implemented to increase the capacity and capability of talent pool in the Telecommunications sector include:

- In 1996, Telekom Malaysia (TM) was given the distinction by the Ministry of Education to set up the first private university in Malaysia, focusing on Communications sector, presently established as Multimedia University (MMU)[3]

- Malaysian Education Blueprint 2015-2025 outlined to increase access to and enrolment in higher education from 36% currently to 53%, mainly through growth in technical and vocational education and training (TVET), private higher learning institutes and online learning[4]. Community colleges, vocational colleges and polytechnics will be premier higher education TVET providers that develop skilled talents to meet the growing and changing demands of industry, which includes talents in the Communications sector[4]

In essence, the findings for supply analysis are largely consistent and similar with other studies that had been conducted previously. Some of the issues are already being addressed by various government interventions.

An additional **43,162 jobs** *with* **more than 75 percent being high-skilled** *and* **paying more than RM48,000 per annum** *will be created* [1]

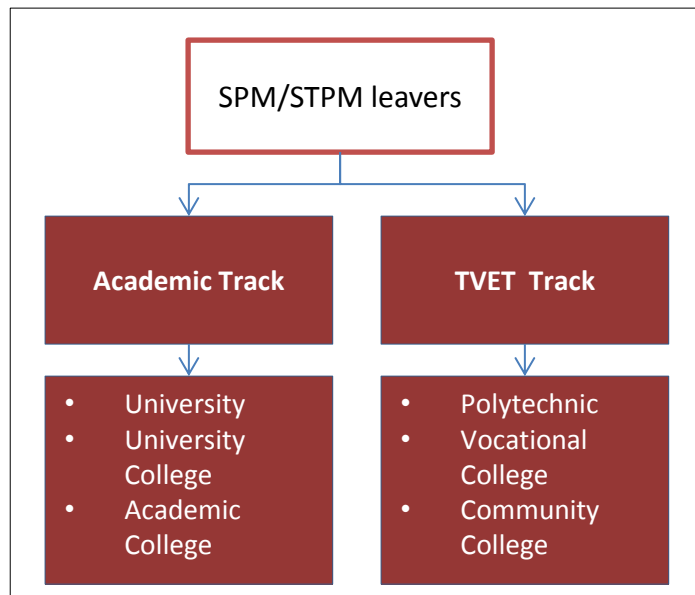
Diagram 2.17: Education pathways for SPM/STPM leavers who want to pursue Communications related courses

Sources:
1.   Economic Transformation Programme– A Roadmap for Malaysia Chapter 13, 2011
2.   Budde: Key Statistics, Telecoms Market Overview, Infrastructure and Forecasts
3.   https://www.mmu.edu.my/index.php?req=25
4.   Malaysia Education Blueprint 2015-2015

2. Study findings
2.10 Supply (educational institutions) perspective

Student intake trends

Overview of student intake trends in educational institutions

Overall the number of student intake for Engineering course (all streams) and Science, Mathematics and Computers decreased from 2012 to 2013. Nevertheless, there is a general increase in the number of students intake for Telecommunications-related courses namely Engineering course (all streams) and Science, Mathematics and Computers courses for public universities. In addition, a number of educational institutions that have been interviewed said students prefer to enroll in Electrical Engineering programme as it offers a broader selection of job prospects. In accommodating to the request and feedback, the universities have made some adjustment to allow the students to declare specialisation during the third year.

The Telecommunications engineering courses are also made available as elective courses for those students that are interested to learn. Talent at educational institutions do not face a challenge in terms of quantity however the capability of talents is inadequate. Insights obtained from surveys, focus interviews and validation workshops for supply and demand perspectives, have cited that local graduates do lack the skill sets especially in non-technical competencies.

Top-Down Data Provided From MoE* (All streams of Engineering)

	2011	2012		2013	
Public Universities	39,331	35,635	⬆	37,043	⬆
Private Universities	13,833	19,705	⬆	12,714	⬇
Polytechnic	24,506	24,345	⬇	17,899	⬇
Total	77,670	79,685	⬆	67,656	⬇
Growth	n/a	3%		-15%	⬇

Table 2.3: Student intake *(Data obtained on student intake is the most recent available – up until 2013 only)*

Sources: Ministry of Education

Top-Down Data Provided From MoE* (Science, Mathematics & Computers)

	2011	2012		2013	
Public Universities	27,151	26,075	⬇	28,952	⬆
Private Universities	13,228	18,544	⬆	15,006	⬇
Polytechnic	2,780	2,707	⬇	2,617	⬇
Total	43,159	47,326	⬆	46,575	⬇
Growth	n/a	10%		-2%	⬇

Table 2.4: Student intake *(Data obtained on student intake is the most recent available – up until 2013 only)*

Sources: Ministry of Education

Challenges faced by educational institutions to produce industry ready graduates

Insufficient interaction between educational institutions and the industry

Currently, there exists certain collaboration between educational institutions and the industry however there is a need to have more support from the industry to ensure that the syllabi are relevant to the current and future market requirements. Moreover, there is a need to make it sustainable to ensure educational institutions are up-to-date on the latest trends in the industry.

Additionally, there is insufficient interaction between educational institutions and the industry based on the feedback received during the focus interviews, survey and validation workshop. As indicated from the survey, approximately 12% of educational institutions held guest lecturer programmes in 2014 on a monthly basis. As a result, educational institutions are looking for more sustainable support from the industry which includes lecture series, lectures on specific subjects, industrial placements, capstone projects and internships.

"Industry can also play a more active role in research e.g. by sending more guest lecturers to teach in the university"

- Interview findings Head of Departments from top Public University

63%
Of survey respondents and interviewees stated that it is difficult to execute ongoing engagement within the industry for consultation on course syllabus

72%
Of survey respondents said that it is difficult to develop partnership with industry players to enrich programmes offered
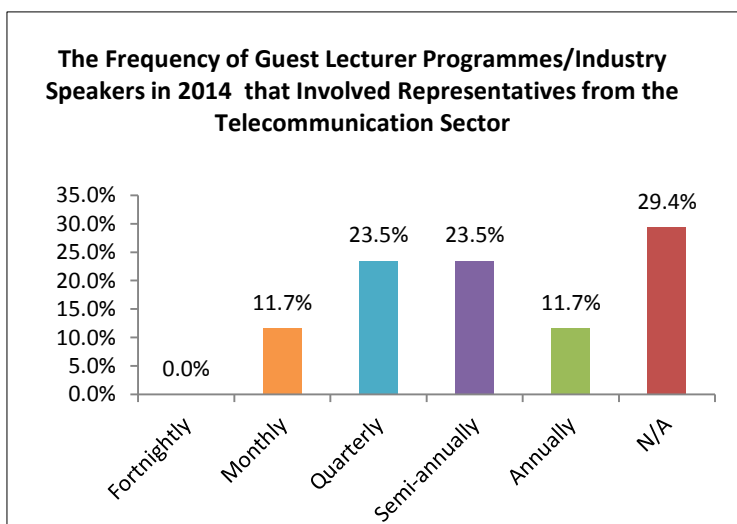
The Frequency of Guest Lecturer Programmes/Industry Speakers in 2014 that Involved Representatives from the Telecommunication Sector

Diagram 2.18
Source: analysis- Talent Study survey results

2. Study findings
2.10 Supply (educational institutions) perspective

Challenges in procuring latest equipment and technology

A few of the educational institutions have mentioned that the facilities and laboratories are not up to date and it would require additional funding to get the laboratories equipped with the latest and modern technology.

There are educational institutions which are faced with low speed internet connection. This has an impact on students to carry out their e-learnings and others such activities. The lack of proper facilities and equipment is a challenge for educational institutions to provide a conducive learning environment for students to be interested in pursuing a Telecommunications-related programme.

81%

Of survey respondents and interviewees felt that it is increasingly difficult to equip the educational institutions with the latest and modern infrastructure

"Educational institutions should build proper laboratories to allow students to learn the new technology available especially for Telecommunications network"

- Interview findings Head of Departments from top Public University

The lack of right instructors to respond to change of the syllabus impact the quality of graduates

Based on the surveys and interviews, most public institutions review their course syllabus every two (2) years. Although the course syllabus is reviewed regularly, the lack of right instructors to respond to change of syllabus impact the quality of the graduates. Additionally, the lecturers lack the exposure of actual working experience in the industry and they may not be able to share the understanding of the latest technology to their students.

The lack of right instructors to teach and understand the latest technology causes the quality of students to decline. As agreed by industry players, local graduates lack the technical competencies in emerging areas; however they have the basic technical knowledge to work in the industry.

It is critical that the teaching instructors have a strong basic degree on that particular subject as well as continuously up-skill their knowledge to ensure that they are able to convey the learning materials effectively to their students.

67%

Of survey respondents and interviewees find it difficult to employ sufficient number of high quality teaching staff.

2. Study findings
2.10 Supply (educational institutions) perspective

Open collaboration between industry and educational institutions

The industry in particular SMEs are proactively approaching different educational institutions in order to give insights to the students about specialised niche areas and the current market trends. Other top Telecommunications organisations have also supported selected educational institutions to provide assistance on financial means and enhance their laboratories equipment. However, these contributions from the industry only occur at very selected educational institutions.

Many educational institutions particularly the smaller and those in remote areas have challenges in getting industry speakers for guest lecturers.

There is a need for educational institutions and industry players to give and take and share their knowledge to constantly collaborate to ensure the graduates are equipped with the necessary skills and attributes to be industry ready.

Practical learning and industrial training are viewed positively but may require structured monitoring

Responses from interviews generally agree that industrial training is an effective way to provide students with real life working experience, industry knowledge and refine their soft skills. Similarly from the survey output, more than 80% of respondents agreed that students gain the relevant knowledge, experience skills during industrial training.

More than 90% of the students that went for industrial training in a reputable firm get employed after graduation. However, there needs to be a structured monitoring mechanism to ensure students are able to get the best out of the internships. Industry training placement should start in the 1st year rather than the final year for students to obtain knowledge and harness their soft skills. There should be flexibility for students to enrol in industrial training beyond the final year requirement.

"Industrial training undergone by students are seen as an effective way to expose students to the working world"

- Interview findings Head of Departments from top Private University

Do you agree that that students gain the relevant knowledge, experience skills during industrial training?
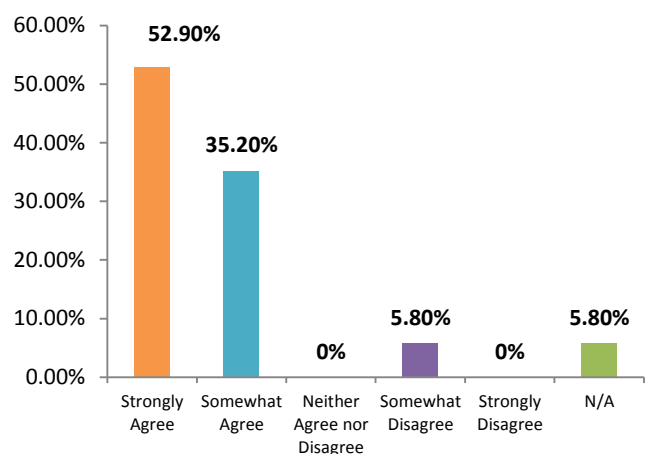

Strongly Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat Disagree	Strongly Disagree	N/A
52.90%	35.20%	0%	5.80%	0%	5.80%

Diagram 2.19
Source: analysis- Talent Study survey results

Capability of graduates

Basic technical skills are sufficient, but the ability to communicate and think strategically is scarce

Most industry players mentioned that they normally hire local graduates. On the other hand, they do invest in enhancing the skill sets of local graduates by developing dedicated technical training programme. As mentioned from the supply perspective, graduates are being taught the theory of basic engineering skills and majority of the Head of Departments from educational institutions cited that their graduates manage to be employed within six (6) months after graduation.

Local graduates who obtained employment still require some kind of training to develop their skill sets. Other than the scarcity in skill sets in emerging areas, local graduates also lack relevant behavioural competencies.

The Industry tend to hire graduates with only Bachelor's Degree

In general, the companies will hire talents with undergraduate degree or diploma holders as it may be constrained to pay high salaries for talents with a higher qualification.
Majority of the Telecommunications companies are not focused on research and development related areas, therefore the organisations do not have the need to hire master or Ph.D. holders. Only 2.4% engineers in the country have post-graduate degree qualification.

"As a CEO, I just need someone with good fundamental engineering and mathematical skills to join my company to avoid training them again"

- Interview findings MNC's top leader

Harnessing innovative and creative mind-set needs to begin at young age

Many industry players agreed that they need to invest some time and training to develop local graduates to harness their communication skills and innovative mind-set.

The main concern in terms of the quality of graduates is the lack of innovation and creativity mind-set. Universities feel that the journey to inculcate innovative and creative mind-set is a continuous process (pre-school, primary, secondary and tertiary). In Malaysia, there are insufficient platforms to harness innovation and creativity among the local talents.

In addition, interviewees feedback from the educational institutions commented on the lack of fundamental knowledge on science and mathematics for students entering the tertiary level. There are efforts by the universities to inculcate creativity and innovation through Final Year Project, Problem Based Learning (PBL) and other approaches.

65%

Of survey respondents said that are inadequate platforms for students with innovative mind-set enrolled in Telecommunications-related programmed to share and develop their innovative ideas commercially.

Challenges to Fulfill the Industry Requirements

2.11 Challenges To Fulfill the Industry Requirements

Overview of understanding talent requirements

Based on Manpower Group's annual Talent Shortage Survey in 2015, it was found out that 48% of Asia-Pacific employers across all sector had difficulty filling job vacancies due to a lack of available talent. Additionally, from the same survey 35% of the employers in Asia-Pacific stated that capabilities is the underlying reason that they face difficulties in hiring.

Globally, it is known countries namely Canada and UK are facing talent gaps (capability and capacity) for talents in the ICT sector[1,2]. Therefore, they are intensely investing to address the talent gaps issues to meet the industry requirements for the future.

In Malaysia, the Government is also investing on closing the talent gaps occurring across various sectors which include the Telecommunications sector. Government agency such as Talent Corporation Berhad has been established to partner with Malaysian employers in key sectors to address talent gaps faced by these industries and find solutions to resolve the talent issues.

Insights obtained from industry players, shows that talents in the Telecommunications sector are scarce especially high-skilled talents for technical areas. Telecommunications organisation across the value chain of the sector face difficulties in hiring talents with the relevant competencies to meet the industry needs.

Thus, this Study have been conducted to analyse and understand the overall talent gap and requirements in the Malaysia's Telecommunications sector. Moreover, it is critical to determine the number of jobs that needs to be filled and identify which focus areas and job families are impacted the most in order for the Government to develop a cohesive talent strategy plan for talent development towards these areas and job families.

For this Study, there are three (3) key areas that talent requirement is analysed. The labour market database information is conducted to forecast the human capital requirements at an aggregate level of the industry. This determines the talent supply of the industry and indicates whether there will be a talent gap in the sector. The analysis is then followed by the top-down analysis is conducted to determine the number of total workforce currently employed in the Malaysian Telecommunications sector and understand the trends of the overall workforce in the sector.

Finally, the analysis is carried out to determine the number of jobs that needs to be fulfilled based on **high-skilled technical areas** for two (2) categories which are for the SMEs & MNCs and network operators & service providers who have different workforce composition. These high-skilled technical areas are based on the four (4) focus areas of this Study from the 29 job families identified. The analysis is then further analysed to determine which job families are impacted the most to identify the key focus areas for talent development in the future.

The data obtained for this analysis contain several limitations. Due to the limitations, the project team have included some assumptions in analysing the human capital requirement.

Sources:
1. http://www.euractiv.com/sections/eskills-growth/employers-tackle-unpredictable-skills-mismatch-ict-sector-301938
2. http://www.ictc-ctic.ca/skills-shortage-a-reality-for-canadas-ict-sector-itac-and-ictc/

2. Study findings
2.11 Challenges to fulfill the industry requirements

Labour market database

In order to understand the human capital requirement in the Telecommunications industry, in the near and long term future, talent demand and talent supply is analysed at an aggregate level for the industry. This section presents the forecasted human capital requirement figures in the near term (i.e. year 2016). For forecasting the human capital requirement numbers the following three factors have been considered, which is explained in the subsequent sections:

Talent Demand	Talent Supply

It is defined as the demand of the headcount for a job area in Telecommunications for a particular year (e.g. 2017).

- **Talent Demand for the baseline year:** The assumed baseline year for the Talent Demand is based on the 6% expected growth of the industry's employment every year until the year 2017
- **Talent Demand growth rate for the future years:** The demand of headcount in the industry is assumed to directly impact by the output produced by the industry. Therefore a varied output growth rate have been used to assess the demand of headcount by creating one (1) different scenario of demand, which are as follows:
  - Scenario 1 (Base Case Scenario): Where the employment growth in Telecommunications industry will grow at a constant rate of 6% up to year 2020 as forecasted by the industry players (i.e. will not exceed Malaysia's GDP)

It is defined as the supply of students headcount available for joining Telecommunications for a particular year (e.g. 2017).

- **Talent Supply for the baseline year***:* For calculating the headcount number for the current year (i.e. 2015) the primary information was gathered from MOE on student intakes and graduates from public universities
- **Talent Supply growth rate:** For calculating the growth rate of the Talent Supply on a year on year basis the average labour force growth rate of 2% CAGR was used for students graduates in Telecommunications-related courses in local public universities, private universities and polytechnic

2. Study findings
2.11 Challenges to fulfill the industry requirements

Telecommunications industry overview – Base case forecasting human capital requirements

As stated in the previous section, the labour market database entails the talent forecast based on demand and supply for talents. This database answers the question "Is there sufficient pipeline of talents to meet the demands from the industry?". The diagram below illustrates the labour market forecasting based on the Base Case scenario from 2015 to 2017.

Base Case Scenario Forecasting
The considerations in the labour market database for Telecommunications industry are:

- Based on previous trends, the annual industry and employment growth stands at an average of 6%[1]
- Based on previous trends, the annual graduates growth rate stands at 2% annually
- The first scenario provides a view of talent forecast where only 10% of engineering graduates enter the sector, while the second scenario provides a view of the same, with 20% of engineering graduates enter the sector

Scenario 1: Assumption is taken where 10% of engineering graduates would be employed in the industry

Scenario 1	Supply/Demand	2015	2016	2017
Base Case	**Talent Demand** new jobs created *(Industry growth rate at 6%)*	2,968	3,146	3,335
	Talent Supply *(Supply CAGR at 2%)*	2,533	2,562	2,596
(Demand – Supply)%		Shortage of 15%	Shortage of 19%	Shortage of 22%

Scenario 2: Assumption is taken where 20% of engineering graduates would be employed in the industry

Scenario 2	Supply/Demand	2015	2016	2017
Base Case	**Talent Demand** new jobs created *(Industry growth rate at 6%)*	2,968	3,146	3,335
	Talent Supply *(Supply CAGR at 2%)*	5,067	5,124	5,193
(Demand – Supply)%		Surplus of 71%	Surplus of 61%	Surplus of 56%

Diagram 2.20: Labour market database for base case scenario forecasting

Based on the forecasting above, if 10% of engineering graduates work in the sector, the result shows that there will be shortage of talents in the Telecommunications industry between 2015 to 2017. Factors such as attractiveness of the sector and high requirements of the industry result to the shortage of talents in this case.

However, if 20% of engineering graduates work in the sector, the result shows that talent demand will be met in the industry in terms of headcount. From 2015 to 2017, there will be an excess of graduates targeted to join the industry. This shows that there will be more than sufficient amount of graduates and talents produced by the universities and polytechnics for the Telecommunications industry. This talent supply may be able to fill the number of jobs available, however this talent supply represents graduates who do not have the relevant and sufficient capabilities to match the high-skilled technical areas.

Source:
1.   Pyramid Research, Operator Analysis

2. Study findings
    2.11 Challenges to fulfill the industry requirements

List of assumptions

The list below shows the assumptions that were made to analyse the labour market database for the Telecommunications sector.

No	Assumptions
1	The scope of research conducted may not be exhaustive but is comprehensive and is based on best effort
2	People who graduate with a Telecommunication-related courses are not hired as support services
3	Due to data availability, average CAGR of previous years are being used for forecasting purposes
4	The availability of qualitative and quantitative talent-related information was limited. Wherever information was not available, the project team have relied on estimates and which are reflected in the respective sections or in appendices.
5	The project team have relied on the oral and written representations and documents provided to us by various stakeholders during the course of the study and have not verified the truth, accuracy and completeness of the information provided to us.
6	Talent supply only accounts for fresh graduates due to data submission in survey
7	Data was provided for Diploma graduates (Public universities) however this figure will be void
8	10% or 20% of engineering graduates are assumed to join Telecommunications industry upon graduation based on available data, interview and validation workshop
9	For forecasting, job roles are selected based on responses of survey. It considers level of demand, vacancies and difficulties to hire

Table 2.5: List of assumptions made to analyse the labour market database

2. Study findings
2.11 Challenges to fulfill the industry requirements

Top-down data analysis

Top-down data obtained from DOSM showed that the number of employed persons in Telecommunications industry stands at 50,800 people in 2013.

2013 Telecommunications industry workforce (50,800 employees)	Managers	9,800
	Professional	17,900
	Technicians	23,100

Diagram 2.21: Total number of employees in the Telecommunications sector for 2013

Based on the diagram above, there are **27,700 employees** at Manager and Professional level in 2013 within the Telecommunications sector. This number of employees represents all positions and roles such as support (i.e. HR, marketing, sales), content development, etc. which are not in the scope of the study. For this Study, the project team is focussing on the number of employees who are high skilled working in the four (4) focus areas and the 29 job families identified. In addition, the selected 29 job families are job families that are associated with employees who are employed at manager and professional level. The 29 job families do not include technician level and is therefore not entailed in the analysis.

Furthermore, based on the historical data obtained via the Labour Force Survey, the number of employed persons in the Telecommunications sector grew at a steady pace from 2010 to 2013. However, the number of professionals and managers working in the sector from 2011 and 2013 has been gradually declining. The historical growth of the workforce in the Telecommunications sector is illustrated in the Diagram 2.22.
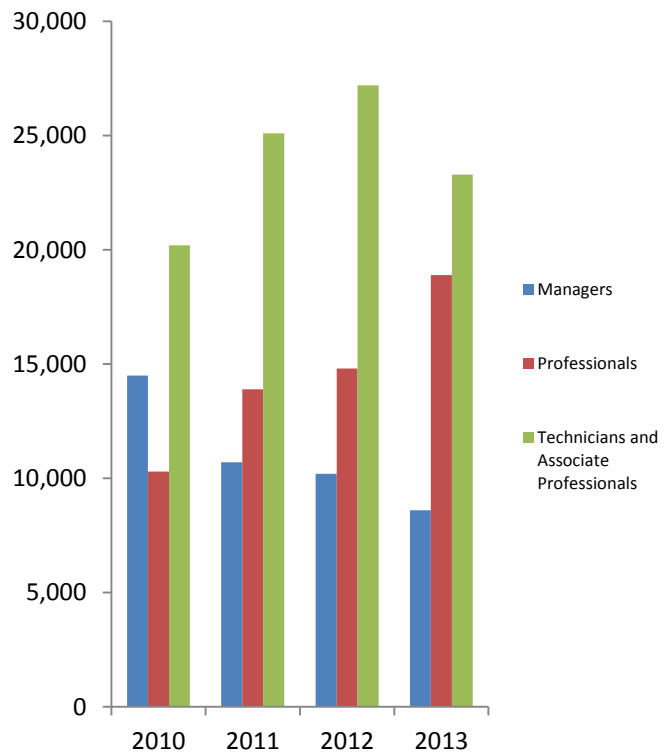
Diagram 2.22: Number of employed persons in the Telecommunications sector from 2010 to 2013

2. Study findings

2.11 Challenges to fulfill the industry requirements

Survey output analysis

Based on the survey responses of the participants (Network operators & service providers, MNCs & SMEs), there are a total **9,513 employees** who are assigned to high skilled technical areas within the Managers and Professionals sphere. Moreover, the high skilled technical areas represent **34%** of the total workforce in the Telecommunications sector for managers and professionals in 2013.

Analysis of new jobs creation

The number of jobs that needs to be filled is analysed based on the number of vacancies required to be fulfilled which corresponds to the annual attrition rate (historical data) and number of new jobs created in 2015 (Labour Market Database). The diagram below depicts the analysis.

High skilled employee for technical areas (based on the focus areas) headcounts for Network Operators & Service Providers and MNCs & SMEs
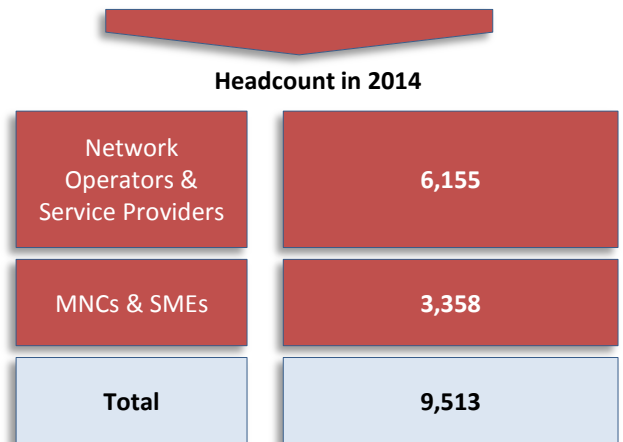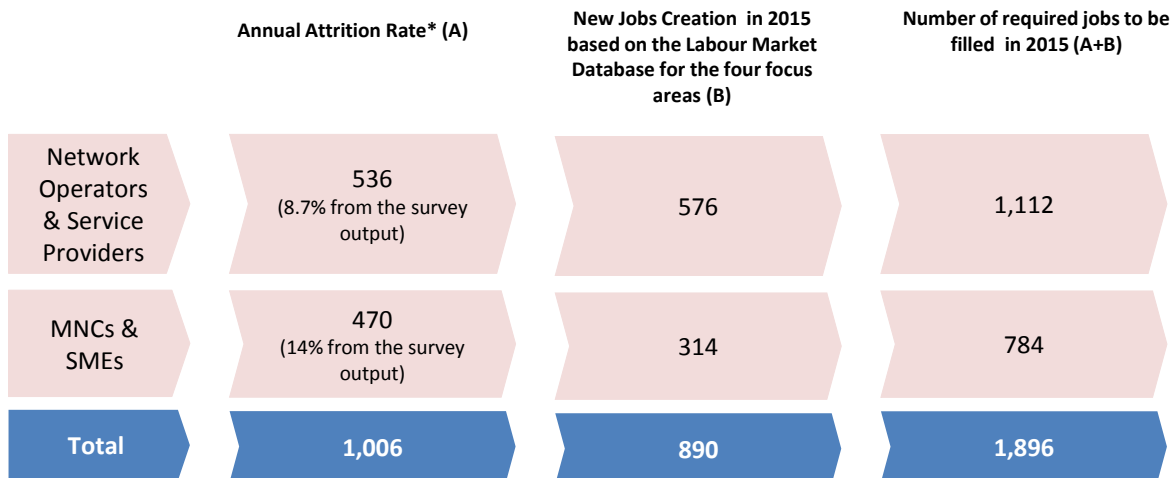
Headcount in 2014

Network Operators & Service Providers	**6,155**
MNCs & SMEs	**3,358**
Total	**9,513**

Diagram 2.23: Number of high skilled employees for technical areas of the focus areas for this Study in 2014

	Annual Attrition Rate* (A)	New Jobs Creation in 2015 based on the Labour Market Database for the four focus areas (B)	Number of required jobs to be filled in 2015 (A+B)
Network Operators & Service Providers	536 (8.7% from the survey output)	576	1,112
MNCs & SMEs	470 (14% from the survey output)	314	784
Total	1,006	890	1,896

Diagram 2.24: Analysis of the number of jobs that needs to be filled in the Telecommunications sector

Note: The comparison of annual attrition rate across various industries can be found in Appendix 6 of this Report.

The analysis of for the number of jobs that needs to be filled was carried out based on the two (2) categories of the Telecommunications organisations and their role in the value chain of the sector. The annual attrition rate was obtained based on historical data from the survey whereas the number of new jobs creation in 2015 was received from the labour market database based on the ETP's target. It was found out that the headcounts for the network operators & service providers represent 65% of the workforce for high skilled employees for technical areas whereas MNCs & SMEs represent 35%. The overall number of required jobs to be filled in 2015 was analysed to be 1,896 jobs.

2. Study findings

2.11 Challenges to fulfill the industry requirements

List of assumptions

The list below shows the assumptions that were made to analyse the number of jobs available in 2015 for the Telecommunications sector.

No	Assumptions
1	MNCs and SMEs numbers were obtained only from 19 companies. The number of employee given is 638 which is then extrapolated based on additional 100 companies. The number of employees being used is 3,358.
2	Annual attrition rate would result to the need to hire talents in order to fulfill the positions left by incumbents.
3	New jobs creation in 2015 are based on the Labour Market Database findings which is 2,968 in 2015. 30% of the 2968 jobs created comes from the four (4) focus areas of the Study which is 890 in 2015.
4	The new jobs that needs to be filled is calculated based on the amount of jobs required to fulfill based on the annual attrition plus the new jobs creation against the total headcounts of high skilled employees.

Table 2.6: List of assumptions made to analyse the number of jobs available in 2015
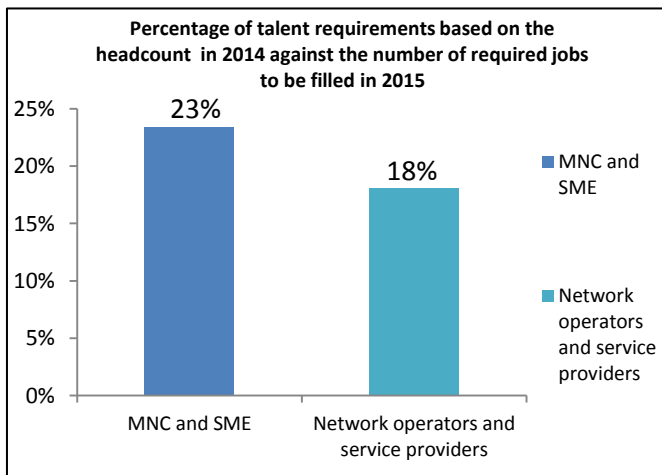

Diagram 2.25: The analysis of the new jobs created that needs to be filled

The percentage of new jobs created that needs to be filled is 20%

- Network Operators & Service Providers have a gap of 18% of unfulfilled vacancies in the key focus areas of the study
- MNCs & SMEs have a gap of 23% unfulfilled vacancies which they need to hire within the key focus areas of the study

For 2015, based on the above analysis the network operators & service providers have a percentage of 18% for the talents to fill the jobs available in 2015 whereas MNCs & SMEs have percentage of 23% .With an average of 20% of jobs need to be fulfilled, it is a challenge for the industry as these jobs would require high level or expertise to be able to operate in their role. Although the labour market database shows that there is abundant supply of talents, fresh graduates are not suited to fill the new jobs created, identified in this study as they are not yet equipped with the required technical capabilities. The challenge now grows, for the industry, the government and even the educational institutions to facilitate and accelerate the growth of talents in the industry to fill the forecasted creation of new jobs in the sector.

"At entry level jobs there is no talent gap but at managers and professionals levels there is a talent gap in terms of capability"
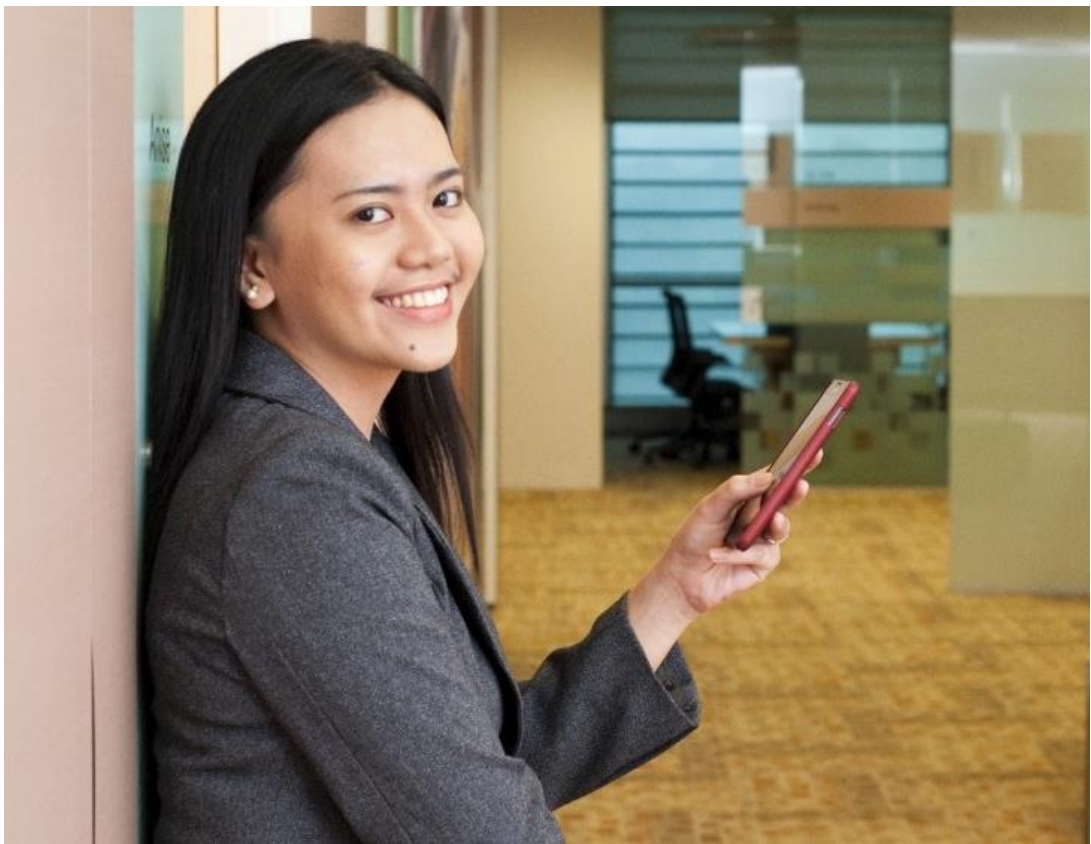
2. Study findings
2.11 Challenges to fulfill the industry requirements

Focus areas that are in high demand for talents

Based on the survey findings, the majority of the Telecommunications sector workforce are employed in focus areas related to infrastructure of wireless and fixed line technology. Additionally, only a small number of employees employed in the focus areas of network security and the emerging technologies such as big data analytics and cloud computing. Furthermore, insights obtained from the industry players have indicated that jobs in emerging areas will require minimal headcounts as they are highly specialised. For network security, despite the small numbers of workers employed, employees feel that their security requirements are met by current and planned numbers of network security personnel.

Majority of the jobs creation in the future will be in the infrastructure area for wireless and fixed line technology.

Therefore, the talent gap will impact these focus areas for infrastructure of wireless and fixed line technology the most. Related to these focus areas, the study has further identified which job families are impacted to understand the talent issues that are faced by Telecommunications organisations in Malaysia.

Diagram 2.27 shows the similarity of the eight (8) job families that have been identified initially. Additionally, it was analysed that there are five (5) indicative critical job families that are required for the next 3-5 years. Out of these five (5) indicative critical job families, the top three (3) families that are impacted from the talent gap for MNCs & SMEs differ from the network operators & service providers. The top three (3) job families are network roll-out which represent >35% of the workforce for the focus area, followed by network engineering and performance & quality management job families.

Diagram 2.26: Top job families that are impacted the most for focus area **Infrastructure Wireless Technology and Network**

From the Diagram 2.26, there were eight (8) job families that have been identified initially. However, it was analysed that there are five (5) indicative critical job families that are required for the next 3-5 years. Out of these five (5) indicative critical job families, the top three (3) families that are impacted from the talent gap are network engineering which represent >40% of the workforce in the focus area, followed by IT and network strategy & architecture job families.
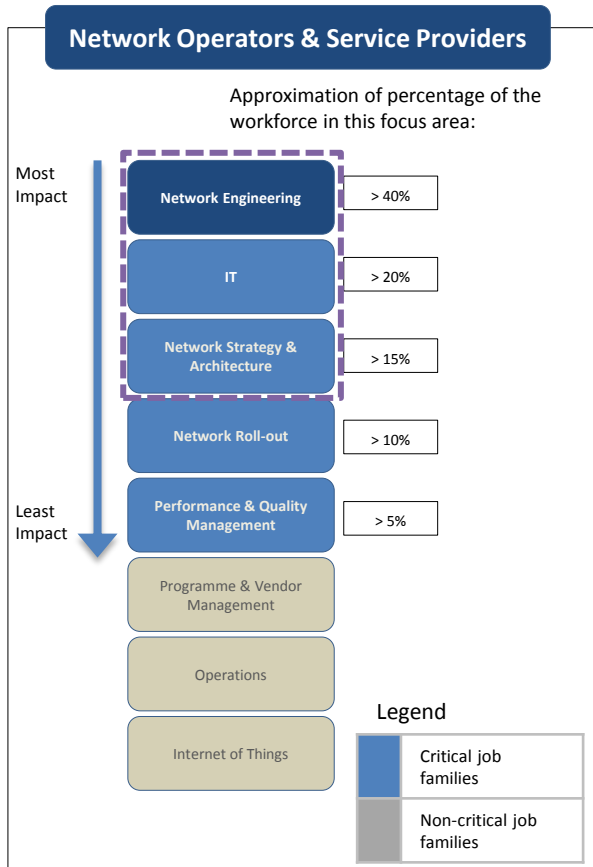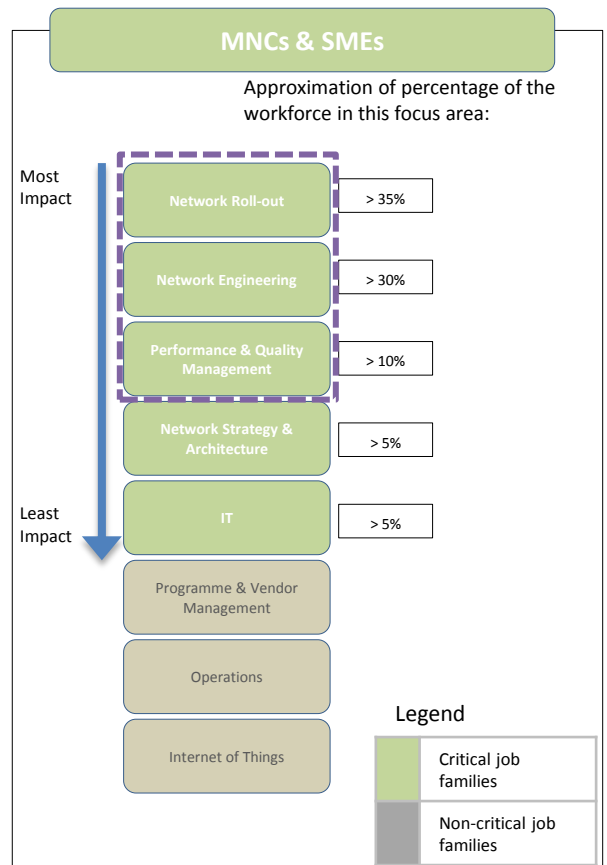

Diagram 2.27: Top job families that are impacted the most for focus area **Infrastructure Wireless Technology and Network**

2. Study findings
2.11 Challenges to fulfill the industry requirements

Network Operators & Service Providers

Approximation of percentage of the workforce in this focus area:

Most Impact

Network Operations	> 40%
Network Engineering	> 20%
Network Strategy & Architecture	> 19%
IT	> 15%
Programme & Vendor Management	
Performance & Quality Management	

Least Impact

Legend

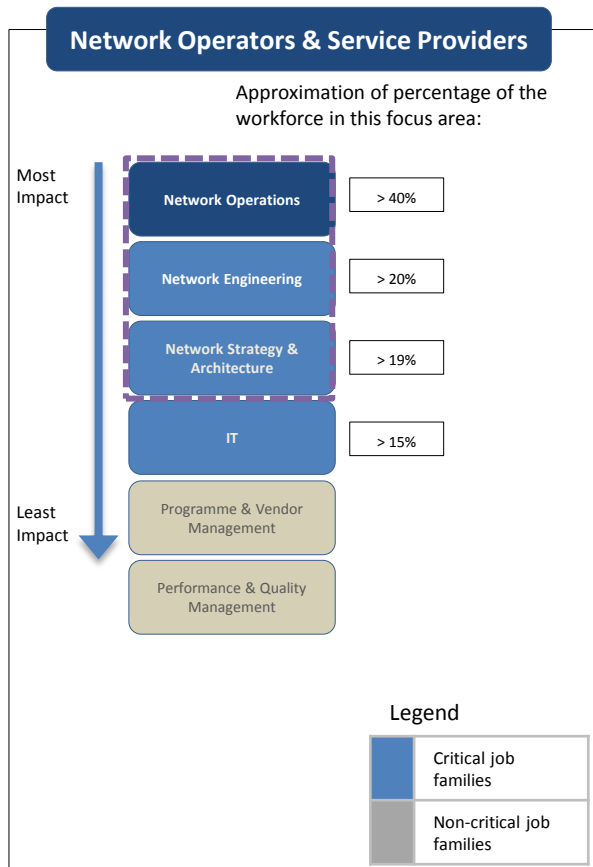|	
	Critical job families
	Non-critical job families

Diagram 2.28: Top job families that are impacted the most for focus area **Infrastructure Fixed Line Technology and Network**

For the focus area infrastructure fixed line technology and network, it was initially identified that there were six (6) job families. From the analysis carried out, four (4) indicative critical job families are identified and further analysis have found out that the top three (3) job families that are impacted from the talent gap are network operations which represent >40% of the workforce in the focus areas, followed by network engineering and network & strategy architecture job families.

Similar to the network operators & service providers, there were six (6) job families that have been identified initially. Out of the six (6) job families, it was analysed that there are four (4) indicative critical job families that will be demand in the next 3-5 years. From these four (4) critical job families, the top three (3) job families that are impacted by the talent gap are network operations which represent >40% of the workforce in the focus area, followed by network engineering and network strategy & architecture.

MNCs & SMEs

Approximation of percentage of the workforce in this focus area:

Most Impact

Network Operations	> 40%
Network Engineering	> 30%
Network Strategy & Architecture	> 19%
IT	> 4%
Programme & Vendor Management	
Performance & Quality Management	

Least Impact

Legend

	Critical job families
	Non-critical job families

Diagram 2.29: Top job families that are impacted the most for focus area **Infrastructure Fixed Line Technology and Network**

Moving forward - Action plans

3

3.1 Moving forward

As a follow up of the study, this section highlights the key observations from the Study and present selected action plans for improving talent in the Malaysian Telecommunications sector. The action plans are designed based on the necessary steps to be taken to solve the dire needs of the industry from three (3) perspective; education, industry and the government.

Mapped to a prioritisation matrix, the strategic initiatives are developed according to key action plans from the previous section. The initiatives are prioritised based on their impact on Malaysia's Telecommunications sector and the effort it will take to implement them.

3. Moving forward - Action plans

3.2 Key trends observed with relations to talent needs in the sector

Current talent development initiatives

The Telecommunications sector in general is responding to the changing business landscape fluidly. They are making small strides in ensuring that their talent pipeline is equipped with the necessary skill sets to respond to the trends observed in the sector. However, there is more room for improvement to ensure that Malaysia has the right set of talents which will assist in driving Malaysia towards a high-income nation by 2020.

Currently, Telecommunications organisations in particular the network operators and MNCs are actively pursuing strategies to attract, retain and develop the brightest talents to meet the increasing demands of talents with the right and relevant skill sets. A key example that is the setting up of a training facility which is an embedded in-house development programme to assist in producing more talents. Other notable example is bringing foreign expertise to conduct specific technical training for local talents. Additionally, one of the MNCs provide a six (6) week dedicated training programme for local graduates which continues into a one (1) year mentoring programme to harness local talents.

Likewise, educational institutions and government agencies are actively creating programmes which relates to development of young talents for the Telecommunications sector. The MCMC in particular have provided technical training on LTE related technical competency which is conducted in collaboration with an educational institution. Additionally, the MCMC has signed an agreement with the Malaysian – American Commission on Education Exchange to offer specialised Fulbright grants for Malaysian and Americans in the field of Communications. The programme allows selected Malaysian and U.S. citizens to become eligible for scholarships to study and conduct research.

MDeC is also playing a role in collaborating with various educational institutions to help in developing local talents for the emerging areas in the ICT sector. One prime example is the introduction of data science courses in selected educational institutions to increase the number of data scientists in Malaysia.

Nonetheless, these efforts are still minimal as the findings of the Study showed that capacity and capability of talents are not there yet in meeting the growing industry needs. Therefore, it is critical for this Study to identify the key trends observed with regards to talent needs in the sector and recommend action plans to develop those talent requirements for the next 3-5 years.

3. Moving forward – Action plans

    3.2 Key trends observed with relations to talent needs in the sector

Challenges faced in talent issues

The sector is facing several challenges in ensuring a talent pool that will meet the demands of the industry currently and in the next 3 to 5 years. These challenges will be the driving force in recommending action plans to solve the talent issues faced in the sector. The key challenges are as follows:

Demand (Industry) Perspective

- **Technological trends changing the needs for talents –** Emerging technologies in the sector cause the need for talents to be adaptable and agile to meet the industry needs. Talents related with IoT/IoE and big data analytics will be in demand.

- **Demographic shift call for talents with ability to innovate –** Most of the subscribers in the future will comprise of more millennials. Thus, talents in the sector are expected to innovate and customise products and services to cater to the diverse requirements of their customers. Innovative mind-set still lacks in local talents.

- **Digitisation will demand for talents to have a combination of hardware and software skill sets –** Talents in the future will be greatly influenced by the digital economy. They are required to possess competencies whereby a network engineer will require programming skills.

- **The sector is perceived as unattractive –** Talent pool coming into the sector is limited as the sector is perceived as not exciting to pursue a career for young talents.

Supply (Educational Institutions) Perspective

- **Talents coming from tertiary education do not meet the industry demands** – The Telecommunications sector requires talents who are knowledgeable on emerging technologies (i.e. 4G, 5G technologies) and core basic technical skills (i.e. basic engineering and mathematics skills) in the sector.

- **Limited collaboration between industry and educational institutions** – There is a lack of strong partnership between these two stakeholders in ensuring that graduates are ready to be employed in the sector.

- **Infrastructure and facilities are not up-to-date to promote talent development** – Educational institutions face a challenge in providing students with the proper facilities to develop their skills in the latest technology.

- **Lack of proper instructors to respond to the change of the syllabi** - The lack of right instructors to respond to change of syllabus impact the quality of the graduates. Additionally, the lecturers lack the exposure of actual working experience in the industry and they may not be able to share the understanding of the latest technology to their students.

3. Moving forward – Action plans

    3.2 Key trends observed with relations to talent needs in the sector

Benefits of the recommended action plans

As stated in the previous section, there are key challenges in developing talents to meet the sector's needs. Henceforth, these challenges are identified and used as abase to recommend action plans in order to meet the future need. Additionally, these recommended action plans were meticulously deliberated to ensure that they are beneficial to develop the right set of talents to meet the requirements of the sector. Overall benefits of the recommended action plans are as follows:

Industry

- **Developing industry ready graduates who are competent with the latest technologies** – Graduates will be equipped with knowledge of the emerging technologies and core basic technical skills in order for them to ready to be employed in the sector. Simultaneously, employability of graduates will be higher as they possess professional certification even before they have graduated.

- **Enabling the sector to attract and develop the right set of talents** – Talents comprising of graduates and experienced hires are more attracted to join the sector and current workforce will be able to up-skill themselves via availability of technical training programmes.

Educational Institutions

- **Developing the right curriculum will assist in bridging the gap between university courses and what is required by the sector** – Educational institutions are able to equip students with the relevant skills for the sector and fostering a strong collaboration between the academia and industry.

- **Fostering an innovative environment and encourage more research & development on Telecommunications-related areas** – Talents will be more innovative in developing products to cater to the future requirements of the subscribers. Moreover, research & development will be more prominent and sustainable to create new products and technologies.

Government

- **Strengthening partnership between government agencies, industry players and educational institutions** –Enhancing collaborations between these three (3) stakeholders will ensure that talent development initiatives are purposeful, and sustainable in the long term.

- **Sharing of data sets to encourage development of innovative products** – The availability of data sets and sharing these data sets to the public allow for crowd-source ideas and co-creation of applications with the wider community to encourage more development of innovative products.

- **Standardisation of the cluster of job families and assist in curriculum development** – Aligning the job roles and technical competencies required will be beneficial to determine which areas are critical for the industry and link it back to the learning materials of educational institutions.

3. Moving forward – Action plans
    3.2 Key trends observed with relations to talent needs in the sector

Key learnings from good practices with regards to talent development action plans

A comparative analysis have been conducted to identify and provide insights on good practices and key initiatives that can be referenced to enhance the development of talent in Malaysia's Telecommunications sector. Some good practices have been adopted from different countries namely UK and South Korea to develop the recommended action plans for this Study.

South Korea

A shift from STEM to STEAM
- In 2011, the South Korean government took a slightly different approach by integrating the art element to STEM and as a result, STEAM education was introduced
- STEAM education aims to inculcate the innovative thinking by emphasising on "problem-solving, deduction and communications skills"

USA

Open research platform
- The Global Lambda Integrated Facility is an open research platform which gathers researchers from educational institutions and industry players to congregate and share their opinions and ideas on lambda research related areas

More information on the good practices can be found in Appendix 7 of this Report.

UK

New National Curriculum – Coding at School
- Teaching programming skills are embedded in the national curriculum for primary and secondary school students

Accelerating the growth of digital economy – Tech Partnership
- The Tech Partnership was introduced in 2014 as a growing network of employers collaborating to create a talent pool to support growth in the global digital economy

Robust plans to support the IoT
- Ofcom robust plans to support IoT. To ensure the UK plays a leading role in developing the Internet of Things and create a regulatory environment which encourages investment and innovation in the IoT, Ofcom has identified four (4) priority works areas, namely spectrum availability, data privacy, network security and resilience, and network address.
- This effort by the regulator to identify areas of development, has guided the industry to nurture talents in selected key areas in order to progress towards IoT

Singapore

Data sharing culture
- The Singapore Government has set up a primary portal to share data to the public
- The aim of the open data platform is to create economic and social value for Singapore through the use of public data in analysis, research, application and development

Approach in developing the action plans

3.3 Overview of the approach in developing the action plans

01 Develop a set of action plans based on the four (4) pillars namely Educational Institutions, Industry Players, the Government and Collaborative Effort.

02 Based on the prioritised action plans, a strategic roadmap has been established to provide an estimated duration for the implementation of the recommended action plans. A prioritisation matrix was also developed to provide a view of quick wins action items which can be the focus, due to low effort and high impact.

03 Elaboration for the prioritised action plans have been developed to provide robust insights on the execution of the action plans. For instances, information such as key action steps, ownership, target measures and the impact of the action plans are all detailed out at the end of the section.

3.4 Developing action plans

In developing the action plans for the study, a few steps were taken to ensure that the action plans developed are purposeful, relevant and fulfill the needs of the industry today. In total, there are 27 action plans which have been identified. Various discussions, validations and desktop research were done to understand the best practices which can be implemented by various parties to develop the talents in the industry.

Input Gathering For Action Plans

There are four main sources of the input for the development of action plans. The four main sources of the input are Survey Analysis, Industry Interview, Benchmarking Analysis and Validation Session. Each of the input provide a deep understanding of the current trends in the industry, the growth of the industry and the current talent needs from the industry.

Source of Input For The Development of Action Plans

Action Plans For The Talent Gap Study for the Communications Sector in Malaysia

1 **Survey Analysis** — Providing quantitative view of the human capital landscape of the industry at Network Operators, MNCs and SMEs level

2 **Industry Interview** — Providing qualitative views, insights and wishlists from the industry leaders on how talent should be developed and their views on talent development practices

3 **Benchmarking And Comparative Analysis** — Providing a view of best practices on talent development across the world, from the perspective of regulators, industry players and education institutions

4 **Validation Session** — Providing a detailed view of how the industry should be developing talents from the perspective of industry players and educational institutions
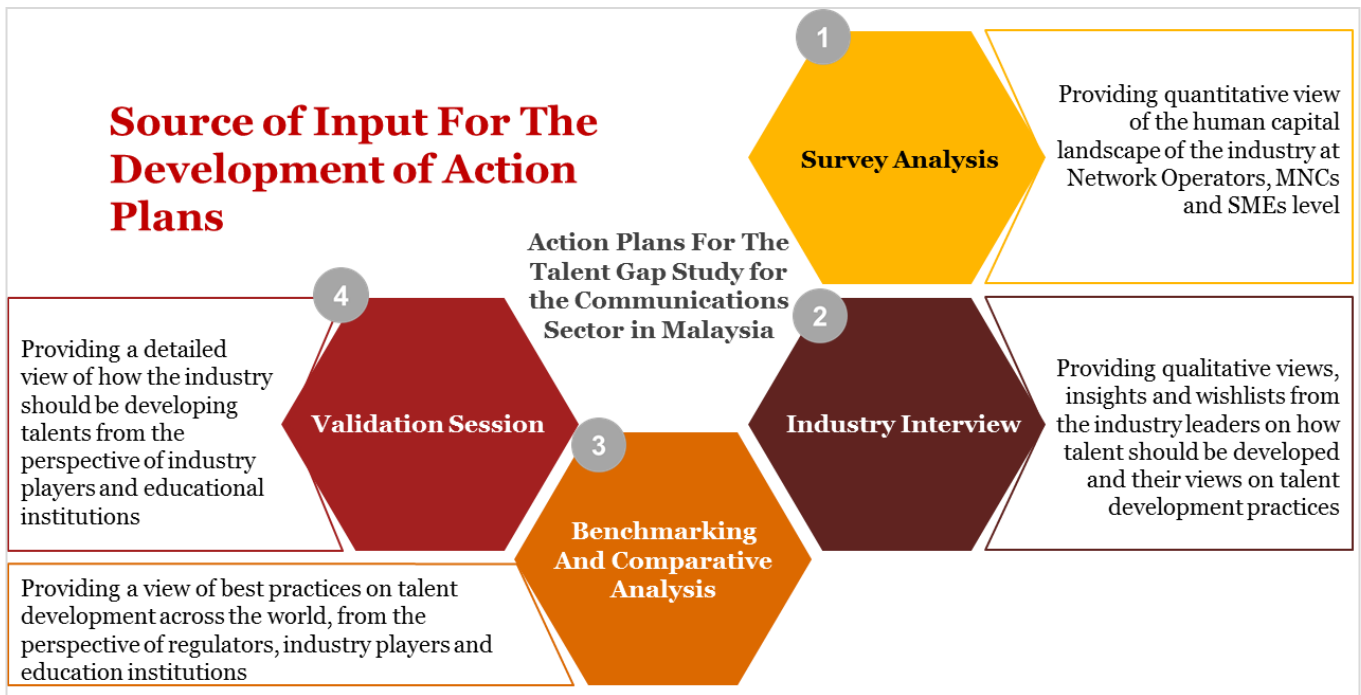
Diagram 3.1: Source of input for the development action plans

The Four Pillars of Ownership

Based on the analysis of the inputs obtained, each of the inputs are mapped to a stakeholder group which should drive the action items to ensure full ownership. The stakeholder groups are defined as "Pillars". The four pillars which will drive the action items are Educational Institutions, Government, Industry and Collaborative Effort. The ownership of these pillars are expected to drive the completion of the suggested action items to achieve the maximum impact possible in developing talents.

> Action plans are developed to ensure that talents are developed based on the industry needs, with efforts driven by Educational Institutions, Government, Industry players and also via Collaborative Effort

Efforts to be driven by educational institutions to increase the quality of the students, to ensure the needs of the industry are met

Educational Institutions

Government

Action items to be driven by government agencies to foster more practices of talent developments in the industry

Providing support to develop the talents required in ensuring that there are no shortages of talents in the industry

Industry

Collaborative Effort

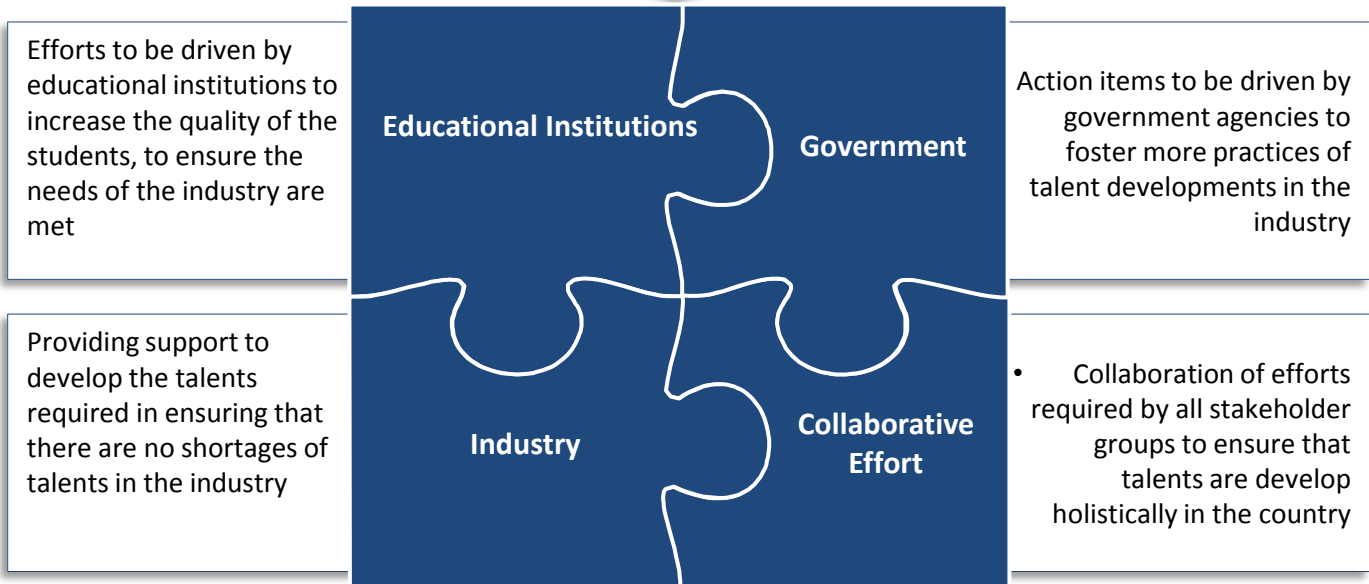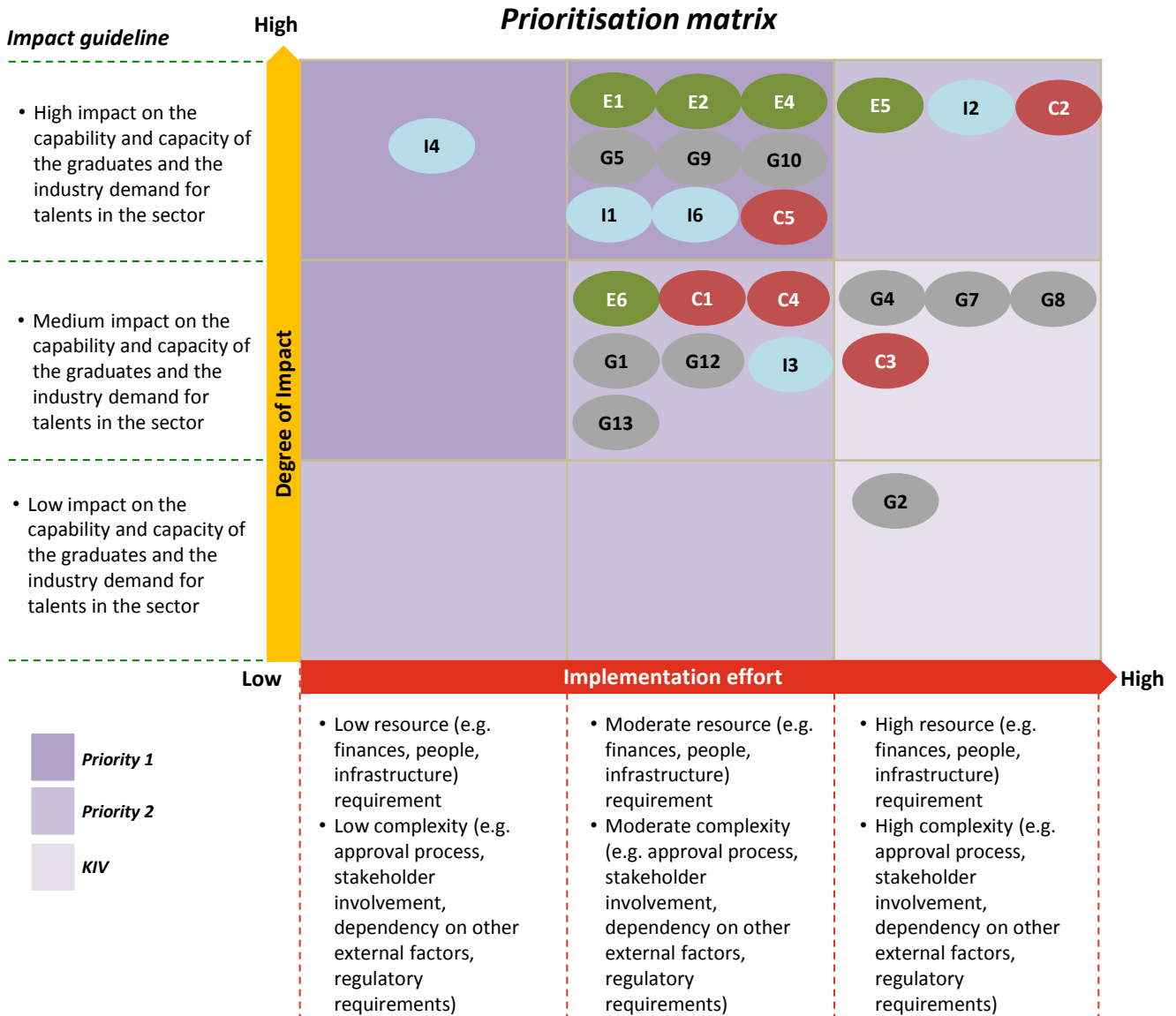- Collaboration of efforts required by all stakeholder groups to ensure that talents are develop holistically in the country

Diagram 3.2: The four pillars of ownership

3.5 *Prioritisation matrix*

Below is the prioritisation matrix based on the strategic initiatives developed according to key action plans from the previous section. The initiatives are prioritised based on their impact on Malaysia's Telecommunications sector and the effort it will take to implement them. The impact and effort of each individual initiative was evaluated based on the success similar initiatives had in other leading institutes, feedback from the stakeholders involved and 's experience with previous engagements.
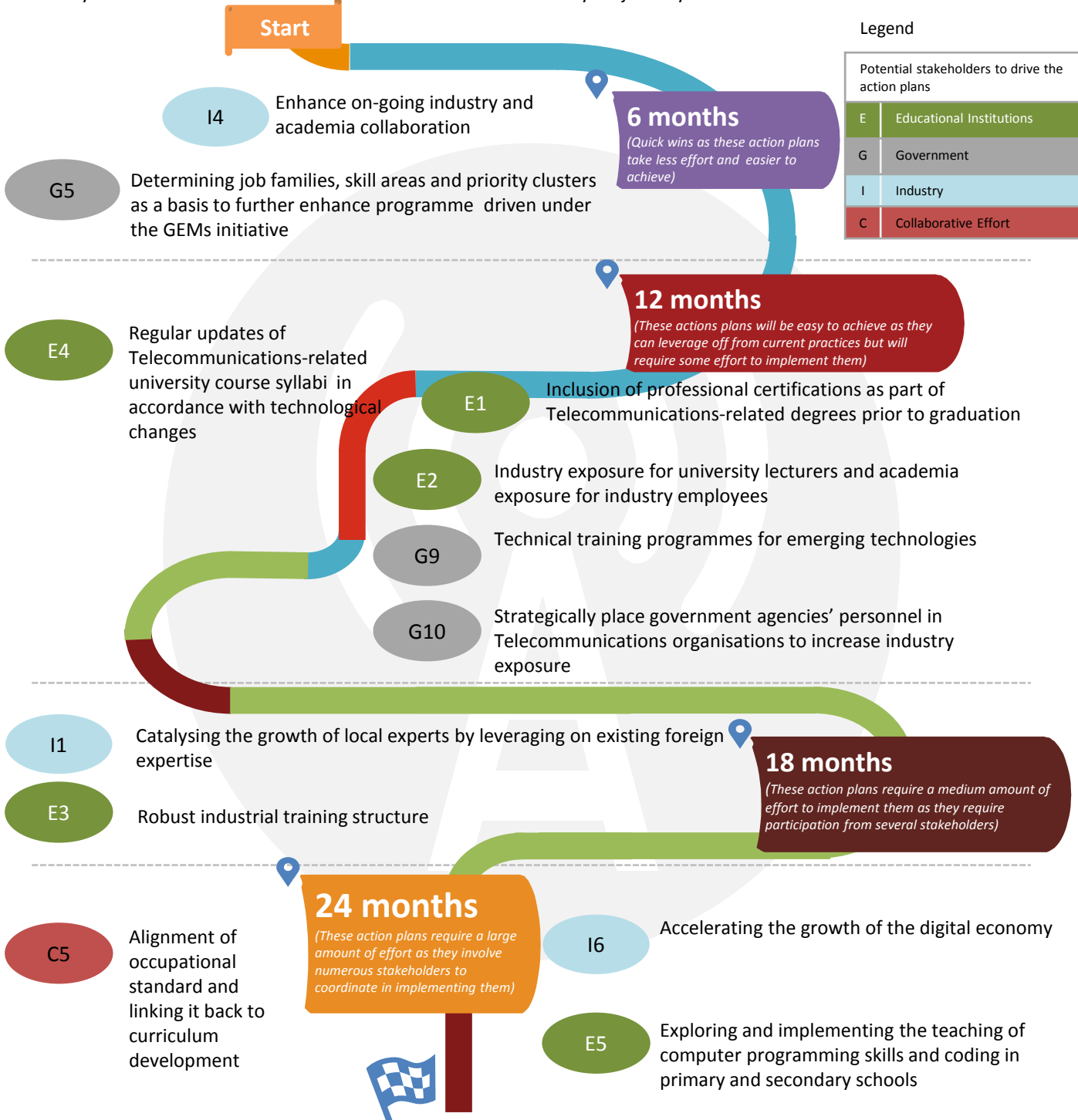
The strategic initiatives below are high-level strategies that may tackle the main root-causes of various issues.

Prioritisation matrix

Impact guideline

High

- High impact on the capability and capacity of the graduates and the industry demand for talents in the sector

I4

E1 E2 E4 | E5 I2 C2
G5 G9 G10
I1 I6 C5

- Medium impact on the capability and capacity of the graduates and the industry demand for talents in the sector

E6 C1 C4 | G4 G7 G8
G1 G12 I3 | C3
G13

- Low impact on the capability and capacity of the graduates and the industry demand for talents in the sector

G2

Degree of Impact

Low | **Implementation effort** | High

| • Low resource (e.g. finances, people, infrastructure) requirement | • Moderate resource (e.g. finances, people, infrastructure) requirement | • High resource (e.g. finances, people, infrastructure) requirement |
| • Low complexity (e.g. approval process, stakeholder involvement, dependency on other external factors, regulatory requirements) | • Moderate complexity (e.g. approval process, stakeholder involvement, dependency on other external factors, regulatory requirements) | • High complexity (e.g. approval process, stakeholder involvement, dependency on other external factors, regulatory requirements) |

Priority 1

Priority 2

KIV

Ten (10) actions plans have been prioritised and are elaborated further to lay out the key action steps and ownership of the prioritised action plans.

3.6 Strategic roadmap for key action plans

With the prioritised initiatives, a visual roadmap of the strategy to strengthen human capital development in the Malaysian Telecommunications sector is illustrated based on a 2-year journey and its milestones.

Start

I4 — Enhance on-going industry and academia collaboration

G5 — Determining job families, skill areas and priority clusters as a basis to further enhance programme driven under the GEMs initiative

6 months
(Quick wins as these action plans take less effort and easier to achieve)

Legend

Potential stakeholders to drive the action plans	
E	Educational Institutions
G	Government
I	Industry
C	Collaborative Effort

12 months
(These actions plans will be easy to achieve as they can leverage off from current practices but will require some effort to implement them)

E4 — Regular updates of Telecommunications-related university course syllabi in accordance with technological changes

E1 — Inclusion of professional certifications as part of Telecommunications-related degrees prior to graduation

E2 — Industry exposure for university lecturers and academia exposure for industry employees

G9 — Technical training programmes for emerging technologies

G10 — Strategically place government agencies' personnel in Telecommunications organisations to increase industry exposure

I1 — Catalysing the growth of local experts by leveraging on existing foreign expertise

E3 — Robust industrial training structure

18 months
(These action plans require a medium amount of effort to implement them as they require participation from several stakeholders)

C5 — Alignment of occupational standard and linking it back to curriculum development

24 months
(These action plans require a large amount of effort as they involve numerous stakeholders to coordinate in implementing them)

I6 — Accelerating the growth of the digital economy

E5 — Exploring and implementing the teaching of computer programming skills and coding in primary and secondary schools

3.7 Key action plans

The project team have identified 27 key action plans where it is categorised into four (4) pillars namely Educational Institutions, Government, Industry and Collaborative Effort. These action plans will then be prioritised via a prioritisation matrix to determine the implementation effort and degree of impact on the capability and capacity of the graduates produced in the Telecommunications sector.

Educational Institutions (Public Universities & Private Universities)

E1	Inclusion of professional certifications as part of Telecommunications-related degrees prior to graduation
E2	Industry exposure for university lecturers and academia exposure for industry employees
E4	Regular updates of Telecommunications-related university course syllabi in accordance with technological changes
E5	Exploring and implementing the teaching of computer programming skills and coding in primary and secondary schools
E6	Strengthening longitudinal graduates tracer study via submission of quality data to further analyse the talent gaps in the industry

Government (Ministries, Government agencies & Regulator)

G1	Aligning professional certifications to the needs of the industry
G2	Initiating and expanding R&D platform for data-intensive research
G4	Expanding training scheme grants for overseas training on critical areas for talent development purposes
G5	Determining job families, skill areas and priority clusters (specific to Telecommunications) as a basis to further enhance programme driven under the Graduate Employability Management Scheme (GEMS) initiative
G7	Improving academic institutions' technological outlook through driving strategic technologies to pave the way for talents in the country by working with educational institutions, industry players and NGOs
G8	Building an anti-discriminatory partnership practice through policy creation
G9	Technical training programmes for emerging technological areas
G10	Strategically place government agencies' personnel in Telecommunications organisations to increase industry exposure and knowledge driven by Human Capital Development Council and Industry Skills Committee
G12	Creating a publicly accessible experiential centre for talent exposure and development
G13	Driving a strong partnership between the Government and SME Corp to provide assistance to SMEs in the Telecommunications sector

Collaborative Effort (A combination of educational institutions, government and industry)

C1	Creating an online database to provide key information (jobs, graduates, professional certifications) for the Telecommunications sector
C2	Enhancing the development of soft skills to students and harnessing analytical thinking capability
C3	Providing more recognition to academicians through research and development for Telecommunications-related projects
C4	Increasing more CSR projects such as Telecommunications field trips for school children
C5	Alignment of occupational standard and linking it back to curriculum development

Industry (Industry players)

I1	Catalysing the growth of local experts by leveraging on existing foreign expertise
I2	Developing a data sharing culture
I3	Providing more assistance and contribution to improve laboratory facilities at academic institutions
I4	Enhance on-going industry and academia collaboration
I6	Accelerating the growth of the digital economy

3.8 Other action plans to consider

Below are other suggested action plans to be taken into consideration to support talent growth in the Telecommunications sector. However, these other suggested action plans are not placed in the prioritisation matrix.

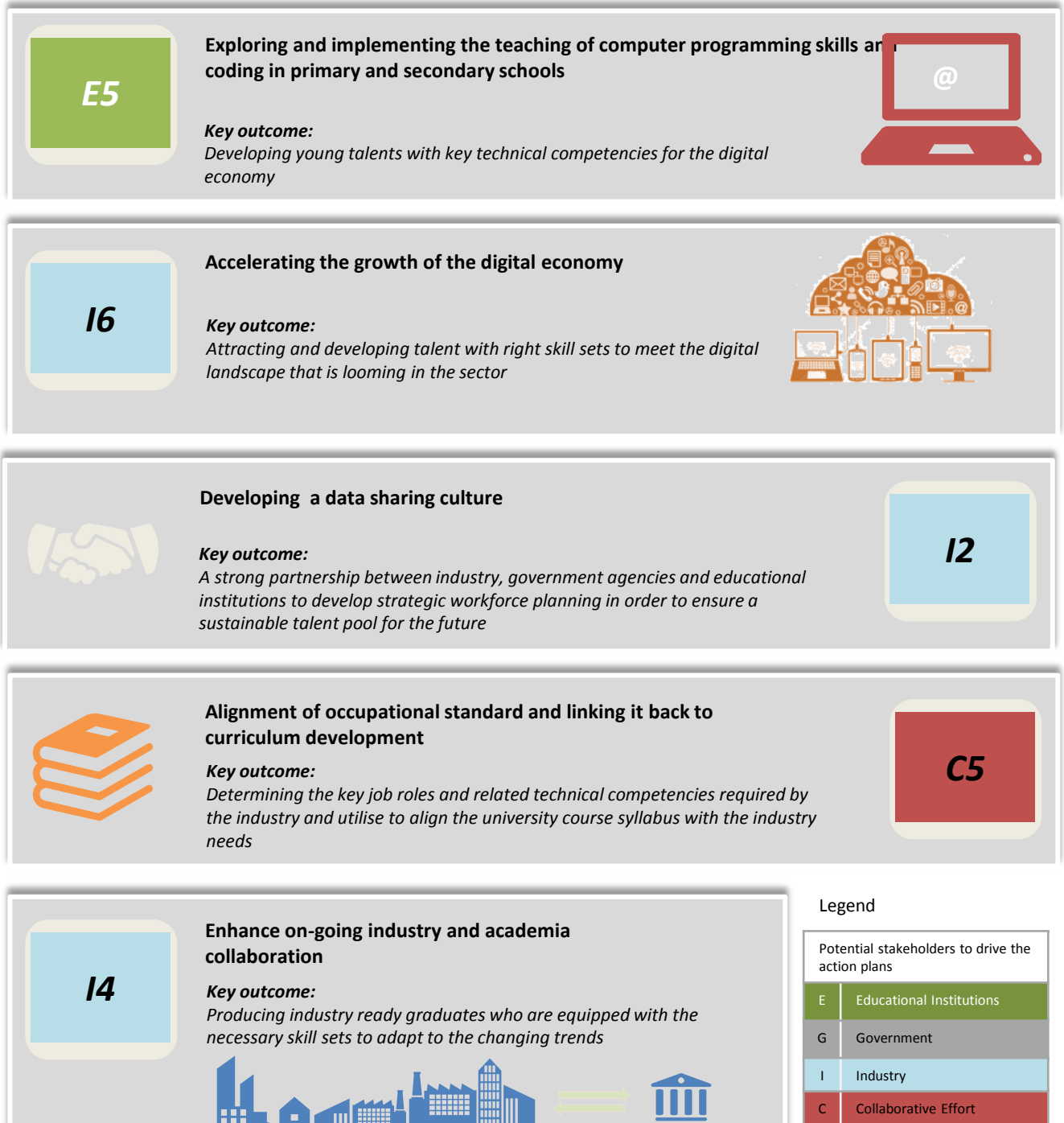|	Educational Institutions
E3	Robust industrial training structure

	Government
G11	Providing a concentrated effort to enhance innovative and creativity mind-set among graduates and communication of education initiative milestones to stakeholders

3.9 Top 5 action plans

A total of 27 action plans have been identified. However, the top five (5) action plans that have been identified as most important and unique to support talent and the industry growth in the Telecommunications sector are listed below.

E5

Exploring and implementing the teaching of computer programming skills and coding in primary and secondary schools

Key outcome:
Developing young talents with key technical competencies for the digital economy

I6

Accelerating the growth of the digital economy

Key outcome:
Attracting and developing talent with right skill sets to meet the digital landscape that is looming in the sector

Developing a data sharing culture

Key outcome:
A strong partnership between industry, government agencies and educational institutions to develop strategic workforce planning in order to ensure a sustainable talent pool for the future

I2

Alignment of occupational standard and linking it back to curriculum development

Key outcome:
Determining the key job roles and related technical competencies required by the industry and utilise to align the university course syllabus with the industry needs

C5

I4

Enhance on-going industry and academia collaboration

Key outcome:
Producing industry ready graduates who are equipped with the necessary skill sets to adapt to the changing trends

Legend

Potential stakeholders to drive the action plans

E	Educational Institutions
G	Government
I	Industry
C	Collaborative Effort

3. Moving forward – Action plans
3.9 Top 5 action plans

Preparing young talents for the digital economy

Why digital talent?

Digitisation will dramatically affect every company in every industry, and it will be significant to build the right capabilities to ensure that companies remain relevant in the digitised environment, achieve growth, and fend off competitive threats. Digital talents as many have referred to are highly sought after particularly in the Telecommunications sector. These digital talents are critical to ensure that the Telecommunications companies can keep up with the pace of the industry's growth. Therefore, it is imperative that the sector itself can produce such talents to support the needs of the sector in the future.

Nonetheless, producing digital talents is not an easy task to do. Insights obtained have mentioned that the current talent pool in Malaysia still lack the ability to adapt themselves in the digital space. There is a rising concern that talents who have the combination of hardware and software skills (e.g. network engineers with operating systems knowledge) are very difficult to find. Additionally, Telecommunications companies are working in silos to develop and train their talents internally so that their talents can be agile and adapt to the changing trends of the sector.

Thus, how do we prepare our talents to adapt themselves and obtain skills that are useful for the digital economy. Moreover, there is a need to determine the best mechanism in producing quality digital talents while simultaneously attracting more talents to join the sector. Industry players should be the driving force to bridge the gap between the demand and supply and collaboratively work together with educational institutions in forming a strategic human capital planning to prepare young talents for the digital era.

Notable action plans that can be taken into consideration to develop young talents for the digital economy are as follows:

E5

Exploring and implementing the teaching of computer programming skills and coding in primary and secondary schools

Key Outcomes:
i.   An increase in the number of young talents who are equipped with relevant skills for the digital economy
ii. High quality school teachers in terms of technical capability to prepare their students with the relevant skill sets

---

I6

Accelerating the growth of the digital economy

Key Outcomes:
i.   An increase in number of industry ready graduates
ii.   A strong partnership between industry players
iii. An integrated platform to bridge the gap between demand and supply to provide strategic human capital initiatives for the digital economy

Sharing of data driving the nation towards a Smart Nation

Importance of data to encourage innovation

Currently, there are many studies or data gathering activities conducted from time to time to supply the data at national level. However, the availability of raw data still lacks as majority of organisations do not share their data if there is some perceived benefit.

It is critical to know that sharing of data is a necessary and desirable social and economic function, and that personal data is at its most socially useful and economically powerful when it is aggregated. Countries like the UK and Singapore have embraced the data sharing culture to unlock a plethora of opportunities and encourage innovation. The value of data sharing is monumental if the Government's aspiration is towards development of a Smart Nation. As many have known, the development of a Smart Nation involves creating an environment that allows for the integration of sensors, applications and remote monitoring which can help and ease day-to-day activities for the population. The significance of data sharing will be a powerful tool to better the lives of citizens, enhance policy decision making and provide feedback for better programmes by understanding trends.

Nevertheless, to encourage open data sharing culture may require a pilot programme to test the possibility of an open data environment. There needs to be safeguards set by the Government by setting stronger guidelines on what information is considered sensitive and what can be released. Moreover, all agencies who are willing to share data needs to be aligned in understanding the dangers of inadequate data protection measures in order to ensure data is protected and there will not be a breach of security threats. To ensure the success of this action plan, there has to be a fine balance between what information that can be shared, how this information can be shared and a proper monitoring structure by the Government to ensure a smooth transition of data sharing.

Steps Towards A Data Sharing Culture

While stakeholders may claim that a data sharing culture between all parties is a signal of a progressive practice, there is a need for a solid and sound framework prior to practicing the culture. An Open Data Framework is required where stakeholders such as Government, industry and various agencies can develop a national policy towards encouraging key organisations and industry players in opening up and sharing data to the public.

In a nutshell, an establishment of an Open Data Framework constitutes the following key points:

   i.   Establish the definition of Open Community Data

   ii.   Set up data aggregator system to standardise multi-data formats

   iii. Establish codes or policies on data security, privacy and traceability

   iv.   Review and manage the commercial aspects of data for new value and creation practices

Sharing of data driving the nation towards a Smart Nation (cont'd)
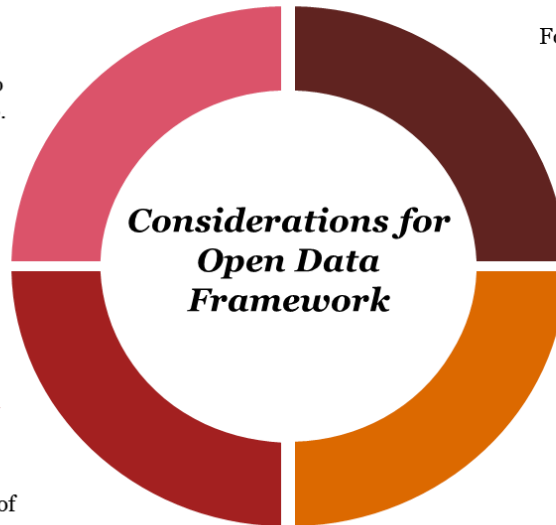
Considerations for Open Data Framework

Establish the definition of Open Community Data

Open Data is useable by anyone, regardless of who they are, where they are, or what they want to do with the data; there must be no restriction on who can use it, and commercial use is fine too. Open data must be available in bulk (so it's easy to work with) and it should be available free of charge, or at least at no more than a reasonable reproduction cost.

Set up data aggregator system to standardise multi-data formats

For maximal access, data must be released in formats that lend themselves to easy and efficient reuse via technology. This means releasing information in open formats (or "open standards"), in machine-readable formats, that are structured (or machine-processable) appropriately.

Considerations for Open Data Framework

Review and manage the commercial aspects of data for new value and creation practices

Sharing of data allow for the co-creation of innovative products/services for the greater good of the community and the country. For example, a mobile application developer can pull real time data such as transport or weather data, for use in developing his application.

Establish codes or policies on data security, privacy and traceability

There needs to be establishment of data protection policies on data security, privacy and traceability to ensure that sensitive data is protected and all data available is traceable.

Thus, the action plan illustrated below is considered as one of the top five (5) action plan as it brings a plethora of benefits to support technology growth and talent development in the sector.

Developing a data sharing culture

Key outcomes:
i.   Development of innovative products to spearhead the growth of Smart Nation
ii.   An increase in talents who are innovative and creative by utilising the availability of raw data to develop products
iii. A strong partnership between industry, government agencies and educational institutions to develop strategic workforce planning in order to ensure a sustainable talent pool for the future

I2

Aligning industry needs and exploit it to develop learning materials

Knowing what the industry wants and link it back to curriculum development

Industry players and the Government are not speaking the same language with relations to the naming convention of job roles in the Telecommunications sector. Each party are working in silos and there is no proper council that can bring these two parties together and define and standardised the occupational standards. Fortunately, EPU and several other government agencies have already recognised the issue at hand and is in-progress of ensuring that there will be an alignment of naming conventions of job roles and the competencies that are needed for that exact similar job roles. This standardisation of the job roles and competencies that are critical to meet the industry needs will allow the Government to have a vivid understanding of key focus areas that needs to be focused and place more time and effort to ensure that the nation is prepared to meet the talent demand.

Once the job roles and competencies required are identified, the Government can exploit this and link it back to the curriculum development. Based on countless discussions with the educational institutions, the main reason why they are not able to produce industry ready graduates is because they are not able to develop syllabi which are up to par with the industry trends. Additionally, the lack of strong partnership between the industry and educational institutions also contributed to the difficulty in developing learning materials which caters to the industry demand for the relevant skills. Many of mentioned that they struggle because there is a lack of cohesiveness in determining which areas require full attention in developing the relevant skill sets that are required by the industry. Therefore, it is imperative that the alignment of the occupational standards can assist the educational institutions to develop curriculum which is guided and more focused to the demands of the industry.

Alignment of occupational standard and linking it back to curriculum development

Key outcomes:
i.   Number of job titles defined and aligned through collaboration between the government and the industry players
ii.   Number of universities that updated the courses syllabus based on the updated occupational standards

C5

Strong partnership to support talent development

Strengthen the existing collaboration between the industry and educational institutions

Insights obtained from educational institutions and industry players have stated there is an existence of industry involvement in educational institutions. Many of cited that they do guest lectures and do collaborate with educational institutions in terms of reviewing the course syllabus. However, the frequency of interaction between educational institutions and the industry is still inadequate. Educational institutions are looking for more sustainable support from the industry which includes lecture series, lecturers on specific subjects, industrial placements, capstone projects and internships. There is an existing industry and academic collaboration framework developed by MDeC and TalentCorp, the Telecommunications sector should leverage on it to ensure all of the collaborations being carried out are sustainable in the long run.

To ensure a strong partnership between the industry and academia, collaborations conducted must have an equal benefit opportunity for both sides to ensure that any parties are willingly to participate and share their expertise to support talent development in the sector. Thus, the action plan below carves out key outcomes of enhancing on-going industry and academia collaboration.

I4	**Enhance on-going industry and academia collaboration** **Key outcomes:** i. Improve sharing of expertise, knowledge and the latest industry requirements between industry players and educational institutions ii. Producing industry ready graduates who are equipped with the necessary skill sets to adapt to the changing trends iii. A strong partnership between the industry and educational institutions to ensure that institutes of higher learning are aware of industry requirements

Measuring and ensuring the sustainability of outcomes

3.10 Measuring and ensuring the sustainability of outcomes

Measuring the impact of action plans and ensuring the sustainability of these action plans

Elements of sustainability are critical in every activities or initiatives that are to be carried out. It is imperative that any actions plans that are recommended needs to go beyond just the outcome but how they impact the society, environmental and economic. There are a few models that are available to manage outcomes in totality to determine the actual value of the action plans recommended. One notable model that can be adopted is the total impact measurement which provides a new 'language of decision making' that generates hard numbers equivalent to the new ways of evaluating national output and wellbeing developed and used within governments. This measurement of totality examines the impacts that arise directly through the effect of the action plans and indirectly through their effects on the participating individuals in the ecosystem, and other stakeholders (for e.g., through the impact on local communities).

The suggested model to measure sustainability of outcomes

- As a direct result of the action plan
- From the participating sides (e.g. educational institutions & industry players)
- From other organisations who are involved in the ecosystem (e.g. Government agencies)
- From outside the ecosystem and communities the action plan affects

Diagram 3.3: Scope of impacts addressed

Diagram 3.4: Illustrative dimensions of impact considered

3. Moving forward – Action plans
3.10 Measuring and ensuring the sustainability of outcomes

Applying total impact measurement towards the action plans

Applying total impact measurement is a five-step process. The first steps is to define the scope. It is about the defining the scope of the impacts to be included, for example the timeframe, the areas of action plans and the relevant stakeholders involved of the Telecommunications sector. The second steps is to determine how far the impacts reach through out the ecosystem of the sector which means understanding the dimensions of total value through end-to-end mapping to ensure that all impacts are considered and a structure for capturing impacts is formed. As the third step highlights, a significant amount of existing data from Government agencies and other existing databases. Any necessary additional information can then be sourced externally in the fourth step, be this from the Telecommunications organisations or educational institutions. The final stage is to quantify outcomes and impacts and to put an economic and social value and track them over time. The five key steps to measure outcomes in totality is illustrated below.

Applying Total Impact Measurement

1

Define the scope

What's the objective?...to gauge the long-term sustainability of strategies, determine the right investment choice or demonstrate value to stakeholders?

What impact to include?. Timeframe, areas of action plans, relevant stakeholders

2

Define dimensions of value

How far do the impacts reach through out the ecosystem? This requires mapping of the total impact and understanding of each – how they arise, what methodologies to assess them with and the data needed to do so.

3

Collect existing data

What information can the action plan provide? A significant amount of information is likely to be available within existing database

4

Source new data

What additional information is needed and how can it be generated or provided? Any necessary additional information is sourced externally – from Government agencies, Telecommunications organisations and educational institutions

5

Analyse data and value impacts

What is the value of the impacts? Put an economic and social value on the impacts and assess these over time. This involves using techniques such as economic and process modelling to estimate impacts and valuation techniques to monetise these

Diagram 3.5: Applying total impact measurement – the five-step process

3. Moving forward – Action plans

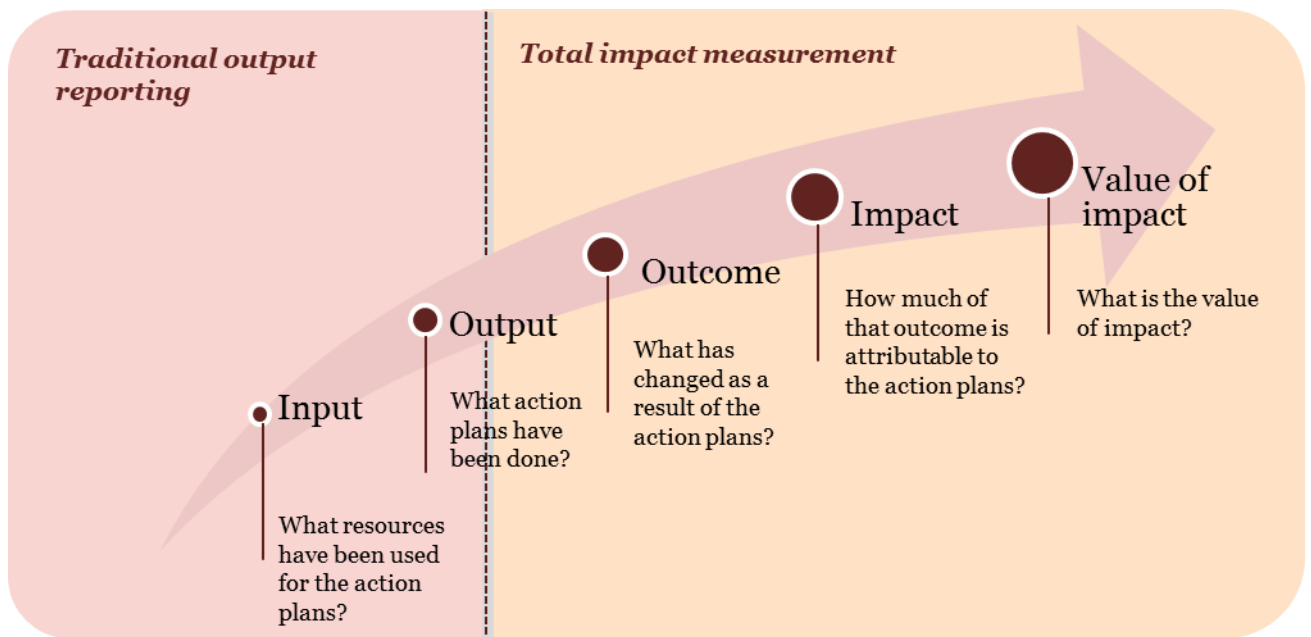## 3.10 Measuring and ensuring the sustainability of outcomes

Traditional output reporting

Total impact measurement

Value of impact
What is the value of impact?

Impact
How much of that outcome is attributable to the action plans?

Outcome
What has changed as a result of the action plans?

Output
What action plans have been done?

Input
What resources have been used for the action plans?

Diagram 3.6: Measuring and managing what matters

Measuring and managing what matters

By valuing social, environmental, tax and economic impacts the Government is now able to compare the total impacts of their strategies and investment choices and manage the trade-offs. Moreover, conventional measurement techniques mainly focus on inputs and outputs. However, total impact measurement develop an understanding of the relationship between the action plans' inputs and activities, their outputs and their longer term outcomes and associated impacts. Once the associated impacts are identified, the value of the impact is determined and decide whether these action plans are significant to support the growth of the Telecommunications sector.

Effective total impact measurement helps the Government to make better decisions by enabling them to understand how their activities create, or destroy, social, fiscal, environment and economic value while still, of course making a profit for their stakeholders. In this way, it gives management the ability to test its strategies and make important decisions such as investment choices.

Equipping the Government to generate good growth

Key benefits include the ability to understand the risks and identify new opportunities by examining critical trade-offs and developing plans capable of generating maximum value to society and the country. It also transforms stakeholder engagement by providing a structured, comparable and meaningful basis for reporting and communications.

It is imperative that Government, industry players and educational institutions are able to adopt the model of measuring outcomes in totality to ensure a sustainable approach to support technology and talent growth in the Telecommunications sector.

3. Moving forward – Action plans
    3.10 Measuring and ensuring the sustainability of outcomes

Total Impact Management Case Studies – HP's "Go West" Strategy in China

HP, like other international companies operating in China, invested in the coastal cities like Shanghai to manufacture goods such as personal computers and printers. In 2008, it noted concerns such as inflationary pressures because of rising food and energy prices, labour shortages, high staff turnover and absenteeism. In response, HP decided to 'Go West'. By encouraging its suppliers to build new facilities in cities like Chongqing, it was able to reduce its costs, increase staff retention and improve the working conditions of the tens of thousands of workers in its suppliers' factories who no longer needed to move from their homes to coastal cities to find work.

However, a critical need to improve the logistics of moving products from Chongqing to HP's consumer markets in Europe remained. Air freight was expensive and transport by road to the coastal ports and then by sea freight took nearly 34 days. HP pioneered the use of the TransEurAsia Railway which connected China to Europe and provided it with a more economically viable route that took only 22 days.

HP's 'Go West' strategy, including the use of the TransEurAsia Railway, is part of its larger supply chain social and environmental responsibility programme. It underscores how HP has been able to use its scale, purchasing power and experience to drive innovation and improve its business processes. The strategy is delivering important benefits for:

Workers and the local community: the TransEurAsia Railway means HP can keep its manufacturing facilities in western China and remain competitive so driving employment and economic growth in the region and improving working conditions for tens of thousands of its suppliers' factory workers.

The environment: by using rail rather than air transport, HP's carbon footprint from transport is reduced by up to 95%.

The business: using the TransEurAsia Railway costs one-third that of air transport, reduces the time to reach the European market by one-third the time of trucking products to the coastal cities and shipping them and also reduces HP's inventory costs.

Quick wins

3.11 Quick wins

This section provides key information on the insights obtained from the industry, educational institutions and government agencies on their key issues and concerns to develop talent for the Telecommunications sector.
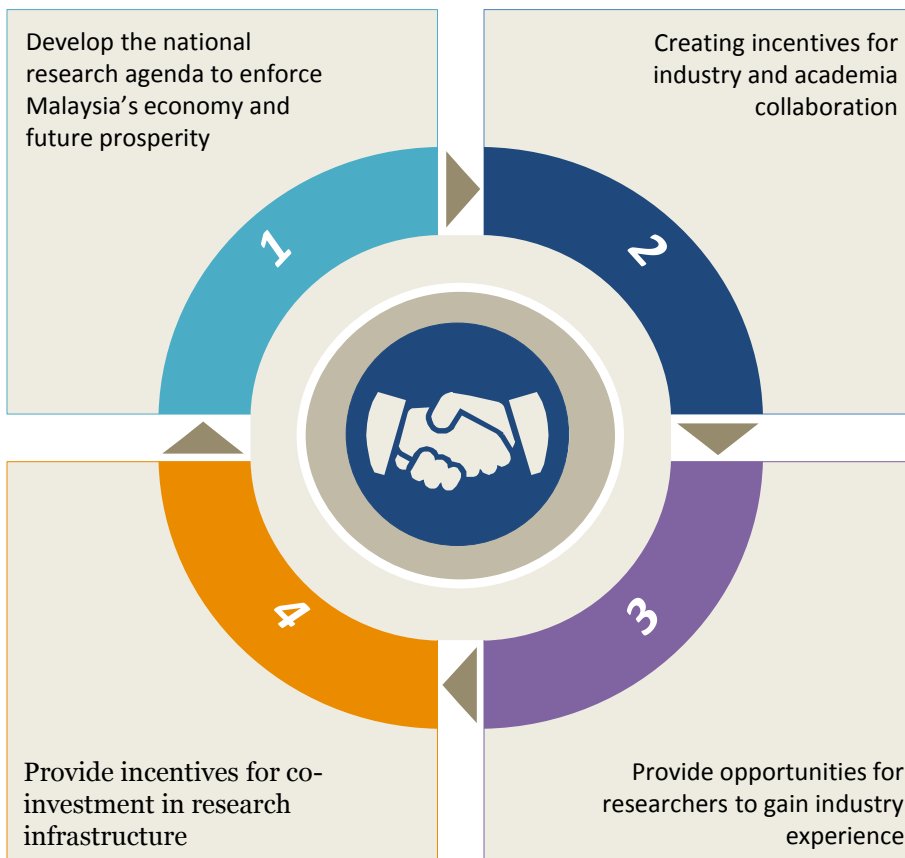
It entails detailed information on action plans that are quick wins based on the role of the MCMC, ILMIA, industry and educational institutions to attract, retain and develop talent in the sector.

Enhancing on-going industry and academia collaboration

This section highlights the recommendation to ensure the strengthening of partnership between the industry and academia to encourage on-going collaboration.

The four (4) key areas that is highlighted in this recommendation are illustrated below:

1 Develop the national research agenda to enforce Malaysia's economy and future prosperity

2 Creating incentives for industry and academia collaboration

3 Provide opportunities for researchers to gain industry experience

4 Provide incentives for co-investment in research infrastructure

Current situation on industry and academia collaboration

Feedback obtained from the surveys, focus interviews and validation workshops have stated there is existence of industry and academia collaboration. However, there is more room for improvement to ensure these collaborations are sustainable in the long term. Selected educational institutions have been inviting industry speakers to their institutions and collaborating with the industry to review course syllabus on an annual basis. This existing partnership between these two (2) stakeholders will need to be strengthen to ensure a sustainable outcome.

The reason to focus on collaboration

The industry and educational institutions play an important role in the talent development sphere for the Telecommunications sector. It is critical these stakeholders are communicating with each other to ensure a robust talent pipeline for the sector. In addition, industry and academia collaboration encourage research and development to develop products that are innovative to boost Malaysia's economy. Innovation provides Malaysia with a pathway to a competitive, high wage and high growth economy. Moreover, there is numerous research and development that have been conducted by the educational institutions but how do they commercialise these products and maximise the potential benefits. Therefore, this is where the industry comes in to play. By collaborating with academicians, industry can convert research materials into commercial outcomes and help contribute to the economic growth of the country.

Strategic action plans to enhance industry and academia collaboration

Strong collaboration doesn't happen on its own. It is very dependent on commitment from all stakeholders. There is a role for industry, educational institutions and there is a significant leadership role for the government. The industry and academia collaboration can be achieved without compromising the independence of educational institutions or the important role they play in Malaysian society. It can also be achieved without disturbing industry from their primary goals, but it will on the other hand assist them in achieving those goals. A strategic recommendation to enhance industry and academic collaboration covers four (4) key areas for a sustainable outcome. The key areas are described below.

1	Develop the national research agenda to enforce Malaysia's economy and future prosperity
2	Creating incentives for industry and academia collaboration i. Incentivise greater private investment in industry-engaged research ii. Establish intellectual property that will enable Malaysian companies to access and commersialise the outcomes of research
3	Provide opportunities for researchers to gain industry experience i. Incentivise businesses to offer internships and employment to researchers ii. Promote industry-focused PhD projects via co-creation of projects with end-users
4	Provide incentives for co-investment in research infrastructure

Source:
1. Ensuring Australia's Future Competitiveness through University-Industry Collaboration, Ai Group

Further details on the key areas that strengthen the partnership between industry and educational institutions

The four (4) key areas mentioned in the previous are further elaborated below.

1

Develop the national research agenda to enforce Malaysia's economy and future prosperity

- The Government needs to maximise outcomes from public research investment by concentrating funding in sectors that have a current economic strength or the potential to develop a globally competitive economic advantage
- It is critical that the Government should empower industry to approach educational institutions and the research community to tender for industry-engaged research that is supported by public funding
- Public funding should flow to collaborative research partnerships between the educational institutions and industry that address the interconnected research priorities of both Government and industry
- Target key focus areas in the sector that is most likely to benefit from investment would increase support and incentive for private investors to engage in R&D
- Educational institutions and businesses could then align their short and long term strategies to respond to these opportunities

2

Creating incentives for industry and academia collaboration

i. Incentivise greater private investment in industry-engaged research
   - Companies can gain access to educational institutions skills and infrastructure in terms of research and development opportunities
   - This access prevents the duplication and reimbursement of investment by individual companies
   - Therefore, it is recommended that companies be reimbursed at a higher rate for R&D expenditure that involves partnership with educational institutions than for research that is undertaken internally
ii. Establish intellectual property that will enable Malaysian companies to access and commersialise the outcomes of research
   - Businesses and educational institutions need a more solid foundation from which to build agreements on

3

Provide opportunities for researchers to gain industry experience

i.   Incentivise businesses to offer internships and employment to researchers
  - There needs to be review of employment regulations to reduce the red tape that exists around employing individuals for internships and part-time work in the industry
  - Employers of PhD students should be rewarded via R&D tax incentive
  - Tax incentives should also assist SMEs and acknowledge the resource intensiveness of supporting the training students in an industry setting

ii. Promote industry-focused PhD projects via co-creation of projects with end-users
  - Develop PhD topics with end users provides those students with research that is valuable to industry and a partner that is engaged throughout the duration of their degree
  - It will likely lead to enhanced job opportunities as they will have skills valuable to both a career in industry and academia at the completion of their degree

4

Provide incentives for co-investment in research infrastructure

- A voucher system can provide funding to help industry gain access to research infrastructure, services and knowledge they may otherwise not have the necessary resources to access
- Vouchers support a transaction between a company and a supplier with money directed at the supplier, rather than the company

3. Moving forward – Action plans
    3.11 Quick wins

Accelerating talent growth through co-operation, leveraging on expatriates and digital economy

The Needs of The Industry

The perception that industry players have towards today's fresh graduates is the lack of ability to work independently in a short amount of time. Handholding may be required extensively, stretched over a period of time which may lead to inefficiency related issues. Moreover, fresh graduates are always seen as lacking sufficient industry knowledge prior to joining the workforce in the Telecommunications sector. This perception led to an understanding that universities, or the students themselves need to be "Industry Ready" before joining the workforce. This core problem, leads to a bigger issue where there is currently a minimum talent pipeline to groom more local experts in the sector for the future. It would take a longer amount of time for any industry players to develop "experts" in the field, simply due to the high amount of time spent to develop talents at an early stage. With only a handful MNCs that has a structured development curriculum for their talents, the talent pipeline of Telecommunication Experts is a "Real" issue that the industry is facing.

One thought on this issue is that there is an insufficient collaboration between Telecommunications organisations to accelerate talent growth in the Telecommunications sector. Though there are a lot of collaboration currently, the effectiveness of these efforts comes to question. Guest lectures, Corporate Social Responsibility activities, student site visits and others are some of the efforts that are in place, but there needs to be a more strategic collaboration, by leveraging each others capabilities to assist the universities to meet the expectations of the industry.

The Opportunity To Catalyse and Accelerate Talent Growth

While some collaborations between Industry Players and Educational Institutions are already in place, there are significant rooms for improvements for these collaborations. For example, there is currently minimal, or none, mechanisms to measure the effectiveness of these collaborations in producing talent. Monitoring of CSR related programme by industry players is required and this should be linked to the amount of talented fresh graduates that the educational institutions can produce upon graduation to feed to the industry.

Similarly, by leveraging the capability of each party, more results can be achieved, and in a shorter amount of time. There are minimal efforts to leverage on industry training modules to apply them in educational institutions to make the students "Industry Ready". GEMS, driven by TalentCorp involves training providers to groom fresh graduates and equip them with technical skills prior to joining the industry. Such modules should be explored and opportunities should be taken to embed the modules for the development of the fresh graduates earlier.

One advantage that is currently available and should be made use, the number of expatriates who are experts in the industry. More knowledge transfer should be done to ensure that knowledge is shared with the talents in the industry. More importantly, measurement of effectiveness of these knowledge transfer should be in place. Such practice can take place at the industry level or educational institutional level to achieve results from all fronts.

The outline and details of the suggested action plans to use the opportunities from the Industry perspective is shown in the subsequent page.

Accelerating talent growth through co-operation, leveraging on expatriates and digital economy (cont'd)

I4

Action Steps:
i.   **Structured and monitored CSR programmes to ensure effective contribution by industry players –** Industry players' CSR programmes and partnership with educational institutions may be focused on the established universities and colleges. There is a need to ensure that the coverage of the programmes are equally distributed to the less reputable educational institutions.
ii. **Increase frequency of guest lectures by notable industry leaders and industry specialists–** The collaboration between industry players and educational institutions to expose students to the latest industry development is already in place, i.e. syllabus review. However, more can be done in terms of inviting guest lectures or speakers more frequently to both small and large education institutions. Topics covered should include the current talent needs within the Telecommunications sector, latest technologies development, career opportunities, emerging technologies and industry key trends and sharing of leadership experiences

Key Outcomes:
i.   Improved sharing of expertise, knowledge and the latest industry requirements between industry players and educational institutions
ii. A strong collaboration between the industry and educational institutions to ensure that institutes of higher learning are aware of industry requirements
iii. All students to be equipped with relevant soft skills upon graduation

I1

Catalysing the growth of local experts by leveraging on existing foreign expertise

Action Steps:

i.   **Engage and Collaborate with Vendors –** The MCMC will approach and engage MNCs in the Telecommunications sector such as Huawei, Nokia, and Cisco and collaborate with them to create strategic initiatives that support technical competencies transfer to local talent.
ii. **Training module development –** Leveraging on MNCs' existing structured in-house development programme to be expanded and applied to transfer knowledge to the SMEs
iii. **Facilitate the Partnership Establishment -** Consequently, the MCMC will act as a facilitator to smooth out the partnership establishment between the MN

Key Outcomes:
i.   Development of local expertise and knowledge sharing culture in Malaysia, leveraging on the existing MNCs' in-house development programme
ii. An increase in number of collaborations between network operators, MNCs and SMEs with recorded results, and positive feedback obtained from the stakeholders

Accelerating talent growth through co-operation, leveraging on expatriates and digital economy (cont'd)

I6

Action Steps:

i.   **Collaborating between industry players to accelerate talent growth in the Telecommunications sector –**The UK model Tech Partnership is developed to create the skills for a million new digital jobs, removing barriers that impede business growth and generating an additional Gross Value Added (GVA) of USD 13.4 billion. This initiative is spearheaded by established Telecommunications and ICT players such as BT Group, CISCO, Google, HP, IBM, Samsung, Oracle and many other massive organisations in the industry. This can be replicated and driven by the Human Capital

Initiative by EPU through the industry working group, where major Telecommunications organisations come together to create an integrated platform to bridge the gap between demand (industry players) and supply (academic) to come up with strategic initiatives in developing human capital planning.

Key Outcomes:

i.   Finalised plan to accelerate talent growth in the Telecommunications sector
ii.   Full collaboration between the industry players to develop talents for the industry at the grassroots level

3. Moving forward – Action plans
3.11 Quick wins

Keeping grasp of the latest technology to create syllabus depth and growth in teaching capabilities

Issues Faced By Educational Institutions

There is a deep appetite by the educational institutions to develop students which meets the needs of the industry. The incentive for the educational institutions to be known as being able to produce employable graduates are paramount and is highly sufficient to drive the institutions to produce industry ready graduates. However, based on the multiple interviews and sessions with the educational institutions, they are faced with numerous challenges to produced such graduates.

The issues faced by the educational institutions are wide, ranging from the lack of infrastructure, lack of funds and participation by the industry players to review the syllabus. However, even when all the ideals are achieved to mitigate the challenges, it is also important to understand that there is a need to ensure that there are capable lecturers who are able to teach and assess the students based on the latest technological trends.

Another main issue faced by the educational institutions is the enrolment of graduates into Telecommunications-related courses. Today, even with all the technology developments, Telecommunications is perceived to be as not attractive for students to enroll. While the feedback shows that there is an appetite to enroll students into Telecommunications-related programmes, students may not necessarily be enticed to join the programmes as there are no views or clarity on employment opportunities. Where industry players are looking to hire graduates with professional qualifications, it is then sensible for educational institutions to explore the inclusion of professional certificates as part of Telecommunications-related-degree programmes in making it more attractive for students and thus creating more supply of talents with the exact qualifications that the industry needs.

How The Rapid Changes in Telecommunications Industry Impacts The Educational Institutions

While it is common knowledge that the Telecommunications Industry are well known to be fast paced and fast evolving, it has a direct impact to the educational industry. The pace of the industry demands a lot from the educational institutions to keep up with the current requirement of the industry. This means that the educational needs to review the syllabus often that to keep up with the pace of the industry, which presents a challenge to the institutions.

However, to review the syllabus relating to Telecommunications industry, participation and cooperation is required from the industry players to assist the educational institutions. The frequency of this review, for the purpose of keeping up with the industry is so often, that it may not be efficient for the industry players to assist in reviewing the syllabus at a high frequency. This naturally presents a new set of challenge for the educational institutions to be able to teach their students with the latest technology trends, technology developments and industry requirements.

Even though it is an issue, the requirement to update the syllabus is still very much relevant. It is a question of the effectiveness of this review an how best it can be done. The quality of this review can be achieved if there are sufficient advice from the MCMC as the regulator in providing insights of the latest trends, MQA to enhance the existing mechanism to accelerate the approval process for programmes, and industry players to provide quality input to the institutions. However, this action items needs to be supplemented further by other action items to make it impactful.

Keeping grasp of the latest technology to create syllabus depth and growth in teaching capabilities (cont'd)

The Need of Teachers or Lecturers Who Are Well Equipped With Telecommunications Industry Knowledge

Another issue that would further develop from the fast paced industry, is the lack of lecturers or teaching capabilities to continue teaching and assessing students based on the latest industry trends, technology growth and industry requirements. As the industry moves fast, which in turns requires the syllabus to be constantly and frequently updated, it comes with the need to have lecturers are well versed with the developments of the industry.

These lecturers would need to be able to teach the students and more importantly, assess the students. Adapting to these changes may be a huge challenge for many universities as syllabus would need to evolve constantly with assessment methodology. There was a common theme of feedback when the educational institutions were interviewed, where even if the universities and colleges are able to keep up with the ever changing syllabus to maintain relevance to the industry needs, assessing the students are a challenge which is hard to mitigate. Though this in no way represents the capability of the lecturers, some form of standards to teach and assess students based on the latest technology and industry developments is required in tertiary education institutions.

For all the issues stated above, some of the noted recommendations are as follows

E1

Inclusion of Professional Certifications as part of Telecommunications-related-degrees

Action Steps:
i.   **MQA to include professional certifications in course syllabi** – MQA needs to allow and actively encourage students to obtain optional professional certificates during the course of their degree.
ii.   **Collaboration with training partners** – Institutes of higher learning need to collaborate with training partners in order to enable students to obtain such certifications while they are pursuing their degree.
iii.   **Create awareness among students**– Educational institutions need to create awareness about professional certifications and encourage students to obtain them.
iv.   **The MCMC to function as the facilitator** – The MCMC needs to facilitate the collaboration between institutes of higher learning and training partners so that students may start obtaining such certifications.
v.   **Industry players to advise educational institutions** – **I**ndustry players need to advise educational institutions about which professional certifications are most sought after and relevant to the industry.

Key Outcomes:
i.   An opportunity for students to obtain professional certifications while they are pursuing their degree
ii.   An increase of students pursuing a technical degree
iii.   An increase in number of industry ready graduates

Keeping grasp of the latest technology to create syllabus depth and growth in teaching capabilities (cont'd)

E2

Industry exposure for university lecturers and academia exposure for industry employees

Action Steps:
i.   **Industry attachment -** Lecturers from the educational institutions will be able to work in the industry for 3-6 months in order to obtain exposure and knowledge regarding the latest trends as well as the industry requirements.
ii.   **Part-time lecturer –** Employees from the industry are able to do a part-time teaching course for 3-6 months to share their knowledge to both students and the lecturers in regards to the industry requirements.

Key Outcomes:
i.   High quality lecturers in terms of technical capability and industry knowledge to share the knowledge to their students
ii.   An increase in number of industry ready graduates
iii. A strong partnership between the educational institutions and industry players

E4

Regular updates of Telecommunications-related university course syllabi in accordance with technological changes

Action Steps:
i.   **Regular updates on industry key trends -** Educational institutions will receive a periodic bulletin from the MCMC that shares on the industry key trends, new Telecommunications-related courses that are recommended to be introduced, new competencies needed in the sector, etc.
ii.   **Increase frequency on syllabus review -** MQA can implement a new guideline that strongly recommends a course syllabus to be reviewed every 2 years and no more than 4 years
iii. **Close collaborations with industry players –** Discussion with industry panel should be held at every quarter to obtain the industry's insights on the critical competencies to drive the sector growth
iv.   **Enhancing the existing mechanism to speed up the process of getting course approval –** MQA can implement an improved mechanism to accelerate the approval process. Previously, at least six months to 1 year is required for a new programme to be approved. To ensure the change in the syllabus is still relevant by the time the syllabus is approved, a shorter duration of approval process should be established

Key Outcomes:
i.   Designed curriculum that incorporates latest changes in the Communications sector
ii.   New graduates are equipped with skills and knowledge of emerging technologies

3. Moving forward – Action plans

    3.11 Quick wins

A robust internship programme structure

Improving Internship Programmes in Malaysia

One of the benefits of an internship programme is it provides the potential fresh graduates to be exposed to the industry and make themselves fully ready prior to joining the workforce. It provides good results for universities and industry players alike, ensuring that students are exposed to the industry and access to leaders, and the actual work that the company does. However, when analysed further, while Internship Programmes or industrial training works well, there is insufficient encouragement to have industrial training for capability development and improve industry readiness purposes for the students or fresh graduates.

Strategising Internship Programmes for Graduates

While exposing students in the industry is important, there is a need to control the internship programmes to ensure that the students obtain the maximum output of the experience. Involvement of MQA is required to improve the guideline of the internship programme, by incorporating the standardised duration of the internship, the frequency of lecturers visiting the organisations involved and monthly reporting from students on their tasks and responsibilities. Another way to expand this practice is for MQA to encourage the internship programme to the students during the earlier part of their studies. This would expose them younger, allowing them to learn more and understand what is expected out of the talents prior to joining the workforce.

Expansion of internship programmes should also be looked into. Government agencies, such the MCMC, can take the lead to develop a structured internship exchange programme to other ASEAN countries. This would provide significant exposure to young talents in the Telecommunications sector. This experience would enable students to understand the practice of the industry beyond the Malaysian sphere. Technologies, technical capabilities and way of working can be brought back and shared locally through this programme. Though the challenge is the sustainability part and measuring the outcomes, such experience is highly valuable for the talents, and is often sought after by companies in the industry.

The outline and details of the suggested action plans to use the opportunities to improve the Internship Programmes even further is shown in the subsequent page:

"It is difficult for us (smaller telecommunications companies) to obtain the best talent for internship programmes as we lose out in terms of choice, due to reputation of organisations"

- Input from validation session from an industry leader

A robust internship programme structure (cont'd)

E3

Robust internship programme structure

Action Steps:
i.   **MQA to include a proper mandatory guideline on the structure of the industrial training -** Elements that need to be incorporated are the standardised duration of the internship, the frequency of lecturers visiting the organisations involved, monthly reporting from students on their tasks and responsibilities, etc.

ii.   **Expanding MQA's requirement to encourage industrial training placement during the earlier stage of studies–** MQA to include in the programme guideline for the educational institutions to send first or second year students for industrial training placement as a way to obtain relevant exposure in the Telecommunications sector and to harness the students' soft skills.

iii. **ASEAN Internship Exchange Programme –** The MCMC can develop a structured internship exchange programme to other ASEAN countries to give exposure to young talent to new areas in the Telecommunications sector. There has to be a mechanism that will allow an effective transfer of knowledge from the participants once they completed their internship

iv.   **Facilitating industry-wide implementation of standardised salary for interns –** Ministry of Human Resources (MoHR) should establish a policy to recognise employment rights and standardised salary range for students who perform industrial training placement

Key Outcomes:
i.   High quality lecturers in terms of technical capability and industry knowledge to share the knowledge to their students
ii.   An increase in number of industry ready graduates
iii. A strong partnership between the educational institutions and industry players

High impact efforts to be driven at Government level

This section highlights the recommendation to ensure that the understanding of the talent needs in the industry is being facilitated and planned at the Government to ensure relevance for the industry.

3. Moving forward – Action plans

    3.11 Quick wins

Bolster more platforms for technical capabilities development from all fronts

Opportunities for the MCMC Based on Feedback From The Survey and Industry

The study has provided a clear view from a regulator's perspective on how the MCMC can be more involved in the development of talents for the Telecommunications industry. There are various opportunities that can be taken up by the MCMC in demonstrating its capability and intent to develop talents for the industry in Malaysia.

Increasing The Involvement of the MCMC in Talent Development Practices

The common feedback obtained from the industry showed that there is a concern with the technical capability of fresh graduates coming into the industry. Technical knowledge, latest technology trends and analytical thinking are some of the areas that the industry feels more help should be given to the fresh graduates. Being the regulator, and combining with its Academia capabilities and infrastructure, the MCMC has the opportunity to lead the development of technical capabilities for fresh graduates, and even more, to share the latest technology trends with the younger talents coming into the industry.

There is a similar practice in the UK where Ofcom was seen as a leader in bringing together industry players to combine efforts in developing talents for the telecommunications industry. This can be emulated by the MCMC, by using their Academia capabilities for the same purpose.

In developing the capabilities of the talents, the MCMC can create the platforms for development purposes as follows:

G9

Providing platforms to develop technical training programmes for emerging technological areas

Action Steps:

i.   **Research and analysis on the emerging technologies** – Conduct a thorough research and analysis on the critical competencies required to drive the emerging technologies in the Malaysian Telecommunications sector.

ii.   **Collaboration with the industry players** - Engage several industry players from network operators, service providers, vendors and SMEs to obtain their insights on the type of assistance needed from the MCMC Academy in terms of expertise specific to emerging technologies

iii.   **Module Development** – Collaborate with the industry experts from educational institutions or industry players to develop a comprehensive training module

iv.   **Training Methodology** - Build training methodology to most effectively deliver the training with an emphasis on interaction and experiential learning to participants. The training will be conducted by those who designed the training module.

Key Outcomes:

i.   Existing workforce has the latest knowledge and technical skills to support the growth of the Communications sector

ii.   Provide an integrated platform for employees to enhance their knowledge and skills to be at par with the technological evolution

Bolster more platforms for technical capabilities development from all fronts (cont'd)

Improving Industry Exposure of Regulators

In general, strategically placing personnel from government agencies can be extended to any industry, the Telecommunications industry would need it more. This is to ensure more collaboration can be achieved between the regulators and the industry players. Having personnel working in the industry would result to regulators being able to synthesize the needs of the industry better than before. As regulators, there is a need to ensure that there are comprehensive understanding of the needs of the industry in terms of talents and the strategies that are relevant to the industry in order for them to participate.

By working together with EPU, in strengthening the understanding of Telecommunications industry, the MCMC can take the opportunity to place its personnel in the industry to work together with various companies in carving out solutions which meets their needs, particularly in talent development practices. Some of the action items that can be taken and driven by the MCMC is as follows:

G10

Strategically place government agencies' personnel in Telecommunications organisations to increase industry exposure and knowledge driven by Human Capital Development Council and Industry Skills Committee

Action Steps:

i.   **Driving the collaboration between government agencies and industry players –** With Economic Planning Unit (EPU) driving the creation of various platforms to support human capital development in the country, one of the suggested efforts is to ensure that the government agencies' personnel are given the opportunities for secondment at Telecommunications organisations. Through the industry working group committee, this effort is seen as feasible to ensure further collaboration between government agencies and industry players. This is to ensure that the government agency personnel are given the opportunity to develop their expertise when operating in the industry. In addition, an important benefit that can be achieved from this initiative is the understanding of the industry actual needs in terms of talents and current focus of talent developments that the industry players are looking into.

Key Outcomes:

i.   Full understanding by government agencies on the Telecommunications sector in terms of the sector's demand of talents and its gaps

ii. Full collaboration between industry players and government to ensure that talent needs are met and gaps are closed

3. Moving forward – Action plans
   3.11 Quick wins

Driving the quality of information or data gathered as a basis for programmes driven to develop talents

Issues With Current Quality of Data

Currently, there are many studies or data gathering activities conducted from time to time to supply the data at national level. However, there are a few loopholes in the practice where the outcome of the analysis may not be as comprehensive that it should be. There are several job titles, job descriptions, skill areas as well as priority areas which are not standardised and leads to various stakeholders understanding and interpreting the data differently.

Based on the analysis, programmes are developed with intentions to close any gaps which are found. However, as various stakeholders refer to the data differently, the impact of the programmes developed may not be as favorable as it is not sufficiently relevant to how each stakeholder may view it.

Speaking The Same Language

The government agencies are already recognising the issue at hand. With TalentCorp investing on Graduate Employability Management Schemes (GEMS), together with EPU and ILMIA they are currently carving out a plan to how best to gather the information required to ensure that there is a strong and valid basis of each programme developed, at the same time, is understand correctly by all stakeholders. This involves refining the Tracers Study which is carried out from time to time. The information provided by the industry may not be sufficient for any detailed analysis for any agency to understand the exact supply of talents coming from universities.

Additionally, there needs to be a discussion between the government agencies and the industry in defining the job families, skill areas and priority clusters in order for all stakeholders to be able to refer to a job title in a standardised manner. This would carry on to an understanding of a common understanding of the needs of the industry.

A recommended action item is illustrated below.

G5	Determining job families, skill areas and priority clusters (specific to Telecommunications) as a basis to further enhance programme driven under the Graduate Employability Management Scheme (GEMS) initiative	

Action Steps:

i.   **Identify job families, skill area and cluster areas to focus on as part of GEMS –** There is a need to identify the specific job roles and skill areas that the industry need, in detail as a basis to understand the gaps within the Telecommunications industry.

ii.   **Educational institutions to create awareness on GEMS initiative –** Ensure the prospective graduates are aware of the existing GEMS initiative as a platform to enhance their employability for unemployed graduates

Key Outcomes:

i.   A more effective implementation of initiative based on a holistic understanding of the actual talent needs of the industry down to the specific job families, skill areas and priority clusters

ii.   An increase in the number of industry ready graduates

iii.   An alternative channel for Telecommunications organisations to obtain potential talent that can be an asset to the company

Elaborated action plans

3.12 Elaborated action plans

There are twelve (12) prioritised action plans that are further elaborated. The prioritised action plans are elaborated based on the root causes, the desired end-state once the action plan is fully implemented, the key action steps required to implement the action plans, the owner for each of the action plans, the estimated duration of implementing the action plans and the impact measurement of the action plans.

Presented below are guidance on how to read the elaboration section of the prioritised action plans.

1 This section shows the title of the action plan

4 This section shows the key action steps to implement the action plan

6 This section shows the duration of the implementation time

8 This section shows the impact of the action plans

2 This section shows the root causes of the action plan

3 This section shows the desired end-states once the action plan is fully implemented

5 This section shows the ownership of the action plan

7 This section shows how the impact of the action plan that can be measured

9 This section shows the implementation effort of the action plan in terms of resources, complexity and implementation cost

Diagram 3.7: Guidance on how to read the section on the elaborated action plans

1. Action plan

I4: Enhance on-going industry and academia collaboration

Root causes	• Students are perceived as lacking sufficient industry knowledge prior to joining the workforce in the Telecommunications sector • There is a challenge for institutes of higher learning to produce industry ready graduates as they are not fully aware of the latest industry requirements • Feedback obtained from the industry players shows that there is significant room for improvement in terms of the graduates' soft skills

Desired end-states:
1. Improved sharing of expertise, knowledge and the latest industry requirements between industry players and educational institutions
2. A strong collaboration between the industry and educational institutions to ensure that institutes of higher learning are aware of industry requirements
3. All students to be equipped with relevant soft skills upon graduation

Action steps

Action steps	Owner	
1. **Structured and monitored CSR programmes to ensure effective contribution by industry players –** Industry players' CSR programmes and partnership with educational institutions may be focused on the established universities and colleges. There is a need to ensure that the coverage of the programmes are equally distributed to the less reputable educational institutions. The MCMC can take this opportunity to encourage industry players to have structured programme to create awareness among students on the career opportunities available in the Telecommunications sector. 2. **Increase frequency of guest lectures by notable industry leaders and industry specialists–** The collaboration between industry players and educational institutions to expose students to the latest industry development is already in place, i.e. syllabus review. However, more can be done in terms of inviting guest lectures or speakers more frequently to both small and large education institutions. Topics covered should include the current talent needs within the Telecommunications sector, latest technologies development, career opportunities, emerging technologies and industry key trends and sharing of leadership experiences.	**Educational Institutions**	• Increase collaboration efforts with industry players to ensure sufficient industry exposure are given to students
	Government	• Facilitate the execution and monitoring of collaboration programmes between industry players and educational institutions
	Industry Players	• Increase engagement with educational institutions, both established and less reputable, in order to allow expertise and knowledge sharing to take place

Estimated Duration   *Legend*: —— Minimum estimated duration – – Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in number of industry ready graduates

Impact	
Criteria	**Assessment* (H/M/L)**
Increase in number of industry ready graduates	H
Increase in number of interactions between industry players and educational institutions	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment* (H/M/L)**
Complexity	M
Resource availability	L
Implementation cost	L
Overall assessment	**L**

2. Action plan

E1: Inclusion of Professional Certifications as part of Telecommunications-related degrees

Root causes	• Telecommunications-related courses are perceived as less attractive • Feedback obtained showed that the industry prefers to employ fresh graduates with certified professional certifications

Desired end-states:
1. An opportunity for students to obtain professional certifications while they are pursuing their degree
2. An increase of students pursuing a technical degree
3. An increase in number of industry ready graduates

Action steps

Action steps	Owner	
1. **MQA to include professional certifications in course syllabi** – MQA needs to allow and actively encourage students to obtain optional professional certificates during the course of their degree. 2. **Collaboration with training partners** – Institutes of higher learning need to collaborate with training partners in order to enable students to obtain such certifications while they are pursuing their degree. 3. **Create awareness among students** – Educational institutions need to create awareness about professional certifications and encourage students to obtain them. Industry players can assist them in doing so by sending guest speakers to educational institutions and stress the importance and benefits of such professional certifications. 4. **The MCMC to function as the facilitator** – The MCMC needs to facilitate the collaboration between institutes of higher learning and training partners so that students may start obtaining such certifications while pursuing their degrees as soon as possible. 5. **Industry players to advise educational institutions** – The different industry players need to advise educational institutions about what professional certifications are most sought after and relevant to the industry so that the holder of such is therefore more likely to be employed.	Educational Institutions	• Need to collaborate with training partners so that students may obtain such certifications while pursuing their degree
	Government	• MQA needs to encourage students to obtain their professional certifications while they pursue their degree • The MCMC needs to collaborate with educational institutions so they may feature professional certifications as part of their degrees in a timely manner
	Industry Players	• Need to advise educational institutions about what professional certifications are most sought after and relevant to the industry

Estimated Duration

Legend: ▬▬ Minimum estimated duration   ▬ ▬ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in number of students pursuing a technical degree
2. Increase in number of industry ready students upon graduation
3. Improved technical skills of the students

Impact	
Criteria	**Assessment (H/M/L)**
Increase in number of students	M
Improved quality of students	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	M
Resource availability	H
Implementation cost	M
Overall assessment	**M**

3. Action plan

E2: Industry exposure for university lecturers and academia exposure for industry employees

Root causes	• There is a need for lecturers to obtain the latest technology trends and articulate the latest technology developments with the students • There is a lack of understanding in the capacity of educational institutions in producing industry ready graduates and the type of assistance needed to ensure the course syllabi fulfil the industry requirements

Desired end-states:
1. High quality lecturers in terms of technical capability and industry knowledge to share the knowledge to their students
2. An increase in number of industry ready graduates
3. A strong partnership between the educational institutions and industry players

Action steps

Action steps	Owner	
1. **Industry attachment -** Lecturers from the educational institutions will be able to work in the industry for 3-6 months in order to obtain exposure and knowledge regarding the latest trends as well as the industry requirements. 2. **Part-time lecturer** – Employees from the industry are able to do a part-time teaching course for 3-6 months to share their knowledge to both students and the lecturers in regards to the industry requirements.	**Educational Institutions**	• Cooperation with the industry players to coordinate a suitable period for the lecturers and the employees from the industry to participate in the exchange programme
	Government	• N/A
	Industry Players	• Collaborate with educational institutions to coordinate the exchange programme

Estimated Duration

Legend: ── Minimum estimated duration ‑ ‑ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in the number of collaboration between the industry and educational institutions
2. Increase in the number of industry-graduates

Impact	
Criteria	**Assessment (H/M/L)**
Increase in the quality of lecturers	H
Increase in the number of industry-graduates	M
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	H
Resource availability	M
Implementation cost	L
Overall assessment	**M**

4. Action plan

E4: Regular updates of Telecommunications-related university course syllabi in accordance with technological changes

Root causes	The outdated syllabus content will affect the educational institution's ability to produce industry ready graduates.

Desired end-states:
1. Designed curriculum that incorporates latest changes in the Communications sector
2. New graduates are equipped with skills and knowledge of emerging technologies

Action steps

Action steps	Owner	
1. **Regular updates on industry key trends** - Educational institutions will receive a periodic bulletin from the MCMC that shares on the industry key trends, new Telecommunications-related courses that are recommended to be introduced, new competencies needed in the sector, etc. 2. **Increase frequency on syllabus review** - MQA can implement a new guideline that strongly recommends a course syllabus to be reviewed every 2 years and no more than 4 years 3. **Close collaborations with industry players** – Discussion with industry panel should be held at every quarter to obtain the industry's insights on the critical competencies to drive the sector growth 4. **Enhancing the existing mechanism to speed up the process of getting course approval** – MQA can implement an improved mechanism to accelerate the approval process. Previously, at least six months to 1 year is required for a new programme to be approved. To ensure the change in the syllabus is still relevant by the time the syllabus is approved, a shorter duration of approval process should be established	**Educational Institutions**	• Educational Institutions need to engage the Industry as per MQA's requirement
	Government	• The MCMC needs to create awareness by sharing relevant information to educational institutions on the future directions of the Communications sector • MQA has to play a role in enhancing existing mechanism to accelerate the approval process for programmes that are highly dependent on the technological evolution
	Industry Players	• Industry players need to be proactive in providing insights and potential solutions to educational institutions to produce industry ready graduates

Estimated Duration

Legend: ▬▬ Minimum estimated duration ▬ ▬ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Number of new graduates are equipped with skills and knowledge of emerging technologies
2. Industry's feedback (Feedback will be measured by using a standardised scoring mechanism)

Impact	
Criteria	**Assessment (H/M/L)**
Number of industry ready graduates	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	M
Resource availability	M
Implementation cost	L
Overall assessment	**M**

5. Action plan

G5: Determining job families, skill areas and priority clusters (specific to Telecommunications) as a basis to further enhance programme driven under the Graduate Employability Management Scheme (GEMS) initiative

Root causes	• The understanding of talent needs based on job families, skill areas and priority clusters can be improved to ensure a holistic plan and implementation of efforts to close the gaps (headcounts and skill matching) • Fresh graduates with average academic performance that are experiencing difficulties to be employed in Telecommunications organisations.

Desired end-states:
1. A more effective implementation of initiative based on a holistic understanding of the actual talent needs of the industry down to the specific job families, skill areas and priority clusters
2. An increase in the number of industry ready graduates
3. An alternative channel for Telecommunications organisations to obtain potential talent that can be an asset to the company

Action steps

Action steps	Owner	
1. **Identify job families, skill area and cluster areas to focus on as part of GEMS –** There is a need to identify the specific job roles and skill areas that the industry need, in detail as a basis to understand the gaps within the Telecommunications industry. Currently, the needs for the industry is defined at a very high level considering only (headcounts and job families). Moving forward, more should be done in identifying the gaps in terms of job roles, headcounts and skill areas which will then contribute to a more effective development programme to close these gaps. 2. **TalentCorp to expand their initiative –** TalentCorp needs to reach out to Telecommunications industry players to expand their GEMS initiative to the Telecommunications industry. In addition, more Telecommunications organisations need to actively get involved in the GEMS initiative to provide fresh graduates with employment in the Telecommunications industry. 3. **Educational institutions to create awareness on GEMS initiative –** Ensure the prospective graduates are aware of the existing GEMS initiative as a platform to enhance their employability for unemployed graduates	**Educational Institutions**	• Create awareness of GEMS existence to the prospective graduates
	Government	• TalentCorp needs to expand the current GEMS initiative to the Telecommunications sector and increase awareness of the GEMS to enhance the employability of graduates
	Industry Players	• Training provider/ programme implementation owner will be providing the mechanism for job match, technical and non-technical training to the participants of the GEMS

Estimated Duration

Legend: ▬▬ Minimum estimated duration ▬ ▬ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in number of fresh graduates working in the Telecommunications sector
2. Decrease in number of unemployed graduates
3. Industry's feedback (Feedback will be measured by using a standardised scoring mechanism)

Impact	
Criteria	**Assessment (H/M/L)**
Increase in number of fresh graduates working for the Telecommunications sector	H
Improved employability of fresh graduates	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	M
Resource availability	H
Implementation cost	M
Overall assessment	**M**

6. Action plan

G9: Technical Training Programmes for Emerging Technologies

Root causes	The existing workforce in the Telecommunications sector is not properly equipped with the latest knowledge and technical skills such as IoT, big data, cloud computing , 5G technology and etc. The inability to up-skill the current talent with the right capabilities and competencies could potentially hinder the sector rapid growth.

Desired end-states:
1. Existing workforce has the latest knowledge and technical skills to support the growth of the Communications sector
2. Provide an integrated platform for employees to enhance their knowledge and skills to be at par with the technological evolution

Action steps

1. **Research and analysis on the emerging technologies –** Conduct a thorough research and analysis on the critical competencies required to drive the emerging technologies in the Malaysian Telecommunications sector. The analysis should also include the existing initiatives by other government agencies such as MDeC, to provide indication for the MCMC the type of skills to be prioritised.
2. **Collaboration with the industry players -** Engage several industry players from network operators, service providers, vendors and SMEs to obtain their insights on the type of assistance needed from the MCMC Academy in terms of expertise specific to emerging technologies
3. **Module Development –** Collaborate with the industry experts from educational institutions or industry players to develop a comprehensive training module that will then be verified by the MCMC's subject matter experts.
4. **Training Methodology -** Build training methodology to most effectively deliver the training with an emphasis on interaction and experiential learning to participants. The training will be conducted by those who designed the training module.

Owner	
Educational Institutions	• Academicians with key expertise on certain emerging technologies will provide assistance to develop the training module and conduct the training
Government	• The MCMC needs to identify the critical competencies required to drive the emerging technologies in the Malaysian Telecommunications sector
Industry Players	• Collaborate with the MCMC to outline the type of competencies that will be in demand to support the Telecommunications sector growth, especially for emerging technologies • Subject matter experts are expected to assist in developing the training module and conduct the training

Estimated Duration

Legend: ──── Minimum estimated duration ─ ─ ─ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Number of existing employees that have the latest knowledge and technical skills
2. Industry feedback (Feedback will be measured by using a standardised scoring mechanism)

Impact	
Criteria	**Assessment (H/M/L)**
Number of existing employees that have the latest knowledge and technical skills	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	M
Resource availability	L
Implementation cost	L
Overall assessment	**M**

7. Action plan

G10: Strategically place government agencies' personnel in Telecommunications organisations to increase industry exposure and knowledge driven by Human Capital Development Council and Industry Skills Committee

Root causes	There is a need for government agencies to have industry exposure and understand the industry requirements more in terms of specific talent needs and other human capital development related-matters.

Desired end-states:
1. Full understanding by government agencies on the Telecommunications sector in terms of the sector's demand of talents and its gaps
2. Full collaboration between industry players and government to ensure that talent needs are met and gaps are closed

Action steps

1. **Driving the collaboration between government agencies and industry players –** With Economic Planning Unit (EPU) driving the creation of various platforms to support human capital development in the country, one of the suggested efforts is to ensure that the government agencies' personnel are given the opportunities for secondment at Telecommunications organisations. Through the industry working group committee, this effort is seen as feasible to ensure further collaboration between government agencies and industry players. This is to ensure that the government agency personnel are given the opportunity to develop their expertise when operating in the industry. In addition, an important benefit that can be achieved from this initiative is the understanding of the industry actual needs in terms of talents and current focus of talent developments that the industry players are looking into.

Owner	
Educational Institutions	• N/A
Government	• Driving the industry exposure for government agencies, by placing the personnel in the industry to identify their needs how best the industry can be supported
Industry Players	• Co-operate with Government agencies by sharing their talent needs, human capital development and areas of support required

Estimated Duration

Legend: —— Minimum estimated duration   – – – Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in number of government agencies personnel placed in industry
2. Various collaboration initiatives between Government agencies and industry players

Impact		Implementation effort	
Criteria	**Assessment (H/M/L)**	**Criteria**	**Assessment (H/M/L)**
Increase in number of government agencies personnel placed in industry	H	Complexity	M
		Resource availability	L
		Implementation cost	L
Overall assessment	**H**	**Overall assessment**	**M**

8. *Action plan*

I1: Catalysing the growth of local experts by leveraging on existing foreign expertise	
Root causes	Due to the scarcity of local experts in various technical areas within the Telecommunications sector, network operators and service providers are very dependent on MNCs who provide foreign expertise. This leads to minimum talent pipeline to groom more local experts in the sector. Thus more collaboration with vendors such as transfer of technical competencies to local talents will help to support talent growth and their competencies in the sector.

Desired end-states:
1. Development of local expertise and knowledge sharing culture in Malaysia, leveraging on the existing MNCs' in-house development programme
2. An increase in number of collaborations between top network operators, MNCs and SMEs

Action steps

Action steps	Owner	
1. **Engage and Collaborate with Vendors** – The MCMC will approach and engage MNCs in the Telecommunications sector such as Huawei, Nokia, and Cisco and collaborate with them to create strategic initiatives that support technical competencies transfer to local talent. 2. **Training module development** – Leveraging on MNCs' existing structured in-house development programme to be expanded and applied to transfer knowledge to the SMEs 3. **Facilitate the Partnership Establishment** - Consequently, the MCMC will act as a facilitator to smooth out the partnership establishment between the MNCs and SMEs	**Educational Institutions**	• N/A
	Government	• The MCMC will approach MNCs and collaborate with them to come up with a competencies skill transfer programme • Incentivising the MNCs to develop the programme
	Industry Players	• MNCs collaborate with the MCMC to execute the competencies skill transfer programme • SMEs to commit their full support to up-skill their employees

Estimated Duration   *Legend*: ▬▬ Minimum estimated duration   ▬ ▬ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. An increase in number of collaborations between network operators, MNCs and SMEs

Impact	
Criteria	**Assessment (H/M/L)**
Increase in local experts in the sector	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	H
Resource availability	M
Implementation cost	M
Overall assessment	**M**

9. Action plan

I6: Accelerating the growth of the digital economy	
Root causes	Insufficient collaboration between Telecommunications organisations to accelerate talent growth in the Telecommunications sector.

Desired end-states:
1. Finalised plan to accelerate talent growth in the Telecommunications sector
2. Full collaboration between the industry players to develop talents for the industry at the grassroots level

Action steps

1. **Collaborating between industry players to accelerate talent growth in the Telecommunications sector –**The UK model Tech Partnership is developed to create the skills for a million new digital jobs, removing barriers that impede business growth and generating an additional Gross Value Added (GVA) of USD 13.4 billion. This initiative is spearheaded by established Telecommunications and ICT players such as BT Group, CISCO, Google, HP, IBM, Samsung, Oracle and many other massive organisations in the industry. This can be replicated and driven by the Human Capital Initiative by EPU through the industry working group, where major Telecommunications organisations come together to create an integrated platform to bridge the gap between demand (industry players) and supply (academic) to come up with strategic initiatives in developing human capital planning.

Owner	
Educational Institutions	• N/A
Government	• Driving and facilitating the discussion and efforts to ensure collaboration between industry players
Industry Players	• Creating an integrated platform to bridge the gap between demand (industry players) and supply (academic) to come up with strategic initiatives in developing human capital planning

Estimated Duration

Legend: ▬▬ Minimum estimated duration ▬ ▬ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increased number of new jobs created as a result of the collaboration
2. Number of programmes and initiatives created as part of the collaboration
3. Increased quality of graduates based on industry feedback as a result of the collaboration

Impact	
Criteria	**Assessment (H/M/L)**
Increased number of new jobs created as a result of the collaboration	H
Number of programmes and initiative created as part of the collaboration	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	H
Resource availability	M
Implementation cost	M
Overall assessment	**M**

10. Action plan

C5: Alignment of occupational standard and linking it back to curriculum development

Root causes	Various organisations call the job titles differently. There are no standardised naming convention of any given job titles in the Telecommunications sector.

Desired end-states:
1. Full alignment of job titles in the Telecommunications sector to enable a better management of industry talent needs
2. Linking the aligned job titles to the curriculum development at educational institution level

Action steps

1. **Driving the collaboration between government and industry to define occupational standards –** Government and industry players to come together to define and standardised the naming convention of job roles in Telecommunications sector. Having a defined and standardised occupational standards in Telecommunications sector will allow a full forecasting of roles and skills needed in the industry as compared to having headcounts of only. Furthermore, both the government and the industry players will have the same understanding of the kind of competencies needed for the exact similar job titles as compared to having different job titles.

2. **Linking occupational standards and updating university syllabus –** This will require MQA's approval in re-visiting the programme guideline and how it fits in the industry's framework. Once the occupational standards have been achieved, it can be further leveraged by updating the university courses syllabus to ensure that students are trained to the needs of the industry. Students will be more guided to the roles and career options early on, allowing them to understand the expectations by the industry in terms of skills, capability and knowledge for the specific job role.

Owner	
Educational Institutions	• Updating the courses syllabus from the defined and updated occupational standards used by the industry and the government • Sharing with the students the career opportunities available from the occupational standards
Government	• Human Capital Council to drive the collaboration with the industry to ensure that job titles are defined and aligned accordingly • MQA will need to re-visit the programme guideline according to the occupational standards
Industry Players	• Provide input to the government in defining the job roles as part of aligning occupational standards for Telecommunications sector

Estimated Duration

Legend: ——— Minimum estimated duration   – – – Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Number of job titles defined and aligned through collaboration between the government and the industry players
2. Number of universities that updated the courses syllabus based on the updated occupational standards

Impact	
Criteria	**Assessment (H/M/L)**
Number of job titles defined and aligned	H
Number of courses syllabus updated	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	H
Resource availability	M
Implementation cost	M
Overall assessment	**M**

11. *Action plan*

E5: Exploring and implementing the teaching of computer programming skills and coding in primary and secondary schools

Root causes	Provide programming lessons to children is seen as a long-term solution to the skills gap between the increasing number of technology-related jobs and the talents that are qualified to fill them

Desired end-states:
1. Designed curriculum that incorporates computer programming lessons for primary and secondary school students
2. Ability to provide comprehensive training to teachers
3. Ability to provide IT infrastructure to ensure teaching effectiveness

Action steps

Action steps	Owner	
1. **Curriculum Research and Analysis –** Research and analyse the impact and implications of incorporating programming lessons in the curriculum, i.e. students and teachers' readiness. Further research can be conducted by observing other countries such as the UK and Singapore that have integrated coding in the national curriculum. This analysis will help to draw comparison, and identify areas of improvement if the similar initiative is to be implemented. 2. **Curriculum and Learning Materials -** Based on the outcomes from research and analysis, a detailed and robust curriculum along with materials will be designed i.e. specific and realistic milestones for each learning stage are clearly stated, design materials /textbook to be more experiential in nature ensuring that such materials encourage knowledge retention. 3. **Training Methodology -** Build training methodology to most effectively deliver the training with an emphasis on interaction and experiential learning to teachers 4. **IT Infrastructure -** Identify required IT infrastructure and platform to ensure teaching effectiveness. Develop action plans to ensure every school is equipped with proper facilities	**Educational Institutions**	• Engagement with primary and secondary schools - Gain the opinion and views of the teachers and pupils, i.e. to make sure that the created platform would be accessible for them
	Government	• Ministry of Education needs to engage in research with relevant partners to leverage on the existing curriculum of other countries to come up with curriculum that is tailored to the nation's needs
	Industry Players	• N/A

Estimated Duration

Legend: ⎯⎯ Minimum estimated duration   ⎯ ⎯ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in number of students who are interested to pursue technology-related field

Impact			Implementation effort	
Criteria	**Assessment (H/M/L)**		**Criteria**	**Assessment (H/M/L)**
Updated Curriculum and learning materials	H		Complexity	H
Exposure to technology since young age	H		Resource availability	H
			Implementation cost	H
Overall assessment	**H**		**Overall assessment**	**H**

12. Action plan

E3: Robust industrial training structure

Root causes	Industrial training is conducted as pre-requisite for graduation where there is insufficient encouragement to have industrial training for capability development and improve industry readiness purposes

Desired end-states:
1. Creation of practice of experiential learning among graduates by having more industrial training to ensure that they are ready to join the workforce upon graduation
2. Creation of a nation-wide improved and structured industrial training to ensure the quality of learning experience is provided to the graduates

Action steps

Action steps	Owner	
1. **MQA to include a proper mandatory guideline on the structure of the industrial training -** Elements that need to be incorporated are the standardised duration of the internship, the frequency of lecturers visiting the organisations involved, monthly reporting from students on their tasks and responsibilities, etc. 2. **Expanding MQA's requirement to encourage industrial training placement during the earlier stage of studies**– MQA to include in the programme guideline for the educational institutions to send first or second year students for industrial training placement as a way to obtain relevant exposure in the Telecommunications sector and to harness the students' soft skills. This can be done through part-time internship and structured apprenticeship 3. **ASEAN Internship Exchange Programme –** The MCMC can develop a structured internship exchange programme to other ASEAN countries to give exposure to young talent to new areas in the Telecommunications sector. There has to be a mechanism that will allow an effective transfer of knowledge from the participants once they completed their internship 4. **Facilitating industry-wide implementation of standardised salary for interns –** Ministry of Human Resources (MoHR) should establish a policy to recognise employment rights and standardised salary range for students who perform industrial training placement	**Educational Institutions**	• Educational institutions to update the course syllabus according to the revised programme guideline established by MQA
	Government	• MQA to include a guideline for industrial training to take place effectively. Additionally, to harness students' soft skills, MQA can play a role to encourage industrial training placement during an earlier stage of the students' degrees • The MCMC to drive the ASEAN Internship Exchange Programme to provide opportunities for students to be exposed to new areas in the sector • MoHR to establish a policy on standardised salary for interns
	Industry Players	N/A

Estimated Duration

Legend: ▬▬ Minimum estimated duration ▬ ▬ Maximum estimated duration

Y1				Y2				Y3				Y4				Y5			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Potential target measures:
1. Increase in number of industry ready graduates
2. Industry feedback (Feedback will be measured by using a standardised scoring mechanism)

Impact	
Criteria	**Assessment (H/M/L)**
Increase in industry ready graduates	H
Overall assessment	**H**

Implementation effort	
Criteria	**Assessment (H/M/L)**
Complexity	H
Resource availability	H
Implementation cost	H
Overall assessment	**H**

A brief write-up on other key action plans

3. Moving forward – Action plans
   3.13 Brief writeoup on other key action plans

A brief write-up on action plans that are not considered a main priority for implementation have been developed. There are 15 action plans that have been identified as least prioritised for implementation.

E6

Strengthening Longitudinal Graduates Tracer Study

- There is room for improvement for the existing Graduates Tracer Study in terms of the follow-up frequency and its content
- The information coverage asked in Tracer Study should be robust enough to capture critical information such as the type of industry the students are planning to join upon graduation
- To further enhance the quality of data collected, there has to be a mechanism that allows employers to share data with relevant government agencies in regards to new fresh graduates intake that enter the workforce
- The ultimate objective is to ensure longitudinal tracer studies can be conducted more frequently and be able to capture comprehensive information that will help the Government to put in place strategic actions in developing the human capital requirement in Malaysia

G1

Aligning Professional Certifications To The Needs of the Industry

- There is a need for alignment of various professional certifications available to ensure standardisation and more importantly, fits to the needs of the industry
- One government agency (e.g. HRDF) will require to drive the alignment of ecosystem to avoid multiple list of professional certifications available
- The intent of this alignment is to increase collaboration between different parties (e.g. CCPS, HRDF) in providing a standardised list of professional certification available for up-skilling and re-skilling

G2

Initiating & Expanding R&D Platform for Data-Intensive Research

- The MCMC to launch an open R&D platform for industry players and academic institutions to conduct data-intensive Telecommunications-related research
- Adopted from the Global Lambda Integrated Facility (GLIF), such a platform can bring together key expertise from the industry and academic institutions who can develop a good national Telecommunications infrastructure by identifying connection requirements, equipment as well as necessary engineering services and functions

3. Moving forward – Action plans
3.13 Brief writeoup on other key action plans

G4

Expanding Training Scheme Grants for Overseas Training on Critical Areas For Talent Development Purposes

- The Government may expand their training scheme grants to overseas for critical/special needs areas to enhance the quality of local talents
- The training will focus on critical technical competencies that will be relevant in the next 3-5 years such as core network planning and design, technology solution and evaluation, network function virtualisation, data mining etc.

G7

Improving academic institutions' technological outlook through driving strategic technologies to pave the way for talents in the country by working with education institutions, industry players and NGOs

- Educational institutions, both private and public, should be equipped with well-established laboratory facilities featuring the latest technologies to improve learning experience for the students
- This initiative can be executed by providing financial assistance to the institutions and strategic mechanisms to incentivise the industry players to be part of the effort, as such tax deduction/credit
- For instance, the MCMC can collaborate with network providers to develop discounted bandwidth packages featuring high speed Internet are offered to academic institutions so that the students can make extensive use of e-learning and blended learning activities.

G8

Building an Anti-Discriminatory Partnership Practice Through Policy Creation

- To ensure all educational institutions receive the same level of interaction between the industry players, the Government can draft a policy that prohibits organisations from practicing a discriminative partnership selection. This policy will greatly benefit students from less reputed academic institutions as they will also have the opportunities to gain adequate industry exposure.

3. Moving forward – Action plans
3.13 Brief writeoup on other key action plans

G12

Creating a Publicly Accessible Experiential Centre For Talent Exposure & Development

- The MCMC may launch an initiative to create a state-of-the-art experiential centre which is accessible to students, people from the industry and public
- This centre will be a good platform to bring talents with different backgrounds together in order to conduct research, thereby improving and developing new technologies and their applications
- Furthermore, this centre comprises of innovative exhibition and experiential way of learning about the Telecommunications sector to entice young talents to be interested in joining the Telecommunications sector

G13

Driving a strong partnership between the Government and SME Corp to provide assistance to SMEs in the Telecommunications sector

- The Government can collaborate with SME Corp to develop a strategic plan in providing relevant assistance to SMEs. Examples of assistance are funding for technical training for talents in SMEs specifically for the Telecommunications sector and increase awareness of the availability of talent initiatives conducted by industry players and the Government
- This collaboration can be a strong partnership to develop talents within the SMEs' ecosystem

3. Moving forward – Action plans
3.13 Brief writeoup on other key action plans

I2

Sharing of data driving the nation towards a Smart Nation

- Malaysian industry players need to start developing a data sharing culture as it is widely practised in the UK Telecommunications sector
- The MCMC needs to start a pilot programme whose objective is to change the industry players' mind-sets so that crowdsourced ideas can be generated as a result of open data sharing
- With well established rules and proper guidance by the MCMC, a pilot data sharing programme can greatly benefit the Telecommunications sector and the country as a whole as similar pilot programme has been achieved that in Singapore in the last few years

I3

Enhancing Laboratory Facilities at Academic Institutions

- ICT-related organisations may donate laboratory equipment as part of their CSR programme to improve the laboratory facilities at educational institutions
- The organisations may also offer the laboratory facilities to educational institutions at a discounted price or they can help setting up some educational institutions' on-campus laboratory facilities
- Furthermore, to enhance the students' knowledge on the usage of different laboratory equipment, organisations may invite students to have an educational visit to their in-house laboratories for student to learn and experience

3. Moving forward – Action plans
3.13 Brief writeoup on other key action plans

C1

Creating an Online Database to provide Key Information (jobs, graduates, professional certifications) for the Telecommunications Sector

- The online platform may comprise information for job seekers (e.g. fresh graduates) to get to know more about possible career options in the sector, employers to advertise job vacancies in their organisations and a comprehensive database of key data for the Telecommunications (e.g. number of fresh graduates employed in the sector, list of professional certifications available to up-skill talents, etc.)

C2

Enhancing the Development of Soft Skills to Students and Harnessing Analytical Thinking Capability

- To improve soft skills, a more holistic approach should be implemented starting at primary and secondary school levels. Harnessing soft skills will involve efforts beyond classroom's activities
- Other than extracurricular activities which are already in the current education framework, one of the ways is to provide exposure/platform for students to be involved in organising industry events to harness critical soft skills, such as communication, teamwork and analytical thinking skills

C3

Providing More Recognition to Academicians Through Research and Development for Telecommunications-related projects

- As it is widely practised among U.S. universities, Malaysian academicians will need to take a more larger role in conducting Telecommunications-related projects such as research and development and product commercialisation
- There is a need to establish an endowment chair in universities to provide a sustainable funding to conduct intensive research in producing innovative products and infrastructure for the Telecommunications sector

3. Moving forward – Action plans

3.13 Brief writeoup on other key action plans

C4

Increasing More CSR Projects Such As Telecommunications Field Trips for School Children

- Industry players should organise field trips or a camp based programme as part of their CSR programme for secondary school children so that they get exposed to the Telecommunications sector
- This may spark some school children's interest in Telecommunications-related work
- Therefore, they will be more likely to choose their field of study and work accordingly

Below is the brief write-up on the action plan that is not prioritised in the prioritisation matrix.

G11

Providing a Concentrated Effort To Enhance Innovative and Creativity Mindset Among Graduates & Communication of Education Initiative Milestones to Stakeholders

- Enhancing and creating more platforms to encourage more innovative and creative mind-set among graduates in Malaysia. This includes training them on innovation and creativity, and providing them with visibility from industry leaders for their ideas to be contributed into solving industrial problems
- Providing a continuous communication of milestones on all education related initiatives by the Government to all stakeholders in ensuring that all strategy, progress, updates and objectives met are aligned and agreed which allows a better understanding of the initiatives implemented

Recommendations for the MCMC to develop talents in the sector

3.14 Current practices of the MCMC

Current practice driven by the MCMC

Currently, the MCMC have been playing a role for talent development in particular competency building under the Communications and Multimedia Act. The two (2) key actions under the act is to facilitate the efficient allocation resources such as skilled, labour, capital , knowledge and national assets and to promote the development of capabilities and sills within Malaysia's convergence industries.

Building content competency initiatives

The MCMC have been participating and organising initiatives that are competency driven. One competency that is hugely invested by the MCMC is the content competency development initiatives. The diagram on the right illustrates the current practices that are associated with the MCMC's content competency development initiatives.

A partnership between the MCMC and UTM

The MCMC has signed a MoU between UTM in research and development and human capital development. This initiative focused on four (4) strategic areas, but not limited to, Long Term Evolution (LTE), unification of cellular and broadcasting technologies, multimedia subsystems, Internet protocols in cellular networks and studies related to radio frequency emissions.

The collaboration has embarked a project to build three (3) more technological laboratories at the Wireless Communication Centre (WCC), UTM namely Wireless Industry Emission (WIE) laboratory, Specific Absorption Rate (SAR) laboratory and Radio Frequency and Interference laboratory. In total, 927 man-days of courses took place throughout the year of 2013 involving 285 partakers from the MCMC and the industry.

Bursary for IP creation

- Collaborate with private colleges to develop talent in the creative industry

#MYDD2014

Apps for mobile and Over-the-Top (OTT)

- Platforms to encourage mobile apps development in Malaysia

League of Creative Teens (LoCT)

- Competition aimed at spurring the creation of local content to expose students at secondary level to opportunities on content development in Malaysia

Diagram 3.8: Content competency initiatives

Continuous efforts to improve the quality of service

Meetings on the Improvement of Cellular Coverage were held periodically with cellular network service providers and other network facility providers such as Verticom, Asiaspace, eDotco and others to resolve issues of cellular coverage nationwide.

Additionally, there are a number of large-scale projects for network improvement performed by the MCMC such as Langkawi Coverage Improvement and also Putrajaya Blueprint. The efforts have improved coverage and enhanced the quality of voice and data services through the addition of new communication towers, the introduction of repeaters, network optimisation and more frequent network configuration activities.

3.15 Future directions for the MCMC

What the MCMC can do to drive further the growth of the sector in the future?

Up to date, MCMC have been playing a prominent role in ensuring that the Telecommunications sector achieve tremendous growth from the last few years. Numerous initiatives have been undertaken to support sector and talent development growth. However, there still more that MCMC can do to achieve the Government's aspiration in achieving a high-income nation by 2020.

Suggested recommendations for the MCMC to undertake for the future

Several views from the industry players, educational institutions and government agencies have suggested that the MCMC can be the main driving force to enhance the industry and academia collaboration. It is imperative that the MCMC can provide a platform to encourage collaborations for discussions and finding solutions to resolve talent issues related in the sector. This issue have come up numerous times that there is still a missing void for a party to bring the industry and educational institutions together and facilitate them to find solutions in solving the talent scarcity occurring in the sector. Therefore, the MCMC can play a role in providing the necessary platform to strengthen the partnership between the industry players and educational institutions.

In addition, one of the emerging technological trends that is overtaking the Telecommunications sector is IoT. IoT will be a big part of the sector in the future and the Government is already planning to ensure the country is already strategically investing to drive the IoT ecosystem. The formation of the IoT ecosystem would definitely require government interventions and the MCMC as the regulator for the Telecommunications sector can assist in preparing talents that is aligned to the National IoT Strategic Roadmap. The impact of IoT will be monumental and it is one of the key steps to drive the development of a Smart Nation and eventually Smart Cities around Malaysia. Thus, it is highly recommended that the MCMC can be one of the champions to support and facilitate in talent development of the IoT industry in Malaysia.

Key action steps that the MCMC can consider to drive the growth of the sector

The two (2) key recommended action plans are as follows:

01
Enhance industry & academia collaboration

02
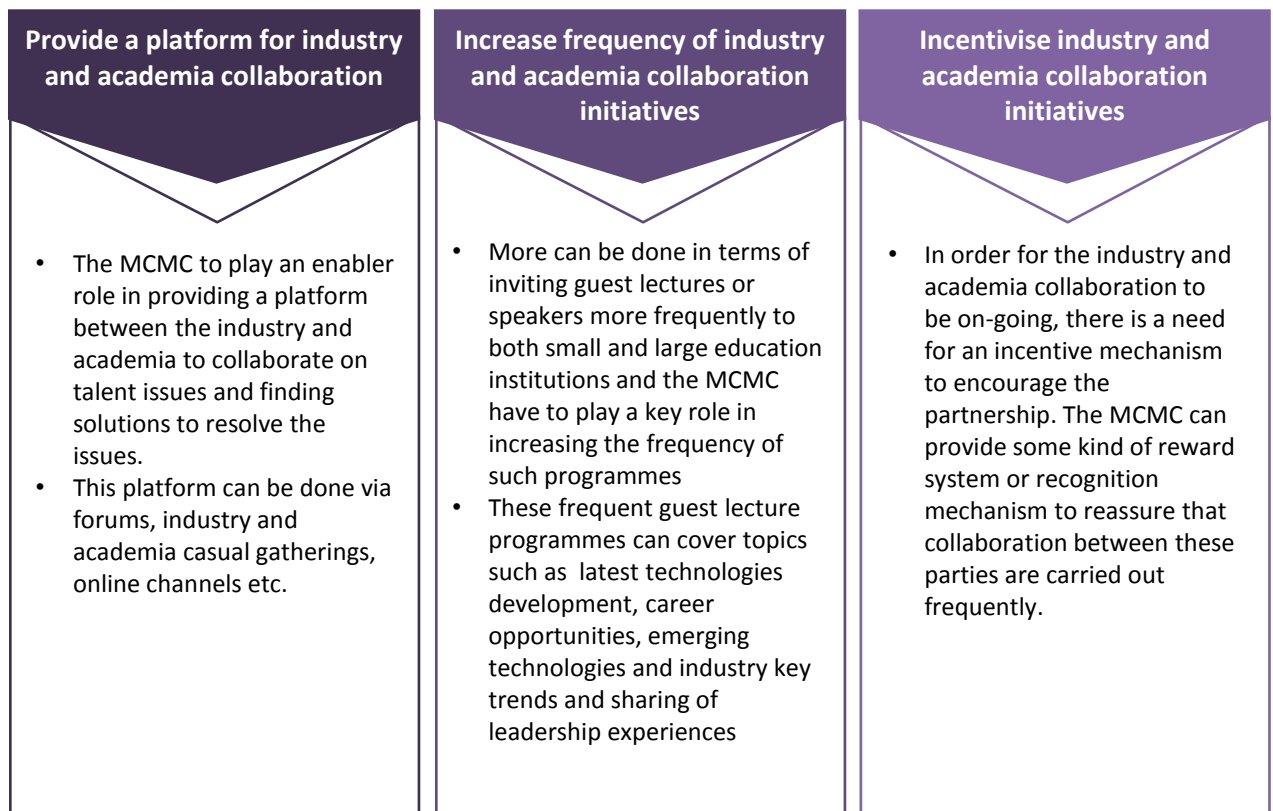*Preparing talents that is aligned to the National IoT Strategic Roadmap (Smart Nation)*

3. Moving forward – Action plans
3.15 Future directions for the MCMC

01

Enhance industry & academia collaboration

Playing a facilitative role in strengthening the partnership between the industry and academia

Industry and academia collaboration encourages research and development to develop products that are innovative to boost Malaysia's economy. Additionally, the strengthening partnership between these two (2) stakeholders ensure that talents coming into the sector are industry ready and possess the relevant skills to the changing trends of the sector. However to ensure that this collaboration is on-going there is a need for the Government to play a central role in bolstering the partnership between the industry and educational institutions. Therefore, this is where the MCMC can play a leading role in providing a platform for industry and academia collaboration. Below depicts the key action steps to consider in the implementation of the suggested recommendation.

Provide a platform for industry and academia collaboration	Increase frequency of industry and academia collaboration initiatives	Incentivise industry and academia collaboration initiatives
• The MCMC to play an enabler role in providing a platform between the industry and academia to collaborate on talent issues and finding solutions to resolve the issues. • This platform can be done via forums, industry and academia casual gatherings, online channels etc.	• More can be done in terms of inviting guest lectures or speakers more frequently to both small and large education institutions and the MCMC have to play a key role in increasing the frequency of such programmes • These frequent guest lecture programmes can cover topics such as latest technologies development, career opportunities, emerging technologies and industry key trends and sharing of leadership experiences	• In order for the industry and academia collaboration to be on-going, there is a need for an incentive mechanism to encourage the partnership. The MCMC can provide some kind of reward system or recognition mechanism to reassure that collaboration between these parties are carried out frequently.

3. Moving forward – Action plans

3.15 Future directions for the MCMC

02

Preparing talent that is aligned to the National IoT Strategic Roadmap
(Smart Nation)

The need for talents in IoT

Within the National IoT Strategic Roadmap, the MCMC is one of the key stakeholders and champions for the IoT Malaysia, who will be responsible for the development of the IoT industry in Malaysia. Being a champion, the MCMC can play a more central role to ensure synergies between the other stakeholders and focus on areas through facilitation of talent preparation to meet the needs of the industry which is critical in driving the IoT ecosystem.

The MCMC's role to facilitate the talent growth in the IoT industry is outlined below. The action items, were designed to create high impact in terms of talent growth and development, in a focused and defined area within the IoT industry.

1

Working with the industry to define the focus for IoT

- Being a big industry, the focus areas of talents development needs to be defined for IoT
- Broad areas such as cyber security, data analytics, data science and machine to machine application development are some of the notable and in-demand skills that the industry needs
- The MCMC needs to work with the industry based on the findings to create a common focus for talent development practices to ensure impact and more importantly, relevance to the industry

2

Facilitating the initiatives of talent development in IoT

- The next step is for the MCMC to facilitate the development of talents within the industry
- This involves working with various government agencies which have already put in place talent development practices to serve various industries, including Telecommunications
- The MCMC can take this opportunity to play the supporting role or an advisory role to the other government agencies in providing qualified talents that meets the needs of the industry

3

Measuring the impact of talent development initiatives

- Ensuring sustainability is equally important to ensure success of the action item
- The MCMC can take the leading role to measure the effectiveness of initiatives in developing talents for the Telecommunications industry, as part of the advisory role
- The results of the measurement can be used to further improve the initiatives, to create continuity of talent development practices as the industry grows

Thank you

Appendices

4

Appendix 1: About the Study

The following presents the background, objectives and approach of this engagement:

Key highlights of the Study

- The Study aims to draw insights on emerging trends impacting talent needs and key skill requirements of local talents. The Study also examines talent shortage issues, attraction and retention practices and provides effective action plans in addressing the talent challenges and issues.

- The Study's findings were based on the following approaches:

  - **Top-down analysis** – Obtained national validated sources to determine the trends observed and the talent landscape in the Telecommunications sector to determine the talent requirements for the future

  - **Bottom-up syndication** – The bottom-up syndication comprise of online surveys, focus interviews and validation workshops for industry (demand side) and educational institutions (supply side)

  - **Desktop research** – Gained understanding of the global and domestic trends relating to industry and talent. Conducted research of the selected countries for comparison on the overview of various graduate training programmes.

Surveys

Who were the survey participants?
Head of HRs are the participants for the demand side whereas Head of Department and Dean of Faculty for the supply side.

What was the survey?
Three (3) surveys catering to educational institutions, training providers and Telecommunications organisations (e.g. SMEs, MNCs, network operators and service providers)

Interviews

Who were the interviewees?
For demand side, interviews were conducted with the Chief Executive Officer (CEO), Managing Director and Chief Technology Officer (CTO).
For supply side, interviews were conducted with Head of Departments and Dean of the Faculty.

Workshops

Who were the workshop participants?
For demand side, Head of HR and CEOs from MNCs, SMEs and network operator and service providers.
For supply side, representatives from different types of educational institutions and training providers.

Appendix 2: List of participating Telecommunications organisations

List of participating Telecommunications organisations

1	Altel Communications Sdn Bhd
2	Aries Telecoms(M) Bhd
3	Asiaspace Sdn Bhd
4	Celcom (M) Bhd
5	Cisco Systems (Malaysia) Sdn Bhd
6	CyberSecurity Malaysia
7	DiGi Telecommunications Sdn Bhd
8	Dimension Data
9	Enabling Asia Tech Sdn Bhd
10	Fiber At Home City Networks
11	Fibrecomm Network (M) Sdn Bhd
12	GTC Global Sdn Bhd
13	HeiTech Managed Services Sdn Bhd
14	Huawei Malaysia
15	IBM Malaysia Sdn Bhd
16	Itel Mobile
17	KUB Malaysia Bhd
18	Maju Nusa Sdn Bhd
19	Maxis Berhad
20	Measat Satellite Systems Sdn Bhd
21	Merchantrade Asia Sdn Bhd
22	mTouche Technology Bhd
23	MyTV Broadcasting Sdn Bhd
24	Nokia Solutions and Networks
25	NTT MSC Sdn Bhd
26	Ohana Communications Sdn Bhd
27	Oscatel Sdn Bhd
28	Packet One Networks Sdn Bhd ("P1")
29	Reach Ten Communications

Appendix 2: List of participating Telecommunications organisations

List of participating Telecommunications organisations	
30	REDtone Telecommunications Sdn Bhd
31	Sacofa Sdn Bhd
32	SAS Institute
33	Setia Haruman Sdn Bhd
34	SKALI (Alam Teknokrat) Sdn Bhd
35	Stealth Solutions Sdn Bhd
36	Tele-flow Corporation Sdn Bhd
37	Telekom Malaysia Bhd
38	Telekom Research & Development Sdn. Bhd
39	TIME dotCom Bhd
40	TS Global Network Sdn Bhd
41	U Mobile Sdn Bhd
42	Visi Cenderawasih Sdn Bhd

Appendix 3: List of participating Educational Institutions and Training Providers

List of participating Educational Institutions and Training Providers

1	ADTEC Batu Pahat
2	ADTEC Kulim
3	ADTEC Melaka
4	Asia e University
5	Curtin University, Sarawak
6	Global Knowledge Network (M) Sdn Bhd
7	HELP University
8	IMS Asia Sdn Bhd
9	InfoSyte Sdn Bhd
10	Info-Trek Sdn Bhd
11	International University of Malaya-Wales
12	INTI International University
13	Kolej Kemahiran Tinggi Mara, Beranang
14	Kolej Komuniti Ampang
15	Malaysia University of Science and Technology
16	Manipal International University
17	Multimedia University Malaysia
18	Network Mileage Sdn Bhd
19	Open University Malaysia
20	Polytechnic Merlimau Melaka
21	Polytechnic Seberang Perai
22	Polytechnic Sultan Azlan Shah
23	Polytechnic Sultan Haji Ahmad
24	Polytechnic Sultan Idris Shah
25	Polytechnic Sultan Mizan
26	Polytechnic Ungku Omar
27	Polytechnic Mersing
28	Polytechnic Muadzam Shah

Appendix 3: List of participating Educational Institutions and Training Providers

List of participating Educational Institutions and Training Providers	
29	SEGi University College
30	Multimedia University
31	Selangor International Islamic College
32	Significant Technologies Sdn Bhd
33	Swinburne University of Technology
34	Taylor's University
35	Tunku Abdul Rahman University College
36	Universiti Utara Malaysia
37	Universiti Islam Antarabangsa
38	Universiti Kebangsaan Malaysia
39	Universiti Malaya
40	Universiti Malaysia Perlis
41	Universiti Malaysia Sabah
42	Universiti Selangor
43	Universiti Teknikal Malaysia
44	Universiti Teknologi Malaysia
45	Universiti Teknologi MARA (UiTM)
46	Universiti Teknologi Pertronas
47	Universiti Tenaga Nasional

Appendix 4: Survey content

Demand Side	
Section: Key Focus Areas	**Survey Questions**

A. Introduction
  • Explanation on scope of survey
  • Key tips for filling out the questionnaire
	Not applicable

B. Organisation and workforce profile
  • General geo-demographic information including location and size
  • General talent composition information (e.g. age, qualification, gender, salaries)
	1. Organisation name
	2. Please select the categories that best describe your organisation and its core business activities in Telecommunications.
	3. Is your organisation considered a small medium enterprise (SME) in your industry?
	4. Please state the total number of employees of your organisation.
	5. Please state the number of employees in your organisation under the following age groups.
	6. Please state the number of Malaysians and non-Malaysians in your organisation.
	7. Please state the number of non-Malaysians at each job level in your organisation.
	8. Please state the number of employees in your organisation based on their highest qualification.
	9. Please select the range that indicates the monthly salary for fresh graduates, of experienced hires at non-executive and executive level, experienced hires at middle management and senior management level in your organisation.
	10. Please state the overall annual attrition rate in percentage (%) of your organisation.

C. Talent composition information
  • Selection of relevant job families and difficulty in hiring
  • Targeted headcount for the next 3 years
  • Other emerging areas in the sector
	11. Please state the number of full time employees for relevant job families and what is the level of difficulty in hiring.
	12. What other emerging areas (apart from cloud computing and big data analytics) do you foresee will impact your organisation?

D. Competency framework	13. Based on the previously selected job families, please state the technical competencies that are relevant to your organisation needs, its envisioned relevance in the future. 14. Information and network security is an area of concern in the Telecommunications sector globally. Is there a specific department/division designated to focus on information and network security?

Appendix 4: Survey content (Demand Side)

Demand Side	
Section: Key Focus Areas	**Survey Questions**
E. Key challenges faced during recruitment and retaining talent	15. What attributes that your organisation sees as important when recruiting talent? 16. For each statement, please select the level of difficulty faced by your organisation during the recruitment process. 17. What is the average turnaround time in recruiting talent? 18. Please state the top three (3) non-technical competencies that are most important for your organisation. 19. Please select initiatives implemented to create an ideal working environment in the last 12 months to retain and attract talent.
F. Efforts in developing existing talent	20. Please specify efforts undertaken to develop existing employees to ensure that they have the right skills to support current and future needs.
G. Growth and attractiveness of the Communications sector	21. Please select the top three (3) factors that drive growth in the Malaysian Telecommunications sector. 22. Please select the top three (3) factors that attract individuals to join the Telecommunications sector.
H. Suggested actions to support talent growth in the sector	23. Please state actions taken by your organisation to support talent growth in the Telecommunications sector.

Appendix 4: Survey content (Supply Side for Educational Institutions)

Supply Side for Educational Institutions	
Section: Key Focus Areas	**Survey Questions**
A. Introduction • Explanation on scope of survey	Not applicable
B. Organisation profile • Name of institution • Type of institution	1. Please state the name of your institution. 2. Is your institute public or private? 3. What is the status of your institution? 4. What type of programmes does your institution currently offers?
C. Number of graduates and new student intake	5. Please select the degree programmes that your institution currently offers, indicate the number of graduates for academic year 2012, 2013 and 2014 and the estimated number of new students for 2015. 6. Please select the diploma programmes that your institution currently offers, please indicate the number of graduates for academic year 2012, 2013 and 2014 and the estimated number of new students for 2015. 7. Please select Professional Certification programmes in the area of Telecommunications that your institution currently offers, indicate the number of certified professionals for academic year 2012, 2013 and 2014 and the estimated number of new certified professionals for 2015.
D. Structure of existing courses to meet industry needs	8. How often is the Telecommunications-related course syllabus at your institution reviewed? 9. Since the last review of the syllabus, were there any new courses introduced at your institution? 10. Besides complying with MQA requirements, how do you develop syllabuses that are aligned to the industry requirements? (i.e. Best-in-Class Practice, Consultation dialogue with industry, etc.) 11. Please state if there has been any engagement with industry players conducted by your institution in 2014. 12. Please specify the total number of industry engagements carried out in 2014. 13. Has your institution organised guest lecturer programmes/ industry speakers to expose students to current industry insights? 14. At your institution, is it mandatory for students to undertake industrial training placement? 15. What is the estimated percentage of students who successfully secured industrial training placement in Telecommunications-related companies in 2014?

Appendix 4: Survey content (Supply Side for Educational Institutions)

Supply Side for Educational Institutions

Section: Key Focus Areas	Survey Questions
D. Structure of existing courses to meet industry needs (cont'd)	16. What is the estimated percentage of students who successfully secured industrial training placement in Telecommunications-related companies in 2014? 17. In your opinion, do you agree that students gain the relevant knowledge, experience and skills during their industrial training? 18. Does your institution assist students to secure of a job before graduation? (i.e. via career fairs held in the institution, etc.).
E. Challenges in attracting students and maintaining the quality of the programmes offered	19. For each statement below, please state if you agree with the reasons that attract students to join the Telecommunications sector. 20. For each statement below, please state the level of difficulty faced when undertaking the following actions to produce industry ready graduates. 21. In your opinion, are there adequate avenues for students with innovative mind-set enrolled in Telecommunications-related programmes to share and develop their ideas commercially?
F. Channels used to attract interest in the Communications related courses	22. Please select the top three (3) methods/initiatives that are effective to attract potential students to join the Telecommunications-related courses program at your institution.
G. Job opportunities after graduation	23. Does your institution undertake tracer studies within one year of graduation? 24. Please state if your institution undertakes follow-up tracer studies? 25. Please state if your institution undertakes follow-up tracer studies within 2 years/3 years/4 years/5 years of graduation.
H. Inputs to support talent growth within the sector	26. What is the percentage of graduates successfully able to secure a job within 6 months of graduation in 2014? 27. Please select the top 3 actions that your institution has accomplished to support talent growth in the Telecommunications sector.

Appendix 4: Survey content (Supply Side for Training Providers)

Supply Side for Training Providers

Section: Key Focus Areas	Survey Questions
A. Introduction • Explanation on scope of survey • Key tips for filling out the questionnaire	Not applicable
B. Organisation profile • Name of institution • Type of institution	1. Please state the name of your institution. 2. Is your institute public or private? 3. What is the status of your institution? 4. What type of programmes does your institution currently offers?
C. Number of graduates and new student intake	5. Please select Professional Certification programmes in the area of Telecommunications that your institution currently offers, indicate the number of certified professionals for academic year 2012, 2013 and 2014 and the estimated number of new certified professionals for 2015.
D. Structure of existing courses to meet industry needs	6. How often is the Telecommunications-related course syllabus at your institution reviewed? 7. Since the last review of the syllabus, were there any new courses introduced at your institution? 8. Besides complying with MQA requirements, how do you develop syllabuses that are aligned to the industry requirements? (i.e. Best-in-Class Practice, Consultation dialogue with industry, etc.). 9. Please state if there has been any engagement with industry players conducted by your institution in 2014. 10. Please specify the total number of industry engagements carried out in 2014. 11. Has your institution organised guest lecturer programmes/ industry speakers to expose students to current industry insights? 12. At your institution, is it mandatory for students to undertake industrial training placement? 13. What is the estimated percentage of students who successfully secured industrial training placement in Telecommunications-related companies in 2014?

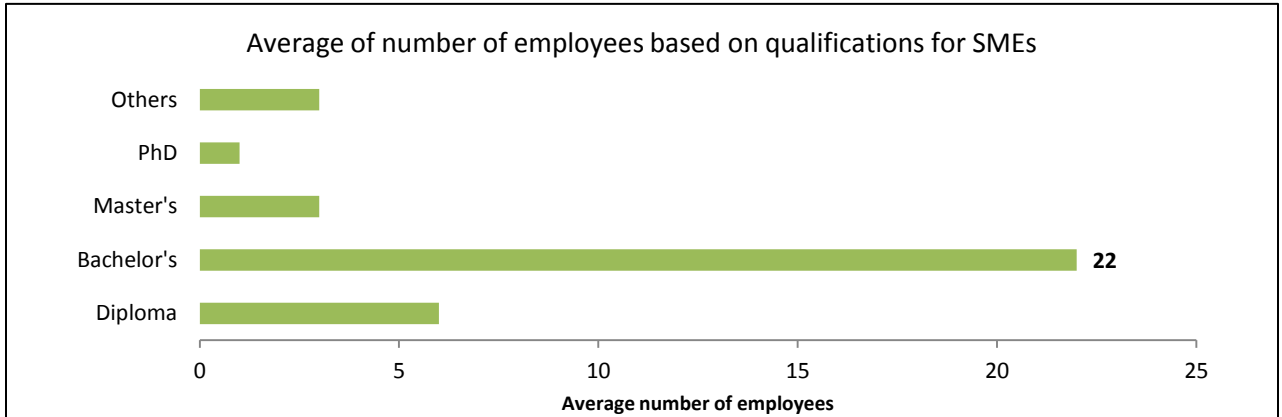Appendix 4: Survey content (Supply Side for Training Providers)

Supply Side for Training Providers	
Section: Key Focus Areas	**Survey Questions**
D. Structure of existing courses to meet industry needs (cont'd)	14. What is the estimated percentage of students who successfully secured industrial training placement in Telecommunications-related companies in 2014? 15. In your opinion, do you agree that students gain the relevant knowledge, experience and skills during their industrial training? 16. Does your institution assist students to secure a job before graduation? (i.e. via career fairs held in the institution, etc.).
E. Challenges in attracting students and maintaining the quality of the programmes offered	17. For each statement below, please state if you agree with the reasons that attract professionals to up-skill in the Telecommunications sector. 18. For each statement below, please state the level of difficulty faced when undertaking the following actions to produce industry ready graduates. 19. In your opinion, are there adequate avenues for students with innovative mind-set enrolled in Telecommunications-related programmes to share and develop their ideas commercially?
F. Channels used to attract interest in the Communications related courses	20. Please select the top three (3) methods/initiatives that are effective to attract potential students to join the Telecommunications-related courses program at your institution.
G. Inputs to support talent growth within the sector	21. What is the percentage of graduates successfully able to secure a job within 6 months of graduation in 2014? 22. Please select the top 3 actions that your institution has accomplished to support talent growth in the Telecommunications sector.

Appendix 5: Survey findings for demand side (Industry)

(These findings are obtained from survey responses)

Small Medium Enterprises (SME)

Average of number of employees based on qualifications for SMEs

Qualification	Average number of employees
Others	~3
PhD	~1
Master's	~3
Bachelor's	**22**
Diploma	~6

x-axis: Average number of employees (0, 5, 10, 15, 20, 25)

Job Level	Average Range of Monthly Salary (Basic Salary)
Senior Management (Senior management consists of the Chief Executive Officer, business function head and business sub-function head)	RM 12,001 – RM 16,000
Middle Management (Middle management consists of team leaders, managers and senior managers who report directly to senior management)	RM 8,001 – RM 10,000
Executive (Executives consist of professionals who report directly to middle management)	RM3,001 – RM 5,000
Non-executive (Non-executives consist of employees who are experienced and not a degree holder)	< RM3,000
Fresh graduates with Bachelor's	RM 2,501 – RM 3,500
Fresh graduates with diploma	RM 1,500 – RM 2,500

Appendix 5: Survey findings for demand side (Industry)

(These findings are obtained from survey responses)

Multinational Companies (MNC)

Average number of employees based on qualifications for MNCs

Qualification	Average number of employees
Others	~10
PhD	~2
Master's	~5
Bachelor's	**135**
Diploma	~22

(X-axis: Average number of employees, 0 to 160)

Job Level	Average Range of Monthly Salary (Basic Salary)
Senior Management *(Senior management consists of the Chief Executive Officer, business function head and business sub-function head)*	RM 16,001 – RM 20,000
Middle Management (Middle management consists of team leaders, managers and senior managers who report directly to senior management)	RM 10,001 – RM 12,000
Executive (Executives consist of professionals who report directly to middle management)	RM3,001 – RM 5,000
Non-executive (Non-executives consist of employees who are experienced and not a degree holder)	RM3,001 – RM 5,000
Fresh graduates with Bachelor's	RM 2,501 – RM 3,500
Fresh graduates with diploma	RM 1,500 – RM 2,500

Appendix 5: Survey findings for demand side (Industry)

(These findings are obtained from survey responses)
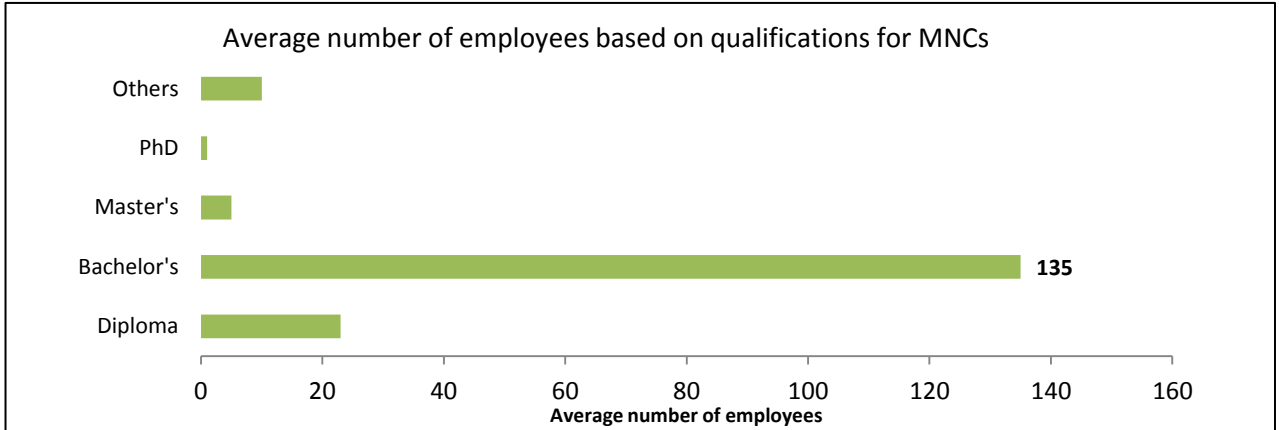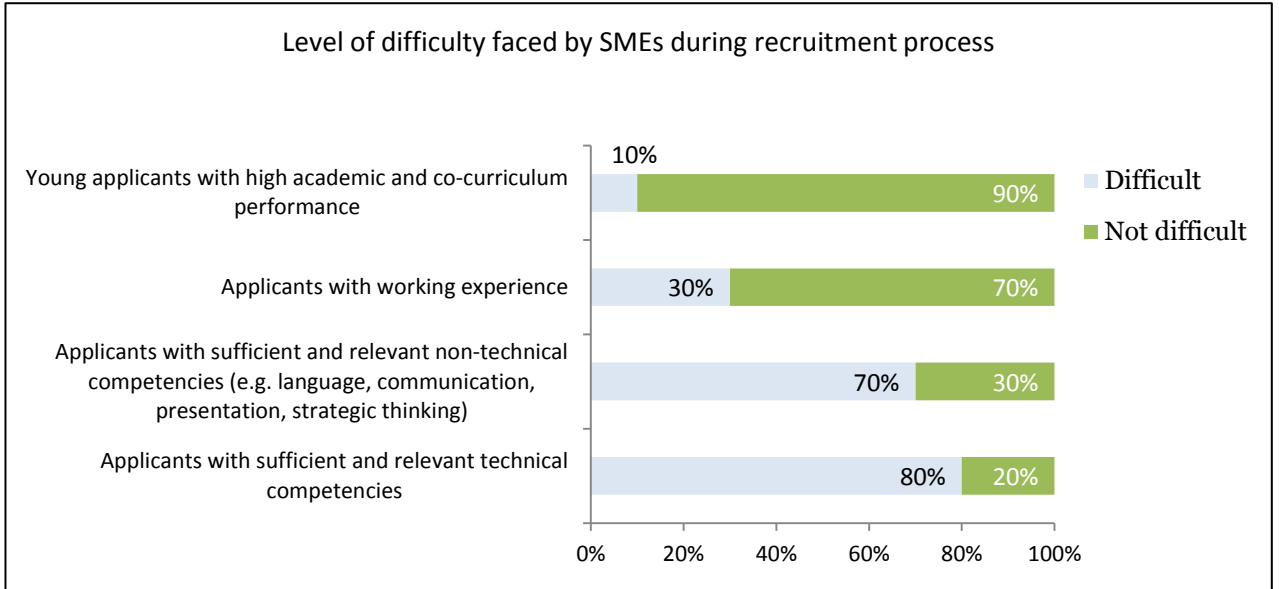
Small Medium Enterprises (SME)

Level of difficulty faced by SMEs during recruitment process

Young applicants with high academic and co-curriculum performance — Difficult 10%, Not difficult 90%

Applicants with working experience — Difficult 30%, Not difficult 70%

Applicants with sufficient and relevant non-technical competencies (e.g. language, communication, presentation, strategic thinking) — Difficult 70%, Not difficult 30%

Applicants with sufficient and relevant technical competencies — Difficult 80%, Not difficult 20%

Multinational Companies (MNC)

Level of difficulty faced by MNCs during recruitment process

Young applicants with high academic and co-curriculum performance — Easy 100%

Applicants with the required years of relevant experience — Easy 100%

Applicants with sufficient and relevant non-technical competencies (e.g. language, communication, presentation, strategic thinking) — Difficult 67%, Easy 33%

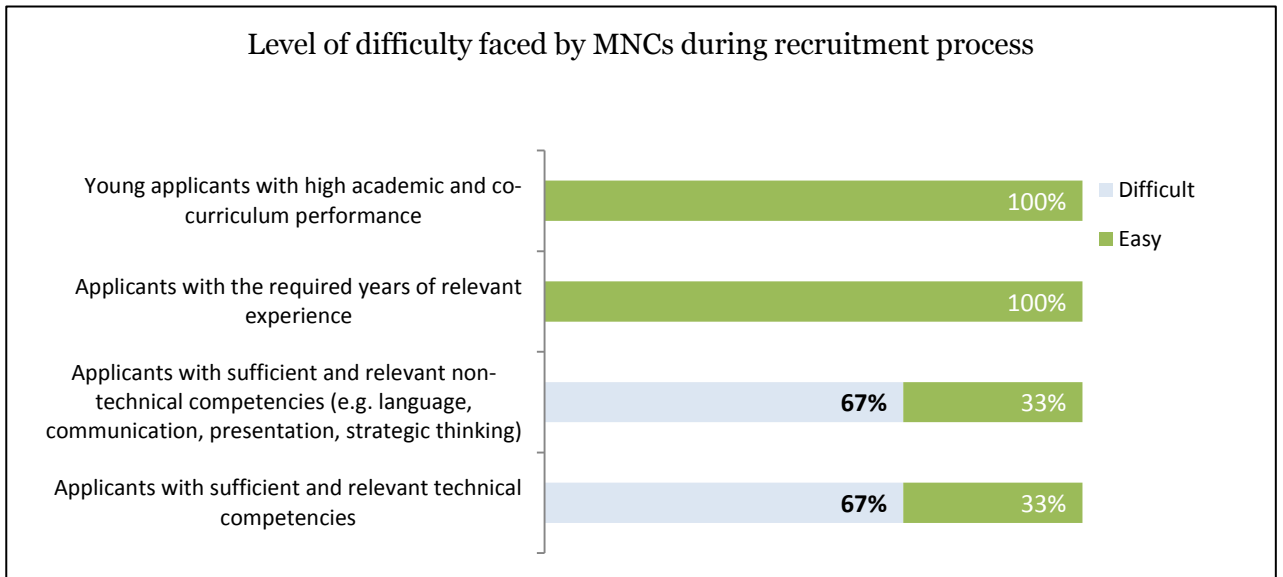Applicants with sufficient and relevant technical competencies — Difficult 67%, Easy 33%

Appendix 5: Survey findings for demand side (Industry)

(These findings are obtained from survey responses)
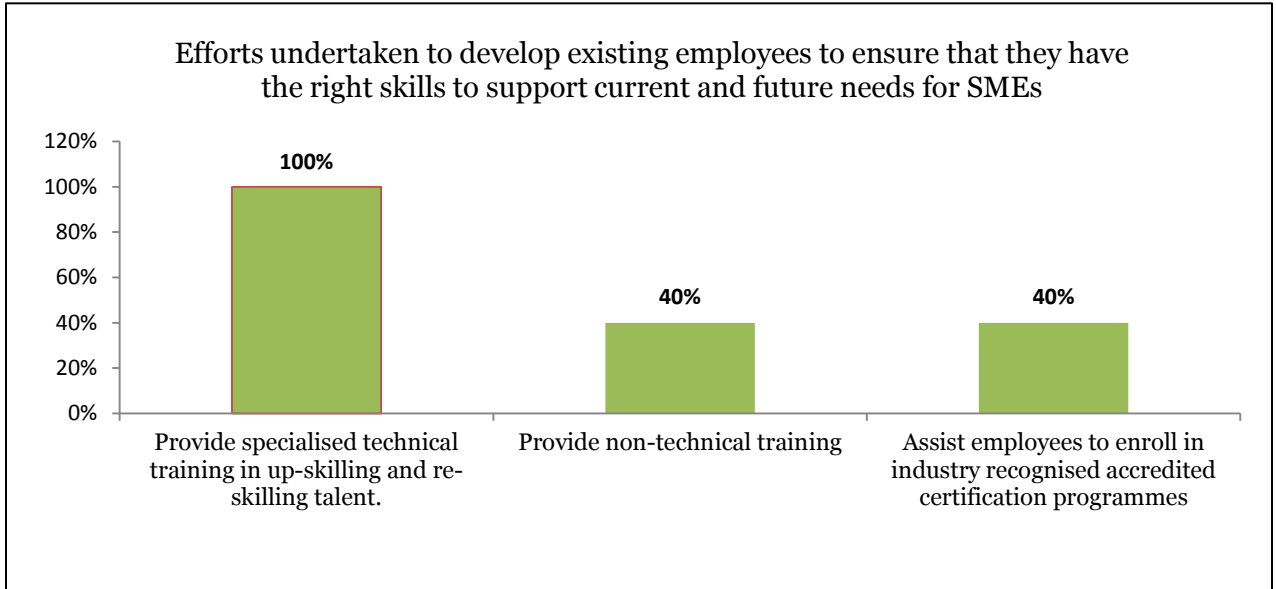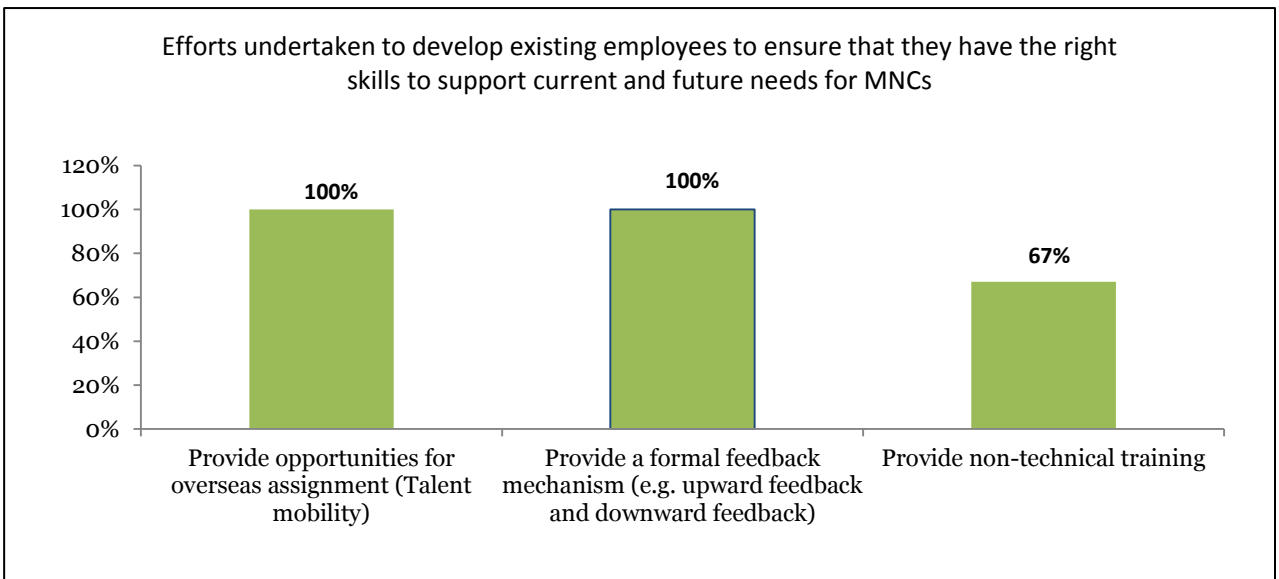
Small Medium Enterprises (SME)

Efforts undertaken to develop existing employees to ensure that they have the right skills to support current and future needs for SMEs

- Provide specialised technical training in up-skilling and re-skilling talent. — **100%**
- Provide non-technical training — **40%**
- Assist employees to enroll in industry recognised accredited certification programmes — **40%**

Multinational Companies (MNC)

Efforts undertaken to develop existing employees to ensure that they have the right skills to support current and future needs for MNCs

- Provide opportunities for overseas assignment (Talent mobility) — **100%**
- Provide a formal feedback mechanism (e.g. upward feedback and downward feedback) — **100%**
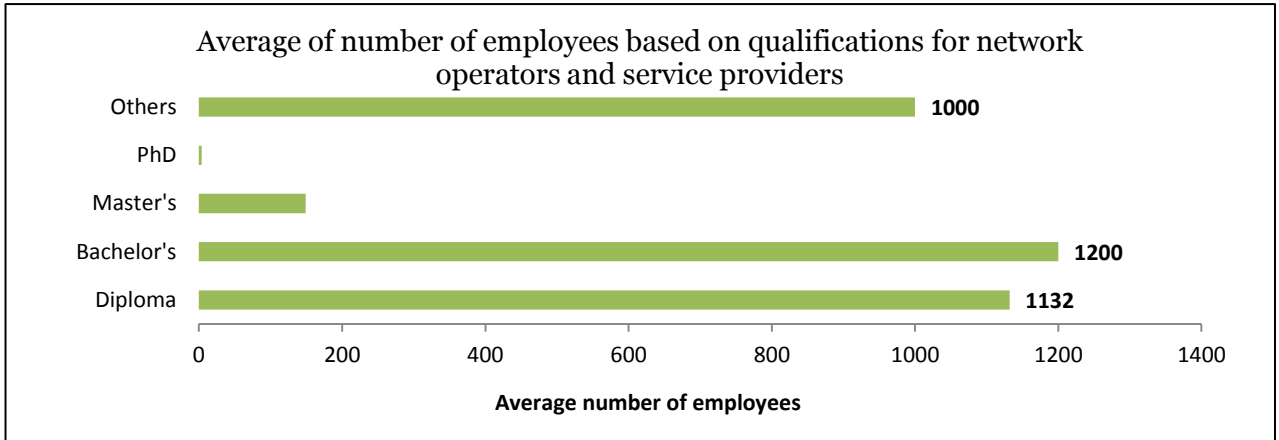- Provide non-technical training — **67%**

Appendix 5: Survey findings for demand side (Industry)

(These findings are obtained from survey responses)

Network operators and service providers

Average of number of employees based on qualifications for network operators and service providers

Qualification	Average number of employees
Others	1000
PhD	
Master's	
Bachelor's	1200
Diploma	1132

Average number of employees

Job Level	Average Range of Monthly Salary (Basic Salary)
Senior Management *(Senior management consists of the Chief Executive Officer, business function head and business sub-function head)*	RM 20,001 – RM 24,000
Middle Management *(Middle management consists of team leaders, managers and senior managers who report directly to senior management)*	RM 10,001 – RM 12,000
Executive *(Executives consist of professionals who report directly to middle management)*	RM3,001 – RM 5,000
Non-executive *(Non-executives consist of employees who are experienced and not a degree holder)*	< RM3,000
Fresh graduates with Bachelor's	RM 2,501 – RM 3,500
Fresh graduates with diploma	RM 1,500 – RM 2,500

Appendix 5: Survey findings for demand side (Industry)

(These findings are obtained from survey responses)

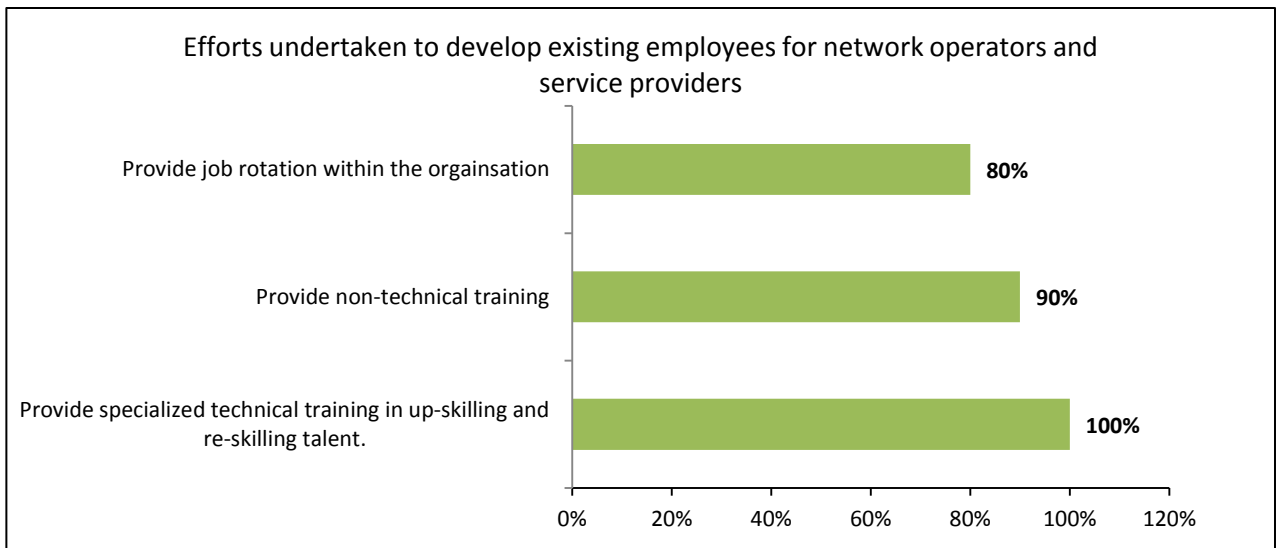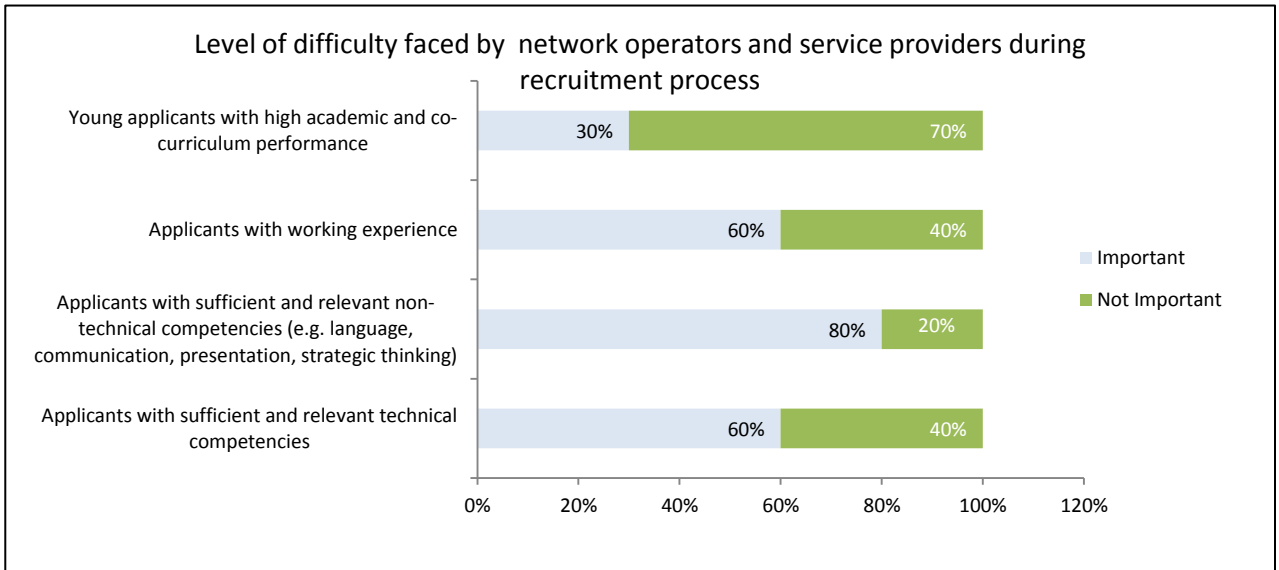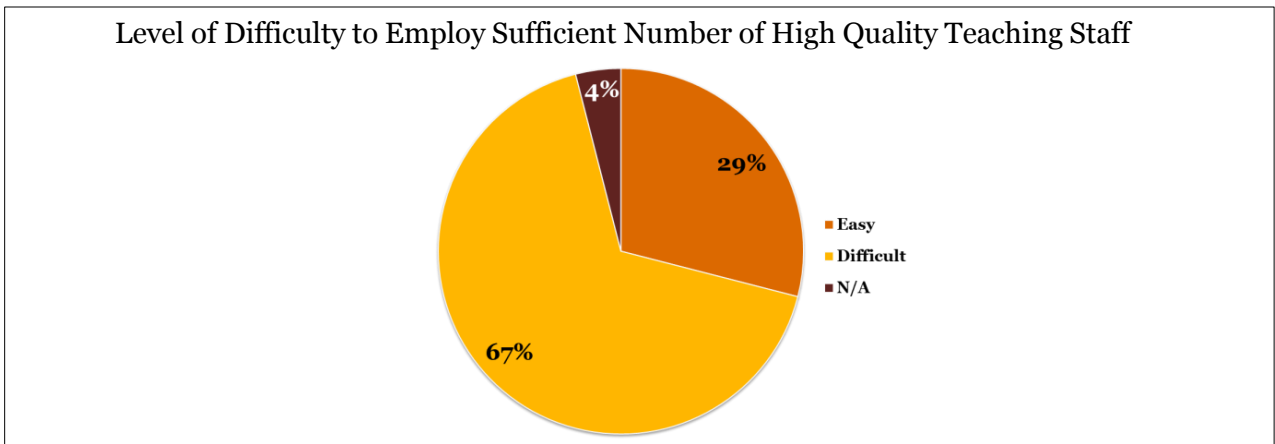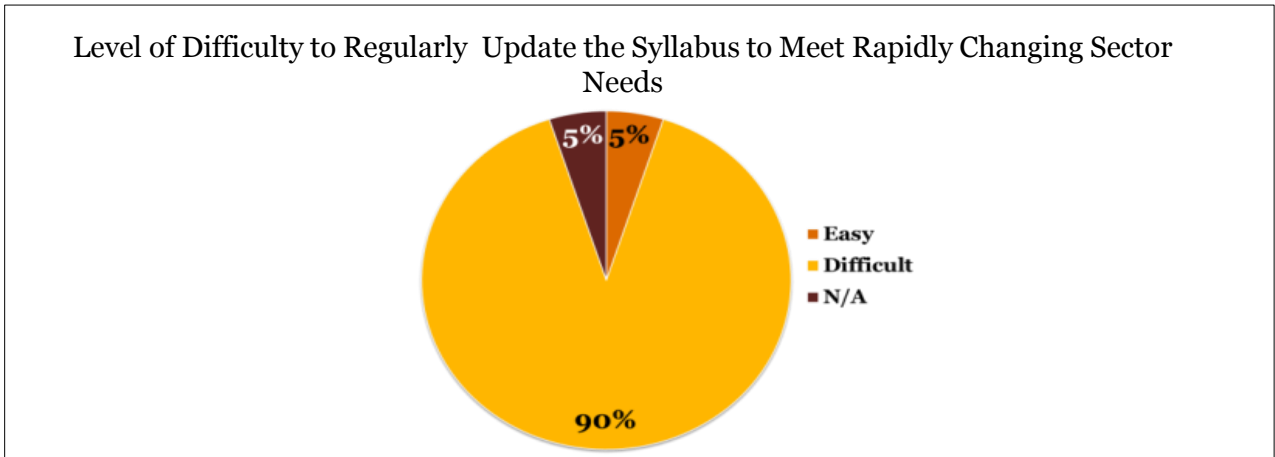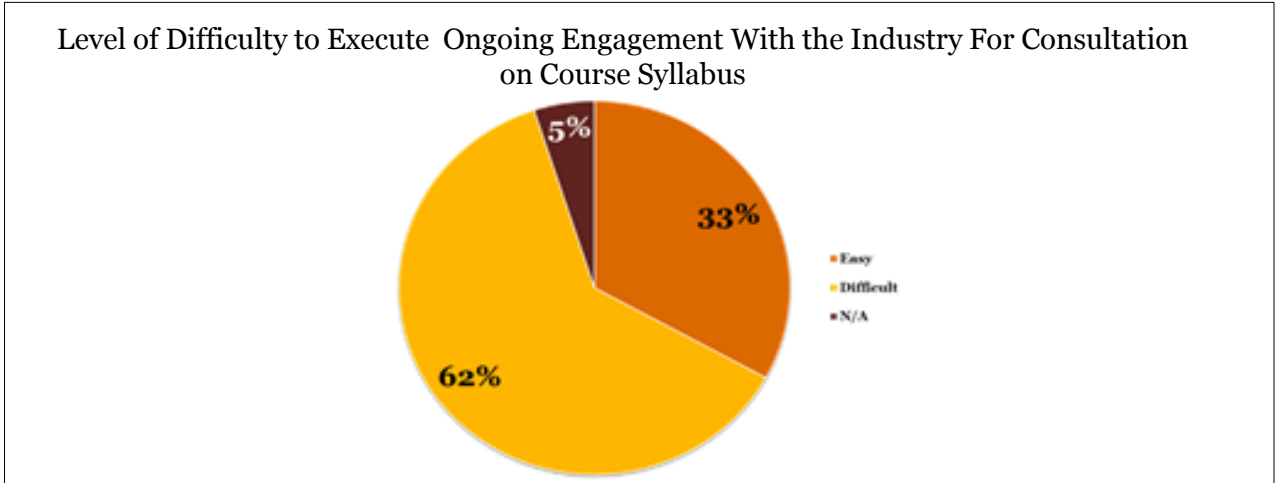## Network operators and service providers

Level of difficulty faced by network operators and service providers during recruitment process

Category	Important	Not Important
Young applicants with high academic and co-curriculum performance	30%	70%
Applicants with working experience	60%	40%
Applicants with sufficient and relevant non-technical competencies (e.g. language, communication, presentation, strategic thinking)	80%	20%
Applicants with sufficient and relevant technical competencies	60%	40%

Efforts undertaken to develop existing employees for network operators and service providers

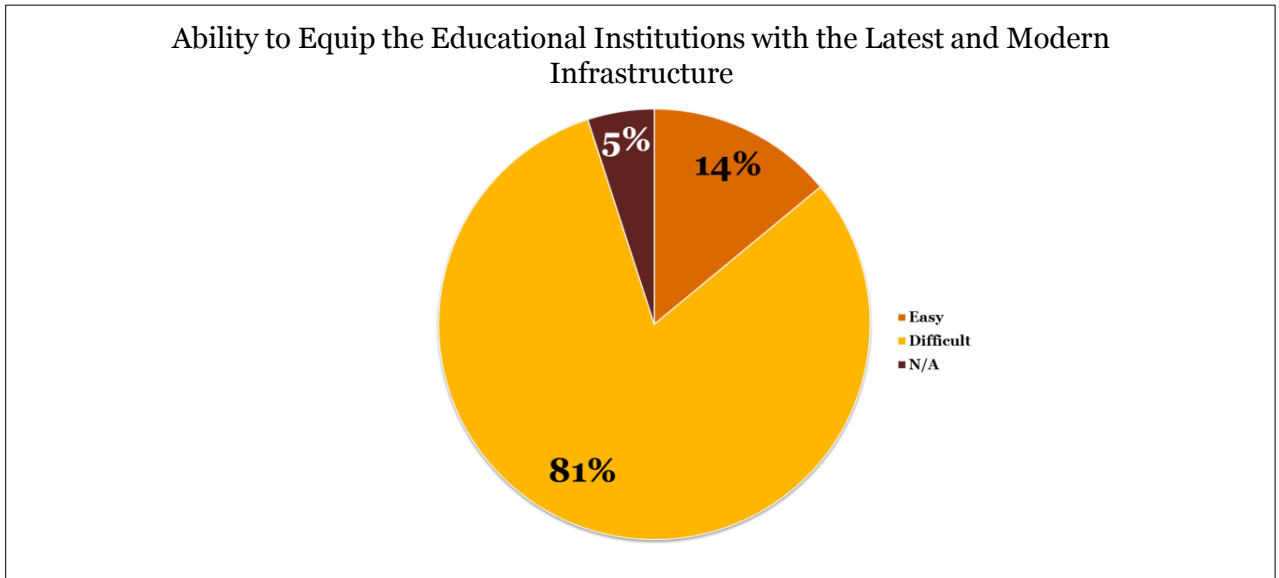| Effort	Percentage
Provide job rotation within the orgainsation	80%
Provide non-technical training	90%
Provide specialized technical training in up-skilling and re-skilling talent.	100%

Appendix 5: Survey findings for supply side (Educational Institutions)

(These findings are obtained from survey responses)

Level of Difficulty to Execute Ongoing Engagement With the Industry For Consultation on Course Syllabus

5%
33%
62%

- Easy
- Difficult
- N/A

Level of Difficulty to Regularly Update the Syllabus to Meet Rapidly Changing Sector Needs

5% 5%
90%

- Easy
- Difficult
- N/A

Level of Difficulty to Employ Sufficient Number of High Quality Teaching Staff

4%
29%
67%

- Easy
- Difficult
- N/A

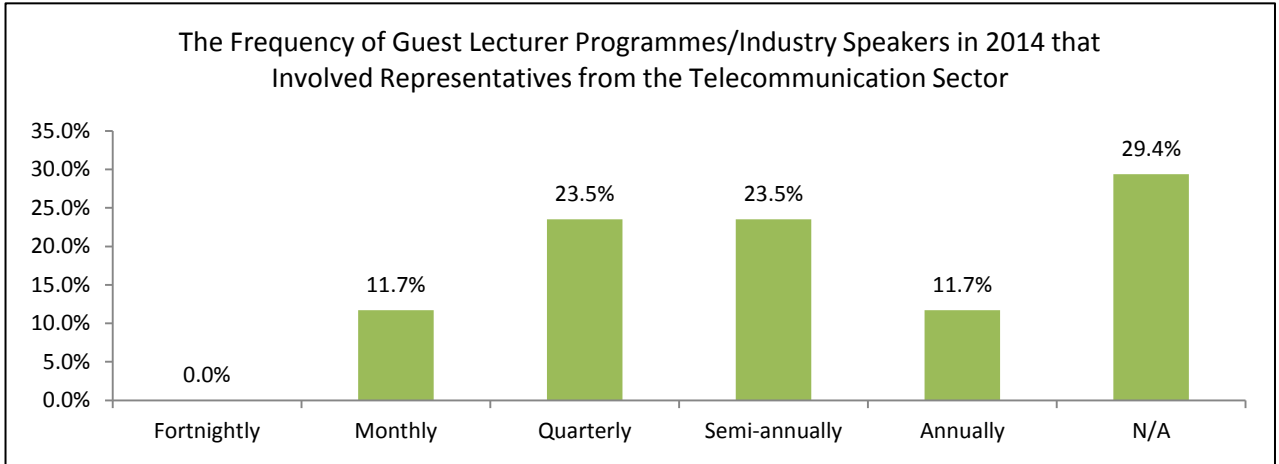Appendix 5: Survey findings for supply side (educational institutions)

(These findings are obtained from survey responses)

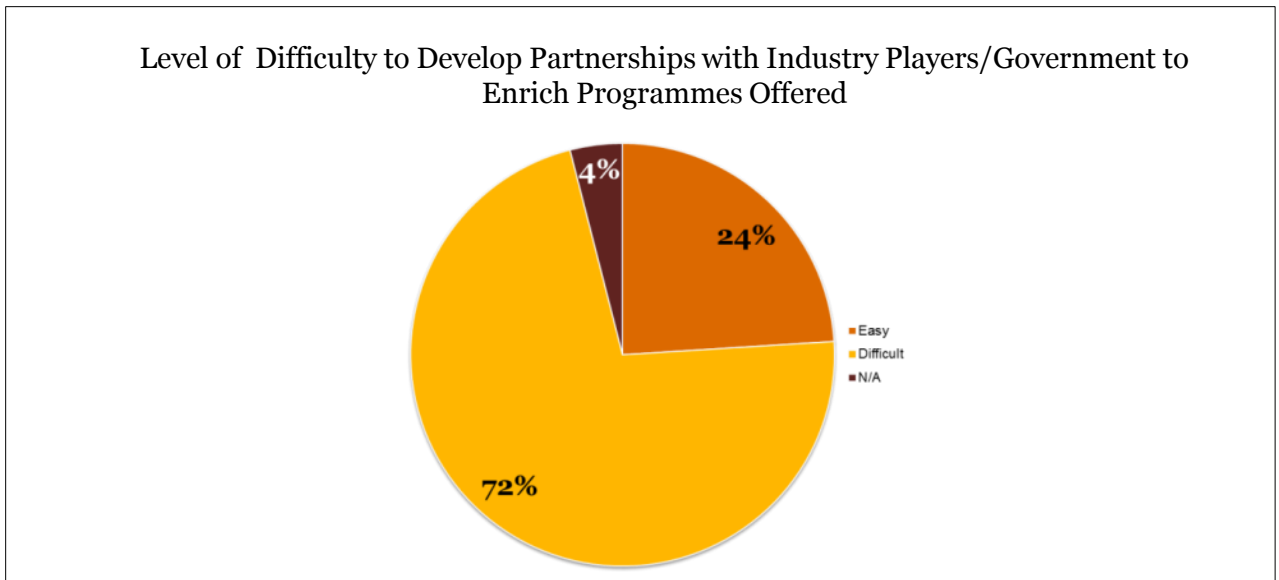**The Frequency of Guest Lecturer Programmes/Industry Speakers in 2014 that Involved Representatives from the Telecommunication Sector**

Category	Percentage
Fortnightly	0.0%
Monthly	11.7%
Quarterly	23.5%
Semi-annually	23.5%
Annually	11.7%
N/A	29.4%

Ability to Equip the Educational Institutions with the Latest and Modern Infrastructure

- Easy: 14%
- Difficult: 81%
- N/A: 5%

Appendix 5: Survey findings for supply side (educational institutions)
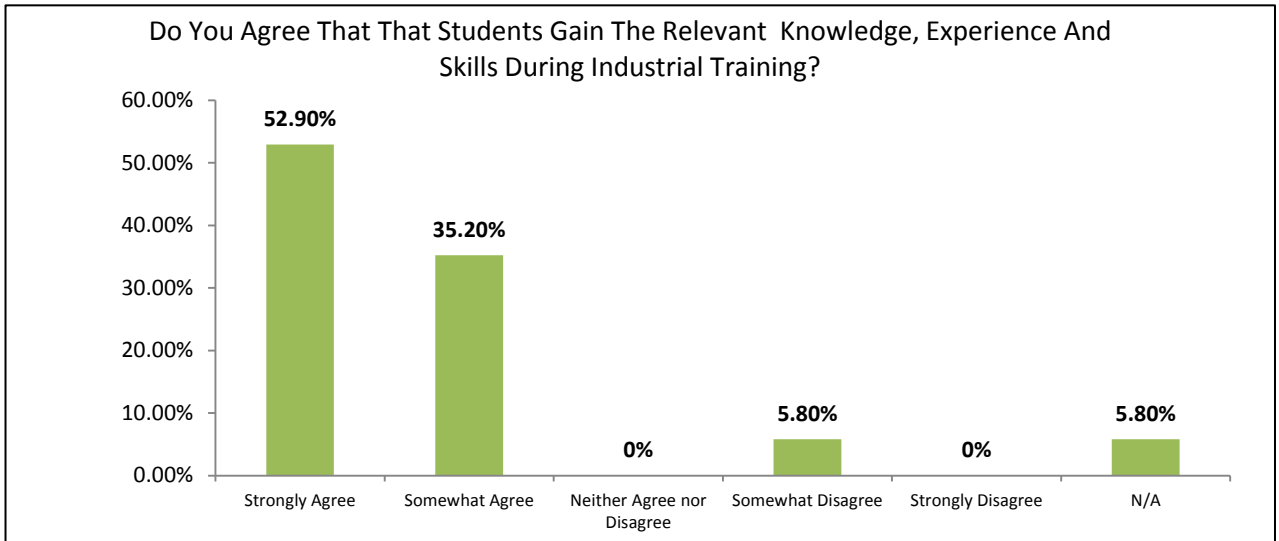
(These findings are obtained from survey responses)

Do You Agree That That Students Gain The Relevant Knowledge, Experience And Skills During Industrial Training?

Category	Percentage
Strongly Agree	52.90%
Somewhat Agree	35.20%
Neither Agree nor Disagree	0%
Somewhat Disagree	5.80%
Strongly Disagree	0%
N/A	5.80%

Level of Difficulty to Develop Partnerships with Industry Players/Government to Enrich Programmes Offered

Category	Percentage
Easy	24%
Difficult	72%
N/A	4%

Appendix 6: Comparison of attrition rate across various industries

Industry	Annual Attrition Rate (Year)
Financial Services	14% (2014)[1]
Manufacturing	24% (2013)[1]
Conglomerates	14% (2013)[1]
Business process outsourcing	19% (2013)[1]
Hotels and Restaurants	32.4% (2011)[2]

Appendix 7: Good practices from benchmarking countries

India

In India, close to 2.8 million people directly and almost another 7 million people indirectly are employed in the Communications sector, which accounts for more than 8% of the total population. In terms of the popularity of the Communications sector among graduates, IT (Information Technology) and ITeS (Information Technology enabled Services) is the most preferred one for the engineering graduates in India. The reason being the higher degree of availability of jobs in this sector coupled with attractive pay packages at time.

UK

The UK, 98,000 students were accepted on to STEM undergraduate courses from 2013-2014, the highest level ever recorded. The massive number of STEM students being produced is potentially translated to the growth of the UK Communications sector.

Talent Landscape

The U.S. shows a large pool of Communications workforce with a total of 8.6 million people. However, it is reported that the median annual wages for electronics engineers in the top five industries employing these engineers is lowest in the Communications sector, therefore making the communications sector to be less attractive for new graduates to enter the sector

South Korea

In South Korea, it is reported that talent with cloud and security experience are in demand in South Korea . From the talent supply perspective, the number of doctoral degree graduates for engineering programmes had increased by 46.8%, from 2,078 in 2008 to 3,050 in 2012 . Although STEM has been getting more attention from the Korean society, this does not reflect their interest towards STEM-related careers .

USA

Talent Drivers

Exposure from Early Age to Spark Interest in Pursuing ICT-related Field

New National Curriculum – Coding at School

UK

Who is involved?

Industry

Who is involved?

Government

Educational Institution

To inculcate interest in ICT related field among the young generations, TechFuture Girls, for example, is a project that aimed to cultivate interest in technology among girls aged 10-14. The materials are designed in close collaboration with employers, and teach universally applicable skills like coding, cyber security, data management and video editing, but are themed around girls' interests, like music, sport or fashion. This is a dedicated project to ensure a diverse workforce in the UK digital industry. Hewlett Packard, British Telecom, National Grid and Oracles were the sponsors for the project which has allowed 20,000 schools to access the materials for free.

Teaching programming skills to primary and secondary students is seen as a sustainable long-term solution to the skills gap between the increasing number of technology-related jobs in the UK and the talent qualified to fill them. The country will become the first nation in the world to mandate computer programming in primary and secondary schools. There are three distinct stages for the new computing curriculum, where stage 1 will involve 5-6 year-olds, stage 2 is targeted to 7-11 year olds and the last stage is for 11-14 year-olds. By the end of stage 1, the expected outcomes include the ability to create and debug simple programmes. Followed by stage 2, students will learn how to design and write programmes, along with the understanding to use logical reasoning to detect and correct errors in algorithm. In stage 3, students will be expected to understand Boolean logic and the various hardware and software component that make up computer systems.

Talent Drivers

Engaging 1 million STEM mentors to inspire young generations

Intel's science and math teachers initiative

USA

Who is involved?

Industry

US2020 is an organisation with objective to increase the number of STEM professionals mentoring and teaching students via experiential projects , in particular for girls and low-income children. US2020 together with its founding partner, Cisco Systems, had successfully held the first STEM Mentoring Week in April 2015, involving more than 600 Cisco STEM professionals mentoring around 500 students. Research has shown that having adult role models provides academic and emotional benefits for students, particularly at-risk youth. Therefore STEM Mentoring Week is uniquely positioned to address the primary barriers to pursuing STEM careers: lack of exposure to STEM and lack of connections to STEM professionals.

Who is involved?

Industry   Educational Institiution

In conjunction with President Obama's "Educate to Innovate" Campaign, Intel had announced a10-year, USD 200 million commitment to advance education in math and science. Intel provides training to more than 100,000 math and science teacher for the first three years. The involved teachers will undergo an intensive 80-hour professional development math course along with receiving new web-based instruction and collaboration tools.

Talent Drivers

Equip Educational Institutions with Network Infrastructure

NTIPRIT - A One-Stop Centre to Upskill Current Talent in the Telecommunications Sector

India

Who is involved?

Government

Educational Institution

The Ministry of Human Resource Development has launched an initiative called "The National Mission on Education through Information and Communication Technology" (NMEICT) which aims at improving the teaching and learning process of ICT-related educational institutions by providing broadband connections to more 2,000 polytechnics and more than 25,000 colleges. Furthermore, optical fibre connectivity will also be provided to more than 400 universities nationwide.
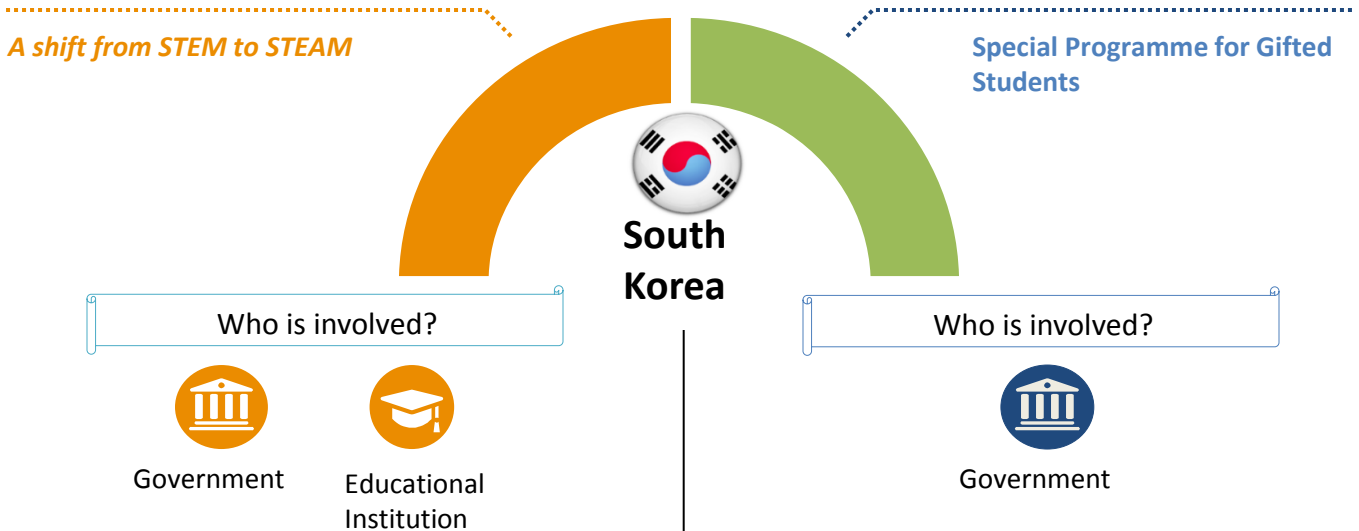
Who is involved?

Government

NTIPRIT was established in the year 2010 as the National Telecom Academy, the telecommunications training Institute of Department of Telecommunications. The purpose of this academy is to build on existing talent capability in the Telecommunications sector. The training courses are designed with a fit for purpose intention, based on the existing capability of the talents. Some of the courses conducted by NTIPRIT are as follows:

Courses	Details
Induction Courses	For directly recruited ITS officers of the Department of Telecommunications
Mid Career Training Programs	To equip the officers to handle new responsibilities arising out of change in the nature of their job as envisaged in the National Training Policy
Specialised Courses	In the field of Advanced technologies, Telecom enforcement & monitoring, etc.
Seminar/ Workshops	For senior officers on technological trends, telecom policy & regulation, etc.

Talent Drivers

A shift from STEM to STEAM

Special Programme for Gifted Students

South Korea

Who is involved?
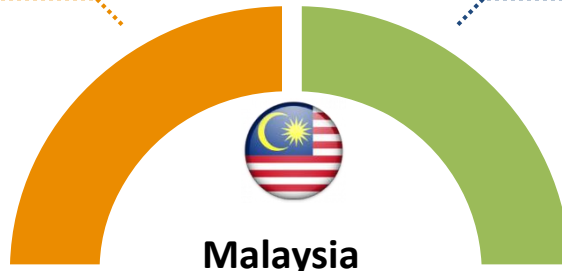
Government

Educational Institution

In 2011, the South Korean government took a slightly different approach by integrating the art element to STEM and as a result, STEAM education was introduced. The rationale of the STEM remodelling was because both mathematics and science education were too far from real-life applications. STEM lessons can be dry and are therefore unable to spark students' interest to explore the STEM-related field. STEAM education aims to inculcate the innovative thinking by emphasising on "problem-solving, deduction and communications skills".

Who is involved?

Government

To recognise outstanding talent during early childhood, the government has created a "Comprehensive Plan for Discovering and Educating Talented and Gifted Youth in Science". The identified gifted students will enrol in special classes/schools and will be taught by instructors who have met certain requirements.

Talent Drivers

Increase of Malaysian Data Scientist

Talent Related Initiatives by MCMC[2]

Malaysia

Who is involved?

Government

Educational Institution

Currently, Malaysia has only 80 data scientists in the Malaysian data analytics industry. However, the target is to have 1,500 data scientists by 2020. Therefore, in order to meet this target, the Multimedia Development Corporation (MDec) announced that seven private and public institutes of higher learning (IHLs) in Malaysia are going to offer courses in data science to working professionals, university students, and graduates so that they pursue a career in data analytics. The institutes that offer these newly introduced data science course are Malaysia Multimedia University, Asia Pacific University, International Islamic University Malaysia, Monash University, Sunway University, Universiti Teknologi Petronas, and University Institute Technology Mara. Furthermore, MDeC also awarded product development and commercialization funds (PCF) to five (5) local companies in order to encourage the development and commercialisation of Big Data Analytics (BDA) solutions.

Who is involved?

Government

The Fulbright – MCMC Grant

The MCMC has signed an agreement with the Malaysian – American Commission on Educational Exchange (MACEE) to offer specialized Fulbright grants for Malaysians and Americans in the field of communications. The programme allows selected Malaysian and U.S. citizens to become eligible for scholarships to study, conduct research, or exercise their talents abroad. It continues to seek to achieve the objectives of facilitating and promoting the development of capability and skills for the Communications industry.

MoU Between MCMC-UTM in Research and Development (R&D) and Human Capital Development

The collaboration has embarked a project to build three (3) more technological laboratories at the Wireless Communication Centre (WCC), UTM namely Wireless Industry Emission (WIE) laboratory, Specific Absorption Rate (SAR) laboratory and Radio Frequency and Interference laboratory. One of the outcomes of this MoU is the successful implementation of a variety of communications technology related courses in collaboration with the MCMC Academy.

Innovative Approaches in Developing Talent to Support Technology Growth

The objective of TechHire initiative is to empower Americans with the skills needed, through universities and community colleges but also non-traditional approaches that can rapidly train workers for a well-paying job, often in just a few months

Tech Partnership is a growing network of employers collaborating to create the skills for a million new digital jobs, removing barriers that impede business growth and generating an additional Gross Value Added of USD 13.4 billion

K-workers Development initiative has taken a 360 degree approach to ensure all potential segments that include fresh graduates, working professionals, students and teachers are tapped to be groomed as the right talent for ICT sector

HRDKorea functions as a one-stop centre to support for workers' lifelong education across all sectors. Through this initiative, the capability gaps can be addressed effectively as it promotes sustainability in enhancing skills by providing required support, to keep up with rapid technology growth, as such in Telecommunications sector

The Telecom Sector Skill Council (TSCC) collaborated with industry players showcases the talent to relevant recruiters and so provides a 360 degree resolution. This creates an ever-ready group of talents which is capable of serving in the industry. It creates a bigger impact as the talents are groomed and trained based on the demands of the telecommunications companies and their requirements

Innovative Approach

TechHire Initiative

Tech Partnership

Human Resources Development Service of Korea

K-workers Development Initiative

Telecom Sector Skill Council