



MINISTRY OF
COMMUNICATIONS

NATIONAL ICT MANPOWER MASTERPLAN

FOR **BRUNEI DARUSSALAM**

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Abbreviations and acronyms

AAB AITI Accredited Business Status

AITI Authority for Info-communications Technology Industry of Brunei Darussalam

BEDB Brunei Economic Development Board

CS Computer Science

EGNC E-Government National Centre

FTTH Fibre-To-The-Home

GDP Gross Domestic Product

HD Higher Diploma

HND Higher National Diploma

HR Human Resources

ICT Information and Communications Technologies

IDA Infocomm Development Authority of Singapore

IDC International Data Corporation

IT Information Technology

MNC Multi National Corporation

MOC Ministry of Communications

MOOC Massive Open Online Course

PAC Programme Advisory Committee

PR Permanent Residents

SME Small and Medium-sized Enterprises

YDP Youth Development Programme

Glossary

Agile

Agile is a software development movement that emphasizes self-organizing, cross-functional teams which uses adaptive, and evolutionary development approaches in order to respond to rapid requirement changes. Examples of agile software development methodologies include Scrum, eXtreme Programming.

DevOps

DevOps is a portmanteau of “development” and “operations”. According to Gartner, DevOps was born of the need to improve IT service delivery agility. Underpinning DevOps is the philosophy found in the Agile Manifesto, which emphasizes people (and culture) and seeks to improve collaboration between operations and development teams and shorten product release cycles.

Hackerspace

A place in which people with an interest in computing or technology can gather to work on projects while sharing ideas, equipment, and knowledge

ICT Industry

Refers to an industry sector whose main activities include the production, distribution, repair and maintenance of computer/telecommunication hardware, software and services.

ICT Professional

Refers to people employed in the delivery of ICT services. These people can be in the ICT industry as providers of services or in other industry sectors which consumes ICT services.

Maker movement

A cultural trend that places value on an individual's ability to be a creator of things as well as a consumer of things

Skills mismatch

The type or level of skills is different from that is required to perform the job adequately

Technopreneur

An entrepreneur who makes innovative use of technology to create a new product or service. Once the person succeeds in it, he/she exploits his/her achievement in the market to make money.

1

Executive Summary

Since the 8th National Development Plan (2001 – 2005), **Information and Communications Technologies or ICT had been identified as one of the key catalyst** that Brunei Darussalam can harness for the socio-economic development of the nation.

The National IT Strategic Plan (IT2000) outlined three (3) core strategies around e-Government, e-Business and e-Brunei to drive the usage of ICT across the different sectors of the country. Since then, considerable progress had been made which

includes the setting up of organization such as EGNC (2000) and AITI (2003) to steer the implementation of the strategies, liberalization of the telecommunication/ broadcast market and to support ICT capability and capacity building in Brunei. Although significant steps

have been taken, more needs to be done to address the on-going challenges facing the ICT sector in order to attain the goals of economic diversification and sustainable development articulated under Wawasan 2035.

Key Issues

The major challenge which drove the requirement to develop this Masterplan is the limitations of the current ICT manpower capacity in the country. The analysis of the current ICT manpower, coupled with feedback from the industry and education institutions have shown several key issues to be addressed. They are:

1 Limited perception of an ICT career. Clarity on career options, opportunities and rewards of ICT careers and the types of competencies needed to progress in the careers are not well understood.

2 Lack of data on ICT manpower. Data such as the number of current ICT professionals, demand and type of skills required by the ICT industry are not readily available. This makes it challenging to ensure a proper match between the supply and demand for ICT manpower.

3 Skills gap and mismatch in the ICT talent pool. Although Bruneians are supported by a well-rounded education system, misalignment in skills and competencies are prevalent, which is one reason why companies are hiring foreigners.

4 Domestic demand for ICT services remains weak, with a high reliance on public sector ICT projects. Although internationalization and export of ICT products and services are an important pillar to create a vibrant ICT industry, it cannot fully supplant domestic demand, especially with an under-developed ICT industry.

National ICT Manpower Masterplan

Recognizing these issues National ICT Manpower Masterplan, a National ICT Manpower Masterplan is proposed for Brunei Darussalam as a means to overcome the challenges and to enable ICT as a major pillar for economic growth. To measure success, the strategic goal is to grow the number of skilled ICT professionals to 6,000 by creating 1,800 additional jobs in ICT by 2020.

Strategic Goal	To grow the number of skilled ICT Professionals to 6,000 by creating 1,800 additional jobs by 2020			
Desired Outcomes	ICT as an attractive career option for Bruneians	Highly skilled ICT professionals with industry relevant competencies	Vibrant Bruneian ICT industry as a source of employment	
Strategies	S1 Attracting Bruneians to ICT careers	S2 Developing "industry-ready" ICT graduates	S3 Deepening the existing ICT talent pool	S4 Creating opportunities for ICT employment
Programmes	P1.1 ICT Possibilities Programme P1.2 Youth ICT Network P1.3 Discover and Excite P1.4 National ICT Scholarships P1.5 ICT Manpower Portal	P2.1 ICT Skills Roundtable P2.2 Structured Workplace Internship P2.3 Enhanced Youth Development Programme P2.4 Enhanced Overseas Internship INSPIRE	P3.1 ICT Industry Competency Framework P3.2 Critical ICT Skills Upgrade Programme P3.3 Overseas Talent Programme P3.4 Review Labour Policies for Foreign ICT Professionals	P4.1 ICT for SME Programme P4.2 ICT Savviness Programme for SME P4.3 Enhanced Absentee Payroll Support P4.4 Government Procurement Dialogue
Enablers	E1 Pilot niche MOOC programmes as part of tertiary curriculum E2 Growing Hobbyist Developers E3 National ICT Manpower Supply E4 Graduate Employment Data Collection Framework			

Figure 1 Proposed National ICT Manpower Masterplan

The Masterplan have also identified three (3) desired goals as important proxies to the proposed **strategic target of 1,800 additional jobs**. These three (3) desired goals are:

- 1** Making ICT as an attractive career option for Bruneians;
- 2** Developing highly skilled ICT professionals with industry relevant competencies; and
- 3** Creating a vibrant ICT industry in Brunei Darussalam as a source of employment.

To attain the desired goals, four strategies with twenty-one (21) different programmes and initiatives are proposed. These strategies are:

- 1** Attracting Bruneians to ICT careers: This strategy focuses on creating a better understanding and perception of the ICT profession, the type of jobs available in ICT amongst students and ICT professionals.
- 2** Developing "industry-ready" ICT graduates: This strategy aims to develop industry-ready ICT students who are capable of meeting

the current and future needs of the economy.

- 3** Deepening the existing talent pool: This strategy seeks to enhance the existing capabilities of the domestic ICT talent pool as well as to improve the hiring of selected foreign ICT professionals.
- 4** Creating opportunities for employment: This strategy seeks to create more opportunities for ICT employment by expanding the scope and adoption of ICT usage in both the government and private sector.

2

**ICT Manpower
Landscape in Brunei
Darussalam**

2.1

Background

Understanding the current ICT manpower landscape is critical in developing the National ICT Manpower Masterplan. The purpose is to determine the key stakeholders that are affected by or can influence ICT manpower development in Brunei, what were the main issues they were facing and their aspirations and desired outcomes for ICT manpower development in Brunei Darussalam.

A series of interviews and workshops were held in August 2014 and a national ICT manpower survey was conducted from September to November 2014 to obtain the required data and information. The selected findings for the ICT manpower landscape are found in the following sections.



2.2

Profile of Brunei Darussalam's current ICT manpower landscape

For the fiscal year of 2014/2015, BND \$31.5 million or 2.7% of the development budget of BND \$1.15 billion had been allocated for ICT related expenditures while the Ministry of Communications allocated approximately BND \$84 million. Based on available

statistics, the ICT industry accounts for less than 2% to the overall GDP in Brunei Darussalam.

With this backdrop, Brunei's current estimated ICT manpower now stands at 4200, and a demand of up to 1,300 ICT professionals in the

next five years. (See Figure 2). According to data from the statistical authority in Brunei (JPKE), the estimated total workforce was 201,474 in 2011. This means that the ICT manpower forms roughly 2% of the total workforce.

Brunei's current estimated ICT manpower now stands at **4200**, and a demand of up to 1,300 ICT professionals in the next five years.

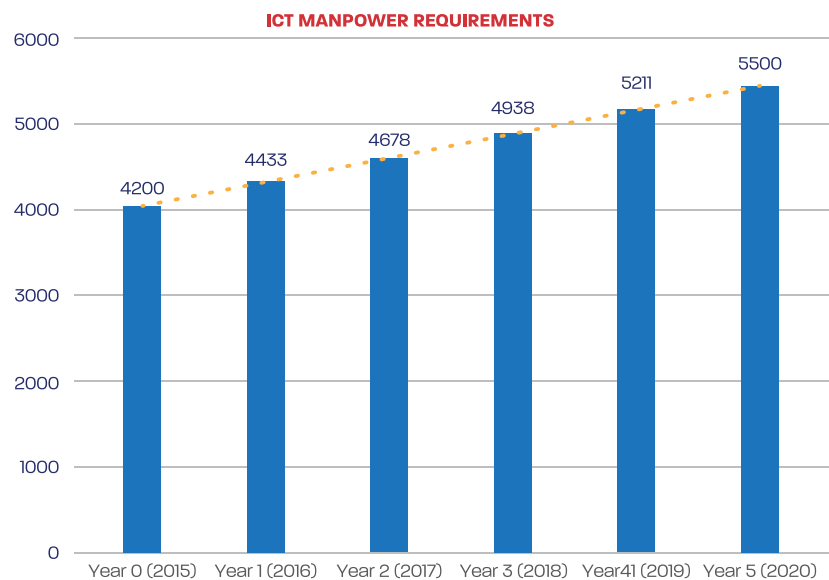


Figure 2 Requirement for ICT manpower in the next five years

¹ From Million to Billion: National Development Plan needs to be successful, URL: <http://www.brudirect.com/0-national/features/features-legco-2014/item/379-from-million-to-billion-national-development-plan-needs-to-be-successful>

² The estimated current number of ICT manpower is computed based on 1,667 ICT professionals from the sample of 807 companies in the survey. The computation takes into account the total number of 6,764 companies in Brunei and applies a weightage based number of employees in the company. The estimated future requirements is based on 2,301 ICT manpower provided by the same sample of 807 companies in the survey and computed based on a similar formula.

The estimates are indicative figures computed on a ceteris paribus basis, with the assumptions on unchanged macro-economic and ICT industry conditions.

³ Brunei Darussalam Key Indicators 2014, Release 1: Half Year, URL: http://www.depd.gov.bn/download/BDKI/BDKI2014_R1.pdf

2.2

The ICT workforce is well educated, with **83% holding tertiary qualifications** (See Figure 3) and 90% with 10 years of experience (See Figure 4).

CURRENT ICT MANPOWER BY QUALIFICATIONS

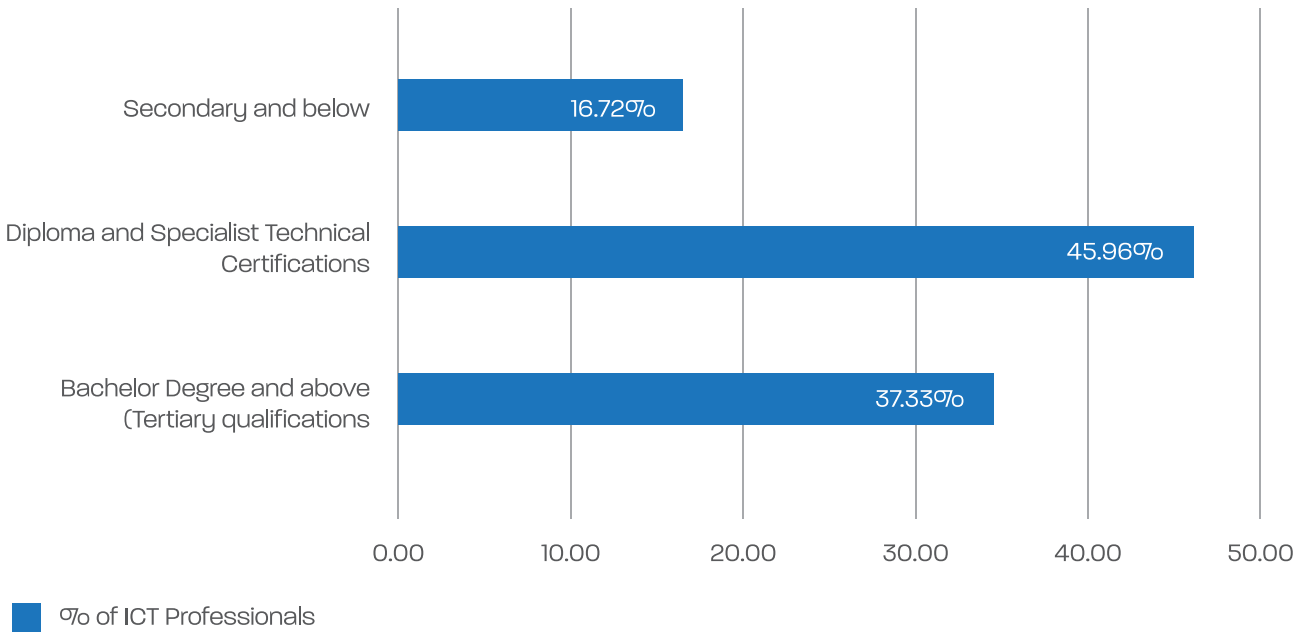


Figure 3 Current ICT manpower by education qualifications

CURRENT ICT MANPOWER BY YEARS OF EXPERIENCES

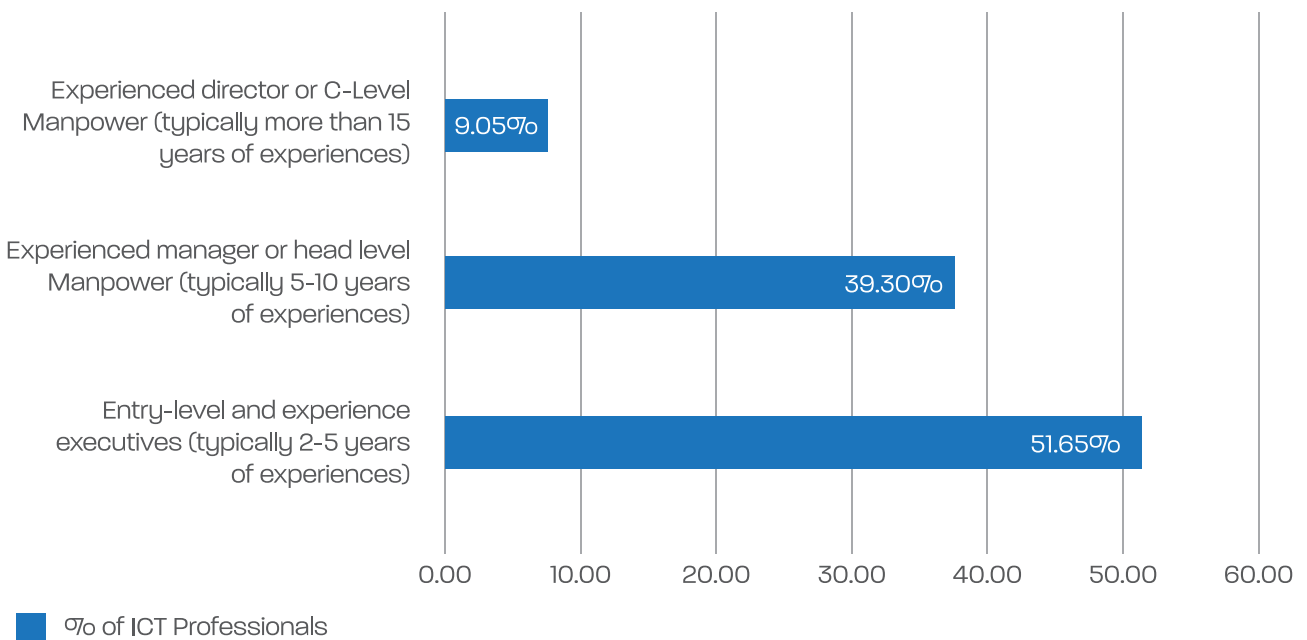


Figure 4 Current ICT manpower by years of experience

On average, **only 38%** said that they have ICT manpower to support their needs and the number drops to 35% and below for SME (1 – 9, 10 – 49) (See Figure 5).

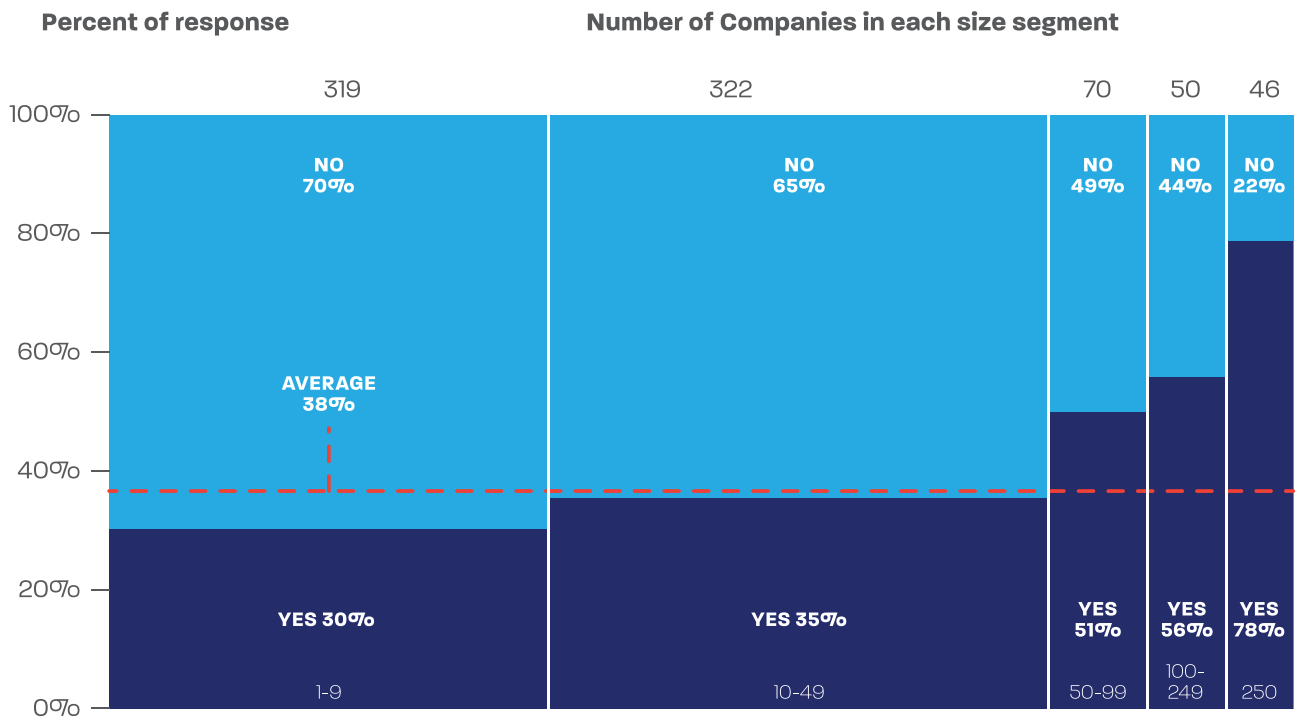


Figure 5 Companies with ICT manpower supporting their needs

2.3

ICT professionals by Nationality

6 in 10 ICT professionals employed are Bruneians and PR after excluding Government and financial services sector (See Figure 6).



Figure 6 Bruneians / PR versus Foreigners by Sector and by Size

While organizations have to hire foreigners to meet their business needs, existing regulations have made it challenging to hire foreign ICT professionals.

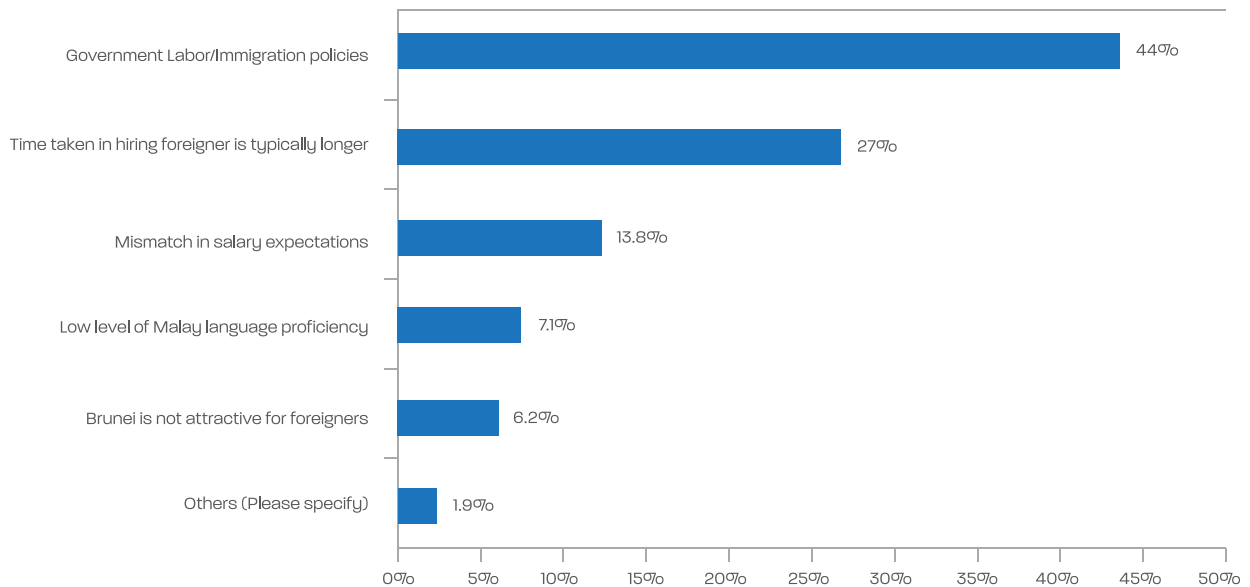
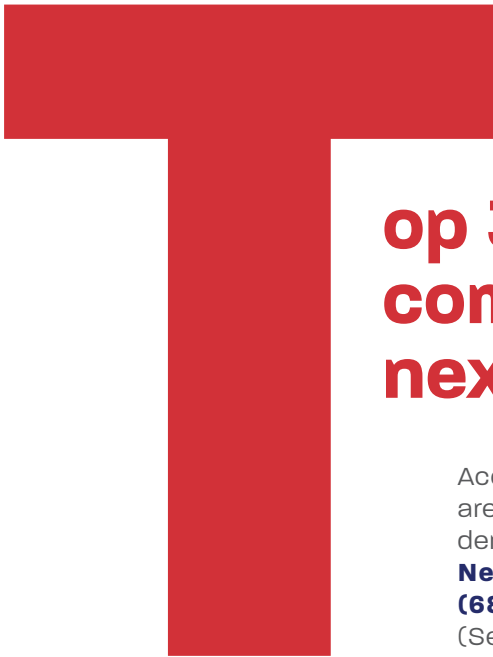


Figure 7 Government regulations makes hiring foreign ICT professional difficult

The findings suggest that the tightening of the foreign worker quota and the imposition of foreign worker levies announced in May 2014 and implemented in July 2014 are having an impact on their operations.

2.4



Top 3 growth competencies in the next five years

According to the survey, the top 3 areas which companies indicated demand are in the areas of **ICT Network (69%)**, **ICT Support (68%)** and **ICT Security (67%)** (See Figure 8).

PERCENTAGE OF RESPONDENTS FORESEEING AN INCREASE IN SKILLS REQUIREMENT

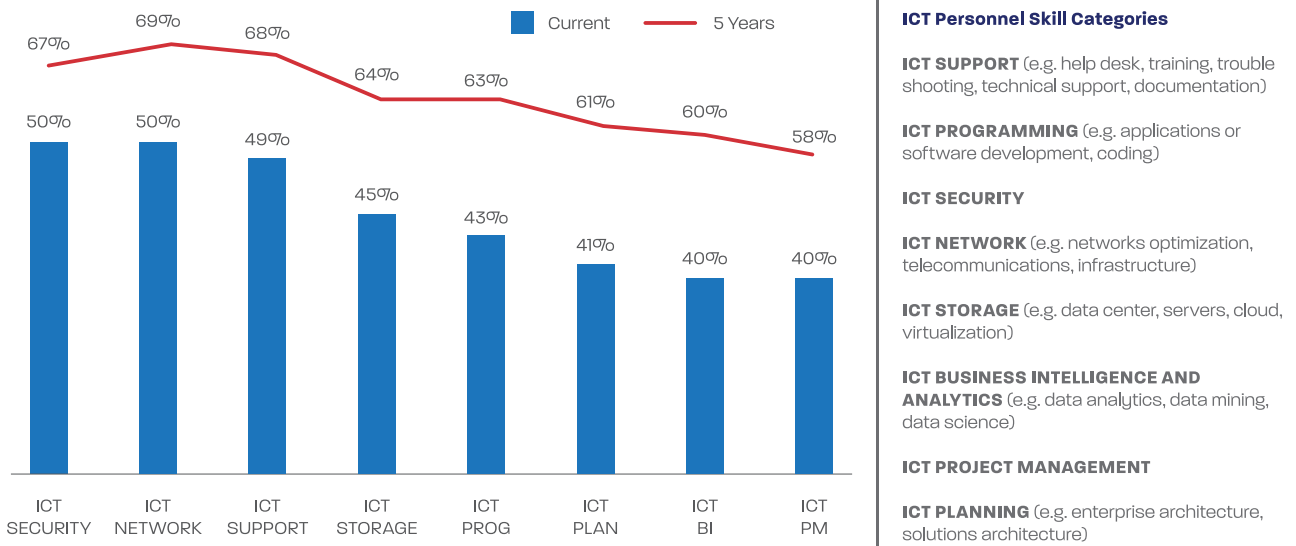


Figure 8 ICT growth areas in the next five years

These are areas where there are a clear demand and requirement for specific competencies. However from a wider perspective, the demand for ICT operations and support skills is a sign that Brunei are more “consumers” of ICT as these competencies are low on the ICT value chain. If Brunei Darussalam

wants to develop ICT as an attractive industry and major economic contributor, considerations must be made to grow capabilities and competencies in areas such as programming, business intelligence and project management so as to support for value-added business activities.

⁴ Foreign worker levy can go up to \$960. 29 May 2014, Brunei Times. URL: <http://bt.com.bn/frontpage/2014/05/29/foreign-worker-levy-can-go-960>

2.5

Attraction / Attrition of ICT Workforce

50.8% of the organizations cited the lack of relevant experience and technical skills as the main reasons in not hiring Bruneians and PRs (See Figure 9).

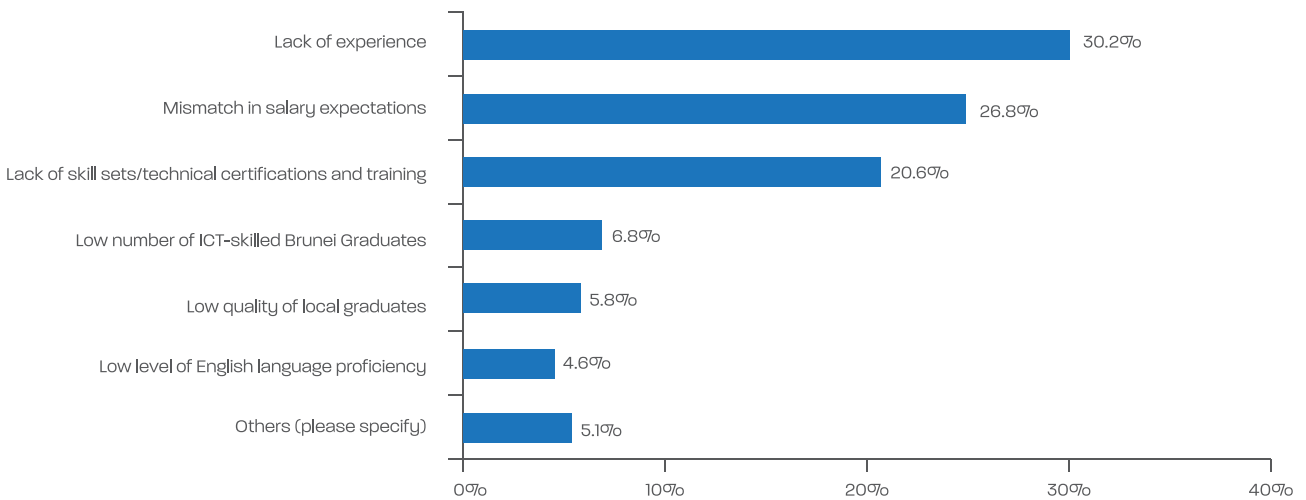


Figure 9 Reasons for not hiring Bruneians and PRs

When compared to the earlier figure where 39.9% of the ICT manpower had up to 10 years of experience, it is possible that although the ICT professionals might have the duration or length of service, the relevancy of the experience and skills sets might not be what is

required in Brunei Darussalam.

The impact of not hiring Bruneians and PRs is compounded by a dependency on government ICT projects and tenders, which are not released regularly. As a result, ICT companies will operate

with lean staff, and resort to contract/temporary hires (24.3%), or internal reshuffling (19.7%) to sustain their operations and to meet with the short-term spike in manpower needs (See Figure 10).

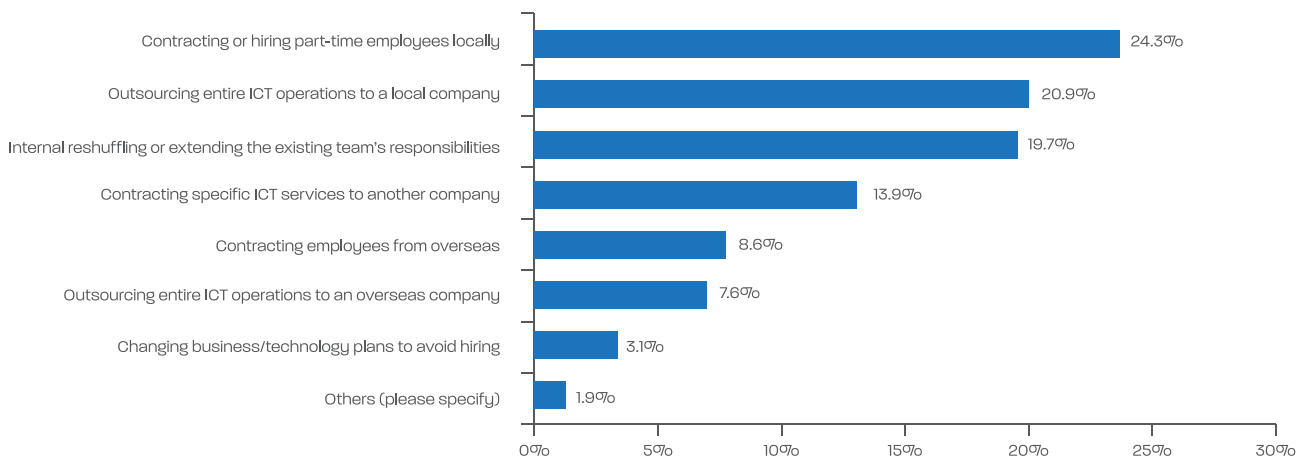


Figure 10 Strategies to overcome lack of right ICT competencies in organizations

2.6

ICT Workforce Skills Training and Development

While 62% of organizations are receptive to sending staff for ICT training (See Figure 11), budgetary considerations and the availability of the right courses weigh heavily on the decisions of the other organizations to offer training for their staff. Based on the figure

below, small and medium sized enterprises do not send their staff for ICT training as much as large companies and many of these companies are in the manufacturing, resources, construction, and distribution and services industry.

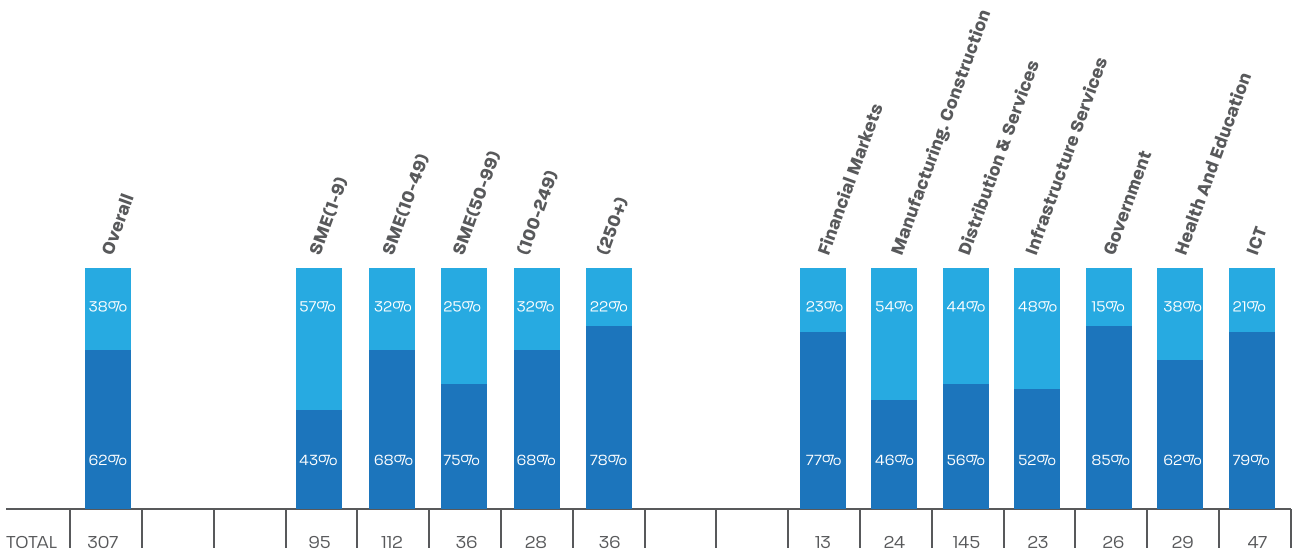


Figure 11 % of organizations that send staff for ICT training

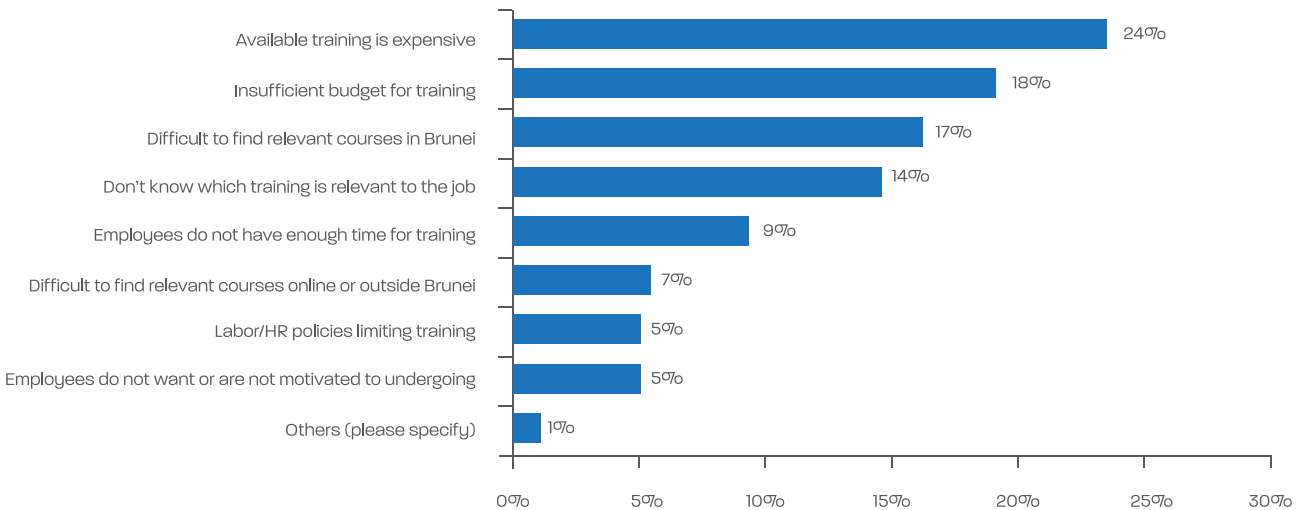


Figure 12 Cost of and Budget for Training and Development is a concern

2.6

The lack of budget and that training cost is expensive were observed among the companies, a large number of them cited self-study and on-the-job training locally as the preferred modes to enhance skills of existing staff (See Figure 13).

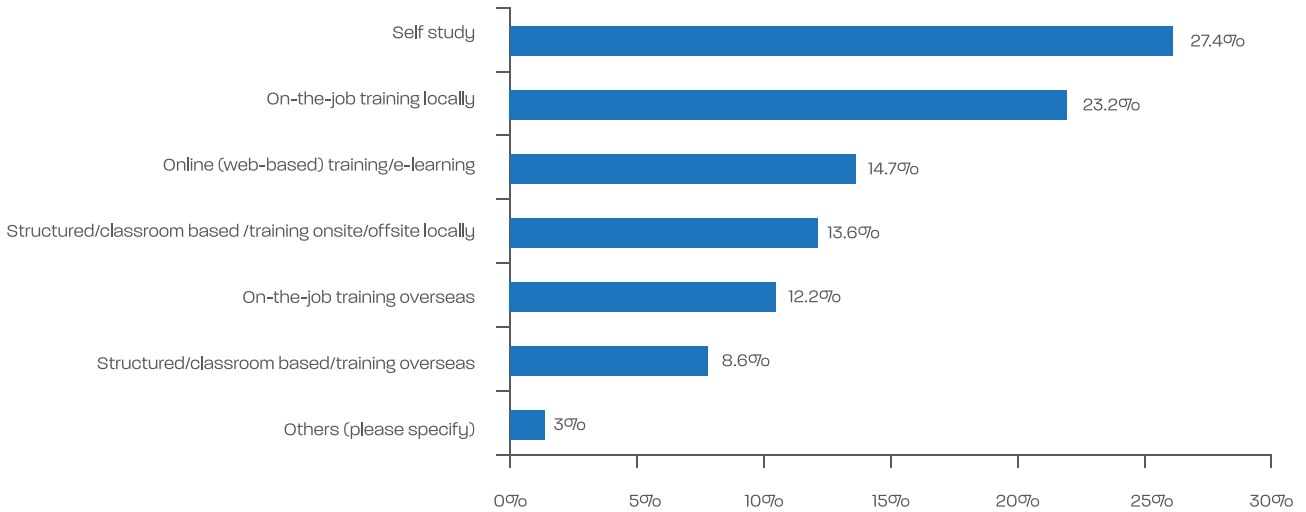


Figure 13 Existing modes of training and skills development

The lack of ICT training can impact Brunei's ICT industry sector in two (2) ways. From the perspective of improving the quality of the ICT talent pool, the competencies and skill level of ICT professionals are limited to self-study

and on-the-job learning instead of professional education. Two, limited awareness of the potential of ICT to transform SMEs is shown in the low adoption of ICT technologies.

2.7

Aspirations and Desired Outcomes for the Development of ICT Manpower in Brunei Darussalam

Together with the survey findings, stakeholder interviews conducted earlier, summary of the key takeaways for Brunei Darussalam's ICT landscape are:

- 1** Need for a national level ICT competency framework
- 2** Encourage greater adoption of ICT services by enterprises to support their business operations
- 3** Need to move SMEs away from relying too much on public sector ICT projects
- 4** Promote more ICT education, training and ICT as a career
- 5** Better use of foreigners and employing the right outsourcing strategies to add value to Brunei's ICT industry sector

These aspirations and desired outcomes served as important guideposts in the crafting of the Masterplan's strategies and programmes.

3

Gap Analysis

When **identifying the issues to be addressed in order to achieve the strategic goal of the ICT industry as a key pillar of Wawasan 2035**, and the desired outcomes, the key questions were:

1 Will there be sufficient demand for ICT professionals in 2020;

2 How to improve the skills and experience of ICT professionals to take on more complex tasks; and

3 The issues faced by employers in attracting and retaining ICT professionals to meet their needs.

Demand for ICT professionals in 2020

Based on the Brunei Darussalam Education Statistics 2012 report, there were 329 computing graduates at tertiary level in 2012 and another 406 graduates from private education institutions in 2012. This means a total of 735 ICT professionals were available to the industry in 2012. With approximately 700 to 800 fresh ICT graduates per year, in five (5) years times an oversupply situation is likely to occur by 2020 if there is insufficient growth in the ICT industry.

Although beyond the scope of the National ICT Manpower Masterplan to examine ICT industry development issues, it was strongly expressed during the stakeholder interviews that the high dependency on government ICT procurement and limited exploitation of ICT in other sectors is a key gap, which constrains the growth of the ICT industry in Brunei Darussalam. Achieving sufficient critical mass in the ICT industry is important in order to sustain a viable ecosystem of ICT companies and ICT manpower talent as well as to lead the export of ICT products and services overseas.

Agencies such as BEDB and AITI are making an effort to nurture a core group of Bruneian “technopreneurs” to support the development of local innovative ICT products and services for domestic use as well overseas export. The lack of opportunities to be exposed to technical and business domains to strengthen their ICT knowledge is another key gap arising from the limited size of the ICT industry in Brunei Darussalam.

Improving the skills and experience of local ICT professionals

In addition to issues around the quantity of ICT professionals, the ability to deepen existing capabilities and enhance professionalism is another consideration. Based on the current ICT manpower profile, while the current Bruneian ICT professionals might have the benefit of a good academic education, continuing adult education and professional development during their careers are limited by a combination of the lack of opportunities to apply their skills, limited exposure to complex/enterprise ICT areas, and the lack of training options/cost within the country. For ICT professionals, continued education does not necessarily translated to career progress or higher remuneration.

⁵ Released by the Education Management Section, Department of Planning Development and Research, Ministry of Education

⁶ Table 1.17, Tertiary graduates by Field of Education, 2012, Brunei Darussalam Education Statistics 2012 report

⁷ Table 1.15, Vocational/Technical Graduates by School, 2012, , Brunei Darussalam Education Statistics 2012 report

3

Issues faced by employers in attracting and retaining ICT professionals with the right skills

Most employers agree that the lack of ICT skills would have a significant effect on ICT and business operations and performance in Brunei Darussalam. To address these skill gaps, most prefer to use internal staff instead of contracting from external providers to meet internal skill gaps (See Figure 14) as well as to hire foreign ICT professionals.

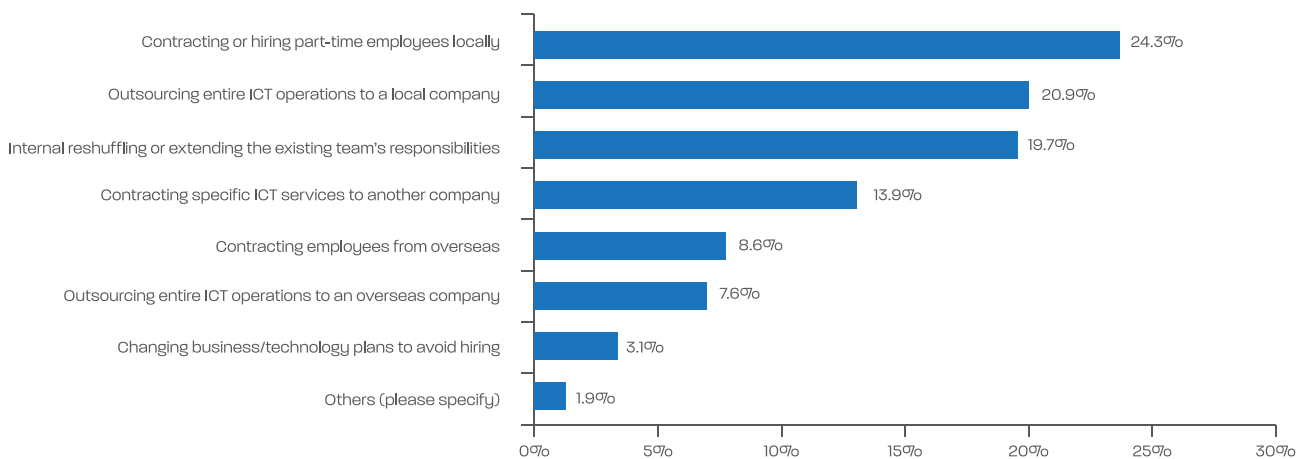


Figure 14 Contracting / Outsourcing to remedy the ICT skills gap

There are two (2) aspects to this issue. One is the environment where there are insufficient recognition on the value-enhancing role of ICT adoption in other industry sectors and two, whether there is sufficient business demand to justify the hiring of full-time ICT professionals. Both aspects will significantly influence the employment opportunities and compensation of ICT professionals in Brunei Darussalam and merits deeper analysis and intervention.

3.1

Critical Gaps for the National ICT Manpower Masterplan

Using the data collected from the national ICT manpower survey, together with the comments solicited from key stakeholders like the employers, education institutions and Government agencies, a number of common issues have been identified.

Comparing these issues against the desired outcomes and aspirations for Brunei Darussalam's ICT manpower, gaps have been identified which requires the National ICT Manpower Masterplan to address (See Table 1).

GAP 1	Inclination to hire foreign ICT professionals
GAP 2	Limited opportunities to strengthen ICT knowledge and capability
GAP 3	Weak communications between stakeholders in the ICT industry
GAP 4	Poor planning, mismatched expectations limits meaningful and effective internship and attachment opportunities
GAP 5	ICT Industry/SME has high dependency on public sector ICT projects
GAP 6	Lack of appreciation on the value of ICT certifications in career development
GAP 7	Limited understanding of ICT careers
GAP 8	SME hampered by time/cost of sending staff for training
GAP 9	Insufficient data on the profile of ICT manpower, and sector needs in Brunei

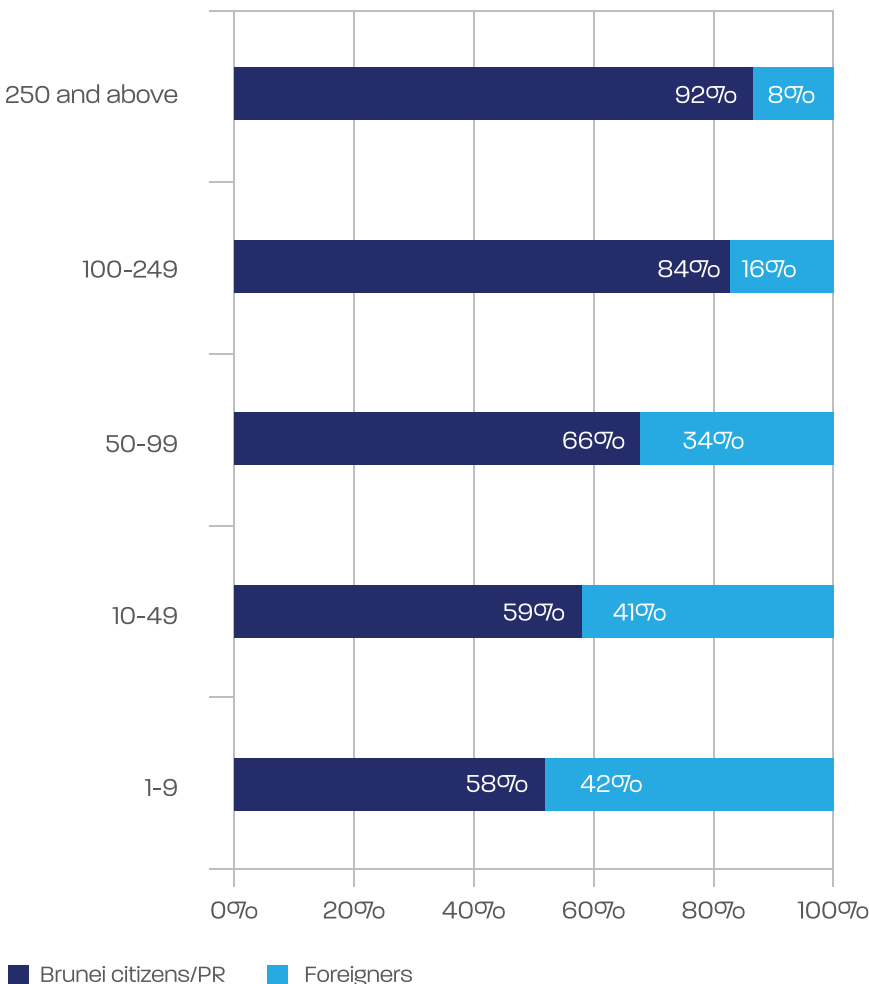
Table 1 Summary of Gaps

3.2

Gap 1 Inclination to hire foreign ICT professionals

Based on the data collected from the survey, organizations in Brunei Darussalam have an inclination to hire foreign ICT professionals compared to local Bruneians and Permanent Residents. For small organizations (1 – 9), **42% of their ICT manpower are foreigners while 34% of the ICT manpower for medium size organizations are foreigners** (See Figure 15).

The inclination to hire foreigners stems from the limited availability of Bruneians and PRs with the necessary technical skills and experience and is a symptom of an ICT industry that is under-developed.



The hiring of foreigner ICT professionals to plug such gaps is not unusual and is common world-wide. In the United States, due to high demand from technology companies in the Silicon Valley, a large number of foreign ICT professionals are imported under the H-1B visa programme and in Australia, the 457 visa allows Australian employers to sponsor and hire foreigners ICT professionals.

However, despite of this necessity, it is recognized that the hiring of foreigners is a temporary, short-term measure where it is neither cost effective nor practical to produce these manpower locally and the issuing of the work visas are strictly controlled to key sectors with the supply gap. This is done via a process such as Australia’s SkillSelect where the capabilities and experience of the professional is assessed for his/her ability to contribute, with corresponding quotas.

Figure 15 Percentage of Bruneians/PR versus Foreign ICT professionals by Sectors

⁸ H-1-B Visa Quota for 2015, URL: <http://www.uscis.gov/working-united-states/temporary-workers/h-1b-specialty-occupations-and-fashion-models/h-1b-fiscal-year-fy-2015-cap-season>

⁹ Comparison of visas in Australia, URL: <http://www.immi.gov.au/Work/Pages/visa-options-comparison-charts.aspx>

¹⁰ Skills Select: URL <http://www.immi.gov.au/Work/Pages/SkillSelect/SkillSelect.aspx>

3.3

Gap 2 Limited opportunities to strengthen ICT knowledge and capability

At present, Brunei Darussalam faces limited opportunities to strengthen the knowledge and capabilities of the existing ICT professionals. This situation can be attributed to two (2) main reasons:

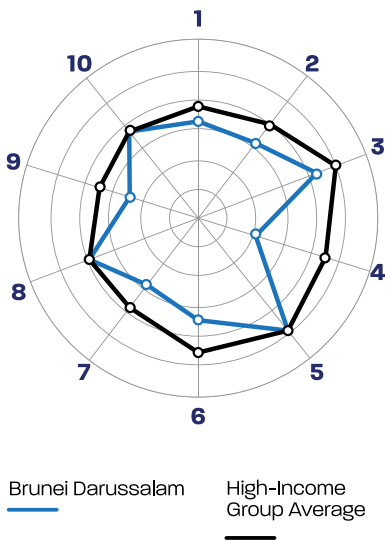
- 1 Low level of ICT usage in the economy
- 2 Limited knowledge transfer from foreign ICT companies to domestic ICT companies

Low level of ICT usage in the economy

Based on the survey data, more than 50% said that the lack of experience and technical skills was the reason for not hiring Bruneians and PRs. Only 38% of the organizations said that they had dedicated ICT personnel supporting their business needs. In addition, organizations surveyed reported demands in the areas of

ICT network, security and support competencies while programming, business intelligence competencies are less in demand.

Demand and usage of ICT is one of the key areas in building a vibrant and skilled talent pool and a good proxy to understand whether ICT professionals have the opportunities to apply their knowledge regularly.



- 1 Political and regulatory environment
- 2 Business and innovation environment
- 3 Infrastructure and digital content
- 4 Affordability
- 5 Skills
- 6 Individual usage
- 7 Business usage
- 8 Government usage
- 9 Economic Impacts
- 10 social Impacts

Figure 16 WEF Global Information Technology Report 2014 - Brunei

Using the WEF Global Information Technology Report 2014 as a basis for comparisons, it is noted that similar observations regarding the limited usage of ICT and its impact can be found in Pillars 7 and 9 of the WEF report.

Improving the savviness of business owners in the use of ICT and other digital innovations would have a significant impact in the creation of new job opportunities, deepen existing capabilities and enhancing the competitiveness of the domestic industries.

Limited knowledge transfer from foreign ICT companies to domestic ICT companies

Key stakeholders had said during the interviews that ICT companies in Brunei Darussalam have limited roles in the implementation of

projects in the country. More than often, the technology or the solution are brought-in from a foreign partner while the local ICT company or partner are restricted to roles such as project coordination and support. In some cases, on-going post project supports are still done by the overseas partners.

While it may not be true for all ICT companies in Brunei Darussalam, this situation can be viewed as a symptom of the lack of confidence in the quality and capabilities of local ICT manpower. More can be done to ensure that proper guidelines are in place to encourage the transfer and cross-training of local ICT manpower during the project implementation and to ensure that post-project maintenance and operations can be localized as much as possible.

3.4

Gap 3 **Weak communications between key stakeholders in the ICT industry**

One of the overarching issues identified through the stakeholder interviews was the weak communications between stakeholders in the ICT industry, such as the ICT companies, ICT professionals, government agencies and education institutions.

Mismatch of skills by fresh ICT professionals

A manifestation of weak communications is the “mismatch of skills”, expressed by employers of fresh ICT professionals. Based on the interviews with the stakeholders, the mismatch of skills can be further distinguished into categories identified by OECD. (See Table 2)

Type of skills mismatch	Definition
Skills shortage	Demand for a particular type of skill exceeds the supply of people with that skill at equilibrium rates of pay.
Qualification mismatch	The level of qualification and/or the field of qualification is different from that required to perform the job adequately.
Over/Under-qualification/ education	The level of qualification/education is higher (lower) than required to perform the job adequately.
Skill gap	The type or level of skills is different from that required to perform the job adequately.
Over/Under-skilling	The level of skill is higher (lower) than required to adequately perform the job.

Table 2 Forms of Skills Mismatch

However, this situation was not a result of the lack of trying. In the higher education institutions, the Programme Advisory Committee (PAC) is the platform where industry experts are given the opportunity to provide feedback on the proposed course contents to the respective curriculum development units/officers, while in the areas of vocational education, the Brunei Darussalam Technical

and Vocational Education Council (BDTVEC) works to ensure the relevancy of the curriculum.

However, the multiplicity of these engagement platforms means that the industry cannot provide effective feedback all the time as the same stakeholders could be sitting in multiple PACs.

3.5

Gap 4 **Poor planning, mismatched expectations limits meaningful and effective internship and attachment opportunities**

The inability of students to maximize their internship and attachment opportunities is one of the contributing factors to the lack of “industry-readiness” of fresh ICT graduates.

Feedback from the industry suggested that interns are unclear what to expect from an internship stint nor are employers certain of the capabilities of the intern and therefore which assignments could be assigned to them. This situation often leads to employers spending additional time to assess and place the intern or the intern being placed in a role which he / she is unable to perform adequately.

3.6

Gap 5 **ICT Industry/SME has high dependency on public sector ICT projects**

Although the Bruneian Government, through AITI and BEDB have actively encouraged local ICT companies to look outside the country for business opportunities, in the short term, ICT companies in Brunei Darussalam, especially the small and medium enterprises remain highly dependent on government ICT contracts as their core business.

The over-reliance on public sector ICT projects have a limiting effect on the growth

of the ICT industry in Brunei Darussalam as these ICT companies tend to focus on the lower end of the ICT value chain, such as the distribution of packaged products, support and maintenance.

Based on feedback from the stakeholders, these government contracts are released at intermittently, resulting in the inability of ICT companies to retain ICT professionals during periods where there are no or limited projects.

3.7

Gap 6 **Lack of appreciation on the value of ICT certifications in career development**

Based on the interviews with the stakeholders, ICT professionals in Brunei said that obtaining ICT certifications such as PMP® do not lead to further career progression, additional remuneration or better marketability, while companies employing ICT professionals said that proven experience is more important than certifications.

The inability to quantify the value of ICT certifications by both employees and employers stems from a limited understanding of what certification confers as well as what a job position requires in terms of the mastery of skills. ICT certifications can be product-centric or skills-centric but both provide a visible independent validation and accreditation of an ICT professional's competencies and experience. By aligning ICT certifications to a competency framework, employers are able to determine and better match remuneration with the appropriate candidate of the right experience and competency.

Gap 7 **Limited understanding of ICT careers**

Based on interviews with stakeholders, employers said interns studying computing / ICT and even fresh graduates are not entirely clear on what an ICT careers offers and the competencies required to progress in their chosen area of study.

According to the Brunei Darussalam Household ICT Survey report 2013, 98% of households have mobile phones while 80% said that they had a laptop computer, while 63% had internet access. Coupled with a mobile subscriber penetration rate of 115.41% and internet subscription rate of 42.45% in 2013, the general populace of Brunei

Darussalam are reasonably connected and familiar with the use of ICT technologies in their daily lives.

While usage of ICT is significant from the perspective of overall ICT literacy of the society, it represents only the “consumer” or “end-user” aspect of ICT products and services (e.g. social media, gaming, internet). There is little, if any understanding into the underlying competencies, and technology needed to create, sustain and deliver these services nor the other dimensions of ICT such as enterprise IT and telecommunications.

98% of households have mobile phones while 80% said that they had a laptop computer, while 63% had internet access

Job role levels and career pathways in ICT

Guru	Senior Management (C-Level) CIO, CTO, Chief Architect, Etc.
Expert Business Process Consultant, Enterprise Architect, Technical Solution Architect, etc.	Management Application Manager, IT Outsourcing manager, Operation Manager, etc.
Specialist (Technical/Business Domain) Network Engineer, System Analyst, Software Engineer, etc.	Specialist (Management) Program Manager, Account Manager, Sales Manager, etc.
Entrant Applications Programmer, Network Administrator, Data Analyst etc.	
Technical	Management

Figure 17 Diverse career pathways in ICT

The prevailing “consumer” perspective of ICT forms a limited view of ICT as a career and shapes attitudes of potential ICT students, parents and peers that a ICT career an “easy” job or that the career does not provide long term career progression. Changing perceptions, attitudes and enhancing digital literacy is an important step in order boost the quality of ICT professionals and enhancing the overall professionalism of the ICT industry.

¹² Brunei Darussalam Household ICT Survey Report 2013, AITI, URL: [http://www.aiti.gov.bn/downloadables/Downloadables%20Library/AITI-ICTHS\(FINAL-20MAY14\)s.pdf](http://www.aiti.gov.bn/downloadables/Downloadables%20Library/AITI-ICTHS(FINAL-20MAY14)s.pdf)

¹³ Brunei ICT Indicators 2006 – 2013, AITI, URL: <http://www.aiti.gov.bn/downloadables/Downloadables%20Library/Brunei%20ICT%20Indicators%202006-2013.pdf>

3.9

For the SME, sending their ICT manpower for structured, classroom based ICT training and development remains challenging. 24% cited training cost being expensive while 18% said that they do not have enough budget. Another 17% said that they are unable to find the relevant courses in Brunei Darussalam (See Figure 18).

Gap 8 SME hampered by time/cost of sending staff for training

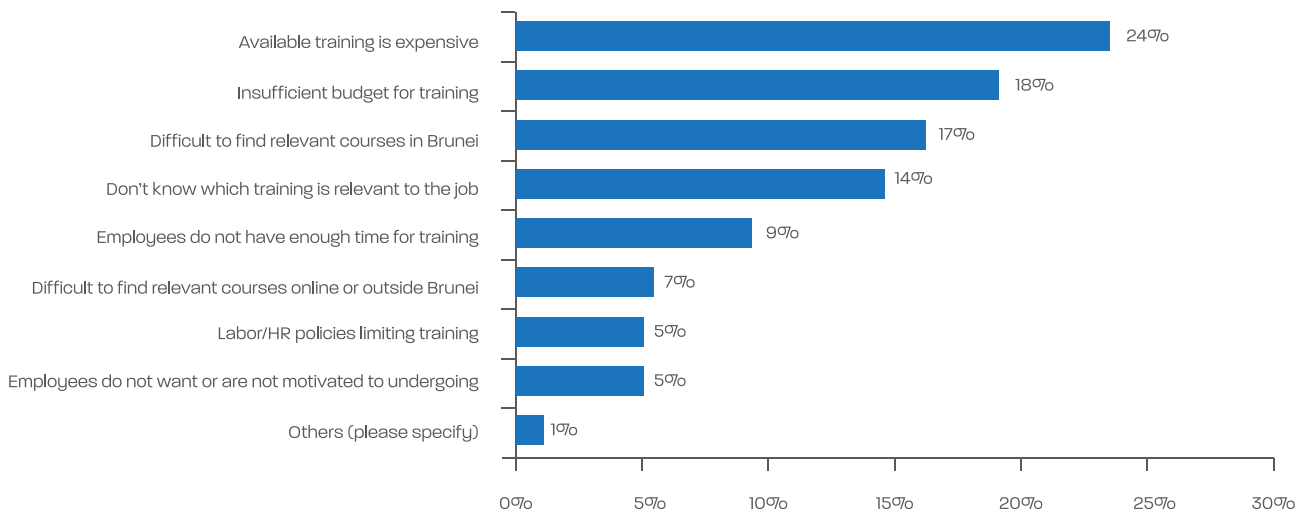


Figure 18 Reasons for not sending ICT professionals for training and development

3.10

Gap 9 **Insufficient data on the profile of ICT manpower, and sector needs in Brunei**

From desktop research and the interviews with the stakeholders, no surveys which focus on ICT manpower in Brunei Darussalam had been done in the recent years, resulting in insufficient data on the profile of ICT manpower and the industry's needs in terms of the critical technical skills sets required currently.

The National ICT Manpower Survey under the National ICT Manpower Masterplan project is a **first step in understanding the profile of ICT manpower** presently.

In particular, during the stakeholder interviews, it was recorded that while the education institutions do collect some data on their graduates, the effort was neither standardized nor done on a regular basis across all institutions. For example, while one education institution was observed to collect:

- 1** Graduates Employment Rate
- 2** Student's Satisfaction Rate
- 3** Employer's Satisfaction Rate

Other education institutions did not report undertaking similar surveys or studies. Without good quality and updated data, it is difficult for Brunei Darussalam to develop impactful and measurable government interventions and programmes.

4

Global Technology Trends Impacting ICT Manpower

Over the last few years, the technology industry has seen the development and subsequent maturity of key technologies that has proven to be disruptive in daily lives. Different terms had been coined in the process to summarize and make sense of these trends. Since 2013, Gartner had referred to these

trends using the term “Nexus of Forces”, which is a convergence of social, mobility, cloud and information patterns that drive new business scenarios, while IDC had described these trends as the “3rd Platform”, driven by mobility, cloud, big data and social.

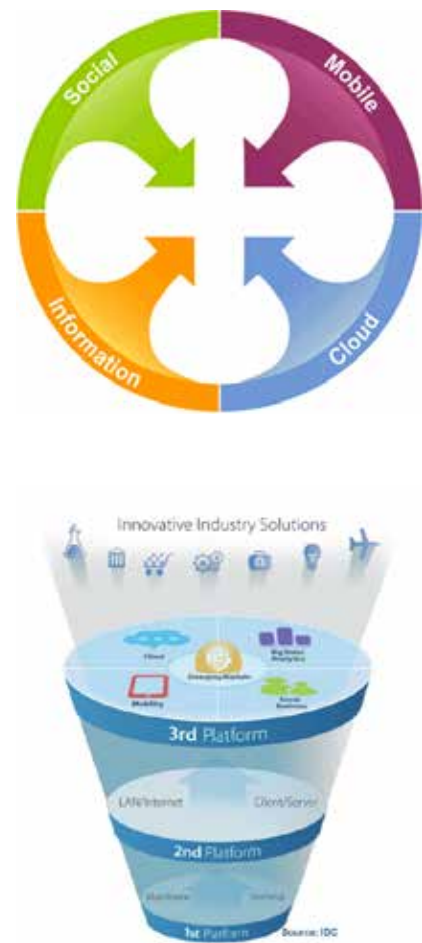


Figure 19 Gartner's Nexus of Forces and IDC's 3rd Platform

¹⁴ Nexus of Forces, Gartner Glossary, URL: <http://www.gartner.com/it-glossary/nexus-of-forces>

4

Regardless of the different terms or definitions used, it is evident that:

Cloud technology;
Social media
technology;
Information / data
technology; and
Mobility.

are the driving forces the development of areas such as Smart Cities, the Internet of Things, wearable computing, DevOps, Agile and Big Data and these would be where the future competencies are in-demand going forward the next five (5) years globally. In the case of Brunei Darussalam, industry development initiatives under BEDB such as the Rimba Digital Junction and the National Data Centre project will generate demands for competencies in the areas of data centre management and animation. The early involvement in such emerging technologies can also pave the way for the technopreneurship drive.

While at this point, it may not be justifiable to create dedicated academic programmes in the areas of Cloud computing and Mobility as demand for such skills do not yet exist in great numbers in Brunei, educational institutions can consider offering modules in these subjects as electives.

This can be done by leveraging on massive, open-online courses (MOOC) from globally renowned universities as a means to overcome challenges in trying to find the right academic staff to teach these subjects. For example, IDA Singapore had supported the use of John Hopkin University's Data Science Course on Coursera as means to grow data science capabilities in lieu of professional classroom training. The possibility and readiness of adopting online education in Brunei Darussalam is high given the response in the ICT manpower survey that 21%¹⁶ said that they were doing self-study.

¹⁵ MOOC Pilot for Data Science & Analytics Training, URL: <http://www.ida.gov.sg/Collaboration-and-Initiatives/Initiatives/Store/MOOC-Pilot-for-Data-Sciences-and-Analytics-Training>

¹⁶ John Hopkin's University Data Science Course, URL: <https://www.coursera.org/specialization/jhudatascience/1>

¹⁷ Refer to Pg 27, Figure 19, IDC's Data Collection Report

Growing Hobbyist Developers to supplement the ICT manpower talent pool

Beyond looking at technology trends in isolation, ICT's 2014 Worldwide Software Developer and ICT-skilled worker estimates provided an overview into the ICT manpower development trends currently and going forward. Some of the important findings include:

- 1** In general that the ratio between software developers and ICT operations is 2:1;
- 2** The growth of the "hobbyist" or "citizen" developers which supplements the professional software developers; and
- 3** Increasing pervasiveness of software and embedding into connected devices and their increasing availability of Internet of Things/ Cloud would stimulate the need for more software developers.

The trend of hobbyist developers is part of a larger and growing movement towards a "Maker" culture where individuals move from being consumers of products

to being creators and makers of products through a discovery process of building, tinkering and self-learning. In Brunei Darussalam, there are small, budding groups of like-minded individuals who had organized themselves in pursue of ICT related hobbies such as programming. Examples of such groups include:

Google Developers Group (GDG Brunei)

SharePoint Brunei User Group (SBUG)

Brunei Geek Meet (BGM)

From these groups of hobbyists, potential future ICT professionals and entrepreneurs can be groomed and capabilities in critical future skills such as data analytics, security can be grown.

Brunei Darussalam can help to nurture this community

by providing "hackerspace" for meetings and hackathons and work with them to promote ICT and computing as a hobby and a passion. It is important that any government assistance remains at a "light touch" and let the community flourish and grow through a bottom-up, grassroots effort.

Encouraging efforts had been made by Brunei Darussalam in this direction with the first Brunei Hackathon in 2014 by BEDB.

¹⁸ 2014 Worldwide Software Developer and ICT-skilled worker Estimate, Al Hilwa, 17 Dec 2013, URL: <http://www.idc.com/getdoc.jsp?containerId=244709>

¹⁹ Google Developer Group Brunei, URL: <http://www.gdg.com.bn/>

²⁰ SharePoint Brunei User Group, URL: <http://www.sharepointbrunei.net/>

²¹ Brunei Geek Meet, URL: <http://www.meetup.com/BruneiGeekMeet/>

²² Brunei launches 1st Hackathon, URL: http://www.bedb.com.bn/news_readmore.php?id=309

5

**National ICT
Manpower
Masterplan**

The National ICT Manpower Masterplan is a set of recommended strategies, programmes and priorities to consider when driving the

development of Brunei's ICT workforce and is illustrated in the following diagram:

Strategic Goal	To grow the number of skilled ICT Professionals to 6,000 by creating 1,800 additional jobs by 2020			
Desired Outcomes	ICT as an attractive career option for Bruneians	Highly skilled ICT professionals with industry relevant competencies	Vibrant Bruneian ICT industry as a source of employment	
Strategies	S1 Attracting Bruneians to ICT careers	S2 Developing "industry-ready" ICT graduates	S3 Deepening the existing ICT talent pool	S4 creating opportunities for ICT employment
Programmes	P1.1 ICT Possibilities Programme P1.2 Youth ICT Network P1.3 Discover and Excite P1.4 National ICT Scholarships P1.5 ICT Manpower Portal	P2.1 ICT Skills Roundtable P2.2 Structured Workplace Internship P2.3 Enhanced Youth Development Programme P2.4 Enhanced Overseas Internship INSPIRE	P3.1 ICT Industry Competency Framework P3.2 Critical ICT Skills Upgrade Programme P3.3 Overseas Talent Programme P3.4 Review Labour Policies for Foreign ICT Professionals	P4.1 ICT for SME Programme P4.2 ICT Savviness Programme for SME P4.3 Enhanced Absentee Payroll Support P4.4 Government Procurement Dialogue
Enablers	E1 Pilot niche MOOC programmes as part of tertiary curriculum E2 Growing Hobbyist Developers E3 National ICT Manpower Supply E4 Graduate Employment Data Collection Framework			

S

trategic goal

The National ICT Manpower Masterplan is guided by Wawasan 2035's goal of having ICT as one of the major pillar of economic growth in Brunei Darussalam. ICT manpower is a critical and strategic enabler to support the creation of a vibrant ICT industry as well as a basic requirement to attract foreign investment into Brunei. To measure success, the strategic goal is to grow the number of skilled ICT professionals to 6,000 by creating 1,800 additional jobs in ICT by 2020. This target is derived from the number of ICT professionals (1,300) which the industry had indicated their desire to have in five (5) years' time and the strategies and programmes proposed in this Masterplan aim to make this target a reality. The higher number of 1,800 in the strategic goal reflects the desire to strengthen the ICT industry to support Brunei's diversification drive.

To put this strategic goal into perspective, Singapore's

ICT industry contributes to 3.9% of the Singapore's GDP, or around SGD \$148.1 billion dollars in 2013. This is supported by 146,700 ICT professionals in the same year, which is approximately 4.2% of the total employed workforce in Singapore. If Brunei Darussalam desires to grow the ICT industry to a similar ratio of 3.9% of the current GDP (around BND\$ 780 to \$800 million), the ICT industry needs to be supported by at least 8,820 ICT professionals. To reach a target GDP growth of around 5% of the GDP, more than 10,000 ICT professionals would be required.

Looking beyond 2020 and into 2035, it would be instructive to examine Singapore's ICT manpower development journey. Over a ten (10) year period from 2003 to 2013, Singapore's ICT manpower grew from 104,300 to 146,700, with an average growth rate of 3%. During the same period, ICT revenue grew from SGD \$32 billion to SGD \$148 billion.

SINGAPORE ICT MANPOWER GROWTH

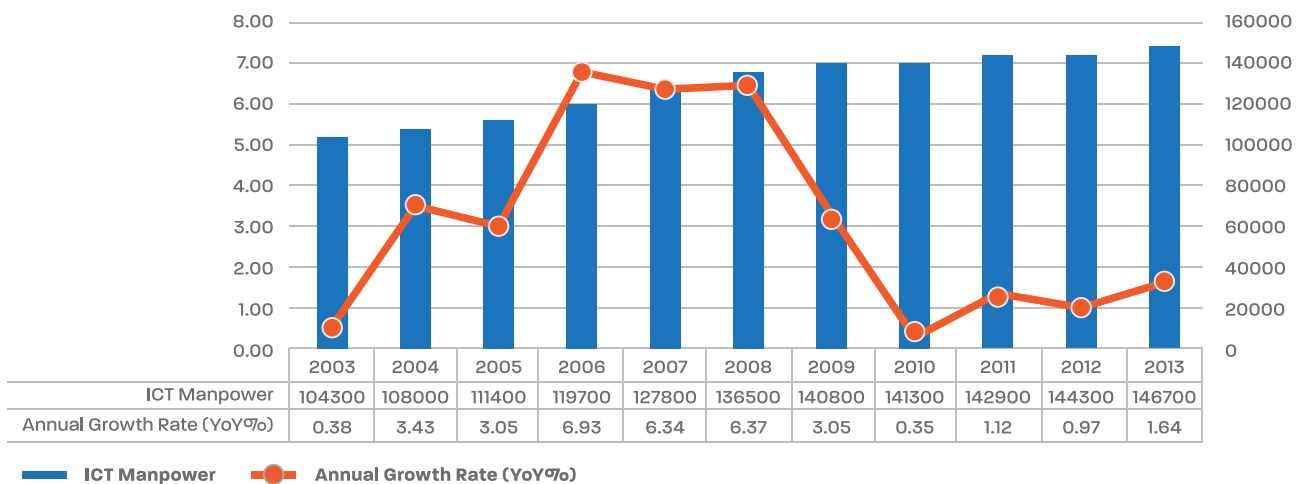


Figure 21 Singapore ICT manpower growth from 2003 to 2013

Singapore's experience shows that aggressive manpower and revenue growth targets are possible with the right interventions, especially in the short term (5 years). Over the long term, as competencies deepen and the ICT industry

moves up the value-chain, ICT manpower growth rates would moderate, however ICT revenue can continue to increase as a result of greater productivity per professional.

SINGAPORE ICT REVENUE GROWTH



Figure 22 Singapore's ICT revenue growth from 2003 to 2013

Using this basis for projection, assuming the ICT industry's contribution to Brunei Darussalam's revenue remain at less than 2% (or 1.8%), by 2035 and the overall GDP reaches BND \$80 billion, a projection using 3% to 5% would suggest an ICT professional workforce of more than 10,000. This figure is speculative as it is dependent on Brunei's ability to anticipate

and react to global macroeconomic trends and technological trends. As shown in Singapore's journey, major events such as the post-dotcom recovery and the global financial crisis of 2008 have significant consequences to any national development initiatives, especially ICT industry and manpower development.

²³ Singapore's Economy in 2013, URL: http://www.singstat.gov.sg/docs/default-source/default-document-library/statistics/visualising_data/singapore-economy29122014.pdf

²⁴ Number of ICT professionals in Singapore in 2013, URL: <http://www.ida.gov.sg/Infocomm-Landscape/Facts-and-Figures/Infocomm-Manpower>

²⁵ Based on JPKE's Brunei Darussalam's Key Indicators 2013, Release 2, Brunei's GDP at Current Prices was BND 20,157.7 million.

5.2

Desired Outcomes

Three (3) desired outcomes are proposed for the National ICT Manpower Masterplan.

5.2.1

ICT as an attractive career option for Bruneians

A career in ICT should be seen as an attractive and rewarding option for Bruneians. This is inculcated at an early age when young Bruneians, their peers and parents are exposed to the possibilities of ICT to enable them to make an informed choice in their education and career direction.

Measurements

Measurements that can be applied to track this desired outcome include:

- 1 Increase in number of students taking higher education in ICT
- 2 Improved perception of ICT among students and parents in surveys

5.2.2

Highly skilled ICT professionals with industry relevant competencies

The development of capable, industry-ready ICT professionals is critical as it supports the growth and creation of a dynamic and sustainable ICT industry for Brunei Darussalam.

Measurements

Measurements that can be applied to track this desired outcome include:

- 1 Increase in number of applicants who apply courses aligned to the ICT Industry Competency Framework
- 2 Improved employment perception surveys of the ICT industry as a career of choice

5.2.3

Vibrant Bruneian ICT industry as a source of employment

A vibrant ICT industry is necessary to create employment opportunities, supported by highly skilled ICT professionals, both Bruneians and non-Bruneians. This desired outcome has a synergistic relationship with the earlier desired outcome because the creation of employment opportunities and job vacancies is dependent on the availability of quality ICT professionals, yet at the same time is responsible for attracting individuals to embark on careers in ICT. It recognizes the importance of the Wawasan 2035 goal of having well-educated and highly skilled people in developing Brunei's ICT industry.

Measurements

Measurements that can be applied to track this desired outcome include:

- 1 Increase in number of new ICT companies created/added to the AAB list
- 2 Increase in number of ICT professionals with at least one professional certifications

5.3

Recommended Strategies

The goal to attract, retain and develop quality Bruneians in the ICT profession will drive the development of the strategies in the National ICT Manpower Masterplan. Each group has its specific characteristics and face unique issues that the strategies would need to address. Besides responding to the key gaps that have been highlighted by the employers and higher education institutions, the strategies will also focus on ensuring there are sufficient Bruneian ICT professionals with relevant skills and competencies to meet the current and future needs of the economy. The strategies would look at how to encourage more interest among students to take up ICT studies and career, and how to ensure existing ICT professionals would have access to training, development and career growth.

In addition, the strategies would explore ways to increase employment opportunities for ICT professionals.

The drive towards a knowledge-based economy is a national effort, with specific components driven by the individual ministries. The strategies in the National ICT Manpower Masterplan also takes into consideration and builds on the major programmes and initiatives planned or undertaken by Government agencies in the areas of labour force development and management, and education and training.

The recommended strategies are designed to reach out to all the key stakeholders of ICT manpower development. Stakeholders can be beneficiaries of the outcomes of the Masterplan as well as participants who can influence and support the successful implementation of the Masterplan. The following are a list of key stakeholders of the National ICT Manpower Masterplan.

Stakeholder	Description	Role
ICT Professionals	Consist of both fresh ICT professionals of no more than 3 years' experience and experienced ICT professionals	Beneficiary
Students	Comprise of primary, secondary students and ICT students in post secondary and tertiary levels	Beneficiary
Employers	Can be ICT companies or non-ICT companies which provides employment opportunities for ICT professionals.	Beneficiary Influencer
School Leavers	Students who had left the education system	Beneficiary
Education Institutions	Comprising of all education institutions, inclusive of both public and private providers at all levels.	Beneficiary Influencer
Government agencies	Government agencies involved in workforce development and management such as MOE, APTK, EGNC etc	Influencer

Table 3 Stakeholders of the National ICT Manpower Masterplan

5.3

The **four recommended strategies proposed** are listed in the table below.

STRATEGY	DESCRIPTION	ACHIEVES
S1: Attracting Bruneians to ICT careers	This strategy focuses on creating a better understanding and perception of the ICT profession, the type of jobs available in ICT amongst students and ICT professionals. The objective is to encourage more Bruneians to take up ICT studies or consider an ICT career, and to meet the demand for skilled Bruneians and Resident ICT professionals. It addresses the problem of the ICT profession being perceived to be unattractive or limited.	<p>Improvement in perception of ICT career in Brunei</p> <p>Increase in the take up of ICT studies by students</p> <p>Increase in number of Bruneians choosing an ICT career</p>
S2: Developing “industry-ready” ICT graduates	This strategy aims to develop industry-ready ICT students who are capable of meeting the current and future needs of the economy. The main focus is to ensure that there are sufficient engagement between the education institutions and the industry so that curriculum development is more aligned to the industries' requirements and to enhance the existing internships so that ICT students can make full use of the learning opportunities presented in their attachment stint to gain knowledge and experience to help in their subsequent careers.	<p>ICT graduates in Brunei are better able to meet the needs of the ICT industry upon graduation</p> <p>Less training required for ICT fresh graduates at their first job</p>
S3: Deepening the existing ICT talent pool	This strategy recognizes the untapped potential of the domestic ICT talent pool and seeks to enhance and deepen its capabilities to support Brunei Darussalam's socio-economic development. Under this strategy, efforts will be made to put into place a competency framework (ICT Industry Competency Framework) to clarify and standardize job roles/descriptions and establish the baseline competencies required to perform the job. In addition, support for ICT professionals and companies to meet the competency framework will be provided in terms of training and skills upgrading programmes.	More Bruneians with the necessary competencies to undertake jobs currently performed by foreign ICT professionals
S4: Creating opportunities for ICT employment	The objective of this strategy is create opportunities for ICT employment by expanding the scope and adoption of ICT usage in both the government and private sector. The strategy does not seek to supplant industry development programmes but to provide employment opportunities for ICT professionals by stimulating the demand of ICT products and services.	Greater employment opportunities for ICT professionals in Brunei

Table 4 Recommended strategies for attracting, retaining and developing Bruneians ICT professionals

R

ecommended programmes

The four strategies each have corresponding programmes that defines specific initiatives to be undertaken to achieve the strategic goal. The twenty-one

recommended programmes are covered in the next sections.

It is essential to ensure that all the gaps highlighted

are addressed by at least 1 program. More than half of the recommended programs address multiple gaps. The gaps are as follows (Table 5):

GAP 1	Inclination to hire foreign ICT professionals
GAP 2	Limited opportunities to strengthen ICT knowledge and capability
GAP 3	Weak communications between stakeholders in the ICT industry
GAP 4	Poor planning, mismatched expectations limits meaningful and effective internship and attachment opportunities
GAP 5	ICT Industry/SME has high dependency on public sector ICT projects
GAP 6	Lack of appreciation on the value of ICT certifications in career development
GAP 7	Limited understanding of ICT careers
GAP 8	SME hampered by time/cost of sending staff for training

Table 5 Summary of Gaps

5.4

PROGRAMME

	GAP							
	1	2	3	4	5	6	7	8
<p>P1.1 ICT Possibilities Programme The Program is aimed to create mindshare, increase visibility and generate interest in ICT careers, ICT professionals, ICT businesses and ICT ecosystem.</p> <p>It would provide greater understanding of ICT careers for students and career counsellors' and change their attitudes and perceptions towards the ICT profession through seminars</p>			●	●			●	
<p>P1.2 Youth ICT Network Youth ICT Network provides students and unemployed youths in Brunei an opportunity to network and learn from each other in order to foster passion in ICT through forming ICT clubs.</p>			●	●			●	
<p>P1.3 Discover and Excite The purpose of the Discover and Excite programme is to allow youths and young students to experience ICT in a tangible and fun way.</p>			●	●			●	
<p>P1.4 National ICT Scholarships This is an ICT-centric scholarship will attract, develop and retain bright Bruneian ICT students, young professionals, to take up the ICT profession or enhance their careers through the provision of scholarships where the bond period will be served through a combination of private and public sector appointments</p>							●	
<p>P1.5 ICT Manpower Portal This one-stop ICT portal can provide information relating to ICT career, jobs and development in Brunei. The ICT portal can also host a section targeted at expatriate professionals, which can be used to showcase the attractiveness of Brunei Darussalam as a living and working destination. The portal should also have a section dedicated to promoting ICT as a suitable career for disabled people.</p>			●				●	

PROGRAMME	GAP							
	1	2	3	4	5	6	7	8
<p>P2.1 ICT Skills Roundtable ICT Skills Roundtable serves as a platform where the higher education institutions, employers (ICT and non-ICT organizations) and representatives from the government meet to exchange ideas and brainstorm ways to ensure that ICT students are well equipped to meet the ever changing demands of the ICT industry and labour market.</p>			●					
<p>P2.2 Structured Workplace Internship Structured Workplace Internship is aimed to increase the effectiveness of the internship process for both employers and interns through better planning</p>				●				
<p>P2.3 Enhanced ICT Youth Development Programme The Enhanced ICT Youth Development (eYDP) programme is to improve the ICT Youth Development experience by introducing new modules as well as soft-skills to improve the employability of the graduates.</p>				●				
<p>P2.4 Enhanced Overseas Internship INSPIRE This program provides more opportunities for high quality, overseas internship for students in the education institutions. Students are exposed to independent living, different work-culture and new technologies by working abroad.</p>				●				
<p>P3.1 ICT Industry Competency Framework ICT Industry Competency Framework ensures Brunei's ICT professionals to have the relevant skills to develop their careers by providing a national standard for ICT job roles, competencies and the type of training required.</p>			●			●		
<p>P3.2 Critical ICT Skills Upgrade Programme Critical ICT Skills Upgrade Programme will ensure Brunei's ICT professionals have the relevant skills for the development of their careers by providing a national standard for ICT job roles and the competencies and training required for these job roles.</p>		●						●
<p>P3.3 Overseas Talent Programme Overseas Talent Programme is aimed to attract the best ICT talents for top positions in the country, with a preference for existing Bruneian and former Bruneian citizens working overseas.</p>	●							
<p>P3.4 Review Labour Policies for foreign ICT professionals The review is to ensure the right foreign ICT professionals are hired to fill gaps in critical ICT roles.</p>	●							

5.4

PROGRAMME

	GAP							
	1	2	3	4	5	6	7	8
<p>P4.1 ICT for SME Programme ICT for SME Programme is aimed to enhance the productivity of companies through the adoption of ICT solutions, thereby leading to new business opportunities for ICT companies.</p>		●			●			
<p>P4.2 ICT Savviness Programme for SME In parallel with the ICT for SME programme, the ICT Savviness programme seeks to educate SMEs on the benefit of using ICT in their businesses to improve their productivity and reduce cost.</p>					●	●		
<p>P4.3 Employer Payroll Incentive Programme This program strives to encourage companies, including SMEs to send staff for training by reducing their cost of operations</p>		●					●	
<p>P4.4 Government ICT Project Forum The objective for the Government Procurement Dialogue is to share with the private IT sector on the government procurement plan so as to make the market place attractive and transparent to supplier</p>					●			

PROGRAMME	GAP							
	1	2	3	4	5	6	7	8
<p>E1: Pilot niche MOOC programmes as part of tertiary curriculum This program is aimed to enhance existing tertiary curriculum with the most current ICT areas by leveraging on technology.</p>		●						●
<p>E2: Growing Hobbyist Developers to supplement the ICT manpower talent pool The session can support hobbyist ICT developers by providing venues and other resources so as to encourage ICT/innovation as a hobby.</p>		●						
<p>E3: National ICT Manpower survey The survey seeks to obtain regular data on the current state of the National ICT manpower in Brunei Darussalam and to identify key trends and requirements going forward</p>							●	
<p>E4: Graduate Employment Data Collection Framework The framework can gather statistics on fresh local graduates through Graduate Employment Surveys. The statistics will help us to understand:</p> <p>the types of employment these graduates go into, e.g. if it is ICT related or not;</p> <p>the types of industry people are working in ICT in, e.g. Oil & Gas, Healthcare;</p> <p>how many students stay on in Brunei and how many leave after graduation; and</p> <p>the jobs Bruneians take up.</p> <p>These statistics will provide data to understand the effectiveness of ICT workforce programmes, e.g. internships and mentorships. The data will also assist prospective students in making informed decisions as to the kind of discipline and course they should pursue in the university.</p>							●	

Table 6 Programmes and the Gaps that They Address

6

Conclusions

Brunei Darussalam's current ICT manpower is supported by a well-funded education system and a number of existing ICT manpower development programmes. However, it remains hampered by low level of skills, misaligned competencies and an under-developed ICT industry which is unable to sustain employment opportunities or contribute meaningfully to the GDP. For a vibrant and productive ICT industry to flourish and to transition Brunei Darussalam from being an importers and consumers of ICT to be exporters and

innovators of ICT, having highly skilled ICT manpower is an important precursor ingredient.

The National ICT Manpower Masterplan, together with the planned ICT Industry Competency Framework is a step in the right direction for developing its human resource capacity and it is critical to use the current momentum to execute and deliver on the strategies and programmes so that ICT can truly be a transformative force for the country and its economy.



Acknowledgements

We would like to take this opportunity to acknowledge the contributions of the various stakeholders who had contributed their comments and feedback during the development of the National ICT Manpower Masterplan (in no particular order)

Organisation/Company/Agency

Prime Minister's Office (PMO)	Institute of Brunei Technical Education (IBTE)	Ishajaya Technology Sdn Bhd
Brunei Economic Development Board (BEDB)	Universiti Brunei Darussalam (UBD)	ITPSS Sdn Bhd
Ministry of Education (MOE)	Institut Teknologi Brunei (ITB)	Bank Islam Brunei Darussalam Sdn Bhd (BIBD)
Ministry of Culture, Youth and Sports (MCYS)	Politeknik Brunei (PB)	Kolej IGS
E-Government National Centre (EGNC)	Brunei Shell Petroleum Company Sdn Bhd	Laksamana College of Business
Department of Technical Education (DTE)	Royal Brunei Airlines Sdn Bhd	Cosmopolitan College
Department of Economic Planning and Development (JPKE)	Telekom Brunei Berhad (TelBru)	Infocomm Federation of Brunei Darussalam (IFB)
Agensi Pekerjaan Tempatan dan Pembangunan Tenaga Kerja (APTK)	DST Sdn Bhd	
	BAG Networks Sdn Bhd	
	Alif Technologies Sdn Bhd	

