ASOCIO
Reimagining the Digital Era

WORLD INFORMATION TECHNOLOGY AND SERVICES ALLIANCE
WITSA

ICT Talent Development & Collaboration

Cross Border Opportunities within Asia Pacific

November 2018

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ABOUT THE REPORT

PUBLISHED BY

The Asian-Oceanian Computing Industry Organization (ASOCIO) is an ICT federation organized by ICT associations representing from 24 economies throughout Asia Pacific. ASOCIO was established in 1984 and it is the most time-honored and active international ICT trade organization in Asia and Oceania. Its influence covers more than 10,000 ICT companies and represents approximately USD 350 billion of ICT revenue in the region. ASOCIO's objective is to promote, encourage and foster relationships and trade between its members, and to develop the computing industry in the region.

Presently, ASOCIO represents the interests of 31 economies, comprising 24 members from Australia, Bangladesh, Bhutan, Brunei, Cambodia, Chinese Taipei, Hong Kong, India, Indonesia, Japan, Laos, Macao, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Thailand, Vietnam and 7 guest members from USA, UK, Canada, Spain, Russia, France, and Kenya. Under the ASOCIO umbrella, member economies are provided an opportunity to collaborate amongst the member economies for growth.

PARTNER

The World Information Technology & Services Alliance (WITSA) is a global consortium of leading ICT industry association members from over 80 countries/economies. As the leading recognized voice of the global ICT industry, WITSA aims to drive transformation and grow the industry, given that ICT is the key driver of the global economy:

WITSA's members and stakeholders comprise national associations, multinational corporations, institutions and organizations, researchers, developers, manufacturers, software developers, telecommunication companies, suppliers, trainers and integrators of ICT goods and services. As such, they represent a large and obviously vital constituent group for whom the effective balancing of concerns and rights affecting the security, privacy and information capability provided by ICT products and services underpins business development and economic activity.

RESEARCH AGENCY

Is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets. With more than 1,100 analysts worldwide, IDC offers global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries.

IDC's analysis and insight helps IT professionals, business executives, and the investment community to make fact-based technology decisions and to achieve their key business objectives. Founded in 1964, IDC is a wholly-owned subsidiary of International Data Group (IDG), the world's leading media, data and marketing services company that activates and engages the most influential technology buyers.

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MESSAGE FROM ASOCIO

It is my great pleasure to present our second ASOCIO research report, ICT TALENT DEVELOPMENT & COLLABORATION: Cross Border Opportunities Within Asia Pacific.

This report comes at an opportune time wherein many countries within the Asia Pacific region are moving progressively forward with their Digital Economy agenda. In their pursuit towards creating a wholesome digital driven economy, stakeholders are also critically aware that future talent requirements, changing landscape of workforce, disruptive technologies such as Blockchain, Analytics, Artificial Inteligence, Machine learning and Robotics to name a few; and national education policies, programmes and agenda will continue to be important focus areas. In particular with today's pace of technology obsolucency and evolutions, to define and ascertain what future job-demands and the necessary future-skills to fulfill these voids, it is imperative that governments, businesses and industries must take appropriate actions now including exploring the option of working cross borders with counterparts and shoring up on effective collaborations and partnerships in the region. It is with this in mind that in this second ASOCIO research report, we have decided to conduct a regional search of data and pertinent information focusing on Cross Border Opporunitues Within Asia Pacific on talent development and collaborations.

Specifically we have targeted and explored the successful talent development initiatives and programmes of 13 economies within Asia Pacific namely Australia, Bangladesh, China, India, Indonesia, Japan, South Korea, Malaysia, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam. Some of the exemplary case studies in the report showed that through partnerships and collaborations between local businesses, industries and the respective government in each country; they have been effective in yielding positive results in a short space of time. We are confident that some of these programs can also be replicated and emulated in the other countries in the region. Based on the report, we also realised that there are certainly ample of opportunities for cross talent collaborations and allowing countries to not only learn from another but assisting the emerging digital economy countries to quickly be placed on equal playing fields in talent development and acquisitions.

I would like to take this opportunity to thank WITSA (World Information Technology and Services Alliance) for their continuing support and all ASOCIO members of the 13 economies for their assistance and collaboration for making this report a success.

David Wong Nan Fay

ASOCIO Chairman

MESSAGE FROM WITSA

The World Information Technology & Services Alliance (WITSA) is pleased to co-sponsor this important report, along of the with the Asian-Oceanian Computing Industry Organization (ASOCIO). Information and Communications Technology is impacting nearly every aspect of human life and endeavor. In order for the massive digital transformation underway to continue throughout societies, the supply of labor must keep up with demand. It is safe to say that the supply of talented workers necessary to fulfill job requirements is woefully inadequate and getting worse. Every aspect of hiring, recruiting, managing, retaining and motivating the workforce in the Digital Age needs to adjust and adapt to this new era. CEO surveys indicate that finding the right skilled workforce is become more consuming and challenging. Work is increasingly driven by rapid and unpredictable technological changes and competition for intellectual capital. The very nature of work is radically changing; thus, affecting skill requirements. Each year it becomes more important and pressing. To add to the challenge, the young digitally skilled workforce is not looking for lifetime employment; like their forbearers. Rather, most are looking for challenges, change and contributing to society. Enter education. In most cases, the promise of Digital Age education, where students of all ages learn at their leisure and acquire advanced skills to meet workforce demands and knowledge is not working. As a result, the global skills gap is growing and is extremely expensive both for businesses and society as a whole. No country has more skilled, digitally trained workers than they have jobs for. The global aging populations are shrinking tax revenues; putting pressure on younger generations to fill the gap. Surprisingly, the Digital gap between countries is also widening, putting pressure on countries to catch up. Public education must adopt new approaches to lifelong learning.

The rate of innovations is creating the need for new skills to be delivered faster than the rate of educational responses. Unfortunately, no one model of teaching has emerged as the "best." Colleges and University in many cases, are stuck in traditional teaching methods and are not keeping up-to-date with technological changes. Some multinational corporations are attempting to take up the slack from higher education in order to ensure adequality trained employees, but such efforts in of themselves, are inadequate. As innovations require new skills to be developed, a close, synergistic relationship between governments, industry and academia needs to exist. Governments must submerge students at a very young age in all aspects of digital technologies, refrain from erecting barriers to the free flow of human talent across boundaries, do a better job at inspiring girls to pursue ICT studies and careers and encourage better gender balance by promoting a stronger role of women. Industry and governments must also work together to facilitate education, training and employment initiatives that enable persons with disabilities to achieve economic wellbeing.

As the World Information Technology and Services Alliance (WITSA), which represents over 90% of the ICT industry among its 83 countries continues the meet the skilled workforce challenges, so to do all businesses, governments, organizations and societies. It is WITSA's sincere hope that this report will add to the understanding of the workforce and skills challenges.

Yvonne Chiu

Chairman
WITSA

EXECUTIVE SUMMARY

OVERVIEW

Asia Pacific region has achieved remarkable economic growth and technological advancements over the past decade. Organizations in the region embarked on the journey of digital transformation to not only re-invent themselves but to also make their businesses more sustainable. There are signs, however, that the strong digital transformation trend is putting pressure on the job market and exacerbating the issue of shortage of the right skilled ICT workforce in the region.

Despite many organizations having incorporated new technologies such as big data analytics (BDA), artificial intelligence (AI), cloud, mobility, Internet of Things (IoT), and cybersecurity into their operations, the lack of ICT skills remains as one of the biggest obstacles, holding back organizations in their digital journey. To elaborate, being unable to hire employees with the right skillset and experience level at the right time, in some cases, have resulted in the delay of projects and core business services. Understanding the key challenges and limitations for ICT talent development of each country in the region is crucial in achieving collaborative and actionable solutions to tackle the ICT talent shortage.

In this report, IDC has identified the key challenges, top ten high demand jobs, and initiatives taken for ICT talent development in 13 economies including Australia, Bangladesh, India, Indonesia, Japan, South Korea, Malaysia, People's Republic of China, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam. Many of the economies in the region continue to be challenged by the lack of ICT graduates. For instance, in Australia and Singapore the ICT course enrolments are relatively low compared to enrolments in other fields of study. Whilst in countries such as Indonesia and Bangladesh, lack of higher education has caused a large portion of the labor force to remain in low-skill occupations.

Some commendable initiatives that are seen carried out by the Singaporean government to address the issue are the introduction of ICT related scholarships in the country such as "Smart Nation Scholarship" and "Skillfuture Study Awards" for Singaporean citizens as well as ICT scholarships for international students. These initiatives will produce a sustainable ICT talent pool and enable high demand jobs such as Mobile & Web Application Developers, Computer System Analysts, and Software Developers to be filled.

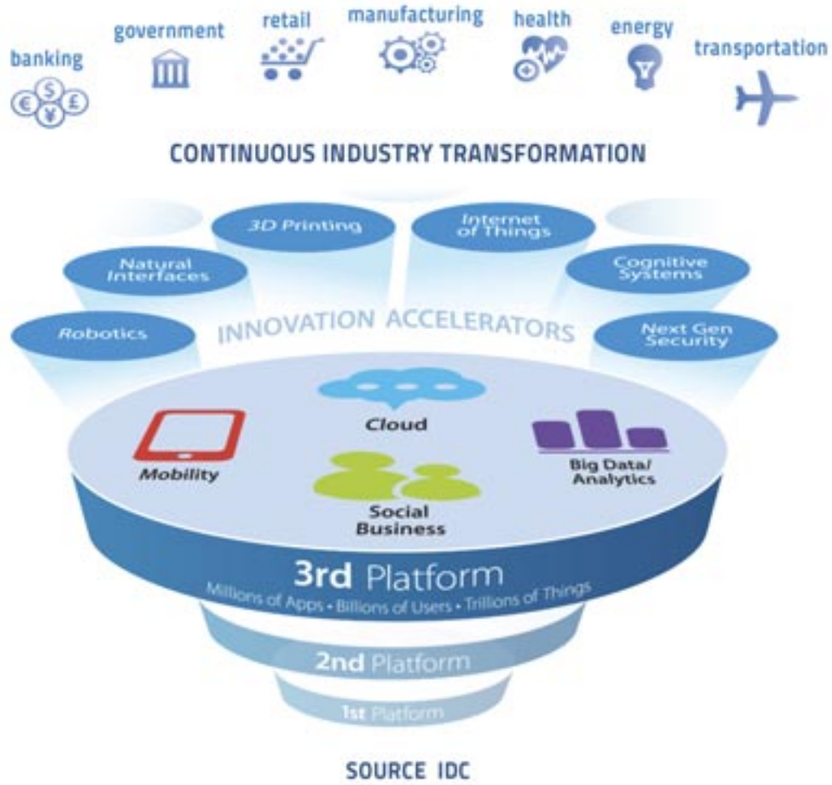
The final section of the report provides recommendations for cross-border talent collaboration.

KEY CHALLENGES

China, India and Japan's combined nominal GDP is more than 20 Trillion US dollars and represents about 32% of the world economy. India, Bangladesh, and Vietnam are one the fastest growing economies in the world. With population of more 4 billion people Asia Pacific is the growth driver of the world. To achieve and sustain economic growth human capital is imperative and is considered one the most important asset that any country has; whether it is their own population or is a mix of local and foreign talent.

As the future of work is experiencing disruptions, innovation and adoption of emerging technologies such as Artificial Intelligence, Robotics, 3D Printing coupled with technological pillars of Mobility, Cloud, and Analytics are becoming more important for economies to create new opportunities of growth and to keep unemployment rate in control.

" In this report, IDC has identified the key challenges, top ten high demand jobs, and initiatives taken for ICT talent development in 13 economies including Australia, Bangladesh, India, Indonesia, Japan, South Korea, Malaysia, People's Republic of China, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam.



SOURCE IDC

ICT has reached and impacted every industry; almost all traditional businesses are disrupted by new wave of technology and is changing how businesses are done for ever. It is crucial for economies to have enough skilled ICT talent to compete in the new world. For example, cyber-attacks have become a norm in today's world where thousands work full time as hackers to earn their income; to protect data and assets such a power grids, nuclear plants, and defense installations; cybersecurity talent has become critical to safeguard against any cyber-attacks.

Following are the key ICT Talent acquisition challenges that are faced by Asia pacific economies:

- **Lack of skilled ICT Workforce**
  In Asia pacific region organizations are facing immense challenges in finding suitable skilled workers to fill in the in-demand ICT jobs. Large percentage of graduates coming to job market each year are not job-ready and requires training by their employer to perform their duties. Many large organizations are addressing the problem by having in-house training centers, but medium and small organizations find it difficult to train them and often engage third-party training providers. Experienced professionals who are not learning continuously to acquire new skills are also losing out as emerging technologies are demanding new skillset.

- **Outdated curriculum creating skillset mismatch**
  In many economies in Asia pacific, school and university curriculums are not fully aligned and updated to industry requirements and students are often taught courses that are outdated. They also lack practical trainings in areas of job requirements. This mismatch is creating large pool of graduates with degrees but substandard skillset.

- **Cross-border ICT Talent acquisition**
  Organizations are unable to freely acquire right ICT talent from across the border due to work visa limitations. Economies needs to protect rights of local population and try to maintain desired demography but if local population is not ready to take up the in-demand jobs, organizations growth should not suffer due to lack of ability to hire right skilled workers from across the borders.

- **Income disparity**
  Within Asia Pacific there is large income disparity. Developed economies in the region pay their employees multiple times more than the average salary of developing economy luring the talented workforce to migrate from their country of birth to work in the more developed economies of the region such as Singapore, Australia, and Japan. These economies also offer better quality of life compelling talented workforce from countries such as India, Bangladesh, and Indonesia to migrate causing brain drain and talent shortage in their home countries.

IN-DEMAND ICT JOB AREAS AND CERTIFICATIONS

IDC HAS IDENTIFIED THE FOLLOWING ICT JOB AREAS THAT ARE IN-DEMAND AND WILL EXPERIENCE INCREASED DEMAND FOR TALENT IN THE FUTURE

	JOB AREAS
1	Business Intelligence Consultant
2	Cloud Solution Architect
3	Computer Systems Analyst
4	Cybersecurity Consultant
5	Data Scientist
6	Internet of Things (IoT) Developer
7	IT Infrastructure Engineer
8	Mobile and Web Application Developer
9	Network Engineer
10	Software Developer

The 10 in-demand job areas are identified based on current and forecasted overall ICT spending by organizations in Asia Pacific economies, hiring trends by end-user organizations and investments in emerging technologies by ICT vendors to offer new products and services.

IDC has also identified 10 in-demand certifications that are sought after by employers in Asia Pacific economies. Acquiring one or more of these globally recognized certifications increases the probability of landing in-demand ICT jobs along with improving performance of the employees.

IN- DEMAND ICT CERTIFICATIONS

1. Certified Information Security Manager (CISM)
2. Certified Information Systems Security Professional (CISSP)
3. Certified Information Systems Auditor (CISA)
4. Project Management Professional (PMP)
5. AWS Certified Solution Architect - Associate
6. Citrix Certified Professional - Virtualization (CPP-V)
7. VMware Certified Professional 6 - Data Center Virtualization (VCP6-DCV)
8. ITIL v3 Foundation
9. CompTIA Project +
10. Cisco Certified Network Professional (CCNP) Routing and Switching

KEY FINDINGS

IDC team has estimated ICT Talent demand for 10 in-demand job areas for 13 economies in Asia Pacific taking. Estimations are based on ICT spending forecasts, industry and market knowledge of IDC Analysts based out of IDC offices across Asia Pacific. IDC Analysts have taken utmost care to estimate the ICT talent demand numbers, but these should not be read as absolute numbers rather they are estimated to demonstrate approximate ICT Talent demand and trends across 13 economies in Asia Pacific region.

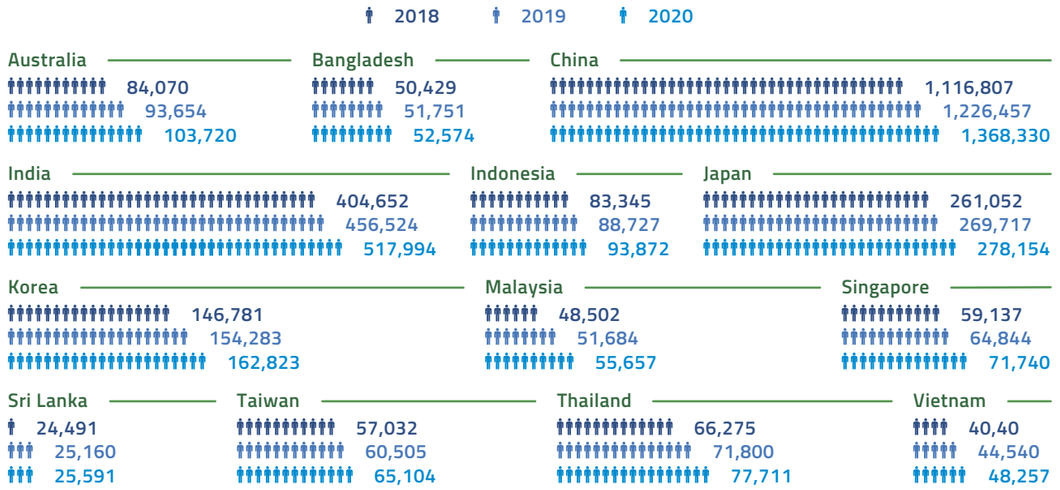
- The estimated ICT Talent demand numbers clearly demonstrate direct link between economic growth of the country and ICT talent demand. As the economies are becoming more dependent on technology and aspire to develop and grow digital economies this linkage will only get stronger as we will move in the future.

- ICT Talent demand in matured and developed economies such as Japan and Singapore is slower than emerging economies such as China and India except for Australia which has tremendous ICT Talent demand growth rates for a developed economy.

- Every economy is the Asia Pacific region has ICT Talent development as a key agenda for overall human capital development and has initiated programs to develop ICT Talent but are at different level of effectiveness and maturity.

- Job creation is also one of economies such as Australia, China, Japan, South Korea Singapore, Malaysia and India to avoid talent glut as the outcome of talent initiatives are produced. Some economies are not doing enough for job creation and must buckle up to keep unemployment rate under control.

- It is observed that initiatives that were good in intent but are not followed through, either they were launched without proper planning or lacked the political will to take them forward. It is imperative for talent development programs to be effective that they must have long term planning and political will in order to achieve sustained results.



RECOMMENDATIONS FOR CROSS-BORDER COLLABORATIONS

1. Advocate ease of working visas and policies amongst ASEAN countries and Asia Pacific region.
2. Introduce cross-border inter-varsities interns or exchange programs.
3. Organise collaborative regional talent events and fairs in major cities.
4. Advocate an alignment of government policies on the ICT certification, training and tertiary qualifications.
5. Standardise ICT job designations, roles and functions across the region allowing portability of talent across borders.
6. Create a regional data and research agency to collect, manage and report on the state of skills and talent including brain-drain out of the region.
7. Create online collaborative learning and training portals that can be accessed by all countries across the region including standardising the certification process.
8. Organise annual government-to-government summit addressing the Human Resources and future talent development issues.
9. Create a Human Resource Fund based on contributions by companies who have cross-border business activities in the region and any certified training programs attended by the staff from the eligible organizations can claim a rebate depending on the program.
10. Identify key private sector training and certification companies from respective countries and assist them in promoting across the region focusing on economies that are most lacking in in-demand ICT skills.
11. Conduct a regional ICT salary comparison study of the various levels from entry to senior managers to better understand the inter-country gaps of salary compensation taking into account Purchasing Power Parity (PPP) reflecting the exchange rate.
12. Advocate strongly that ICT talents and Human Resources priorities must be high on the agenda of all the Governments in the region and set up a regional Talent Advisory Council (TAC) to advice on this agenda.
13. A realistic vision be developed to act as a beacon for direction and decision of future initiatives and programs.

CONCLUSION

It is important to realise that to pursue a national digital agenda successfully for the economy it is imperative that you also need a clear and effective talent fulfilment strategy collectively for the country for the medium and long term.

Based on the research data, there are certainly ample opportunities for cross border talent development and acquisitions in the region across the 13 economies identified. One can simply emulate others individually to gain short term resolutions to your skills gaps and deficiencies or an effective collaboration across the region which will perhaps yield a more sustainable outcome.

There is need for greater collaboration among government, ICT industry players, end-user enterprises and educational institutions to improve existing and develop new policies and programs for betterment of talent agenda which requires serious continuous efforts to achieve the vision of availability of desired skilled ICT Talent in ever changing Future of Work (FOW) environment.

KEY EMERGING TECHNOLOGIES

BIG DATA ANALYTICS AND AI DEFINED

Big data analytics (BDA) is a complex group of fundamental technologies that provide the tools for utilizing data that is constantly evolving. For example, driverless cars, digital personal assistants, and intelligent fraud analysis require a thorough understanding of data science technologies that include performance management, business intelligence, data platforms, and machine learning.

The BDA industry represents a collection of software tools, their services, and applications for data extraction, integration, governance, movement, curation, analysis, and visualization deployed to support or automate a broad range of strategic, operational, and tactical decision making.

Big data software is defined as a new generation of software and architectures designed to economically extract value from very large volumes of a wide variety of data by enabling high-velocity capture, discovery, and/or analysis. IDC associates three attributes to "data" in a big data definition: volume, variety, and velocity.

The BDA software market includes three primary segments:

INDUSTRY SEGMENTS

ANALYTIC AND PERFORMANCE MANAGEMENT APPLICATIONS

Enterprise Performance Management Applications

Customer Relationship Analytic Applications

Supply Chain and Product Analytic Applications

Services Operations Analytic Applications

Workforce Analytic Applications

Production Planning Applications

ANALYTIC DATA MANAGEMENT AND INTEGRATION PLATFORMS

Data Integration and Integrity Tools

Continuous Analytics Tools

Non-relational Analytic Data Stores

Relational Data Warehouses

BUSINESS INTELLIGENCE AND ANALYTICS TOOLS AND PLATFORMS

Query, Reporting, and Analysis Tools

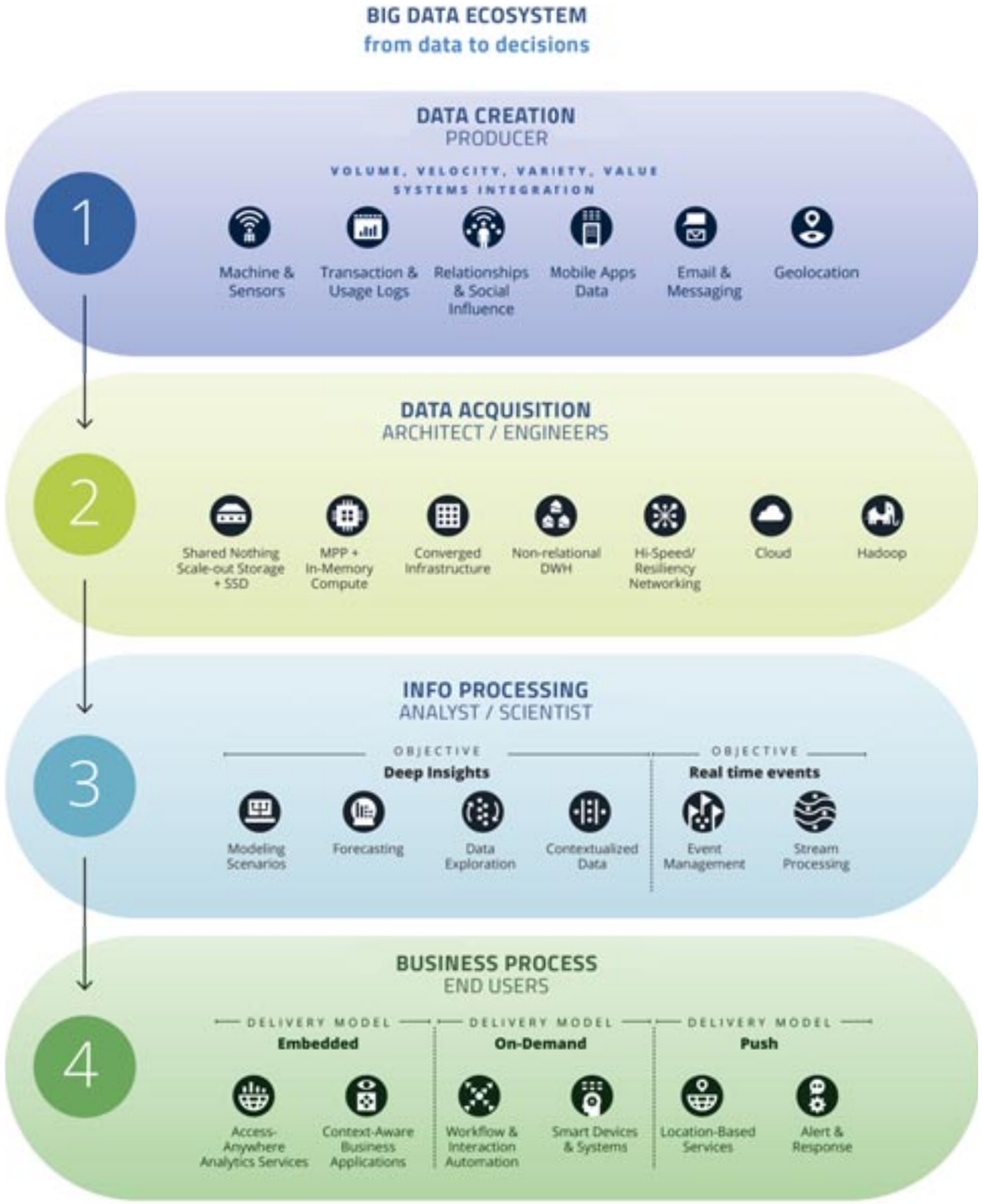
Advanced and Predictive Analytics Tools

Content Analytics Tools

Search Systems

Spatial and Location Analytics Tools

Cogntive / AI Software Platforms

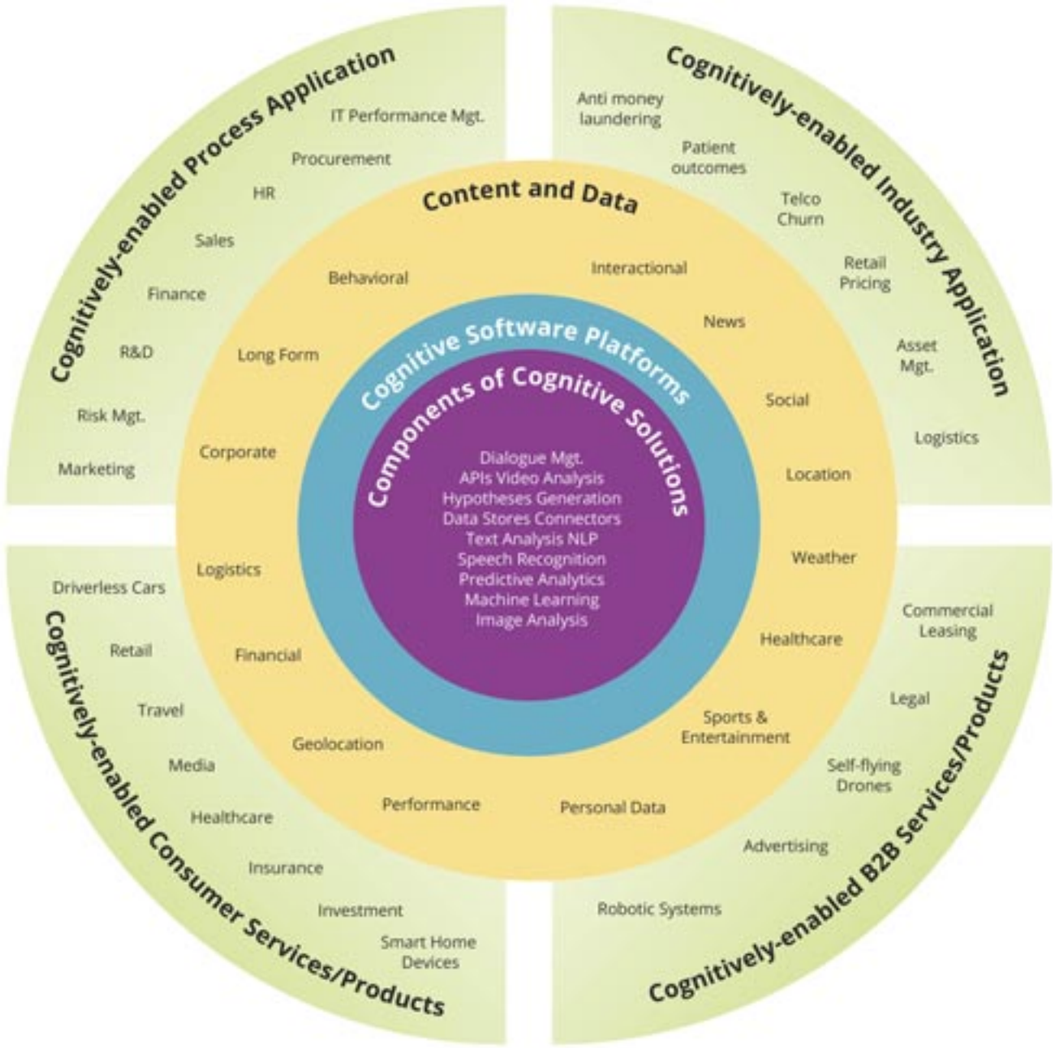


COGNITIVE AND AI ECOSYSTEM

Existing among the subsegments of BDA is the emerging 3rd Platform technology of cognitive/AI systems. IDC defines cognitive/AI systems as a technology that uses deep natural language processing and understanding to answer questions and provide recommendations and direction. The system hypothesizes and formulates possible answers based on available evidence, can be trained through the ingestion of vast amounts of content, and automatically adapts and learns from its mistakes and failures.

Cognitive/AI software platforms are a subset of the overall cognitive/AI systems market segments:

IDC'S COGNITIVE SOLUTIONS ECOSYSTEM



With unstructured and semi-structured information to build up curated information bases and knowledge graphs that can be mined and analyzed by various AI techniques and algorithms, such as machine learning, neural networks, and deep learning.

Recommendations, predictions, and advice based on this AI provide users with answers and assistance in a wide range of applications and use cases.

Cognitive AI systems, located at the heart of DX initiatives, are a class of technologies that has emerged to facilitate the discovery, use, and collaboration of information in analysis and decision making. These technologies use information curation, information retrieval, knowledge graphs, and numerous other components to assist business leaders in identifying improvement areas in business processes, answering key questions about the market, and shaping organizational strategies.

IDC views the potential opportunity for cognitive/AI systems by use case. This approach establishes a rich vocabulary and framework to enable meaningful conversations between vendors and clients by painting a vivid, specific portrait of the potential end state. An IDC use case is a conceptual framework that provides a view of business value that is created when a set of technologies comes together. Use cases are not defined by the technology itself. The parameters of a use case are defined by the value being created and recognized by an organization.

Use cases can be categorized according to the three primary benefits they provide:

- Creating new products and services
- Optimizing operations
- Transforming the customer experience/creating customer loyalty

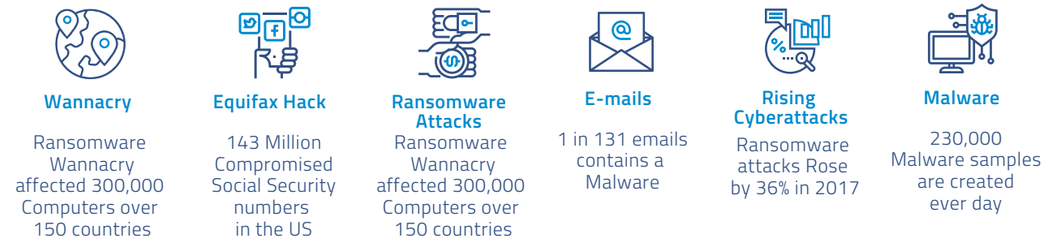
CYBERSECURITY

With the growing threat incidents and sophistication of cyberattacks, cybersecurity is becoming a critical business as well as IT requirement for most countries in Asia Pacific. As series of cybersecurity incidents over the last year has highlighted the seriousness of the situation. And the situation is exacerbated by weak data protection and breach notification guidelines/regulations.

Furthermore, security continues to be crucial in the context of digital transformation (DX), with organizations looking to identify and mitigate the potential security risks across endpoints, networks, applications, and storage. The adoption of 3rd Platform technologies and innovation accelerators is increasing the scope and scale of cyberattacks.

5 CYBER SECURITY THREATS TO EXPERT IN 2018

SOME CYBERCRIME STATISTICS FROM 2017



CIOs face two essential talent imperatives with digital transformation — ensuring that their IT teams have the right people and that their teams have the right skills. Selecting IT professionals has never been straightforward. In this period of very low unemployment in IT (some estimates put it at less than 3%, Monster.com even reported 0% unemployment for cybersecurity professionals recently), it has never been harder. Recognizing or validating specific competence in available candidates can be a challenge. IDC believes that leveraging relevant, well-constructed IT certifications from significant technology vendors can help IT leaders identify appropriate candidates for openings.

However, in the absence of a strong regulatory environment, the limited capabilities of local professional security services entities, and the lack of qualified cybersecurity professionals, assess their complex IT environments, and identify the gaps in their security measures. Security vendors are increasingly focusing on training and retaining qualified security engineers and analysts that have a strong understanding of specific vertical security needs and challenges and will help clients understand their security needs.

BLOCKCHAIN

Blockchain technology is part of a new era of digital trust between enterprises and their communities, whether it be with their customers, regulators, suppliers, or service providers. Some would consider blockchain technology a paradigm shift in how enterprises will approach the management of data in the years to come. From the transparency and decentralized consensus of distributed ledger technology to the security and incorruptibility ensured by cryptographic signatures and encryption, many features make blockchain an appealing solution to problems across various industries.

BLOCKCHAIN / DLT USE CASES : A BRIEF SUMMARY

Use Case

(in no particular order, many have yet to move beyond the proof of concept stage)

Finance

Crowdfunding

Cross-border Transcations

Regulatory (KYC, Data Exchange)

Trade Finance Automation

Financial Loyalty Programs

Insurance

Multiparty Insurance Product Management

Multi-Jurisdiction Insurance Product Management

Consumer Insurance (e.g. travel insurance)

Logistics

Shipping Documentation & Coordination

Trucking (transaction management)

Perishable Product Provenance, Safety & Tracking

Retail

Supply Chain Management

Equipment/Parts Management & Authentication

Disintermediation of Online Payments

Asset/Goods Management & Monitoring

Utilities

Wholesale Energy Trading

Decentralized Grid Management

P2P Energy Trading

EV Charging (P2P + V2G)

Professional Services

Legal Services Workflow Automation

Commercial Property Selection

Real Estate Due Diligence

Leasing Transaction Management

The primary objective for using blockchain technology is process efficiency, trust and scalability. Investment in blockchain has gained momentum.

IDC expects to see rapid growth in the blockchain developer marketplace, supporting the expected growth in services. By 2021, the number of consultants and developers in blockchain services will have grown tenfold from current estimates. Blockchain developers, including those building front-end blockchain application or enterprise application integration in Java, C++, Pyton and Node.js are in the 'sub unemployment 'market today with the greatest shortage in the United States, the United Kingdom and Japan (Tokyo).

1. AUSTRALIA

1.1 INTRODUCTION

Australia's Gross Domestic Product (GDP) is US$1379.5 Billion in 2017. The International Monetary Fund IMF has estimated a 2.2% GDP growth rate in 2017. The current population in Australia is 24.8 million reported by the International Monetary Fund 2017. The unemployment rate of 5.6%. The Information and Communication Technology (ICT) workforce in Australia is approximately 663,000 as of 2017, with an increase of over 3% of an estimate of 640,000 workers in the last year. The Industry is also estimated to grow by almost 100,000 by 2023.[1]

1.2 FUTURE INDUSTRY DIRECTION AND IMPLICATION TO TALENT DEMAND

There are a few initiatives put in place to develop the ICT industry in Australia. For example, technology parks, tax incentives and innovation hubs.

ICT WORKERS BY CIIER OCCUPATION GROUPINGS, 2017

ICT Technical & Professional — 251,300

ICT Trades — 72,900

ICT Industry Admin & Logistics Support — 113,000

ICT Management & Operations — 194,400

ICT Sales — 27,900

Electronic Trades & Professional — 3,600

This data demonstrates that the most in-demand ICT occupations are those which combine technical ICT skills and expertise with broader business needs.[2]

LOCAL DEMAND

The Australian government's 2017 Industry Employment Predictions Report indicates that employment is expected to grow strongly in the computer system design and related services sector, which is projected to grow by 54,200 (or 24.6%) after having grown by 83.9% over the past 10 years to its current employment level of 220,200.

These high growth rates have been partially due to demand-side initiatives by the federal government to ensure sustained demand for these skills.[3]

TECHNOLOGY PARKS

The Australian Technology Park (ATP), located in Sydney, is spread over almost 14 hectares of land and houses several high-tech start-up companies as well as university research bodies to encourage innovation and development.[4]

Digital Harbour, Melbourne's technology park established in 2004, is a "mixed use neighborhood held together by a series of green landscaped recreation spaces with overlays of high-speed communications infrastructure and Australian and World Best Practice Ecologically Sustainable Development (ESD)".[5]

It houses the Bureau of Meteorology, Melbourne Water, the National Broadband Network Co, and the Telstra National Learning Academy.[6]

TAX HOLIDAYS

Since July 2016, the Australian government has been offering tax offsets to investors that invest in early stage innovation companies. The purpose of this plan is to drive growth in innovation start-ups. Faster growth in this area will lead to greater demand-side pull for employees with ICT experience.[7]

STONE & CHALK

Stone & Chalk is an independent, not-for-profit fintech hub that supports start-ups in Australia. Grounded on a "give first" philosophy, Stone & Chalk has attracted corporate membership from 26 large Australian and global corporate and government.[8]

Major corporate partners include DXC Technology, KPMG, Optus, ANZ, Westpac, NAB, HSBC, and Ernst & Young.[9]

Stone & Chalk has proved relatively successful in driving the demand for ICT skills and development: "After just 18 months of operations, S&C now houses over 300 entrepreneurs working in over 60 fintech start-ups that have already collectively raised over A$101 million in funding."[10]

Stone & Chalk has coworking spaces in both Melbourne and Sydney, providing opportunities for entrepreneurship and generating potential employment opportunities for ICT professionals.

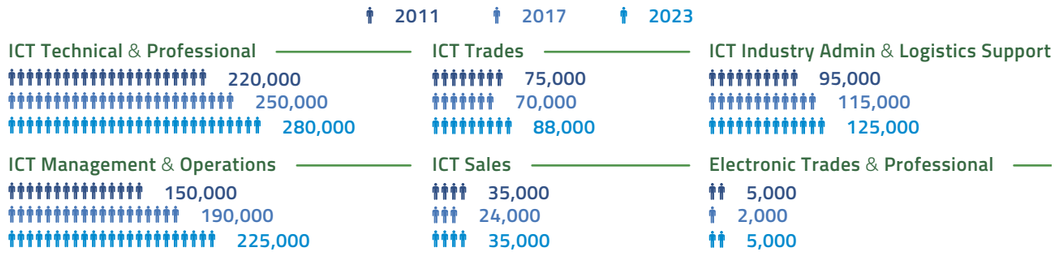
" The Australian government's 2017 Industry Employment Predictions Report indicates that employment is expected to grow strongly in the computer system design and related services sector. "

TECHNOLOGY PARKS

Similarly, LaunchVic is a start-up agency that was created by the Victorian government in 2016 as an independent agency responsible for developing Victoria's start-up ecosystem. [11]

LaunchVic does not fund start-ups directly but connects them with established service providers: "LaunchVic connects credible service providers with start-up founders and entrepreneurs who are building ambitious and exciting businesses in our state... our rounds target start-up sector specialists who can deliver programs and support to Victorian start-ups in the form of education, incubators, accelerators, mentoring, professional development, and other programs."[12]

HISTORICAL & FORECAST ICT EMPLOYMENT, 2011 - 2023



Growth is forecasted in all ICT employment areas, with the most substantial growth expected to occur in ICT management and operations and ICT technical and professional. This demonstrates an expected growth in both supply and demand for all ICT employment.[13]

AUSTRALIA IN-DEMAND JOBS 2018-2020

IN DEMAND JOBS	2018	2019	2020
Business Intelligence Consultant	5,241	5,848	6,585
Cloud Solution Architect	5,336	6,800	8,333
Computer Systems Analyst	19,202	19,893	20,592
Cybersecurity Consultant	5,451	6,428	7,593
Data Scientist	1,965	2,193	2,469
Internet of Things (IoT) Developer	3,658	4,118	4,603
IT Infrastructure Engineer	8,537	10,880	13,333
Mobile and Web Application Developer	16,754	17,399	17,858
Network Engineer	6,403	8,160	10,000
Software Developer	11,521	11,936	12,355
Australia Total	**84,070**	**93,654**	**103,720**

AUSTRALIAN SKILLS GAP

According to a report published by the Australian Computer Society (ACS) and Deloitte, there is currently a significant technology skills gap in Australia, with an extra 200,000 technology workers needed in the next five years.

In the past year, there were only 22,300 new technology jobs created, indicating a significant shortage in meeting this demand at current rates of ICT job creation.

The report outlined some of the ICT skills in greatest demand: "Analysis of LinkedIn data from 2016 found that the top skills demanded by employers hiring new ICT workers included technical skills - such as IT infrastructure, web programming, and cloud computing - as well as broader business skills like project management, customer service, and strategic planning."

To bridge this gap, Australian state and federal governments should seek to foster programs that ensure the development of ICT skills, beginning at the primary school level and continuing to tertiary programs.[14]

There are less than 5,000 local ICT graduates produced a year, which inevitable will contribute to the issue of shortage of ICT skilled talent and as a result the only way for the industry to sustain is to continue importing skilled talents into the country. This has been an underlying problem in the past 5 years.

According to the Australian government website Job Outlook, there are a range of ICT professions in which there is low unemployment. These include ICT support and test engineers, ICT support technicians, and ICT managers.

Lower unemployment figures are indicative of a general imbalance in supply/demand numbers, which means there are significant talent gaps in some cases, with the supply not able to meet the demand for this range of professions.[15]

Additionally, Australia's current labor force has diversity issues. Rendering from the report published by ACS and Deloitte, 28% of the ICT workforce consists of female workers and 12% are females above the age of 55% comparison to 45% and 15% in all other industry professions. [16]

" According to the Australian government website Job Outlook, there are a range of ICT professions in which there is low unemployment. "

1.3 CROSS-BORDER TALENT OPPORTUNITIES

CROSS-BORDER TALENT

As per the government, increasing dependence on technology ICT is changing the way the government operates, and the pace of change will continue to accelerate through technology-enabled transformation of government business.

The Hays January 2017 quarterly forecast for ICT in the public sector also confirms the strong upward pressure on the demand for ICT skills and notes that "competition between public sector organizations themselves for this limited resource pool will present the greatest challenges."[17]

The ICT workforce grew to an estimated 640,846 workers in 2016, representing a 1.9% increase on the 628,810 ICT workers recorded in 2015 (DAE 2016a). The continued growth in ICT employment across the Australian economy reflects the strong employer demand for ICT workers and skills as well as continued improvements in the foundations of the Australian labor market.[18]

ICT OCCUPATION MOST ADVERTISED IN 2016[19]

NEW VISA PILOT

Highly skilled workers from around the world will have a new visa pathway into Australia as a part of the government's new Global Talent Scheme pilot program. From July 1, 2018, all businesses will be able to sponsor highly skilled and specialized workers who will help grow their businesses and create more jobs.

The pilot will run for 12 months and provide businesses with a streamlined process to sponsor overseas workers with cutting-edge skills, where there are no suitable Australians available to fill the vacancies.

The government has been consulting with industry, start-up, and tertiary institution leaders, who informed the initial design of the scheme and will provide additional advice during the pilot.

The scheme includes two streams - one for established businesses and one for start-ups.

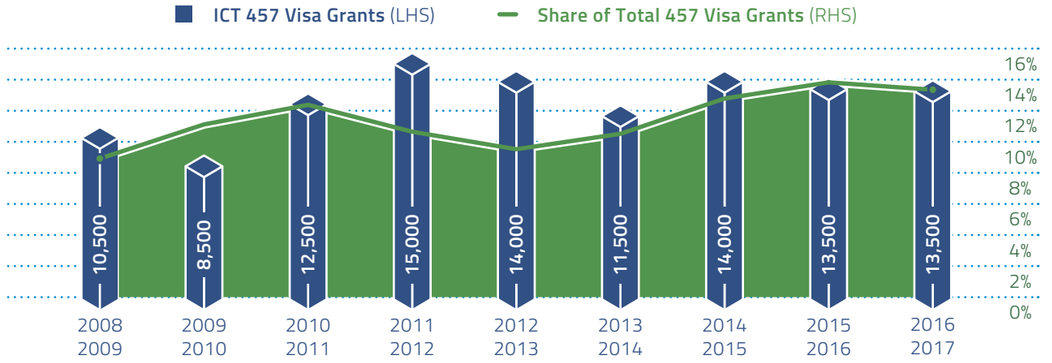
All businesses sponsoring workers to Australia under the scheme will need to demonstrate that they have been unable to source suitable individuals in the Australian labor market.

Workers sponsored under the scheme will have access to a Temporary Skill Shortage visa and permanent residence after three years.

Minister for Jobs and Innovation and Senator Michaelia Cash said the new scheme answers the call from businesses to deliver more flexible, future-focused visa arrangements that help attract global talent to Australia.

Minister for Citizenship and Multicultural Affairs Alan Tudge said the innovative new scheme will help attract top global talent into Australia. "This scheme is designed to facilitate businesses accessing top talent from around the world… It complements existing Temporary Skill Shortage visa arrangements by providing the flexibility to handle high-value, niche skills that can't be obtained under the standard visa program. A lot of the top talent is in fierce demand from companies all over the world. We want this talent to come to Australia, to support businesses here and create wealth for the nation."[20]

SUBCLASS 457 TEMPORARY WORK(SKILLED) VISAS GRANTED TO ICT WORKERS



* Excludes ICT industry administative and logistics support, for which breakdowns are unavailable; data for electronic trades and professional roles is for all industries

Source:
Department of Immigration and Border Protection Subclass 457 Visa Statistics (2018).

Although the total number of 482 visas granted to ICT workers has fluctuated, there is a general upward trend in the ICT share of the total number of 482 visas granted. This indicates a greater reliance on foreign workers to fill ICT occupations, demonstrating an excess of demand that outstrips domestic supply.[21]

MIGRATION

Migration continues to be a key source of talent; however, more could be done to utilize this resource.

There was a net migration inflow of around 19,600 ICT workers in 2014-15, with software and applications programmers recording the largest net inflow of workers. Around 13,900 457 visas were granted to ICT workers over 2014–15, representing 15% of total visas but only around 2% of the overall ICT workforce in Australia.[22]

457 visas have now been replaced with 482 Temporary Skill Shortage visas. This visa "enables employers to address labor shortages by bringing in genuinely skilled workers where they cannot source an appropriately skilled Australian."[23]

1.4 KEY INITIATIVES

AUSTRALIAN GOVERNMENT ICT STRATEGIC PLAN

The ICT Strategic Plan is subordinate to the parliamentary strategic plan and provides the context of ICT planning across the four parliamentary departmental corporate plans.[24]

NATIONAL INNOVATION AND SCIENCE AGENCY EDUCATION

As part of the A$1.1 billion National Innovation and Science Agenda, the Australian government has allocated over A$64 million in an initiative to support early learning with regard to science, technology, engineering, and mathematics (STEM) subjects.

This includes two measures: Embracing the Digital Age (school initiatives - A$51 million) and Inspiring STEM Literacy (early learning initiatives - A$14 million).

STRATEGIC THEME 1	STRATEGIC THEME 2	STRATEGIC THEME 3
1. Supporting parliamentarians to be more effective through better use of ICT anywhere and anytime on a range of devices. 2. Parliamentary ICT systems and policies need to better reflect this requirement and provide improved levels of support to parliamentarians to carry out their duties anywhere, at any time and on a range of devices. New mobile devices from smartphones to tablets are becoming increasingly available, affordable and popular, and parliamentarians require a choice of mobile devices that are secure, seamlessly synchronized and link readily to a range of parliamentary systems.	1. Support for the effective and efficient operation of parliament and its committees. 2. Trends in parliaments across the world are demonstrating that innovative business processes supported by the appropriate ICT tools and platforms can result in the more effective and efficient operation of parliamentary systems. 3. Common examples include the increased digitization of documents, with some international chambers and committees now being paperless, electronic voting and remote access through video conferencing.	1. Changing community expectations about access to information and a more active engagement in the parliamentary process present new opportunities through the use of ICT for the public to be more easily and directly involved with parliament and parliamentarians. 2. Developments in ICT are increasingly enabling parliamentarians to communicate with individuals and groups through email, video conferencing, websites and social media. 3. As technology becomes more consumer-friendly and affordable and as broadband speeds increase, many more forms of interaction are becoming possible.

As part of this plan, the government has dedicated A$1.5 million to support the delivery of Artificial Intelligence (AI) in Schools, under the Australian Technology and Science Growth Plan. The purpose of this is to boost Australia's artificial intelligence capability to support businesses. This funding will create further demand for ICT job areas specializing in AI.[25]

The government also announced multiple grant programs to support women in STEM, including the Women in STEM and Entrepreneurship (WISE) grant program, with 22 organizations across Australia receiving over A$4 million in funding.[26]

> ***" As part of the A$1.1 billion National Innovation and Science Agenda, the Australian government has allocated over A$64 million "***

PRIVATE SECTOR GROWTH

In the private sector, there has been funding toward the Cyber Security Growth Centre. The purpose of this Growth Centre is to work with the private sector to increase collaboration, build capability, innovate, and participate globally in competitive markets in cybersecurity. The funding of such a program is likely to lead to increased demand for experienced cybersecurity engineers.[27]

CORPORATE PLAN 2017–2021

In 2016, the Australian government set out its digital transformation agenda. The agenda is focused on delivering better and more accessible digital services to individuals and businesses.

Responsibility for realizing the digital transformation agenda is owned by all agencies that are accountable for delivering services to individuals and businesses.

For digital transformation across government to work, the government has outlined the need for successful coordination and collaboration between the Digital Transformation Agency (DTA) and other agencies.

In August 2017, the ICT Procurement Taskforce report was released. To implement the recommendations, the government is working across agencies to transform how it manages its ICT procurement by implementing a series of reforms.

AUSTRALIAN UNIVERSITIES

Out of the 43 universities in Australia, 21 offer specialized computer science degrees. The computer science degrees offered by Australian universities are of a high quality. According to the QS World University Rankings, there are five Australian universities that are among the top 50 in the world in computer science degrees, with Australia's best university in this field being the University of Melbourne, placing 13th.[28]

Additionally, TAFE, an Australian vocational and educational training institute, offers 79 ICT courses in various areas, such as IT systems administration, network security, and IT support.[29] The broad array of courses which can be undertaken at several tertiary institutions means that there is a steady supply of employees working in the identified ICT job areas.

Several Australian universities, including the University of Adelaide, La Trobe University, Deakin University, and the University of Wollongong, have implemented digital literacy programs to hire technologists to support the digital literacy of staff and students.[30]

The Council of Australasian University Directors of Information Technology (CAUDIT) is an entity with membership drawn from major Australian and South Pacific universities. CAUDIT provides advice and support to IT directors/CIOs and IT professionals across the education sector so that they can take a proactive leadership role within their institutions.[31]

UNIVERSITIES

TALENT DEVELOPMENT RELATING TO ICT SKILLS IN AUSTRALIA

Although ICT degree enrollments and completions remain below the peak of the early 2000s, they have gradually increased in recent years, with enrollments rising from 19,000 at the start of the decade to almost 24,000 in 2014. IT-related vocational education and training courses have also seen higher take-up over the past few years.

It should be acknowledged that ICT workers can be educated in other fields aside from directly studying IT and technology-specific tertiary or vocational qualifications. The 2011 Census reported that 65% of ICT workers studied non-IT degrees.

Some of the most common courses studied by Australian ICT workers include computer science, information science and technology, accounting, and business.[32]

TALENT DEVELOPMENT

Australian businesses need to be the driving force for this, both now and in the future. Responding to digital disruption and technological change can require changes to a business's products, operations, processes, and infrastructure. Associated with these, there can also be significant changes to the digital skills required of both ICT workers and the broader workforce. Companies need to be aware of this and should therefore work to identify their ICT skills requirements and consider whether there are any skills gaps among their existing workforce; capability assessments and competency-based frameworks, such as the Skills Framework for the Information Age, can be useful diagnostic tools for this purpose.

There may be a role for the government to highlight the importance of ICT workforce development initiatives by prioritizing programs that support ICT-related skills development.

1.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

The Australia Computer Society ACS is the main body in Australia in supporting ICT talent, to improve the Australia's digital competency to a global level and to help bridge the talent gap in the industry. The need for these few other bodies will aid the transformation and growth of the ICT industry and talent supply in the country. These organization will address workforce issues of related to talent shortage in the ICT industry.

CORPORATE INITIATIVES

Microsoft currently offers a number of certification courses through Microsoft Certification to assist in developing a range of ICT skills and closing the gap; these courses include areas such as mobility, cloud, and data.[33]

Google also offers an IT Support Professional course.[34]

AUSTRALIA INFORMATION INDUSTRY ASSOCIATION (AIIA)

AIIA is a non- profit organization in Australia and sets the direction for the ICT industry for the country. The objective of the association is to fuel the prosperity of the ICT industry in Australia by providing advisory and co-ordinating body to ICT industry in Australia, represent and advocate ICT matters with the government bodies and industry players.

AIIA has Special Interest Group SIG which consist of Industry Vertical SIG, Cross Industry SIG and Government SIG.

The purpose of the education SIG is to encourage collaboration between members of the SIG to develop learning and training within the Australian ICT industry. This includes the promotion of digital skills and Science Technology Engineering and Mathematics STEM knowledge.

ACTIVITIES:

- The Education SIG will have regular meetings to discuss on new developments in education related technology, curriculum, and delivery
- The SIG engages with Government, both at State and Federal levels, to identify opportunities in ICT industry
- Conducted navigating technology and the job of the future summit 2018
- Published the skills policy precision statement
- Encouraging the Australian government to take action and to create a future workforce with the appropriate knowledge skills and motivation to maximise global competitiveness in the digital age

AUSTRALIA COMPUTER SOCIETY (ACS)

ACS is a member of Australia's Council of Professionals, predominantly supports the ICT workforce. ACS aim is to foster future domestic ICT talent by strengthening the talents with the appropriate skill set to ensure the talents are globally competitive. Besides that, attracting international talent into the country by way of promoting awareness of the future technology career opportunities, this will eventually help lower the employments issues within the country.

ACS also believes that delivering the right program to all levels of education will groom future talents hence improve employability rate.

ACS will also strengthen the technology management and governance to enable agile process.

ACS has three advisory board:
1. Membership Advisory Board
2. Professional Advisory Board
3. Technical Advisory Board

ACS continuing professional development and education:
- Network and events
- ACS accredited courses
- Digital library (41,000 videos)
- ICT leader series
- Professional year program
- Diploma of IT- ICT50115
- Instructor-led courses
- Education across the nation (EdXN)

INNOVATION & BUSINESS SKILLS AUSTRALIA (IBSA)

IBSA is a body of the Australian Government under the department of Education and Training. IBSA presence is to create skilled workforce by developing future talents capabilities by working closely with industries to understand the talent demand in the market. IBSA has also been the lead in developing high quality Vocational Education and Training (VET) to help achieve value result in Australia.

IBSA Manufacturing is working on the project of Digital Skills Cross Sector on behalf of all Australian industry to cultivate digital literacy skills, addictive manufacturing (3D printing) skills, programming/ coding skills and so forth.

2. BANGLADESH

2.1 INTRODUCTION

Bangladesh, along with other emerging economies in Asia, such as Myanmar and Cambodia, is regarded as one of the last "Asian Tigers." The term Asian Tiger was used initially to describe economies that experienced rapid growth and expansion following World War II.

Economic growth began to accelerate in Bangladesh in the 1990s coinciding with the adoption of democracy. The country saw a 4.8% growth in gross domestic product (GDP) between 1990 and 1999 compared with 3.8% per annum between 1980 and 1989[35].

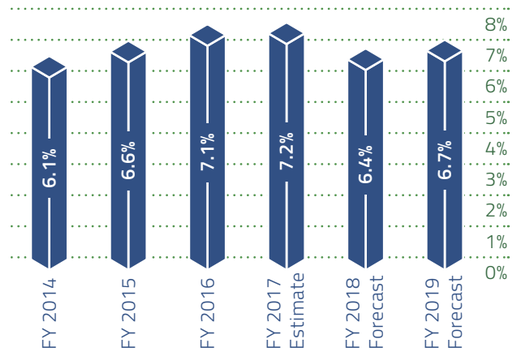
PRE AND POST DEMOCRACY GDP GROWTH IN BANGLADESH[36]

GDP Growth **in the 1980s** — 3.8% CAGR

GDP Growth **in the 1990s** — 4.8% CAGR

At present, the Bangladesh workforce sustains a large economy of US$248 billion and the economic growth is driven byt the manufacturing and services sectors. GDP has grown at an annual rate of over 6% since 2010 and is expected to continue growing at the same rate.

REAL GDP GROWTH AT CONSTANT MARKET PRICE[37]



BANGLADESH ECONOMIC SNAPSHOT[38]

GDP in 2017

USD248,000,000,000

Average GDP Growth Rate Since 2010

6.4% CAGR

Technology plays an integral part in the economic success of Bangladesh, and the government is quick to integrate technology into its national vision and plans. For example, "Digital Bangladesh" is a long-term plan to develop the nation's IT infrastructure, business industry, and talent supply. IT itself isn't new to Bangladesh, and we can trace its history back to the 1960s. The ICT industry of Bangladesh has a long history, dating back to the 1960s.

NOTABLE DEVELOPMENTS IN BANGLADESH'S IT INDUSTRY[39]

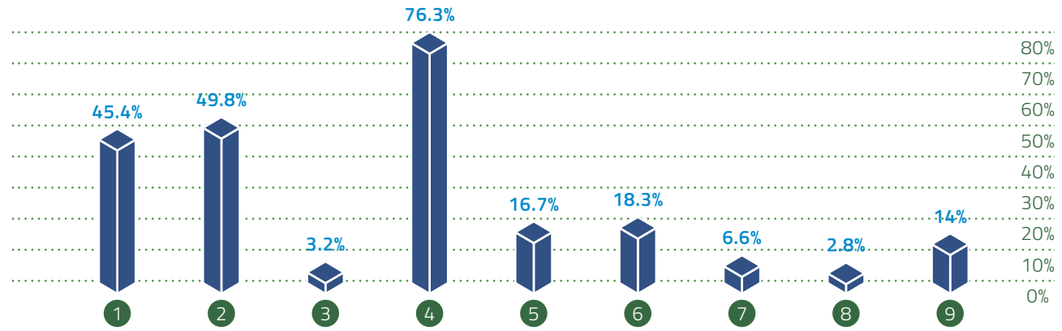
1960S - 1980S	Dhaka University obtained its first mainframe computer in 1964 Banks and industrial companies began using computers for accounting and payroll Public utility companies (gas and electricity) began using computers for billing The local ICT industry was set back after a financial crisis in 1971 The Bangladesh Computer Society was formed in 1979 In 1982, a computer center was established at the Bangladesh University of Engineering and Technology The first font to display the Bangla script was developed in 1982 The government's National Computer Committee was formed in 1983 The Bangladesh Computer Samity was established in 1987[40]
1990S	Internet service gained popularity in 1995 The Bangladesh Association of Software and Information Services was formed in 1997
2010 - PRESENT	The Digital Bangladesh vision was conceived The National ICT Policy was formed in 2009 The ICT in National Education Policy was formed in 2010 ICT education is provided at secondary and tertiary education institutions Various technology parks that house IT companies have been established or are being planned throughout the country.

2.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

A large number of IT companies in Bangladesh are offering IT or IT-enabled services (ITES). There is also a large export market where these services are done remotely for foreign companies based in other parts of the world.

The Bangladesh Association of Software and Information Services (BASIS) is the national trade body for the software and IT-enabled service industry. It was established in 1997, and the association has been working with a vision of developing a vibrant software and IT service industry in the country. The composition of its members provides insights into the potential areas of talent demand.

BUSINESS SPECIALIZATION OF BASIS MEMBERS[41]



The demand for talent that specialize in areas such as software development programming and digital content creation can be expected to remain strong as most of the IT companies in Bangladesh are focused on software development or soft content creation.

There is also an indication that a workforce with a high level of IT literacy would be needed as a large percentage of companies are also involved in providing IT-enabled services to their clients. Examples of ITES include data processing, graphic design, web design, and content management. Employees in the ITES sub-industry would need to be comfortable and efficient at using IT applications and tools.

Comparatively, the ITES sub-industry generates a higher percentage of revenue compared with software development, despite a smaller percentage of companies involved in ITES. There could potentially be a demand for talent who command a broad range of IT skills as companies in Bangladesh do not necessarily focus on one narrow IT sub-industry.

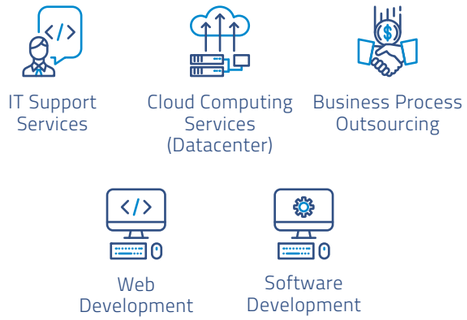
NEW SECTION: GOVERNMENT INITIATIVES TO BOOST THE IT INDUSTRY

The Government of Bangladesh has several initiatives to develop the IT industry. One series of initiatives involves the commissioning of technology parks across the nation. These technology parks will be equipped with the suitable infrastructure and environment to support the operations of technology-focused firms. It is estimated that the combined effect of the technology parks is the creation of up to 300,000 new jobs in the IT industry[42].

OVERVIEW OF BANGLADESH'S SOFTWARE TECHNOLOGY PARK (STP-1)

- Governed by the Bangladesh Hi-Tech Park Authority
- Uninterrupted electrical power supply
- Shared facilities, such as training centers and conference rooms
- 12-story special purpose building for software development companies
- Hi-speed fiber-optic internet connection
- Round-the-clock building management services

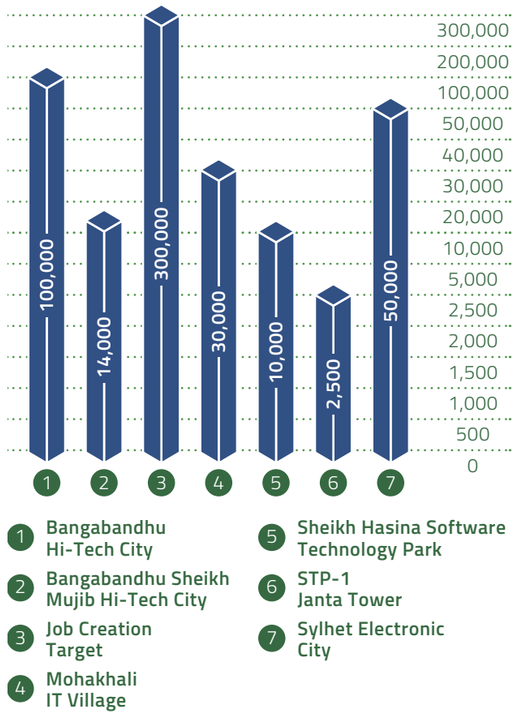
ACTIVITIES OF STP-1 TENANTS



The software technology park addresses some fundamental business needs of IT companies operating in developing countries, such the availability of uninterrupted electrical power supply. The lack of reliable power supply is a common problem faced in many emerging economies, such as Cambodia and Myanmar. A single power loss can last for hours, impacts productivity, and wipes out business-critical data.

Additionally, the provision of high-speed internet will allow companies operating from the park to offer reliable services to their clients. This is especially important if they are working with clients based overseas, which may not be familiar with the challenges faced by IT companies in Bangladesh.

ESTIMATED IT JOBS CREATED BY TECHNOLOGY PARKS ACROSS BANGLADESH (EXISTING AND PLANNED)



Besides the above, the Executive Committee of the National Economic Council (ECNEC) has approved the development of technology parks in Khulna, Barisal, Rangpur, Chittagong, Comilla, Cox's Bazar, Mymensingh, Jamalpur, Natore, Gopalganj, Dhaka, and Sylhet.

LIST OF TECHNOLOGY PARKS IN BANGLADESH (EXISTING AND PLANNED)

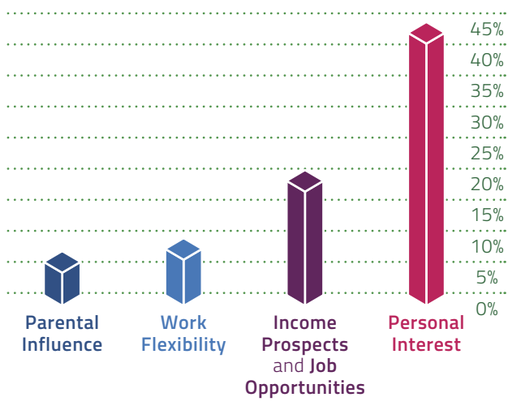
- STP-1 Janta Tower
- Bangabandhu Hi-Tech City
- Sheikh Hasina Software Technology Park
- Job Creation Target
- Sylhet Electronic City
- Bangabandhu Sheikh Mujib Hi-Tech Park
- Mohakhali IT Village
- Barind Silicon City
- Sheikh Kamal IT Training and Incubation Centre
- CUET IT Business Incubator Centre
- KUET Khulna IT Park

BANGLADESH IN-DEMAND JOBS 2018-2020

IN DEMAND JOBS	2018	2019	2020
Business Intelligence Consultant	423	489	567
Cloud Solution Architect	474	593	720
Computer Systems Analyst	13,742	13,892	13,835
Cybersecurity Consultant	847	993	1,178
Data Scientist	159	183	213
Internet of Things (IoT) Developer	723	825	946
IT Infrastructure Engineer	1,137	1,423	1,728
Mobile and Web Application Developer	23,827	23,950	23,790
Network Engineer	853	1,068	1,296
Software Developer	8,245	8,335	8,301
Bangladesh Total	**50,429**	**51,751**	**52,574**

Women face significant barriers to enter the IT industry's workforce. Lack of support from their families is one of the major reasons that discourage them for pursuing such careers despite having the requisite IT knowledge[43].

MOTIVATION FOR PURSUING IT-RELATED TERTIARY EDUCATION

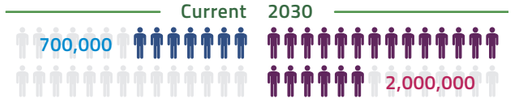


A study was conducted in March 2018 to gather information on the involvement of women in ICT. The study found that students choose ICT programs, such as engineering and computer science, for the following reasons:

- Personal interest: **42%**
- Income prospects and job opportunities: **18%**
- ork flexibility: **7%**
- Parental influence: **5%**

Parents are not well versed in ICT and are reluctant to support their daughters to pursue a career in ICT. The government aims for equal employment of men and women in ICT by 2030, with a total ICT sector workforce of 2 million up from an estimated 700,000 currently.

GAP BETWEEN THE CURRENT IT WORKFORCE AND DEMAND IN 2030



2.3 CROSS-BORDER TALENT OPPORTUNITIES

One of the areas that IT companies in Bangladesh focus on is exporting their IT and IT-enabled services (ITES) abroad through activities such as business process outsourcing (BPO) and independent freelance work.

A case study done by the Nyenrode Business Universiteit highlighted the kind of crossborder talent opportunities available to IT talent in Bangladesh with economies that are more developed and are looking at operational strategies to achieve cost efficiency[44].

The Nyenrode Business Universiteit in the Netherlands conducted an in-depth study on the cross-border opportunities in the IT industry between Bangladesh and the Netherlands in 2014. Findings from this study provide a view of a larger trend of European IT companies leveraging on talent in Asian countries.

There are several avenues for the export of Bangladesh IT services to the Netherlands, and possibly other developed economies as well, through outsourcing. Several IT services in demand in the Netherlands have a corresponding talent base in Bangladesh.

COMPARISON BETWEEN THE SUPPLY OF SERVICES IN BANGLADESH AND DEMAND OF SERVICES IN THE NETHERLANDS

SERVICE AREA	SUPPLY: BANGLADESH	DEMAND: THE NETHERLANDS
Web Design	✓	✓
Mobile Application Development	✓	✓
Customized/Web Application Development	✓	✓
BPO	✓	
Web Development	✓	
Graphic Design	✓	
Application Maintenance	✓	
Customized Software Development		✓
Cloud Computing		✓
Systems Integration		✓

Services such as web design and web application development can be exported easily to European countries. The technologies involved do not require special development hardware or environment. Furthermore, a large percentage of IT service companies in Bangladesh are already providing such services.

Another area with great potential is business process outsourcing. This model has been implemented in many Asian countries by multinational corporations (MNCs) to leverage on cost saving of a centralized back-office processing center. Basic computer literacy is sufficient for many ERP-enabled business tasks.

Bangladesh still lacks the supply of talent that are skilled in emerging technologies, such as cloud computing, and technologies relevant to very large and complex organizations, such as systems integration.

INDUSTRY SPECIALIZATION OF SOFTWARE COMPANIES (% OF SURVEYED COMPANIES SPECIALIZING IN THE RESPECTIVE FUNCTION)

ORGANIZATION	Boo 2 Bangla Ltd.	Budget View	CIM Solutions	Hawar IT	Kimball Systems	Mister Clipping	Parkingware BV	Rocket Internet Benelux	Verint Systems B.V.
BUSINESS ACTIVITY TYPE	Software, IT Services	Consulting	Web Design	IT Services	Hardware	Hardware	Software, Hardware	Investment	Software

2.4 KEY INITIATIVES FOR TALENT DEVELOPMENT

The development of ICT talent supply is enshrined within Bangladesh's national agenda, "Vision 2021." Vision 2021 is both a political manifesto and a concrete development plan for Bangladesh. Bangladesh will celebrate its 50th anniversary in 2021, and this will be marked by a number of milestones in various areas, including the development of the ICT industry. Collectively, the vision for Bangladesh's ICT development is known as "Digital Bangladesh"[45].

FOUR PILLARS OF DIGITAL BANGLADESH[46]

- Taking Services to Citizens' Doorsteps
- Making the Private Sector and Market More Productive and Competitive through the use of Digital Technology
- Developing Human Resources to Meet 21st-century Needs
- Connecting Citizens in Ways that are Most Meaningful to Them

OBJECTIVES OF ICT IN EDUCATION MASTER PLAN, 2012-2021[47]

- Development of the Teaching–learning Environment
- Development of Teachers' Professional and ICT Skills
- Development of Teaching–learning Resources
- Development of Human Resources to Meet Present-day Demands
- Ensuring the participation of education-related personnel
- Ensuring Transparency, Skills, and Accountability in Education Management
- Bringing Education Services to the Doorsteps of Citizens

The government is actively working on several projects to boost the IT capabilities of the workforce. One example would be an initiative with the World Bank Group to train new IT graduates and also upskill the existing workforce.

BANGLADESH ICT/ITES SKILLS INITIATIVE, 2015–2018[48]

Implications to Talent Supply

30,000
New and Upskilled IT Professionals will Enter the Labor Market Supply by 2018

10,000
Science or IT Graduates will be given Additional or "Top-up" Training

20,000
High School Graduates will be given "ITES Foundation Skill Training"

The Certification Agencies are Appointed by the Government of Bangladesh

The programs are Supported by the World Bank

Beneficiaries of the Training Programs will Receive Assistance in Gaining Employment

All Training Provided to Beneficiaries will be Certified by International Certification Agencies to Ensure the Quality of the Training Provided

BANGLADESH ICT/ITES SKILLS INITIATIVE, 2015–2018[49]

Implications to Talent Supply

A technology business incubator will be established by the Government of Bangladesh at the Chittagong University of Engineering and Technology (CUET)

The incubator will focus on research, innovation, entrepreneurship, job creation, and human resource development

BANGLADESH ICT/ITES SKILLS INITIATIVE, 2015–2018[50]

Implications to **Talent Supply**

The project has since grown to encompass a large digitization effort by the government.

For instance, in 2015, the government appointed Telenor Digital to develop and implement digital and mobile technology to drive economic and social development in the country.

The a2i Project started as part of the government's effort to realize its Vision 2021 by providing access to high-quality data to the citizens of Bangladesh.

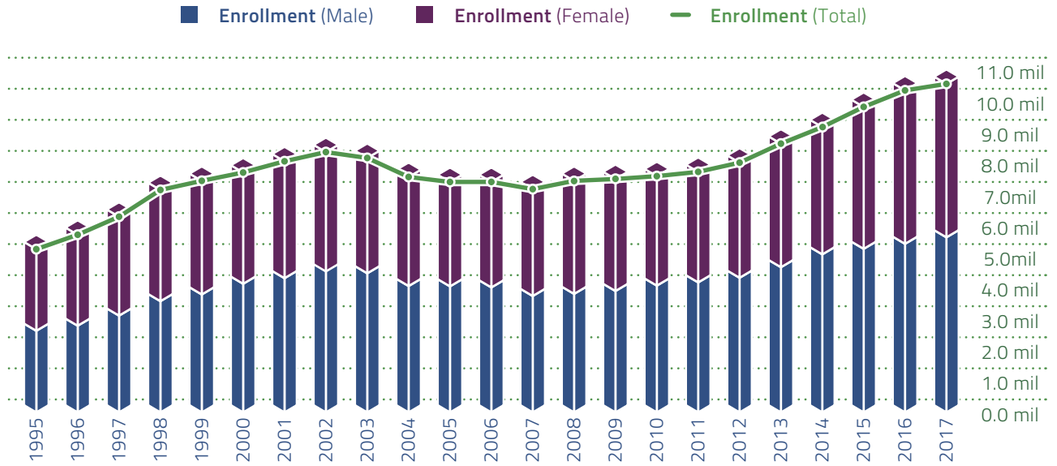
The government has also signed a memorandum of understanding with Microsoft for the support of women entrepreneurs. Microsoft will provide IT training at 5,273 digital centers across Bangladesh.

Additionally, Microsoft will connect them to employment opportunities at services centers following completion of the training.

PRIMARY AND SECONDARY EDUCATION IN BANGLADESH

The development of the primary and secondary education system also provides a view on the ability of the economy's youth to take up ICT skills later in life. The youth will need to be prepared with a solid foundation in literacy and numeracy skills.

SECONDARY SCHOOL ENROLLMENT, 1995–2017[51]



Primary education is defined as education up to Grade 8 in Bangladesh and is free. The government may provide a stipend for secondary school students who have financial needs, but this is not guaranteed. Enrollment rates in secondary schools have been steadily increasing since 2008, which signal the increasing desire and importance of having a good education despite the costs involved.

TERTIARY IT EDUCATION IN BANGLADESH

There are several tertiary education institutions that offer IT-related courses in Bangladesh. They range from technical and vocational institutions offering basic IT training to universities with engineering and computer science programs.

A large amount of published statistics on tertiary education in Bangladesh grouped students that study computing and information and communication technology under a single banner of science, technology, engineering, and mathematics (STEM). Therefore, data from the Board of Accreditation for Engineering and Technical Education (BAETE) provides insights into the composition of programs within the engineering discipline in Bangladesh's tertiary institutions.

The BAETE was set up by the Institution of Engineers, Bangladesh (IEB) to oversee the quality of engineering programs offered at tertiary education institutions in the country. The IEB has a long history in Bangladesh, going back over 50 years.

NUMBER OF IT-RELATED VERSUS NON-IT ENGINEERING PROGRAMS ACCREDITED BY BAETE

Accredited programs allow for specialization in software areas, such B.Sc. Computer Engineering and B.Sc. Computer Science and Engineering, as well as hardware areas, such as B.Sc. Electronic and Telecommunication Engineering. There is a much larger number of engineering programs related to ICT that have been or are accredited by BAETE (35 to 13).

The availability of such programs creates a diverse pool of talent that can fill vacancies in positions that focus on software development and programming, such as software developers, mobile application developers, and web developers. There will also be talent for positions that require a deep understanding of hardware, such as network engineers and IT infrastructure engineers.

ANALYSIS OF ACCREDITED IT-RELATED ENGINEERING PROGRAMS IN BANGLADESH

		NUMBER OF ACCREDITED PROGRAMS		
	PROGRAM TITLE	ACCREDIATION IN FORCE	ACCREDIATION NEEDS RENEWAL	TOTAL PROGRAM
ICT Related	B.Sc. Aeronautical Engineering (AE)	1		1
	B.Sc. Chemical Engineering & Polymer Science (CEP)	1		1
	B.Sc. Civil & Environmental Engineering (CEE)		1	1
	B.Sc. Civil Engineering (CE)	6		6
	B.Sc. Industrial & Production Engineering (IPE)		1	1
	B.Sc. Mechanical Engineering (ME)	2		2
	B.Sc. Textile Engineering (TE)	1		1
Not ICT Related (Total)	B.Sc. Textile Engineering (TE)	11	2	13
ICT Related	B.Sc. Computer Engineering (CoE)	1	1	2
	B.Sc. Computer Science & Engineering (CSE)	9	2	11
	B.Sc. Electrical & Communication Engineering (ECE)		1	1
	B.Sc. Electrical & Electronic Engineering (EEE)	10	3	13
	B.Sc. Electrical, Electronic & Communication Engineering (EECE)	1		1
	B.Sc. Mechanical Engineering (ME)	1		1
	B.Sc. Textile Engineering (TE)	3		3
	B.Sc. Textile Engineering (TE)	2		2
	B.Sc. Textile Engineering (TE)	1		1
ICT Related (Total)		**28**	**7**	**35**
Total Programs		39	9	48

2.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

There are both public and private organizations involved in talent development in Bangladesh. Public organizations are focused on building up talent as a whole starting with education at the primary level. A strong foundation is necessary for talent take on ICT skills later in life.

GOVERNMENT BODIES RESPONSIBLE FOR EDUCATION IN BANGLADESH

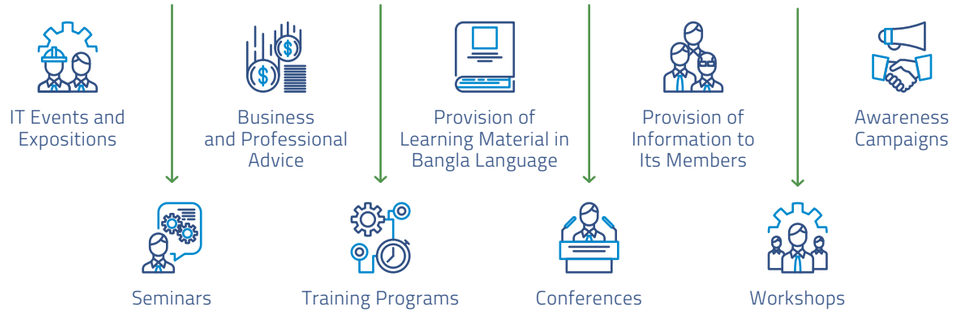
GOVERNMENT BODY	RESPONSIBILITY
Ministry of Education	Responsible for the central management of the nation's education system
Ministry of Primary and Mass Education Directorate of Primary Education	Responsible for planning and managing public primary and pre-primary schools
Bureau of Non-Formal Education	Oversees the provision of basic literacy, numeracy and life skills outside of the formal education system in schools
Directorate of Secondary Education and Higher Education	Responsible for secondary and tertiary education, including providing aid and support to privately managed secondary schools
Directorate of Technical Education	Oversees technical and vocational education and training (TVET), which provides skills that can be directly applie upon gaining employment
University Grants Commission	Ensures the quality and standards of all university-level education in Bangladesh
Directorate of Madrasah Education	Oversees traditional schools (Madrasah) that are still popular among the Bangladeshi citizens
Ministry of Social Welfare and Ministry of Women and Children Affairs	Coordinates special-purpose education programs targeted at specific social groups

Private organization on the other hand are focused on developing the ICT industry of which software, outsourcing and IT enabled services are in the lead. Some initiatives specifically target the development and upskilling of ICT talent such as the Bangladesh Computer Samity's Techno Master Class and the BASIS Institute of Technology & Management.

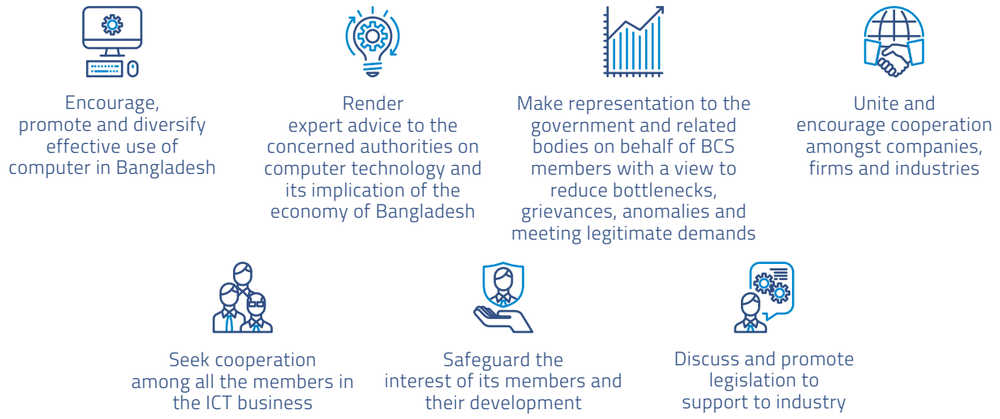
BANGLADESH COMPUTER SAMITY (BCS)

The Bangladesh Computer Samity (BCS) is trade association formed in 1987 that represents players in the Bangladesh ICT industry. Their members include distributors, dealers, resellers of computer and allied products, locally assembled computer vendors, software developers and exporters, internet service providers, ICT based educational institutions and training houses and other ICT enabled services providers. They have more than 1500 members[52].

BANGLADESH COMPUTER SAMITY ACTIVITIES



BANGLADESH COMPUTER SAMITY OBJECTIVES[53]



TECHNO MASTER CLASS

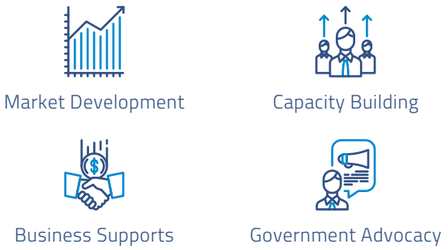
The Techno Master Class is a series of training events in 2018 made possible through a collaboration between BCS, Bangladesh Skill Development Institute Vinsys[54]. The focus of these training events is IoT, data science, big data, and blockchain technologies[55].

Vinsys is a global training provider that offers courses in areas such as project management leaded to a PMP, PRINCE2 and other certifications. They also offer a wide range of training courses targeted at technologies offered by Microsoft, Oracle, SAP and Apache.[56]

BANGLADESH ASSOCIATION OF SOFTWARE AND INFORMATION SERVICES (BASIS)

The Bangladesh Association of Software and Information Services was established in 1997 as a national trade body for Software & IT Enabled Service industry of Bangladesh. They are involved a range of industry building activities including market development, capacity building, business support services and government advocacy[57].

OBJECTIVES OF BASIS[58]



BENEFITS ENJOYED BY BASIS MEMBERS

PAST AND CURRENT PROJECTS OF BASIS

- Software Technology Park -1 (STP-1)
- BASIS Institute of Technology & Management (BITM)
- BASIS-A2I Joint Project for national portal framework development
- CBI-IT Outsourcing Export Coaching Program
- NTFIII Project (supported by CBI, Netherlands Government and implemented jointly with ITC, UN and DCCI)
- Policy Reform Initiative of BASIS (BASIS in collaboration with The Asia Foundation)
- BASIS Softexpo 2017
- Support to Kaliakoir Hi-Tech Park Project (BASIS in collaboration with Bangladesh Hi-Tech park Authority)
- Leveraging ICT (LICT) Project (With the support of Ministry of ICT)

BANGLADESH COMPUTER SOCIETY

The Bangladesh Computer Society was established In 1979 as a non-profit professional body for computer engineers, scientist and technologist. They are involved in ICT human resource development by providing certification for IT professionals, contributing to Government policy making and organizing events such as seminars, workshops and lectures[59].

BANGLADESH COMPUTER SOCIETY OBJECTIVES RELATED TO ICT TALENT DEVELOPMENT[60]

BANGLADESH SKILL DEVELOPMENT INSTITUTE (BSDI)

The Bangladesh Skill Development Institute (BSDI) was founded in 2003 and is now a leading provider for professional education in Bangladesh. It employs competency-based training to produce high quality graduates[61].

ICT RELATED PROGRAMS OFFERED BY BSDI

DIPLOMA IN ENGINEERING WITH THE FOLLOWING FOCUS AREA[62]

- Computer Technology
- Electrical Technology
- Telecommunication Technology
- Civil Engineering

CERTIFICATION IN CREATIVE DESIGN AND TECHNOLOGY WITH THE FOLLOWING FOCUS AREA[63]

- 3D Animation
- Architectural Visualization
- Motion Graphics
- Game Development

SHORT COURSES[64]

- Cisco Certified Network Associate (CCNA)
- Graphic Design
- Online Outsourcing
- Linux
- Search Engine Optimization
- Advanced Computer Application
- Web Application using PHP, MYSQL, Ajax, Jquery, HTML, CSS & JavaScript
- Complete Software Development in Microsoft Platform
- Computer Hardware and Networking
- Database Design and Development
- Web Design and Development
- Advanced Microsoft Excel
- JAVA Application Development
- Mobile Apps Development

3. CHINA

3.1 INTRODUCTION

China is the largest economy in Asia. GDP was reported at USD 12,014 billion in 2017 and the economy is expected to grow more than 79% by 2023. Unemployment is below 5% and is expected to remain stable according to forecast by the International Monetary Fund.

CHINA ECONOMIC SNAPSHOT[65]

SUBJECT DESCRIPTOR	UNITS	SCALE	2015	2016	2017	2018	2019	2020	2021	2022	2023
Gross domestic product, current prices	U.S. dollars	Billions	11,226.2	11,221.8	12,014.6	14,092.5	15,543.7	16,952.0	18,401.8	19,925.4	21,573.9
Unemployment rate	Percent of total labor force		3.4	3.1	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Population	Persons	Millions	64.0	64.6	65.3	65.6	65.4	n/a	n/a	n/a	n/a

LARGE AND GROWING IT TALENT POOL[66]

China is home to a large number of ICT talent. According to Ministry of Science and Technology, there were 71 million people specializing in science and technology in China. The science and technology category cover a range of industries including high technology manufacturing, ICT, bio-tech, environment protection and energy.

Talents in science and technology are defined as person with science and technology academic degrees who are working in technology-facing jobs including research & development, engineering design, technology development, technology services and management according to Ministry of Science and Technology.

The ICT industry alone commands a 15 million strong workforce which represents over 20% of the total science and technology workforce. Employees in the ICT industry are well skilled as they are graduates of ICT-related courses or ICT training programs.

This number is expected to grow at a rapid pace. Should historical trends continue, the whole science and technology category is expected to grow at 6% annually. The ICT segment is expected to grow at an even faster pace of 10% annually.

The positive outlook for ICT talent growth is based on the strong growth rate of ICT talent between 2008 to 2017. Other factors include supportive government policies and initiatives, high enrolment of students in ICT majors, availability of ICT training programs and growth of internet companies in China.

GROWTH POTENTIAL OF CHINA'S ICT TALENT POOL[67]

Science and Technology Talent

71,000,000 People

6% Annual Growth

ICT Talent

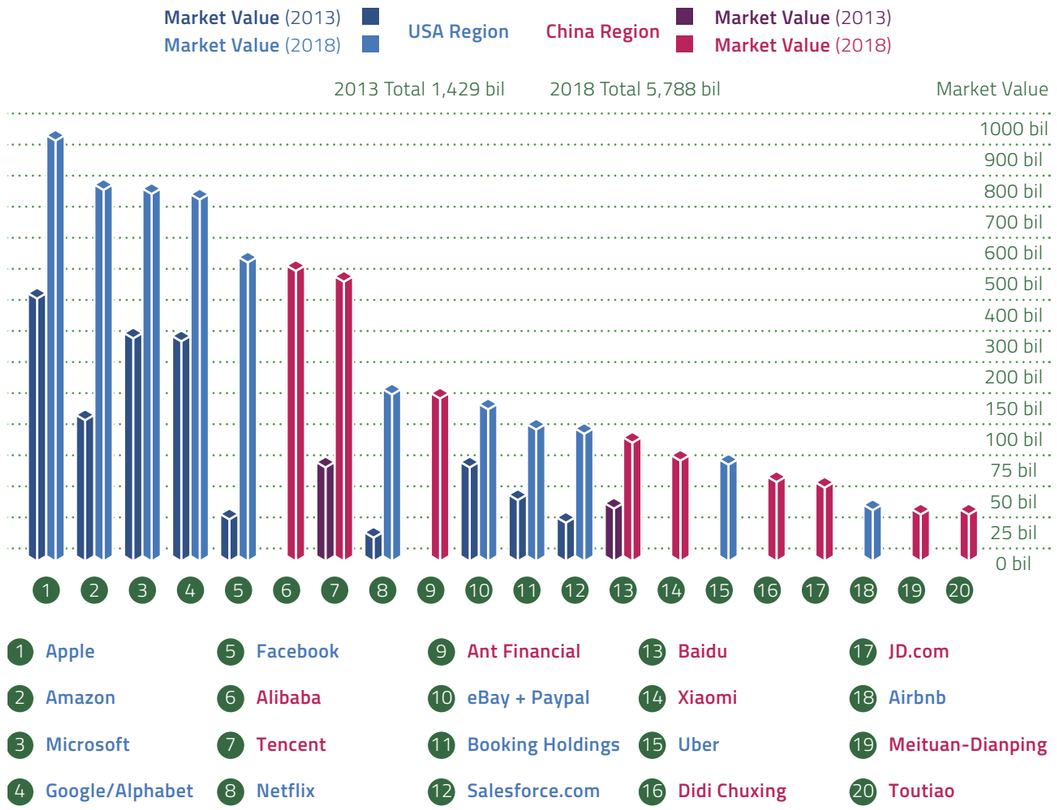
15,000,000 People

10% Annual Growth

3.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

The Chinese Government has been working to develop the ICT industry. Major policies and initiative can be traced back to the turn of the century. Currently, China is home to technology giants such as Huawei, Xiaomi and Alibaba. In fact, China is home to 9 out of 20 of the biggest technology companies globally with a prominent presence on the internet.

TOP 20 INTERNET COMPANIES BY MARKET VALUE, 2018[68]



The development of the Chinese ICT landscape can be broken up into 4 stages. The foundation was laid with a focus on software, outsourcing and services sub industries in the early 2000s and improvements to science and technology talent. The ICT industry development continued to infrastructure investments including software parks and training programs.

Over the past decade, the focus of ICT development in China has shifted to emerging technologies such as cloud computing, big data and artificial intelligence. China is positioned to be a major competitor to technology giants around the world.

TIMELINE OF CHINA'S ICT INDUSTRY DEVELOPMENT, 2000 - PRESENT

National Policies and Initiatives to Drive China ICT Growth

National mid and long term science and technology development planning guideline (2006-2020)

Advice to speeding up the development of ICT service industry

Government Released Work Report to Optimize ICT Industry and Drive Growth of ICT Technology

Suggestions on accelerating the development of service outsourcing industry

Government guidance on the purchase of services from enterprises and companies

Accelerating the construction of cloud computing and big data standard system

Action plan for promoting big data development

Beginning Stage — Before 2006

Development Stage — 2006-2010

Expanding Stage — 2011-2015

Innovation Stage — 2016 and Afterwards

Government Set Up High Tech Parks, with Supportive Programs to Speed the Growth

MOC, MII and MOST collaborated to set up high tech parks for software outsourcing industry growth

Implementation of 1,110 policies for software outsourcing industry

State council approved 21 cities as host for software outsourcing industry

IT training program to support IT talents for software industry growth

Government Issued Strategies to Prioritize Importance of ICT for Economic Development and Innovations

Software outsourcing host cities being increased to 31 cities

Software outsourcing industry has its own 13th five year planning

Made in China 2025, Internet + Initiatives, big data action guideline, One Road, One Belt program, etc.

ICT technology innovations to be emphasized and highlighted as key force to drive business innovations and adoption in industries e.g. financing

Development plan of artificial intelligence new generation, etc.

The Government has laid out several policies and plans to ensure that the country is ready to harness the economic potential of Big Data and AI technologies. The application of these emerging technologies is not confined to the ICT industry. Big Data has found a home with environmental science and medical field as well.

GOVERNMENT POLICIES ON BIG DATA

POLICY	TIME	MINISTRY	CONTENT
Overall Plan for Big Data Construction of Ecological Environmen	Mar 2016	Ministry of Environmental Protection	Recommends the establishment of three platforms Big Data, namely: Big Data Environmental Protection Cloud, Big Data Management Platform and Big Data Application Platform. Presently, the first phase of the ecoenvironment big data application platform has been launched.
Guidance on Promoting and Regulating the Development of Big Data Applications for Healthcare	Mar 2016	Office of the State Council	Promotes the integration and open sharing of government health medical information system and public health medical data and the creation of a development environment that promotes security norms and innovative applications for Big Data in healthcare.
Outline of the Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China	Sep 2016	National People's Congress Financial and Economic Committee National Development and Reform Commission	Proposes the implementation of the National Big Data strategy and promote the innovative applications of Big Data.
Big Data Industry Development Plan (2016 - 2020)	Jan 2017	Ministry of Industry and Information Technology	Promotes the coordinated development of technology, applications and security related to Big Data.
Meteorological Big Data Action Plan (2018-2020)	Apr 2018	China Meteorological Administration	By 2020, the meteorological Big Data cloud platform will be the meteorological department's most comprehensive and authoritative cloud computing platform. It consists of an online data warehouse and data mining application that enables scientific decision making and service provision based on Big Data technologies.

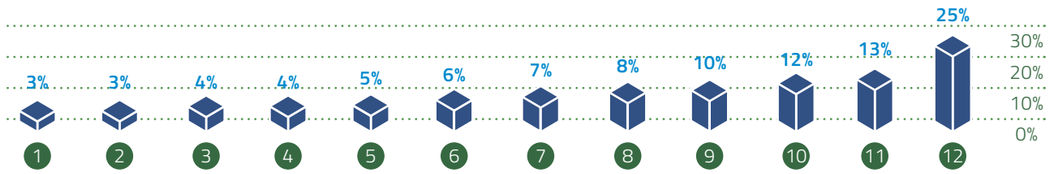
GOVERNMENT POLICIES ON AI

POLICY	TIME	MINISTRY	CONTENT
"Thirteenth Five-Year" National Science and Technology Innovation Plan	Jul 2016	State Council	Proposal for the development of big data driven artificial intelligence technology
Science and Technology Innovation 2030 - Major Projects	Mar 2017	Ministry of Science	Outline of artificial intelligence as a national strategy
National Artificial Intelligence New Generation Open Innovation Platform	Nov 2017	Ministry of Science	Plans for artificial intelligence development and highlights of projects already implemented
Three-Year Action Plan for Promoting the Development of New Generation of Artificial Intelligence Industry (2018 - 2020)	Dec 2017	Ministry of Industry and Information Technology	Promotes for deeper integration of artificial intelligence and manufacturing

Traditional, mobile and web application developers make up the largest segment of ICT employment in China. The push toward emerging technologies through government initiatives as well as by businesses needing to stay competitive in the global market will drive the demand for new categories of talent. There is already a sizable number of talent specializing in IoT and Data Science at 7% and 6% of total ICT employment respectively.

ICT EMPLOYMENT SEGMENTS, 2017

Total ICT Employees, 2017 is 15 million persons



1. Digital Marketing Consultant
2. Software Functional Consultant
3. Business Intelligence Analyst
4. Cloud Solution Architect
5. Cybersecurity Engineer
6. Data Scientist
7. IoT Developer
8. Software Tester
9. IT Infrastructure Engineer
10. Network Engineer
11. Mobile and Web Application Developer
12. Custom Application Developer (Traditional App)

PRC IN-DEMAND JOBS 2018-2020

IN DEMAND JOBS	2018	2019	2020
Business Intelligence Consultant	21,290	25,113	29,458
Cloud Solution Architect	28,731	42,369	58,742
Computer Systems Analyst	237,559	249,781	261,575
Cybersecurity Consultant	31,255	39,758	50,368
Data Scientist	10,645	12,557	14,729
Internet of Things (IoT) Developer	134,218	151,713	170,895
IT Infrastructure Engineer	45,970	67,790	93,987
Mobile and Web Application Developer	430,127	436,664	461,142
Network Engineer	34,477	50,843	70,490
Software Developer	142,536	149,869	156,945
PRC Total	**1,116,807**	**1,226,457**	**1,368,330**

The Ministry of Science and Technology highlighted several challenges within the ICT talent pool. These include the lack of high end and leading ICT talents, inability to fill in roles across the whole IT value-chain, and unbalanced purchasing power between sub-industries.

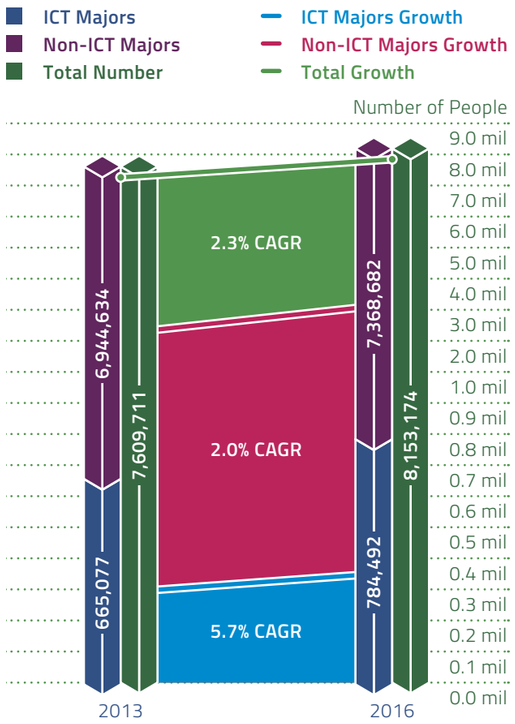
ROOM FOR MORE ICT MAJORS AMONG HIGHER EDUCATION INSTITUTES

According to statistics, there were 2,596 HEIs (High Education Institutes) in 2016. Around 8.15 million new students enrolled in HEIs in 2016 with about 10% enrolling in ICT majors. Overall, ICT majors make up 9.6% of the total students enrolled in 2016.

The job marks indicated that ICT graduates are in high demand with 94% if ICT graduates getting employed compared to the overall employment rate for graduates at 92%.

" According to statistics, there were 2,596 HEIs (High Education Institutes) in 2016. Around 8.15 million new students enrolled in HEIs in 2016 with about 10% enrolling in ICT majors. "

NUMBER OF ICT MAJORS IN CHINESE UNIVERSITIES



3.3 CROSS-BORDER TALENT OPPORTUNITIES

In 2016, the Ministry of Public Security approved a total of 1,576 foreigners (mostly scientific and technology talents) for permanent residence in China, an increase of 163% over the previous year.

Foreign scientific and technology talents are allowed to act as legal representative of foreign scientific research institutions, and foreign scientists are allowed to undertake national science and technology projects, receive government science and technology awards, and carry out innovation activities.

GOVERNMENT DECISION RELATED TO CROSS-BORDER TALENT

DATE	INITIATIVE
2016/2/18	The General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the "Opinions on Strengthening the Management of Permanent Residing Services for Foreigners "This includes: ▪ Adjusting the policy of applying for permanent residence for foreigners working in China ▪ Removing of job-level restrictions ▪ Relaxing residence time requirements ▪ Easing transition for work permission to permeance residence for foreigner in field supported by the country
2016/3/17	The State Council announced the outline of the Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China that includes improvement to the permanent residence system for foreigners and relax the requirements for skilled personnel to obtain permanent residency. It also includes the call to make it convenient for overseas talents to work in China, and attract foreigner to study in China
2017/6/15	The State Council issued the Notice on Several Measures for Active and Effective Use of Foreign Capital to Promote High-Quality Economic Development that includes the call to enhance the convenience of foreign talents working in China, and introduce measures to ensure that foreign talents in China enjoy basic public services and provide more convenient work permit management services

" the Ministry of Public Security approved a total of 1,576 foreigners (mostly scientific and technology talents) for permanent residence in China, an increase of 163% over the previous year. "

3.4 KEY INITIATIVES FOR TALENT DEVELOPMENT

GOVERNMENT INITIATIVES ON TALENT DEVELOPMENT

The Government has several initiatives in place to encourage the development of ICT talent.

GOVERNMENT POLICIES FOR ICT TALENT DEVELOPMENT

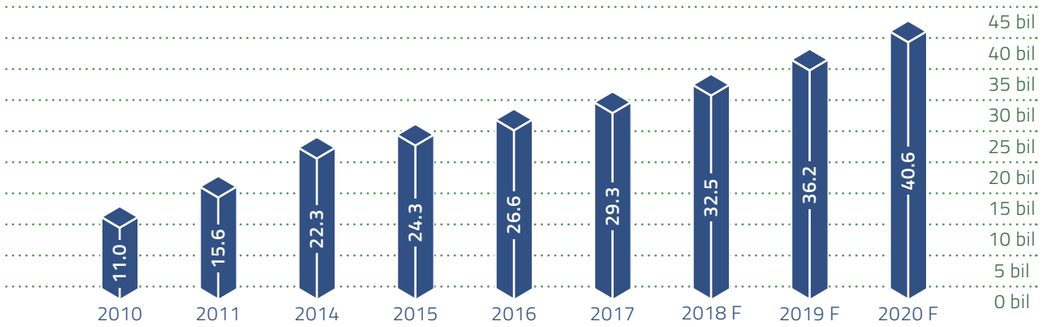
POLICY	DATE	MINISTRY	SUMMARY
Legal Provisions for Promoting Scientific and Technological Achievements	2016/3/2	State Council	Awards given to people to made major contributions to science and technology Scientific and technical personnel can work part-time at private enterprises to engage in scientific and technological advancement and transformation
Thirteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China	2016/3/17	State Council	Includes areas on discovering, cultivating, and gathering strategic scientists, technology leaders, and highly skilled personnel To highlight the need to improve the talent evaluation mechanism and service guarantee system
National Innovation Driven Development Strategy Outline	2016/5/19	State Council, CPC Central Committee	Policies to attract innovative and entrepreneurial talents Policies to promote equity options as incentives so that innovative talents of various subjects and positions can enjoy the gains from scientific and technological achievements.
Guiding Opinions on Deepening the Integration of Manufacturing and the Internet	2016/5/20	State Council	Support for colleges and universities to set up "Internet +" and other related majors To promote the provision of professional degrees in higher education institutions To promote the CIO system in large and medium-sized enterprises and expand the network application talent team
Thirteenth Five-Year National Science and Technology Innovation Plan	2016/8/8	State Council	To improve the evaluation method of talent evaluation and implement the classification evaluation of scientific and technical personnel. To reform/enhance the salary and recruitment system to create fair and equitable for all types of talent
Notice on Printing and Distributing the Development Plan of a New Generation of Artificial Intelligence	2017/7/8	State Council	To prioritize the formation of a highly talented pool of employees in emerging technology areas such as artificial intelligence

VOCATION EDUCATION IN SUPPLYING ICT TALENT

Vocational training in China plays a major role in in supplying talent to the ICT industry in China. In 2017, around 4.1 million students are registered for the ICT vocational training and 870,000 IT certification granted. The market is worth USD 4.4 billion in 2017.

The ICT training market is driven by students in academic institutions who want to learn practical ICT skills for job opportunities. The are also employees who wish to improve their ICT skills for new job opportunities or learn the latest technologies to remain competitive.

SIZE OF CHINA'S ICT VOCATIONAL TRAINING MARKET, 2010-2017 (billion RMB)



Training providers such as Aptech, Xinhua computer, Ambow, Thinkbank, Huadi, Wanbo, NIIT, Eduask, Gamfe, Tarena, and Wenda have cultivated their reputation as a reliable source of high-quality ICT talent over the year. These training providers are also involved in ICT certification programs.

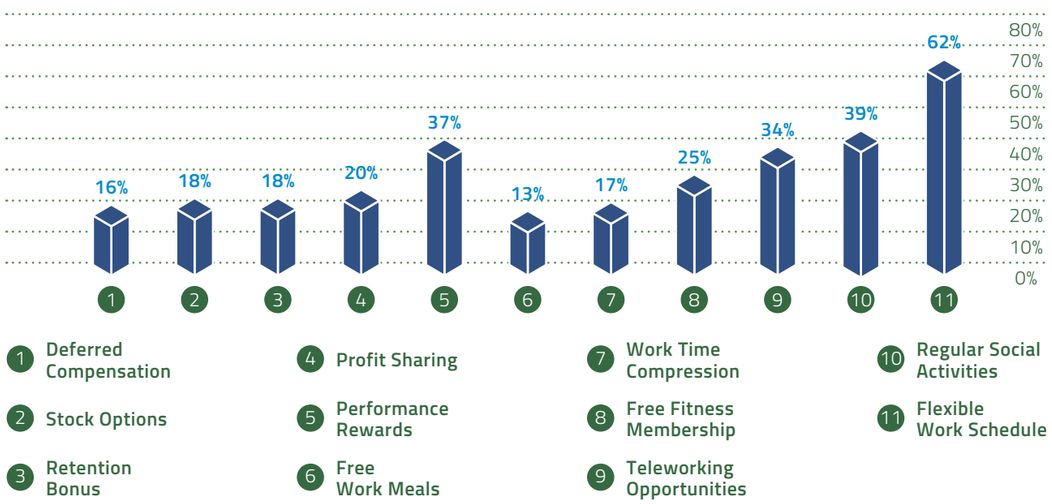
REGION TALENT INCENTIVES

There are also incentives tailored to attract ICT talent to specific region in China. For instance, Shenyang City has plans to develop high-valued industries such as equipment manufacturing, intelligent robots, electronic information, pharmaceutical and chemical industry, and aerospace. Thus, the city has developed an incentive to be given to qualified talent in the form of subsided up to USD 72,000.

FINANCIAL INDUSTRY TALENT RETENTION INCENTIVES

The financial industry has resorted to various soft incentives to retain the best ICT talent in a competitive job market. These incentives include flexible working hours, shorter workhours, free meals, performance rewards, profit sharing, retention bonuses, stock options and deferred compensation.

EMPLOYEE INCENTIVES PROVIDED



3.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

China is home to many of the biggest technology companies in the world. As such, securing talent it is crucial for them to remain competitive in the intense and fast-moving global market. Many of these companies have launched their own initiatives to attract and develop ICT talent for their organization.

HUAWEI ICT ACADEMY[69]

Huawei ICT Academy is a collaboration program between Huawei and education institution that delivers Huawei ICT technologies training, encourages students to get Huawei certification, and develops talents with practical skills for the ICT industry and the community.

Courses are carried out by education institutions or academies certified by Huawei. Education institutions under this program include universities, colleges, polytechnics training centers and others. Huawei provides various forms of business support for certified academies. Students also enjoy a variety of benefits for enrolling in course under this program and are awarded with recognized certificates upon completion.

BAIDU

SCHOLARSHIP PROGRAM

In 2013, Baidu established the Baidu Scholarship Program to provide the industry's most generous financial support for the top technical talents who may become technology leaders or scientists in the future, and provide data, platform and expert guidance for their research work, aiming to make potential outstanding technical talents stand out.

Under the program, there are research scholarships that provide 100,000 yuan per year per person for two consecutive years. This award is to be used for the academic research, including but not limited to international academic conferences, article publications, patent applications and other fees.

ALIBABA

CLOUD AUCP UNIVERSITY INCLUSIVE PLAN

Provides students and teachers in universities and educational institutions around the world
with a wealth of courses in cloud computing and big data, practice, certification, and other
educational ecological resources, and to train the future technology professionals,
entrepreneurs and leaders of cloud computing and big data industry.

TENCENT

RHINO BIRD ELITE TALENT DEVELOPMENT PROGRAM

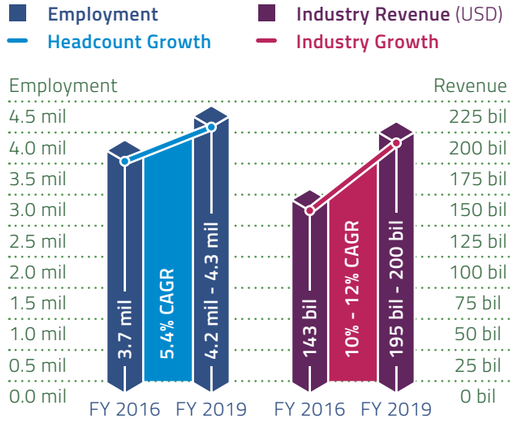
The program is aimed at recruiting talents from undergraduate, master's and doctoral
students in science and technology. It aims to use the Tencent platform and resources to
work together to create a school-enterprise joint training program for students, and to train
students to innovate to promote the cultivation of scientific research and innovative talents.

4. INDIA

4.1 INTRODUCTION

The Indian IT industry currently stands at USD 143 billion in terms of revenues and employs about 3.7 million directly across the four sub-sectors: IT Services, Business Process Management (BPM), Software Product Development (SPD) and Engineering Research & Design (ERD) with an incremental hiring of nearly 0.2 million witnessed in FY 2016. The Indian IT industry is expected to grow at about 10 to 12% CAGR as compared to global IT spends, which are expected to increase at 3.6% YoY, over the 2014 to 2019 period - leading to an increased India's share of the Global IT spends. However, the employment growth is expected to settle down with increasing maturity of the sector and evolution of non-linear business models and innovations, leading to a decoupling of revenues and employment.

INDIA IT SECTOR REVENUE AND EMPLOYMENT PROJECTION



2019 industry revenues are expected to reach USD 190 to 200 bn and the industry is expected to employ about 4.2 to 4.3 mn people directly. This speaks to headcount growth of about 5% over the next 3 years as against a revenue growth of ~10 to 12%. This difference of growth rates is a result of the adoption of automation technologies as well as other new digital technologies namely IoT, SMAC and Cyber Security which is seeing a higher revenue per employee potential as compared to traditional services provided by companies from across the globe.

While the 0.5-0.6 mn new jobs being created will require fresh skilling initiatives, the existing workforce of 3.7 mn requires significant re-skilling and up-skilling in new digital technologies to maintain our competitive edge in the future. Though skilling efforts are required across the industry it is imperative to understand the "High Demand Occupations" where companies expect majority of hiring to take place.

It is also vital to keep track of emerging occupations. It is expected that going forward, the IT services sub-sector will also witness incremental hiring in Application Maintenance, Sales & Pre-Sales occupations apart from the identified high demand occupations while in the BPM sub-sector, Health Services, Human Resource Outsourcing and Knowledge Services will have incremental hiring over the next three years.

HIGH DEMAND OCCUPATIONS IN THE IT-BPM INDUSTRY

IT Services

- Data Scientist
- Information/Cyber Security
- Application Development

ER&D

- Product Lifecycle Management
- Software Development

BPM

- Analytics
- Finance and Accounting
- Customer Relationship Management (CRM)

SPD

- Product Development and Delivery
- Quality Assurance

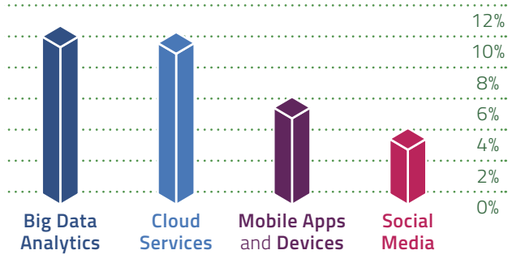
On the supply side, the industry can continue to expect a surplus of manpower seeking and willing to work in the IT industry. About 7 million students are expected to be eligible for jobs every year for qualifications relevant to the IT industry. However, employability of the new workforce remains a major concern and therefore it becomes imperative to ensure that the new entrants possess relevant national and global qualification standards.

India remains the world's No.1 sourcing destination for the information technology (IT) industry, accounting for approximately 5 per cent of the USD 2,720 billion global IT spends. The indirect employment attributed by the industry employs about 10 million people and continues to contribute significantly to the social and economic transformation in the country. As per the NASSCOM Strategic Review report 2016, the industry is estimated to employ nearly 3.7 million people directly in FY2016.

More importantly, the industry has led the economic transformation of the country and altered the perception of India in the global economy. The IT sector in India grew at a compound annual growth rate (CAGR) of 13 per cent over 2010-16, which is 3-4 times higher than the global IT spend, and is estimated to expand at a CAGR of 12 per cent to USD 201 billion by 2019.

International Data Corp. (IDC) estimates that Indian IT vendors will generate at least USD 225 billion in overall revenue in 2020 on back of growth of SMAC. The break-up of spending expected across each of the components are 10% of the total IT budget on big data and analytics, 9.5% on cloud services, 5.3% on mobile apps and devices and 3.4% on social media. A survey of 410 global IT decision makers **in 2014 predicted India will export $15 billion worth of SMAC software and services in FY17.**

SPENDING PERCENTAGE OF OVERALL ICT REVENUE



4.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

India has one of the world's largest education systems, which includes 1.3 million schools, over 35,000 higher educational institutions including colleges and universities. Over the last decade, the education market, especially the higher education sector, has witnessed massive expansion in terms of growth and enrolment. National focus on education, especially higher education, is not new. Many governments of the past have understood the pivotal role it plays in shaping a nation's socio-economic makeup. In recent times, several big-ticket reforms and progressive initiatives have been ideated on and discussed to strengthen the sector and its preparedness for future opportunities.

The announcement by the Centre in the Union budget 2015 to establish new institutes of excellence including IIMs and IITs in the country, setting up of financing authority, extending additional funds for infrastructural development of institutions of national importance, amongst others, are expected to essay a new storyline for the higher education sector in the country. At the statelevel, the states of UP, Tamil Nadu, Maharashtra, amongst others are some of the leading states in terms of students' enrolment in higher educational institutions. Five southern states led by Tamil Nadu and Karnataka accounts for almost 30 percent of total enrolments in the country.

According to the AISHE report of 2014-15, the country has a total of 757 universities comprising of Central Universities, state universities, private universities, deemed universities, institutes of national importance among others. State universities form the highest share of universities in India, followed by private universities and deemed universities. Rajasthan and Uttar Pradesh have the highest number of universities (64 each), followed by Tamil Nadu (58), Karnataka (51) and Gujarat (49).

"International Data Corp. (IDC) estimates that Indian IT vendors will generate at least USD 225 billion in overall revenue in 2020 on back of growth of SMAC."

BREAK UP OF UNIVERSITIES BY STATE

STATE	CENTRAL UNIVERSITIES	STATE UNIVERSITIES	PRIVATE UNIVERSITIES	DEEMED UNIVERSITIES	INSTITUTES OF NATIONAL IMPORTANCE	OTHERS	TOTAL NO. OF UNIVERSITIES
Rajasthan	1	20	32	8	3	0	64
Uttar Pradesh	4	26	20	10	4	0	64
Tamil Nadu	2	21	0	28	6	1	58
Karnataka	1	26	8	15	1	0	51
Gujarat	1	26	18	2	2	0	49
Maharashtra	1	20	0	21	3	0	45
Madhya Pradesh	2	18	13	3	4	1	41
Haryana	1	13	16	5	1	0	36
West Bengal	1	23	0	1	5	0	30
Andhra Pradesh	0	21	0	5	0	2	28

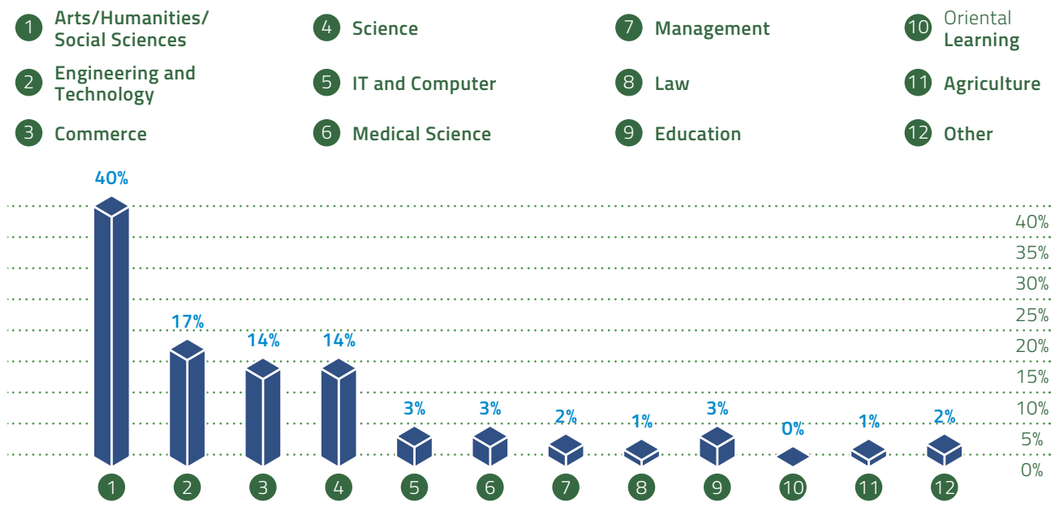
*Source: AISHE report, 2014-15

NATIONAL ENROLMENT BY EDUCATION LEVEL

According to AISHE report for 2015, there are more than 33 million students enrolled in the Higher education system in India. Maximum enrolment in higher education is at the Under Graduate level (79.4%), followed by Post Graduate (11.4%) and Diploma (6.8%). This pool of Graduate and above form the initial basis of supply for the IT industry. Share of enrolment by gender is almost the same in school and higher education, boys form about 52.3% of the enrolment in both categories.

National enrolment split by Academic Stream Enrolment at the graduate level by discipline reveals that enrolment was highest in Arts (40.4%), followed by Engineering & Technology (17.4%), Commerce (13.9%) and Science (13.8%). The share of enrolments in other disciplines is given in the table below:

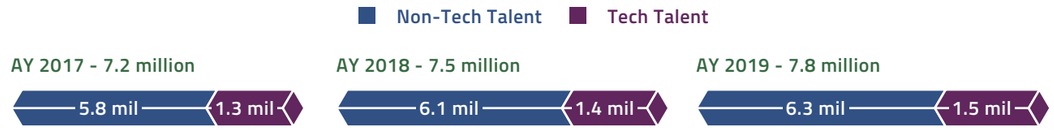
ALL INDIA SURVEY OF HIGHER EDUCATION, 2013 - 2014



OVERVIEW OF TOTAL SUPPLY TO THE IT INDUSTRY

The total supply of talent from different states at different levels across different streams is expected to increase with supply getting close to 22.5 million for the period (Assessment Year from July to June every year) AY17 to AY19. Of the same, about 19% of the talent can be attributed as core IT sector talent which includes all engineers as well as IT specific qualifications like BCA/MCA.

ANALYSIS BASED ON AISHE REPORT



INDIA IN-DEMAND JOBS 2018-2020

IN DEMAND JOBS	2018	2019	2020
Business Intelligence Consultant	8,546	9,757	11,400
Cloud Solution Architect	14,566	20,418	28,159
Computer Systems Analyst	123,121	130,751	139,787
Cybersecurity Consultant	10,453	12,383	14,703
Data Scientist	4,273	4,878	5,700
Internet of Things (IoT) Developer	34,796	38,795	43,088
IT Infrastructure Engineer	23,305	32,668	45,055
Mobile and Web Application Developer	94,241	103,921	112,439
Network Engineer	17,479	24,501	33,791
Software Developer	73,873	78,451	83,872
India Total	**404,652**	**456,524**	**517,994**

Considering the jobs expected to be created within the industry, the "industry-ready" workforce is higher and thus the demand supply gap seems high with a higher number of employable workforce expected to be eligible and willing for jobs. The supply of the talent from the non-technical streams account for a larger share in the talent pool of supply when compared to the technical streams from 2015-16 to 2018-19. The technical streams contribute about 15% to 17%of the talent supply for the years 2015-16 to 2018-19 respectively. The talent for demand seems to be highest in the year 2018-19.

However, while the "industry-ready" supply is higher than the projected demand for technical and nontechnical streams, the job-ready demand accounts for only about 4.5% of the industry ready demand thus creating a huge supply deficit. The need thus is to have the requisite qualified as well certified manpower in order to meet the industry demand of a "job-ready" workforce..

4.3 CROSS- BORDER TALENT OPPORTUNITIES

The number of jobseekers in India across industries, rising steadily over the last few months, spiked to 7.1% in the week which ended on February 25 2018.There are around 31 million unemployed Indians seeking jobs now—the highest since October 2016, according to a report published on Feb. 27 by the Centre for Monitoring Indian Economy (CMIE), a think-tank that tracks business and economic data.After falling to a low of 3.4% in July 2017, unemployment rates have been rising gradually, the CMIE data show. In addition to the 31 million unemployed Indians as of February 25 2018 urban India will see a spike in demand for jobs as a fresh batch of college graduates enters the workforce. But the number of jobs created in financial year 2018 is an estimated 600,000.

On the other hand, with increased focus on digital transformation and analytics, the demand for data scientists in India shot up by 417 percent in the past one year, according to a new study. People seeking data scientists' job during the same period increased by just 19 percent, according to the study titled "Talent Supply Index" (TSI) by data-driven hiring solution provider Belong Technologies India Pvt Ltd. The demand for security engineers in the past year increased by 120 percent while the supply has been able to match up by only 14 percent, showed the 2018 edition of TSI.

Indian IT industry is experiencing change in hiring patterns due to new global outsourcing trends and pressures due to emergence and increasing adoption of new technologies such as AI which is helping organizations to automate number of processes, hence making many jobs done by humans redundant and impacting Indian IT industry which depends heavily on US and European outsourcing clients. It is an irony that on one hand there is high unemployment and on the other there is shortage of skilled resources. One of the main reasons for this situation is outdated curriculum and quality of education. Still with 7 million graduates joining workforce every year in a country of 1.35 billion, India is and will remain a big exporter of talent to developed and semi-developed countries. Better salaries, higher currency value and lack of jobs at home remain prime reason for Indian talent to cross border for work. In Asia Pacific; Singapore, Australia and Malaysia are most sought after destinations for Indians to work as an expatriate. It is expected that this trend will continue to hold along with new opportunities in China and Indonesia where recently Indian talent has started to move.

TOP REASONS FOR INDIANS TO MIGRATE FOR WORK

4.4 KEY INITIATIVES

1. DIGITAL INDIA INTERNSHIP SCHEME

An internship is an opportunity for a student to secure first hand and practical work experience under the guidance of a qualified and experienced Supervisor/Mentor. It also aims at active participation in the learning process through experimentation and putting into practice the knowledge acquired in the classrooms.

The Ministry of Electronics and Information Technology is engaged in electronic development through e-Infrastructure creation to facilitate and promote

(1) e-governance
(2) Promotion of electronics hardware manufacturing and Information Technology & IT Enabled Services (IT-ITeS) Industry
(3) Providing support for creation of Innovation Infrastructure in emerging areas of technology
(4) Providing support for development of e-skills and knowledge network and
(5) Securing India's cyber space. For the larger benefit of the student community and with a view to enrich the management/implementation of its various schemes/programmes, the Ministry of Electronics and Information Technology has decided to notify these "Internship Guidelines", to provide a framework for engagement of Interns for a limited period.

2. BPO PROMOTION SCHEMES

The India BPO Promotion Scheme (IBPS) has been approved under Digital India Programme, to incentivize BPO/ITES operations across the country, for creation of employment opportunities for the youths and growth of IT-ITES Industry. IBPS aims to incentivize establishment of 48,300 seats distributed among each State in proportion of State's population, with financial support up to Rs. 1lakh/seat in the form of Viability Gap Funding (VGF), with an outlay of Rs. 493 crore up to 31.03.2019. The scheme provides following financial supports:

A. FINANCIAL SUPPORT:
Up to 50% of expenditure incurred on BPO/ITES operations towards capital expenditure (CAPEX) and/or operational expenditure (OPEX) on admissible items, subject to an upper ceiling of ₹ 1 Lakh/Seat.

B. SPECIAL INCENTIVES:
The following special incentives will be provided within the ceiling of total financial support i.e. Rs. 1 Lakh/seat:

3. PHD SCHEME

Ministry of Electronics and Information Technology, Government of India initiated "Visvesvaraya PhD Scheme for Electronics and IT" with an objective to enhance the number of PhDs in Electronics System Design & Manufacturing (ESDM) and IT/IT Enabled Services (IT/ITES) sectors in the country. Cabinet Committee on Economic Affairs (CCEA) approved the scheme in 2014 for a period of nine years with a total estimated cost of ₹ 466 crores (Rupees Four Hundred Sixty Six Crores Only)

OBJECTIVES:

1. To enhance the number of PhDs in Electronics System Design & Manufacturing (ESDM) and IT/IT Enabled Services (IT/ITES) sectors in the country.

2. Give thrust to R&D, create an innovative ecosystem and enhance India's competitiveness in these knowledge intensive sectors.

3. To fulfil the commitments made in National Policy on Electronics (NPE 2012) and National Policy on Information Technology (NPIT 2012) which recommend to give special thrust on significantly increasing the number of PhDs in the country to enable India to compete globally in the coming decades, to develop an ecosystem of research, development and IP creation in these knowledge intensive sectors.
4. To support 1500 PhD candidates including both full-time (500) and part-time (1000) in each of ESDM and IT/ITES sectors (Total: 3000 PhDs).
5. The scheme is also expected to encourage working professionals and non-PhD faculty members to pursue PhD.

4. DIGITAL INDIA

Digital India is an initiative of Government of India which aims at

(i) ensuring the government services are made available to citizens electronically by reducing paperwork,
(ii) connecting rural areas with high-speed internet networks and
(iii) promoting digital literacy amongst the citizens of the country.

This umbrella program pulls together various existing schemes of the government in an effort to restructure, re-focus and thereafter implement in phases to be centrally coordinated by the Department of Electronics and Information Technology (DeitY). It has an overlay of about INR 1.1 trillion from budgets of various departments and is slated to be completed by.

5. FUTURESKILLS

FutureSkills is an industry utility to get India accelerated on a journey to build its skills and become the global hub for talent in the emerging technologies. FutureSkills portal is designed as a resource for the IT-ITeS industry to enable discovery, continuous learning and deep skilling in 9 emerging technologies.The portal has been designed as a marketplace and content library, where the best global providers of content and learning will come together to offer learners information on the latest jobs, the skills needed for those jobs, learning content, assessments and certifications.

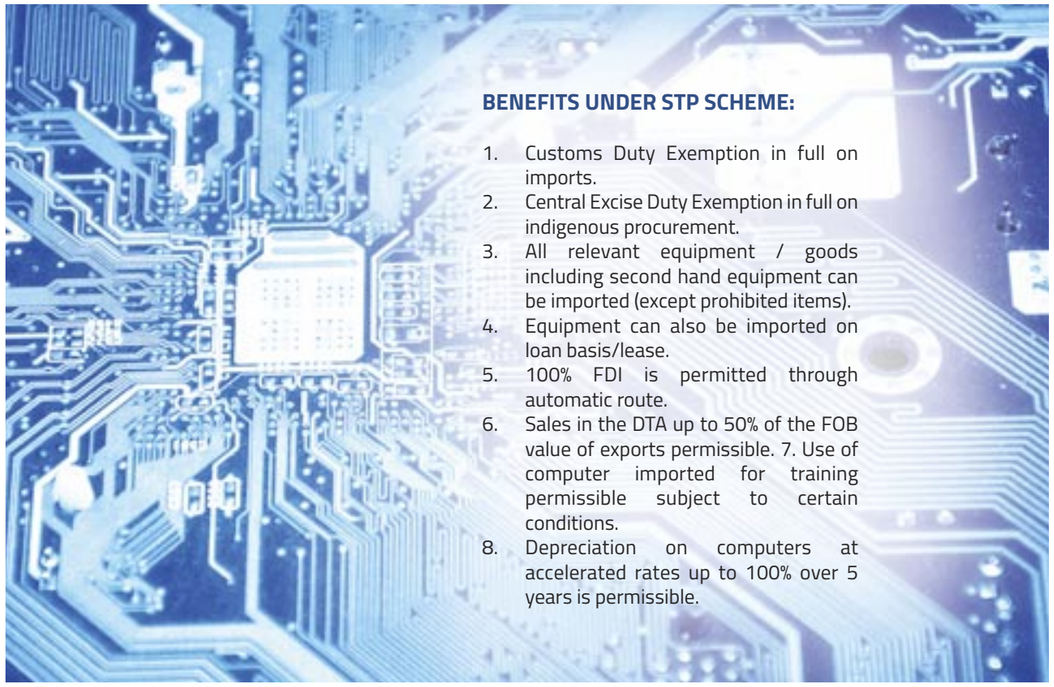
The platform is fueled by a curation engine that has the ability to trawl the massive amount of high quality learning content available on the web and funnel it in an easy to consume format that's meaningful and effective for the learners.

INDIAN GOVERNMENT INITIATIVES THAT CAN BE EMULATED BY OTHER COUNTRIES

After the economic reforms of 1991-92, liberalization of external trade, elimination of duties on imports of information technology products, relaxation of controls on both inward and outward investments and foreign exchange and the fiscal measures taken by the Government of India and the individual state governments specifically for IT and ITeS have been major factors for the sector to flourish in India and for the country to be able to acquire a dominant position in offshore services in the world. The major fiscal incentives provided by the Government of India have been for the Export Oriented Units (EOU), Software Technology Parks (STP), and Special Economic Zones (SEZ).

SOFTWARE TECHNOLOGY PARKS (STPS)

For the promotion of software exports from the country, the Software Technology Parks of India was set up in 1991 as an autonomous society under the Ministry of Electronics and Information Technology. The services rendered by STPI for the software exporting community have been statutory services, data communications servers, incubation facilities, training and value added services. STPI has played a key developmental role in the promotion of software exports with a special focus on SMEs and start up units. The STP scheme which is a 100% export-oriented scheme has been successful in fostering the growth of the software industry. The exports made by STP Units have grown over the years. The STP scheme allows software companies to set up operations in convenient and inexpensive locations and plan their investment and growth driven by business needs. More than 4000 units are registered with STPI.



BENEFITS UNDER STP SCHEME:

1. Customs Duty Exemption in full on imports.
2. Central Excise Duty Exemption in full on indigenous procurement.
3. All relevant equipment / goods including second hand equipment can be imported (except prohibited items).
4. Equipment can also be imported on loan basis/lease.
5. 100% FDI is permitted through automatic route.
6. Sales in the DTA up to 50% of the FOB value of exports permissible. 7. Use of computer imported for training permissible subject to certain conditions.
8. Depreciation on computers at accelerated rates up to 100% over 5 years is permissible.

SPECIAL ECONOMIC ZONES (SEZ) SCHEME

In 2005, the Department of Commerce, Ministry of Commerce & Industry, Government of India has enacted the Special Economic Zone (SEZ) Act, with an objective of providing an internationally competitive and hassle-free environment for exports. A SEZ is defined as a "specifically demarked duty-free enclave and shall deemed to be foreign territory (out of customs jurisdiction) for the purpose of trade operations and duties and tariffs". It provides drastic simplification of procedures and a single window clearance policy on matters relating to central and state governments. The scheme is ideal for bigger Industries and has a significant impact on future Exports and employment.

The SEZ policy aims at creating competitive, convenient and integrated zones offering world class infrastructure, utilities and services for globally oriented businesses. The SEZ Act 2005 envisages key role for the state governments in export promotion and creation of related infrastructure.

SALIENT FEATURES OF SEZ SCHEME ARE AS UNDER:

1. Duty free import/domestic procurement of goods for development, operation and maintenance of SEZ units
2. 100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.
3. Exemption from Central Sales Tax, exemption from Service Tax and exemption from State sales tax. These have now subsumed into GST and supplies to SEZs are zero rated under IGST Act, 2017.
4. Other levies as imposed by the respective State Governments
5. Single window clearance for central and state level approvals.
6. This scheme has a significant impact on future exports & employment. About 230 IT-ITeS specific SEZs have been notified by the DOC.

" C-DAC is the premier R&D organization in India. It also provides excellent education and training services in areas such as Cybersecurity, Health Informatics, Grid Computing and Embedded Systems. "

4.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

KEY TRAINING PROVIDERS AND IN-DEMAND CERTIFICATIONS

APTECH

Aptech is a premier education institute. Aptech is a pioneer in providing career-orientated courses to aspiring professionals since 1986. The institute has trained 68 lakh (6.8 million) students through a wide network of education centres located in over 40 countries.

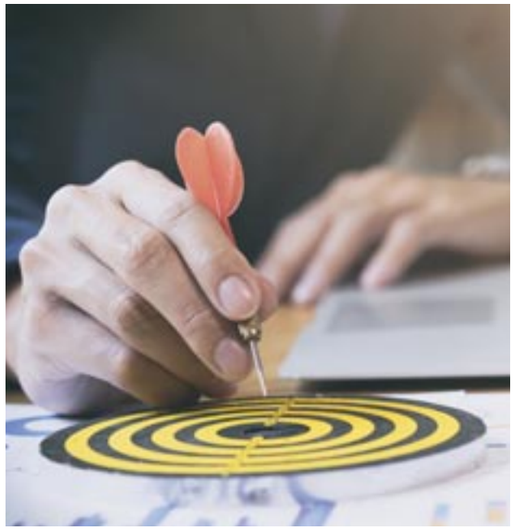
CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING (C-DAC)

Centre for Development of Advanced Computing (C-DAC) is the premier R&D organization of the Ministry of Electronics and Information Technology (MeitY) for carrying out R&D in IT, Electronics and associated areas. Different areas of C-DAC, had originated at different times, many of which came out as a result of identification of opportunities.

- The setting up of C-DAC in 1988 itself was to built supercomputers in context of denial of import of supercomputers by USA. Since then C-DAC has been undertaking building of multiple generations of supercomputer starting from PARAM with 1 GF in 1988.
- Almost at the same time, C-DAC started building indian language computing solutions with setting up of GIST group (Graphics and Intelligence based Script Technology); National Centre for Software Technology (NCST) set up in 1985 had also initiated work in Indian Language Computing around the same period.
- Electronic Research and Development Centre of India (ER&DCI) with various constituents starting as adjunct entities of various state electronic Corporations, had been brought under the hold of Department of Electronics and Telecommunications (now MeitY) in around 1988. They were focusing on various aspects of applied electronics, technology and applications.
- With the passage of time as a result of creative ecosystem that got set up in C-DAC, more areas such as health informatics, etc., got created; while right from the beginning the focus of NCST was on software technologies; similarly C-DAC started its education & training activities in 1994 as a spin-off with the passage of time, it grew to a large efforts to meet the growing needs of indian industry for finishing schools.

NIIT

NIIT is a leading Global Talent Development Corporation, building skilled manpower pool for global industry requirements. The company which was set up in 1981, to help the nascent IT industry overcome its human resource challenges, has today grown to be amongst world's leading talent development companies offering learning solutions to Individuals, Enterprises and Institutions across 40 countries.



IN- DEMAND CERTIFICATIONS

1. Certified Information Security Manager (CISM)
2. Certified Information Systems Security Professional (CISSP)
3. Certified Information Systems Auditor (CISA)
4. Project Management Professional (PMP)
5. AWS Certified Solutions Architect – Associate
6. Citrix Certified Professional – Virtualization (CCP-V)
7. VMware Certified Professional 6 – Data Center Virtualization (VCP6-DCV)
8. ITIL v3 Foundation
9. CompTIA Project + 10. Cisco Certified Network Professional (CCNP) Routing and Switching

KEY MINISTRIES AND GOVERNMENT BODIES THAT DRIVE TALENT STRATEGY AND DEVELOPMENT

Government of India
Ministry of Human Resource Development

Government of India
Ministry of Electronics and Information Technology

5. INDONESIA

5.1 OVERVIEW OF INDONESIA

Indonesia has a population of close to 260 million, and more than 25 million Indonesians still live in poverty. However, it is a growing middle- income country, the government has improved the poverty reduction by half since 1999 to close to 10% in 2018. The Gross Domestic Product (GDP) in Indonesia was stated at US$1015.54 Billion in 2017, which represents 1.67% of the world economy. The number of employed persons in Indonesia increased to 127,067,835 in 2017.On the other hand, the unemployment rate of Indonesia plummeted to 5.13% in the first quarter of 2018 from 5.5% in the third quarter of 2017.

Indonesia ICT industry is evolving quickly, and a shortage of 9 Million skilled and semi-skilled ICT workers between the period of 2015-2030 is projected.[70] The Indonesian government has started working on programs to bridge the gap. One of the initiatives was to sign a memorandum of understanding (MoU) on vocational education development on the 29th November 2016 among 5 other ministries (Ministry of Industry, Ministry of State-owned Enterprises/BUMN, Ministry on Manpower, Ministry of Education and Culture, and Ministry of Research, Technology and Higher Education).[71]

5.2 FUTURE INDUSTRY DIRECTION AND IMPLICATION TO TALENT DEMAND

INDONESIA'S GOVERNMENT PLANNING ON DIGITALLY DRIVEN ECONOMIES

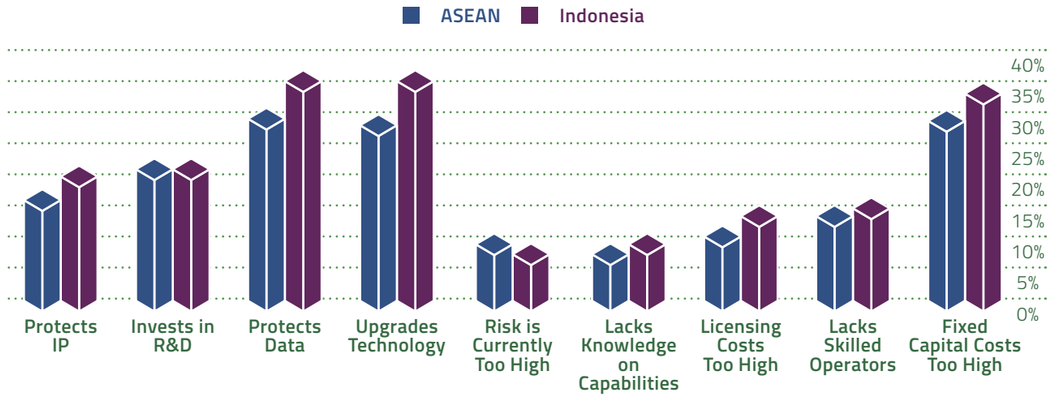
GERAKAN NASIONAL 1000 STARTUP DIGITAL

The Indonesian government has launched its vision to make Indonesia a digital economy by 2020. By leveraging digitalization, the government expects fast growth and contribution from digital businesses. To support the initiative, the Indonesian government has introduced key programs that will be leveraged and enable new job opportunities and skill-set development in the market. These are:

- **1,000 start-ups.** One of the key targets for the digital economy is small and medium-sized enterprises (SMEs) that can be enhanced through this initiative.
- **Industry 4.0.** The industrial revolution is determined to be the key market development in Indonesia, focusing on production optimization in the manufacturing sector. Textile & Garment, Food & Beverages, Automotive, and Chemicals will be the priority subsectors for Industry 4.0 development.
- **eCommerce Road Map.** With SMEs dominant in the country, there is an indirect push and motivation to enable digitalization in the SME landscape. In the ecommerce road map, one of the focuses are skillset development.
- **Internet of Things (IoT).** The Ministry of Communication & Information fully supports the implementation of IoT in all sectors in Indonesia. The government wants to encourage the use of this technology not only for large companies but also for farmers, fishermen, etc.

Technology awareness in Indonesian enterprises is higher compared with other countries in ASEAN but still lags behind Malaysia and Singapore. Indonesian consumers are determined to be tech-savvy, using smartphones and the internet to find information and make decisions. In the long run, Indonesian enterprises should be able to adapt and be agile about changing purchasing behavior, a situation where technology is a key enabler.

- In spite of organizations' technology awareness, high fixed capital costs and the lack of skilled operators remain barriers
- Many hackathon events were held by private enterprises in Indonesia. They hold these events to capture ideas for company development and to support the spirit of improving business through technology.
  - Jasa Raharja; Indosat; Telkom; AWS; XL; BNI; Pertamina; Bank Mandiri; BCA; BTN
- Nongsa Digital Park Batam resulted from the collaboration between Indonesia and Singapore to build a technology park.
- **Tech park: Digital Hub, Slipicon Valley**
- **Community**
- **Foreign IT principal**
  - **Google Developers Kejar; Alibaba Cloud Community; Apple Developer Academy; AWS**
- **University**
  - **UMN; Binus; Purwadhika**
- **Community-based online learning platform**
  - **Online: codepolitan; ajaro.id; decoding; PHP Indonesia; codelabs; algoritma; iykra**
  - **Community: numerous communities that emphasize emerging technology**
  - **Ncubator: block71**



ENTERPRISE INITIATIVES AND OBSTACLES ON TECHNOLOGY DEVELOPMENT

Overall, awareness about technology development by Indonesian enterprises is higher than the ASEAN average. Around 35% of enterprises in Indonesia reported upgrading technology, yet the ASEAN average is only 27%. Data protection is again higher in Indonesia than the ASEAN average (28%), with 34% of Indonesian enterprises reporting plans to enhance data protection.

" Technology awareness in Indonesian enterprises is higher compared with other countries in ASEAN but still lags behind Malaysia and Singapore. "

PEOPLE DEVELOPMENT ON ICT SKILLSET

There were some initiatives on the demand side made by the private sector for human capital development toward ICT job areas. Along with the private sector, there were groups that focused on emphasizing emerging technology within their community of developers, engineers, and data enthusiasts.

Numerous hackathon events were also held by private companies in Indonesia. Jasa Raharja, Indosat, Telkom, XL, BNI, Pertamina, Bank Mandiri, BCA, and BTN held hackathons to capture ideas to develop their businesses and support the spirit of ICT skills improvement.

In Indonesia, there are growing trends in communities that emphasize technology advancement. Several communities even build their own courses for ICT-related skills. Codepolitan, Ajaro.id, Dicoding, PHP Indonesia, Codelabs, Algoritma, and iykra are some of the well-known ICT skills training and certification providers.

For people development on ICT skills, foreign IT principals are also focusing on Indonesia. Apple recently opened a Developer Academy in Indonesia through collaboration with Bina Nusantara University — the first Developer Academy built by Apple in Southeast Asia. Teaming up with dicoding, Google will hold a Developer Training and Course in 10 cities across Indonesia. AWS also had developer workshops in Indonesia. It collaborated with Block71, a start-ups incubator owned by Salim Group.

INDONESIA, SINGAPORE JOINTLY OPEN NONGSA DIGITAL PARK IN BATAM

*Image taken from The Jakarta Post

NONGSA DIGITAL PARK, BATAM

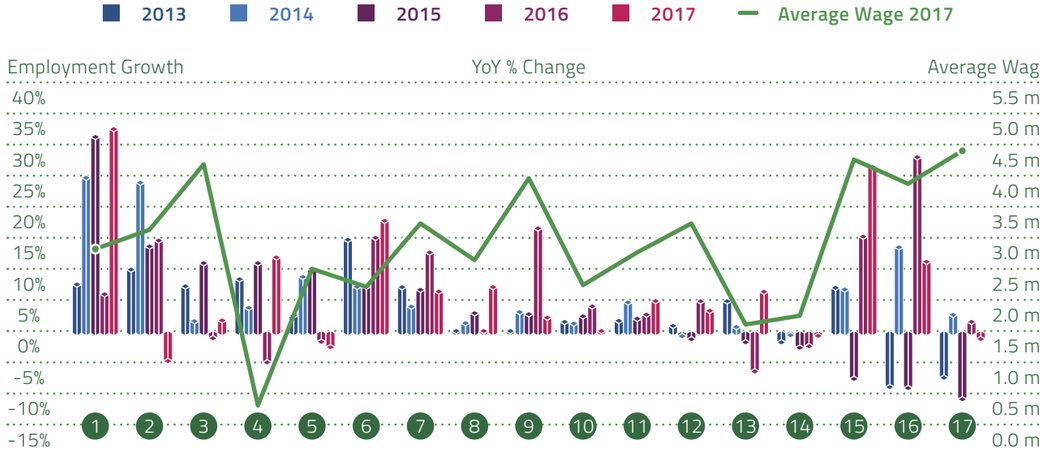
In March 2018, the Indonesian and Singaporean Foreign Minister inaugurated the Nongsa Digital Park in Batam. This facility is the result of the Indonesia and Singapore governments' commitment to enhance economic cooperation in a digitally driven economy. The Indonesian government is eyeing an investment of US$500 million, which is expected to create 10,000 jobs. Both governments stressed the importance of education in keeping up with the rapid changes in the digital industry and committed to future cooperation on human capital development.

There are also future plans to transform the Nongsa Digital Park to be a Special Economic Zone. With regards to this initiative, the Special Economic Zone is expected to ease the investment toward them and make exchange of good, services, and talent easier. Nongsa Digital Park is expected to be a game-changer for Indonesia in the global development of the digital economy.

INDONESIA IN-DEMAND JOBS 2018-2020

IN DEMAND JOBS	2018	2019	2020
Business Intelligence Consultant	1,159	1,377	1,644
Cloud Solution Architect	1,130	1,430	1,790
Computer Systems Analyst	18,468	19,469	20,378
Cybersecurity Consultant	1,614	1,892	2,244
Data Scientist	579	688	822
Internet of Things (IoT) Developer	5,445	6,113	6,817
IT Infrastructure Engineer	1,808	2,289	2,864
Mobile and Web Application Developer	40,704	42,071	42,940
Network Engineer	1,356	1,717	2,148
Software Developer	11,081	11,681	12,227
India Total	**83,345**	**88,727**	**93,872**

EMPLOYMENT GROWTH AND AVERAGE SALARY CLASSIFIED BY SECTORS



1. Public Utilities
2. Real Estate
3. Financial Services and Insurance
4. Enterprise Services
5. Construction
6. Accomodation and Restaurant
7. Healthcare and Social Services
8. Manufacturing
9. Public Authorities
10. Trading
11. Education
12. Transportation and Logistics
13. Other Services
14. Agriculture
15. Information and Communication
16. Energy
17. Mining an Quarrying

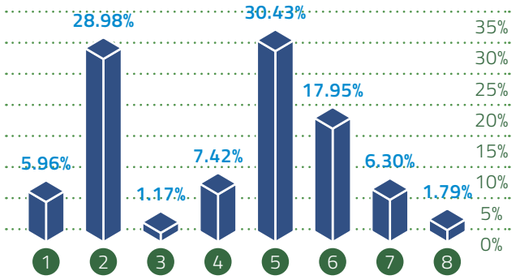
INDONESIA'S EMPLOYMENT OUTLOOK

For two consecutive years, the information and communication sector[1] has outperformed other leading sectors in terms of employment capacity. In 2017, the ICT sector's GDP also experienced the highest growth over other sectors. In Indonesia, working in ICT job areas is gaining significant interest from jobseekers[2]. This shows that the ICT sector not only performed better but is also extensively absorbing the workforce in Indonesia.

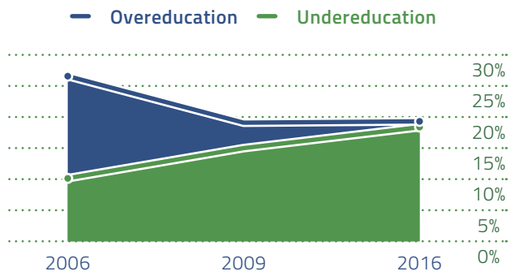
Working in the information and communication sector, on average, also receives a higher income compared with other sectors. It is logical to interpret that jobs in ICT areas demand higher skills, thus producing a higher salary even in the early phase of employment or as a junior. Other leading sectors could produce high variations on the salary received by the workers as they have a wider wage gap between different levels in the organization, with the majority coming from the low-wage end of the spectrum. [72]

EMPLOYMENT CLASSIFIED BY JOB TYPE

1. Administrative
2. Agricultural
3. Executive
4. Experts
5. Operators
6. Sales
7. Services
8. Others



SKILL MISMATCH ON INDONESIAN WORKFORCE

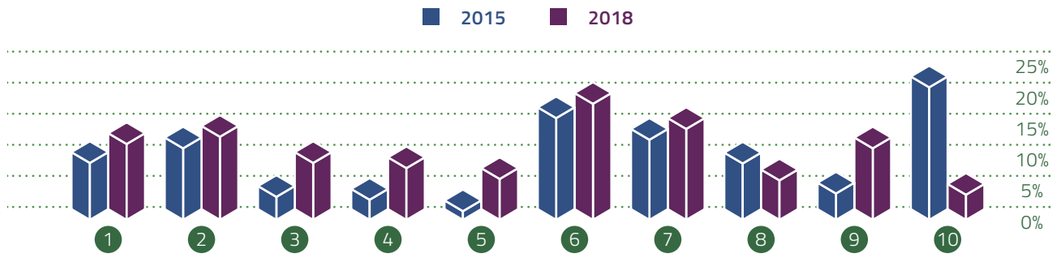


INDONESIA'S WORKFORCE LANDSCAPE

Recent data from the Indonesia Statistics Bureau showed that most of the Indonesian workforce are still in low-skill occupations, accounting for almost 70% of total employment. Agricultural work and machine operator account for 30.4% and 29.0%, respectively. This might be a consequence of the low education in Indonesian labor.

JOB FIELDS SEEKD BY JOB SEEKERS

1. BFSI
2. Education
3. Entertainment
4. FMCG
5. Hospitality
6. IT
7. Marketing
8. Resources
9. Social
10. Others



JOB AREAS THAT JOB SEEKERS SEEK

Jakpat published pooled cross-sectional data that observed the jobs that are sought by various job seekers in two periods of time. Examining the data and ICT-related jobs for two consecutive points of time yielded the leading jobs being sought by job seekers. **In 2015, 16% of job seekers sought ICT-related jobs and, furthermore, this number is increasing to 18% in 2018.** The number was only slightly higher in 2018 but this job type is still at the top in terms of the jobs sought by the Indonesian workforce. ICT has attracted the Indonesian workforce in the past 5 years.

The rapidly growing ecommerce, fintech, and digital transformation among enterprises and start-ups produced significant demand in ICT job areas. From the government side, they also extensively support the development of workforce skills in ICT job areas.

" The number was only slightly higher in 2018 but this job type is still at the top in terms of the jobs sought by the Indonesian workforce. "

Current Condition

Most of the Indonesians are still categorized as low skilled labor, thus resulting in high occupancy in low skill jobs.

Flourishing technology startups and digital transformation initiative by enterprises made the demand for ICT jobs increase rapidly, yet the supply of labor couldn't keep up with the demand.

High-skilled job is increasing quickly, showed by declining rate of overeducation and increasing rate of undereducation.

The latter is more concerning because there were more of less qualified workers placing certain position in business (attach under-and-overeducated labor).

Gap

If government want to push digitalization through their initiatives they must help to develop worker's ability, yet there weren't any significant initiatives according to this.

Through vocational high school and diploma, government could develop new curriculum on ICT job specialization in order to reduce the gap.

Based on the survey by ILO, the enthusiasm by fresh graduate toward ICT-related jobs is very positive, but enterprises felt that it is still hard to look for talent in ICT jobs.

Targeted Condition

Fulfilling demand of high skill labor in response to rapidly growing digital economy.

It is unbearable that automation from industry 4.0 initiative will impact the low skilled labor.

ASEAN Economic Community (AEC) will facilitate skilled labor mobility within ASEAN.

Closing the Gap

Government could increase Public Private Partnership in order to develop tangible programs and facilities for workforce skillset development. This type of partnership could be a win-win for both Government and Private sector to fulfill the target and demand to produce high-skilled labor.

There were many examples on academic research that showed the openness of economies for cross-border talent will fasten the process of technology and knowledge transfers (Worldbank3, 2007 and Japan Research Institute4, 2015). Indonesia's economy will expectedly to benefit if they were more open to cross border talent.

The other gap that Indonesia is also experiencing is the lack of female talents in ICT sector. The ICT sector is predominantly occupied by male talents. Below is the data from Hacker Rank, it is stated that Indonesia has 15% female developers. The need to encourage more females to enter the ICT sector will also help bridge the shortage of talent gap.

WHICH COUNTRY HAS THE LARGEST PROPORTION OF FEMALE DEVELOPERS?

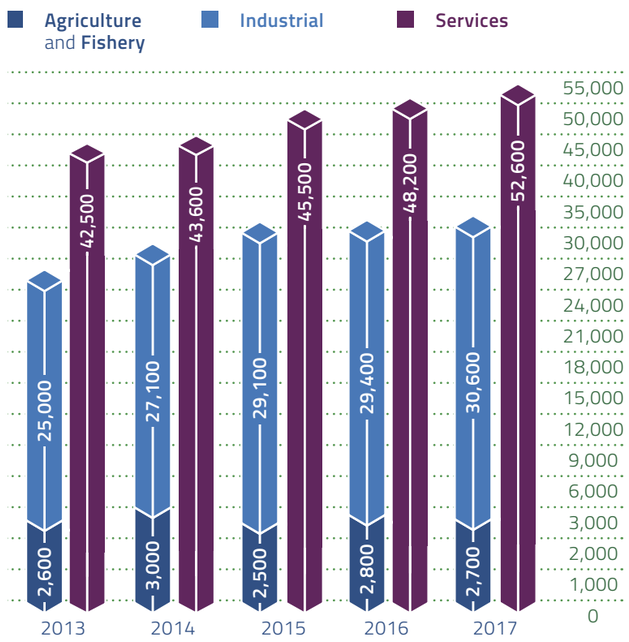
Share of HackerRank Tests

RANK	COUNTRY	FEMALE
1	India	22.9%
2	United Arab Emirates	21.0%
3	Romania	20.6%
4	China	19.6%
5	Sri Lanka	19.0%
6	Italy	16.7%
7	BUlgaria	16.5%
8	Singapore	15.2%
9	Philippines	15.1%
10	Indonesia	15.0%
11	United States	14.8%
12	New Zealand	14.6%
13	Malaysia	14.4%
14	Hong Kong	13.8%
15	South Korea	13.6%
16	Israel	12.9%
17	Japan	12.8%
18	Ukraine	12.6%
19	Bangladesh	11.9%
20	Canada	11.4%
21	Vietnam	11.3%
22	Australia	10.7%
23	United Kingdom	10.3%
24	Poland	10.2%
25	Ireland	9.7%

RANK	COUNTRY	FEMALE
26	France	9.4%
27	Switzerland	9.0%
28	Egypt	8.9%
29	Netherlands	8.3%
30	Greece	8.3%
31	Belarus	7.8%
32	Russia	7.8%
33	Spain	7.4%
34	Germany	7.4%
35	Portugal	7.2%
36	Turkey	6.7%
37	Colombia	6.5%
38	Pakistan	6.5%
39	Mexico	6.3%
40	Venezuela	6.3%
41	Beigium	6.0%
42	South Africa	5.9%
43	Brazil	5.8%
44	Sweden	5.7%
45	Austria	5.4%
46	Hungary	5.0%
47	Argentina	4.5%
48	Czech Republic	4.5%
49	Denmark	3.3%
50	Chile	2.9%

5.3 CROSS-BORDER TALENT OPPORTUNITIES

FOREIGN WORKERS IN INDONESIA ACCORDING TO TYPE OF WORK, 2013-2017

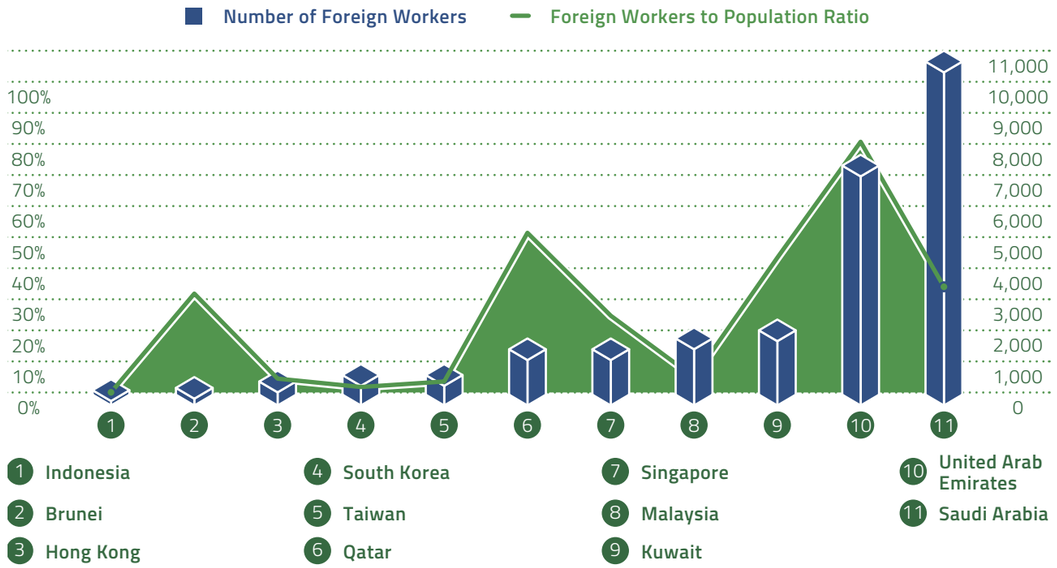


Foreign talent that work in Indonesia must be categorized as high-skilled labor. The Indonesian government must forbid low-skilled labor from abroad to work in Indonesia. According to the data published by Ministry of Manpower and Transmigration, 61.2% of Indonesia's foreign workforce is occupied in the services-based sector.[73]

The number of foreign workers absorbed in Indonesia's labor force is noticeably lower compared with other emerging economies: the ratio of foreign workers to population is only 0.03%. Compared with Malaysia and Singapore, Indonesia's foreign worker absorption is very low. It is known that Indonesia is quite protective of the local labor force. This data also showed that there will be consequences from low knowledge exchange from foreign workers to local workers that have already noticed by the government of Indonesia. [74]

The Ministry of Information and Communication realized that Indonesia still lacks high-skilled labor in technology and might ease the permit for cross-border talent. Through a presidential decree, the government will ease the paperwork for foreign talent that work as a lecturer (or teacher). By this deregulation, the Indonesian government means to increase the exchange of knowledge between expertise abroad and local talent.[75]

NUMBER OF FOREIGN WORKERS 2007



5.4 KEY INITIATIVES

INDONESIA GOVERNMENT'S MILESTONES IN WORKFORCE DEVELOPMENT

The Indonesia government acknowledges that three should be tangible action to enhance the country's workforce skill set in ICT job areas, that would catch up with the plan that the government has already made. Several programs in line with this include:

- The Ministry of Manpower has developed a partnership with education organization lingkaran. The Ministry has leveraged scholarship through the lingkaran community, especially on digital businesses. In the program, key skill sets are developed, especially for digital marketing specialists.
- **The Center of Training and Development on Information and Communication Technology built by the Ministry of Information and Communication.** To improve the technical competence of the ICT field for ASN and support the implementation of eGovernment in Indonesia, BPPTIK and the Ministry of Communication and Information will hold a Technical Training on ICT for ASN.
- The National ICT Occupational Map from the Ministry of ICT was published in order to clarify job competencies in ICT job areas along with job certifications. The Ministry will provide certification in ICT to create a more competitive landscape in the country, where technology implementation is more aggressive. The job certifications that will be given include those for technicians, programmers, network technicians, among others.
- The Bandung College of Technology in collaboration with the Ministry of Industry held a Public Discussion entitled, "Preparing Human Resources in Facing the Revolution of Industry 4.0."
- The Ministry of Information and Communication is ready to help disabled to build start-ups. The MoIC will help in terms of capital financing.

Some actions are being done by government agencies to support digital talent and digital transformation within the organization.

- The Ministry of Manpower has developed a partnership with education organization lingkaran. The Ministry has leveraged scholarship through the lingkaran community, especially on digital businesses. In the program, key skill sets are developed, especially for digital marketing specialists.
- Bekraf developer day
- BPPTIK. To improve the technical competence of the ICT field for ASN and support the implementation of eGovernment in Indonesia, BPPTIK and the Ministry of Communication and Information will hold a Technical Training on ICT for ASN.
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- Indonesia Financial Services Authority is developing an innovation hub as a place to try out financial technology start-ups under their supervision.
- The Ministry of Information and Communication is ready to help disabled to build start-ups. The MoIC will help in terms of capital financing.
- MoMT, MoIC, and MoRTHE will support easing the employment process for foreign talent in order to increase the exchange of knowledge.

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lingkaran

- lingkaran is a group of informal education communities that focus on building untouched capabilities such as digital and creative capabilities that may not be available in most universities in Indonesia.
- lingkaran's programs are held frequently. Several programs that are delivered are Mini Class, Class Series, Digital Mastership, Business Starter Pack.
- Recently, lingkaran launched a partnership with the Ministry of Manpower and Transmigration to leverage digital capabilities and skill sets in the country.
- Several enterprises also work with lingkaran for its talent development for digital capabilities.

MAUBELAJARAPA

- MauBelajarApa.com is an online marketplace that allows learners to search and register for offline classes/workshops published by educators and has a mission to make learning and the sharing of lifestyles inspiring and available to anyone.
- MauBelajarApa collaborates with key partners to run workshops, short courses, sharing sessions, and so forth. For example, MauBelajarApa partnered with Purwadhika School to provide lessons in coding for non-IT individuals.

ACTIONS	ENTITIES	IMPACT
Regulation	Ministry of Manpower and Transmigration	The government of Indonesia, led by the Ministry of Manpower and Transmigration, regulates foreign workers who will work in Indonesia such that they must have high skills that are not available in Indonesia. The regulation, without further development of the enhancement of high skills in the country, has created a talent gap in Indonesia. While the needs of high skills are growing, the supply is limited, which then creates a high cost of labor in the country.
Strategic Planning	Ministry of Manpower and Transmigration	The Ministry of Manpower and Transmigration has started programs to address digital infrastructure requirements and human resources capabilities, and to bridge regulation and incentive gaps. This program will create better talent development and aims to help the country in accelerating and enhancing the future of worksource.
Talent Development and Training Center	Universities, Ministry of Manpower and Transmigration, Technology Partners, Technology Community	Most universities in Indonesia have their center for skill-set development.. Several well-known universities already acknowledge additional skill-set certification for their students. Goals include to create ease and practical situations as well as prepare the students for work. Some private universities have added technology-driven courses and faculties to increase digital capabilities within their organizations. These universities work together with technology vendors to create a mutual engagement where students get "on-hand" experience through the partnership. The Ministry of Manpower and Transmigration has developed a partnership with the technology community to enhance and create visibility for digital capabilities in Indonesia. The availability of training development and centers in the country is growing and brings a positive impact in skill development especially in digital and future capabilities. Intense competition in specific fields of work, especially in digital capabilities, is expected to occur due to the high demand yet low supply in Indonesia.
Career Center and Job Fair	University, Talent Recruitment, Community	Along with talent development, career centers are meant to ease the job seeking process for the recently graduated. Universities enter into cooperation with enterprises to recruit new employees. Talent recruitment becomes more diverse and is growing in Indonesia with vertical-focused enhancement as key go-to-market strategy. Informal networking is also found in Indonesia in order to bridge the gap of supply and demand in the market. Vertical-based community, for example, technology community is determined as key influencer and driver of the engagement in the country. The Ministry of Manpower and Transmigration could act as an intermediary for labor demand and supply, considering its routine engagement in annual job fairs. The beginning of active engagement in talent fairs can still be improved in the market.
Formal Education and Certification	Government Universities School/ Vocational School	The government again raises the courses of ICT in early school because ICT has to be mastered by students in junior and senior high school or vocational school in the midst of rapid technological development. New courses are added in business schools in Indonesia by building partnerships with technology vendors and the technology community as key experts and stakeholders in talent development. Leadership and business-driven thinking such as design thinking, business model canvas, are taught and part of the learning process in universities. The change of the learning approach is felt is aimed to provide competitive advantage in Indonesia.

5.5 ORGANIZATIONS INVOLVE IN TALENT DEVELOPMENT

JACK MA INSTITUTE TO BE ESTABLISHED IN INDONESIA

*Image taken from The Star

The idea to establish the Jack Ma Institute in Indonesia to develop human resources and entrepreneurship was proposed at a meeting between the President of Indonesia, Joko Widodo, and Alibaba's Executive Chairman Jack Ma.

According to Jack Ma, talent development is important in developing digital technology in the country. He wants to encourage small and medium-sized businesses in Indonesia to use business opportunities that have been served by ecommerce.

SMARTGEN BY HUAWEI

Huawei Indonesia ICT training program - SmartGen providing ICT training program in 7 state-run colleges. The state college that provides SmartGen program are as follows: University of Indonesia (UI), Bandung Institute of Technology (ITB), Gadjah Mada University (UGM), Telkom University (Tel U), Diponegoro University (UNDIP), Padjadjaran University (UNPAD) and Sepuluh November Institute of Technology (ITS). This program also allows the applicants to further their training by commissioning vocational trainings in Beijing and Huawei headquarters in Shenzhen.

Future generation will be exposed to the latest ICT technology in preparing these young talents to be globally competitive and capable to enter the future working force. Application of SmartGen program in these colleges would comprise of Tech Day, Huawei Experience Day, Smart Campus Consultancy, Seeds for the Future and Students Internship.

TECHNICAL VOCATIONAL EDUCATION AND TRAINING (TVET)

The senior education level also known as Sekolah Menengah Kejuruan (SMK) has an initiative to ensure that what is being taught is in sync with the industrial demand and have collaboration with the industries. The need of both ICT hard and soft skills will be crucial in the syllabus.

Multimedia syllabus will focus on Internet of Things (IoT), mobile application development, computer programming and computer network. Electric engineering for ICT skills will be crucial due to the rapid growth in digital transformation.[76]

6. JAPAN

6.1 INTRODUCTION

Japan is in East Asia and is a significant trade partner with many Asian and Western economies. The gross domestic product (GDP) was reported at US$4,872 billion in 2017. Unemployment is below 5% and is expected to remain stable, according to forecast by the International Monetary Fund.

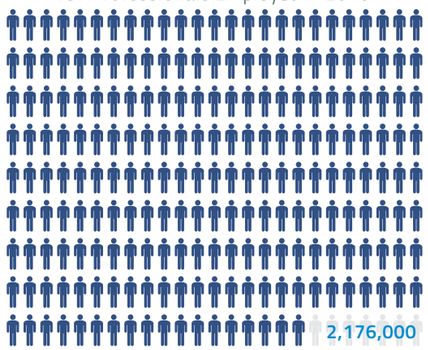
JAPAN ECONOMIC SNAPSHOT[77]

SUBJECT DESCRIPTOR	UNITS	SCALE	2015	2016	2017	2018	2019	2020	2021	2022	2023
Gross domestic product, current prices	U.S. dollars	Billions	4,395.0	4,949.3	4,872.1	5,167.1	5,362.2	5,498.8	5,641.5	5,796.7	5,962.4
Unemployment rate	Percent of total labor force		3.4	3.1	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Employment	Persons	Millions	64.0	64.6	65.3	65.6	65.4	n/a	n/a	n/a	n/a
Population	Persons	Millions	127.0	127.0	126.7	126.5	126.1	125.7	125.2	124.7	124.1

Japan is home to approximately 2,176,000 ICT professionals. Technology is almost synonymous with Japan, which has been a leader in both advancing technology through research and development as well as bringing new technologies to the market through efficient manufacturing.

ICT PROFESSIONALS IN JAPAN[78]

ICT Professionals Employed in 2016



6.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

The Japanese ICT industry is mature, with several companies employing in the thousands and having a global market reach. Familiar corporations include technology giants, such as NTT DoCoMo, SoftBank, Canon, Hitachi, and Mitsubishi Electric. Despite the prominence of technology in Japan, the nation lacks software and online companies at the scale of Amazon, Apple, and Google. The government and technology companies are working to keep Japan up to pace with the latest technologies, such as data analytics and Internet of Things (IoT), to ensure it can continue to compete with global players well into the future[79].

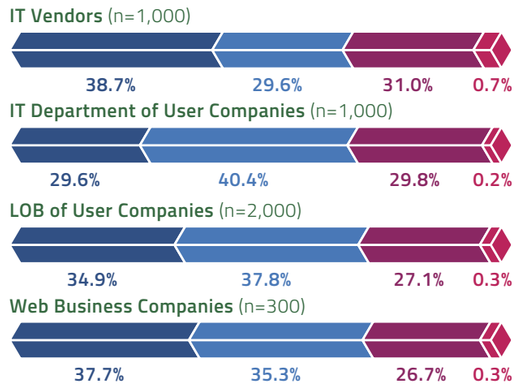
DIRECTION OF IT COMPANIES IN JAPAN BY SUB-INDUSTRY

- To be a world leading industry by creating competitive IT products and services
- To be a domestic advanced industry by leading advanced IT utilization for society and industries
- To provide a safe guard of the society and industries without obstacles
- Other than the above

SENSE OF URGENCY WITHIN THE JAPANESE ICT INDUSTRY

The Japanese ICT industry is structured around a multilayered system of subcontractors as this enables companies to better respond to fluctuation in demand and reduce costs. However, as the multilayer structure expanded, so has the competition among IT companies.

Within the context of this intensive competition, ICT industry players have a strong drive to be industry leaders. The possession of "outstanding skills," especially in areas such as software services, data analytics, artificial intelligence, Big Data, and IoT provides a competitive advantage to industry players. Traditional IT vendors that are not at the top of the competition may face a difficulty in competing without undergoing their own digital transformation.



NEED FOR OUTSTANDING IT SKILLS IN THE INDUSTRY

Do you think that IT vendors who do not have outstanding skills and services will be culled out?

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

Thus, the Government of Japan is exploring several avenues to develop the ICT industry, including investments, funding, and policies.

IT INDUSTRY DEVELOPMENT INITIATIVES

The Ministry of Economy, Trade, and Industry (METI) has allocated US$550 million in FY18 as measures to realize "Connected Industries" and to accelerate the utilization of data.[80]

METI
Ministry of Economy, Trade and Industry

METI INVESTMENT IN "CONNECTED INDUSTRIES"

Core Budget in FY 2018

"CONNECTED INDUSTRIES" PROJECT

- Fair use of data, utilization of data possessed by the government and formulation of data distribution rules
- Proof of concept for business model and R&D in important vertical area
- Human resources supply support according to the growth stage of companies
- Human resource development through strengthening collaboration with the US and Israel and others
- Practical application of fusion technology of robot, bio, etc. by AIST and University of Tokyo
- Utilization of Japanese Green Card for advanced worker, acceptance of foreigners
- Diverse human resource development
- Review of industrial restructuring related system such as law to strengthen industrial competitiveness
- Cyber Attack Information Sharing Scheme
- Cyber security of critical infrastructure
- IT skill standards and courses certification system
- Realization of highly productive way of working

METI CONNECTED INDUSTRIES

Japan aims to achieve "Society 5.0" in the future through the utilization of technological innovation, including IoT, artificial intelligence (AI), and Big Data. Achieving Society 5.0 goals requires active participation of the industry. Therefore, the Japanese government has announced "Connected Industries" as a new concept framework in which industries will create new added value and provide solutions to various problems in society. The idea is to leverage on the "connectedness" of modern lifestyles between humans (including our roles as consumers and suppliers), machines, systems, and companies. To this end, the Japanese government is advancing a wide variety of policy initiatives in cooperation with private sector parties.[81]

NEW VISION FOR FUTURE JAPANESE INDUSTRIES

Current Situation

Japanese industries are advancing digitalization of data for their establishments and factories as well as technologies and techniques, but the companies tend to manage the data in-house and tend not to collaborate on conducting these activities

Industry-Academia-Government Collaborative Efforts for Encouraging Discussions and Study

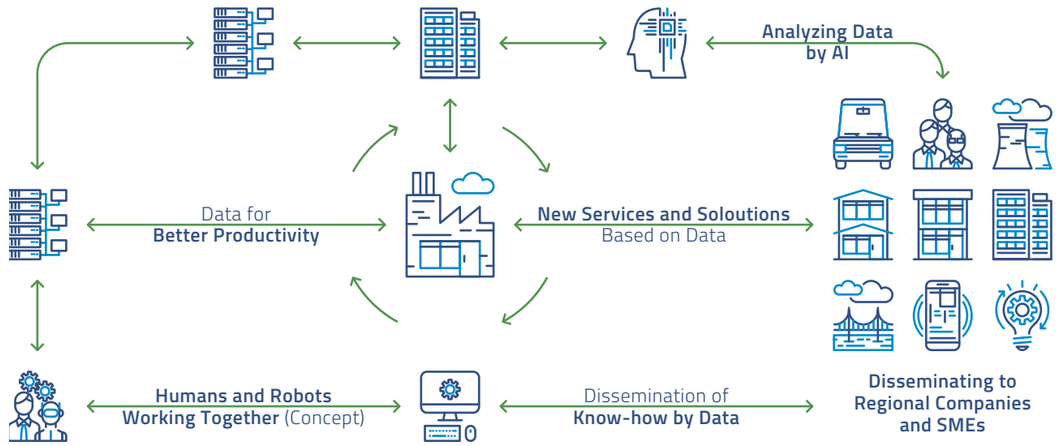
Sector-based efforts, e.g.: Mobility, Manufacturing, Biotechnology and Materials, Plant Safety, Smart Life

Cross-sectoral efforts, e.g.: Data Utilization, Standardization, IT Human Resources, Cyber Security, AI R&D

Future Goals

Connecting data and using data efficiently will encourage innovation, better productivity and dessemination of technology

"Connected Industries" will become a strength for Japanese industries, such as Made-in-Japan Products, "Industrial Robots", "Kaizen", etc.



CONNECTED INDUSTRIES OUTLINE

Priority fields tackled under the "Connected Industries"

Automated Driving and Mobility Service

Identifying approaches for data harmonization

Enhancing AI and related human resource development

Establishing future vision of mobility service concerning logistics and EVs

Manufacturing and Robotics

International standardization of data rules including formats

Enhancing inter-company collaboration in harmonized fields (e.g.: Cyber Security and Human Resource Development)

Environmental improvement for the IoT introduction for SMEs (e.g.: IoT Tools)

Plant/Infrastructure Safety Management

Improving technological capability for safety through utilizing IoT

Developing guidelines and other common rules for harmonizing data across companies

Promoting further reform of regulation systems

Biotechnologies and Materials

Achieving joint utilization of data across companies in harmonized fields

Establishing an AI technology platform for commercialization

Obtaining public acceptance

Smart Life

Discovering potential needs and materializing possible services

Data collaboration through inter-company alliances

Developing other rules for further data utilization

OTHER GOVERNMENT INITIATIVES

Besides METI, other government bodies have several initiatives to promote the use of ICT within their industry verticals.

INITIATIVES OF GOVERNMENT BODIES TO PROMOTE IT INDUSTRY

MINISTRY OR AGENCY	IT HUMAN RESOURCE - RELATED ITEMS
Ministry of Economy, Trade and Industry	Realization of Connected Industries Enhancement of cybersecurity Measures aimed at nurturing venture companies Training diverse human resources through utilization of EdTech and recurrent education Information-Technology Promotion Agency (IPA) management expenses grants
Ministry of Internal Affairs and Communications (MIC)	Enhancement of cybersecurity Promotion of utilization of IoT, Big Data, AI, sharing economy, and so forth, leading to productivity improvement and talent development
Financial Services Agency	Strategic response to fintech and securing cybersecurity

5TH SCIENCE AND TECHNOLOGY BASIC PLAN

The 5th Science and Technology Basic Plan highlight several areas of emerging technology within Japan's vision for the future.

FOCUS AREAS OF THE 5TH SCIENCE AND TECHNOLOGY BASIC PLAN

- Cutting-edge Information and Communication Technology (ICT)
- Emulation of China's "Made in China 2025"
- Emulation of Germany's "Industry 4.0"
- Emulation of US's "Advanced Manufacturing Partnership"
- Energy Value Chains
- Internet-of-Things (IoT)
- Intelligent Transportation System (ITS)
- Integrated Material Development

The Japanese government will also promote the creation of a common platform or "super smart society service platform" that allows for coordination and collaboration between multiple ICT or IoT systems and for a wide variety of data (e.g., web data, human activity data, 3D geographical data, transportation data, environmental observation data, production and distribution data of manufacturing and agricultural produce).

In this regard, the Japanese government will further promote the development of technologies for IoT, Big Data and analytics, high-speed processing device, AI, networking, edge computing, and cybersecurity as the "fundamental technologies necessary to build the super smart society service platform," as well as technologies such as those for robotics, sensor, and human interface as the "fundamental technologies that are Japan's strengths, which form the core of new value creation."

SUPER SMART SOCIETY SERVICE PLATFORM TECHNOLOGIES

- Intelligent Transportation System (ITS)
- Value Chain Optimization System
- IoT-based Manufacturing or Production System
- Integrated Community Care System
- Smart Food Chain System
- Quasi-Zenith Satelite System
- AI
- IoT
- Big Data

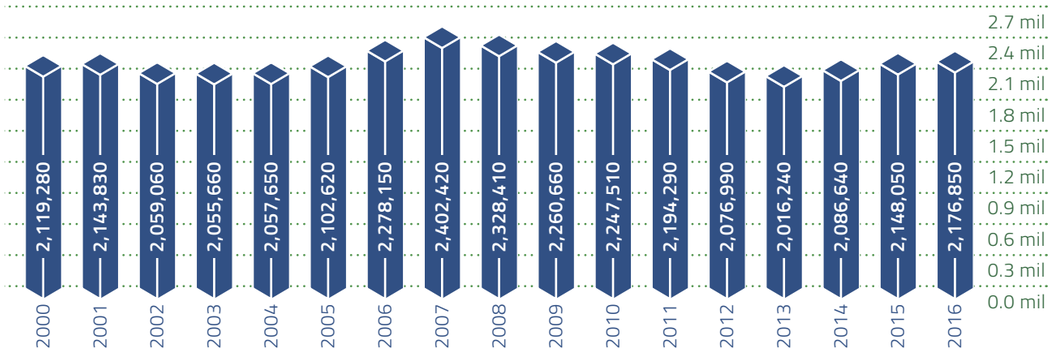
" The Japanese government will also promote the creation of a common platform or "super smart society service platform" that allow for coordination and collaboration between multiple ICT or IoT systems and for a wide variety of data "

JAPAN IN-DEMAND JOBS 2018-2020

IN DEMAND JOBS	2018	2019	2020
Business Intelligence Consultant	13,771	14,180	14,583
Cloud Solution Architect	25,821	26,587	27,343
Computer Systems Analyst	24,565	25,873	27,084
Cybersecurity Consultant	16,870	17,370	17,864
Data Scientist	8,033	8,271	8,507
Internet of Things (IoT) Developer	24,100	24,814	25,521
IT Infrastructure Engineer	48,200	49,628	51,041
Mobile and Web Application Developer	57,840	59,554	61,249
Network Engineer	27,113	27,916	28,711
Software Developer	14,739	15,524	16,251
Japan Total	**261,052**	**269,717**	**278,154**

The number of ICT talent in the economy has been in decline since 2007. Several issues have been suggested as the cause for the talent gap, including the declining population, rigid work culture, and lack of foreign investment in the ICT sector.

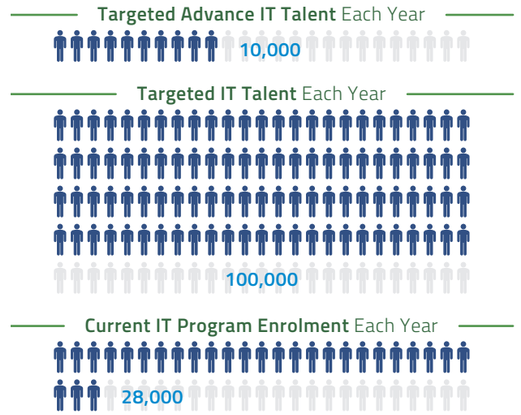
NUMBER OF ICT PROFESSIONALS, 2000-2016



DECREASING POPULATION

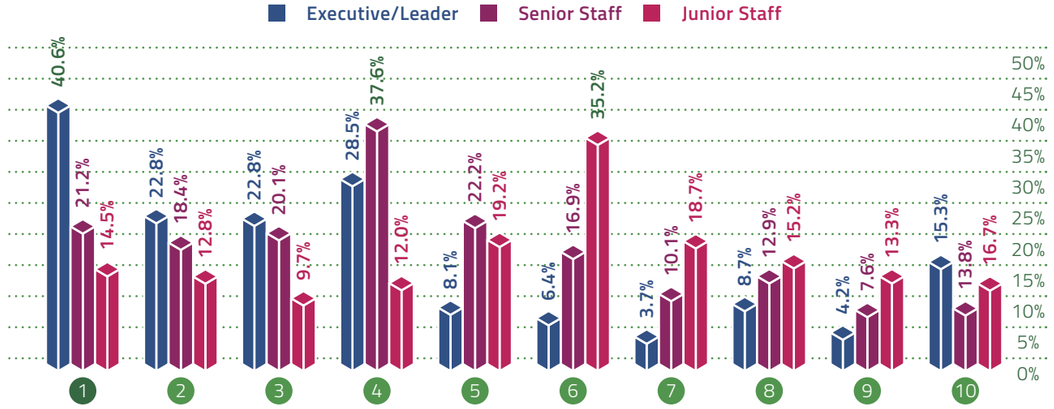
The declining birthrate and aging population is expected to have a significant impact on ICT Talent. Government initiatives such Comprehensive Innovation Strategy aims to develop 100,000 IT talent each year with up to 10,000 possessing advance IT skills. However, university enrolment in ICT majors is estimated to be between 26,000 -28,000 per year suggesting that the talent gap may be widening[6].

TARGETED IT TALENT SUPPLY VS CURRENT IT TALENT SUPPLY[7]



Surveys on the IT talent gap reveal a more in-depth picture of the issue with areas such as application development and project management experiencing greater difficulties. There is also a bigger gap for talent with skills in emerging technologies such as IoT and Big Data.

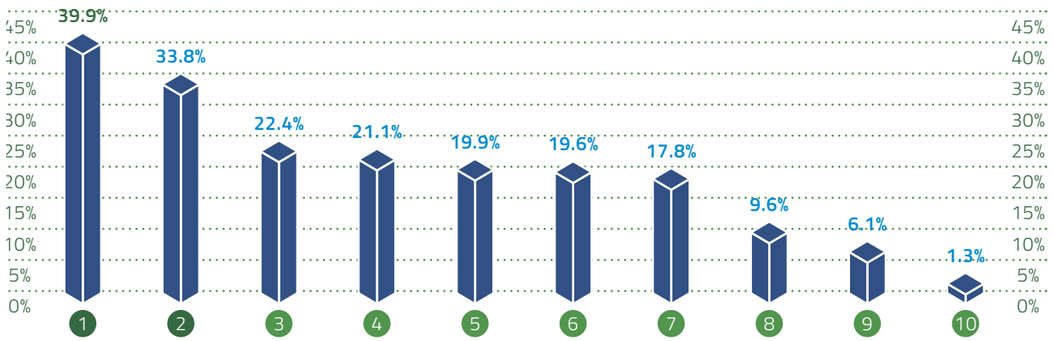
STATISTICS ON IT TALENT SHORTAGES BY CATEGORY



1. Business Development
2. Sales Resources (Expanding Sales for Existing Business)
3. Consultant
4. Project Manager
5. Architect (IT Architect/System Architect, etc.)
6. Development Resources (Application Development, etc.)
7. Development Resources (Infrastructure, etc.)
8. Cybersecurity Resources
9. Operation and Maintenance Resources
10. Data Analytics Resources

In order to survive the intensifying competitive environment, it is **strongly required that IT vendors' executives and leaders be responsible for new business development and business creation**.

STATISTICS ON IT TALENT SHORTAGES BY ISSUES



1. Difficulty of Hiring Talented Mid-career Resources
2. Difficulty of Hiring Talented New Graduate Resources
3. Experimenting with Various Methods but it has not been Trained Up Well
4. There is no Place to have Adequate Experience in the Company
5. Difficult to Provide Appropriate Training Internally
6. There is no Qualified Personnel of Motivated Personnel
7. We don't know how to Develop Human Resources
8. We cannot get Understanding from Management Layer
9. We cannot get Understanding from Execution Members
10. Others

It is the biggest problem that it is difficult to hire talented resources both mid-career and new graduate.

SHORTAGES OF IT TALENTS

Estimate Results on "Shortages of IT Talents"

Supply of Talents

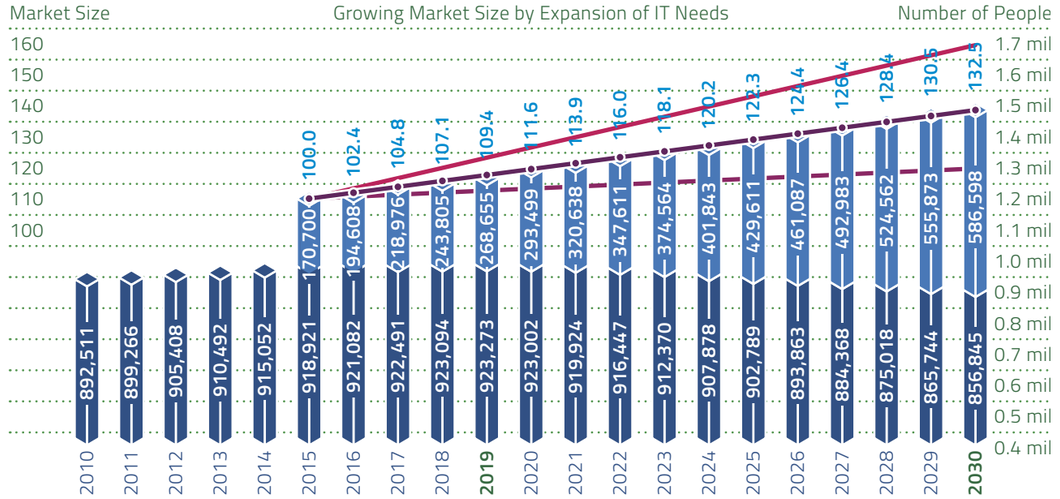
Highest Scenario 790,000
calculated using 2 to 4%
of market grows

Shortage of Talents

Internediate Scenario 590,000
calculated using 1.5 to 2.5%
of market grows

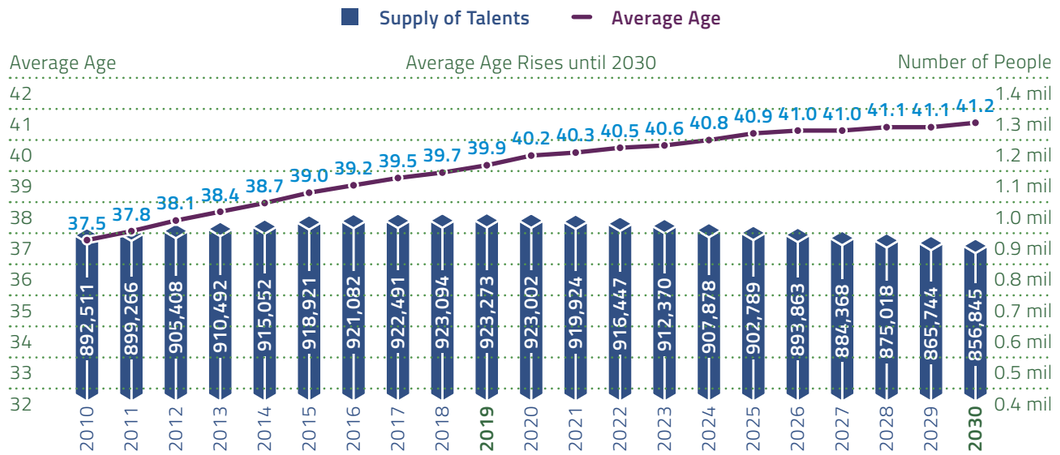
Market Size: 100 in 2015

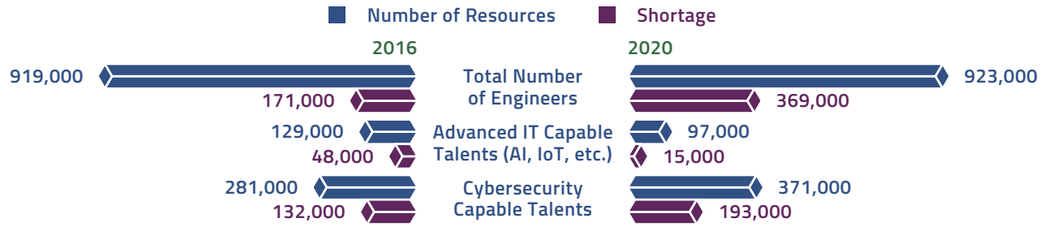
Lowest Scenario 410,000
calculated using 1%
of market grows



In 2019, the retirement rate exceeds the employment rate and the industrial population declines. Shortage in 2030.

Survey Results on the Latest Trends and Future Estimates of IT Talents





6.3 CROSS-BORDER TALENT OPPORTUNITIES

Recognizing the potential talent shortage that may affect the IT industry in Japan, a number of organizations have implemented plans to attract and retain foreign talent.

METI and MEXT advocated the implementation of the "Asian Human Resources Fund" concept to promote mutual understanding and economic partnership in Asia[84].

There is also an advanced development program for international students[85] who are willing to study in Japan and get a job in a Japanese company. These programs include industry-academia collaborative education program, business Japanese language education, Japanese business education, internship, and employment support.

CURRENT STATUS OF FOREIGN NATIONAL IT HUMAN RESOURCES

As the domestic population declines, it is difficult to strengthen the IT human resources supply capability by focusing only on Japan. Acceptance and taking advantage of foreign national IT human resources are important as measures to secure sufficient IT human resources in the future. The government improved the acceptance of highly skilled foreign professionals through the "Japan Revitalization Strategy."

ACCEPTANCE POLICY OF FOREIGN PROFESSIONALS AND FOREIGN STUDENTS

CABINET

Japan Revitalization Strategy 2014, 2015, 2016 | **Future Investment Strategy 2017, 2018**

MINISTRIES AND AGENCIES

Ministry of Justice	Ministry of Foreign Affairs	METI (IPA)	Cabinet Office
Point-based System for Highly-skilled Foreign Professionals	Innovative Asia	Brochure Related to Employment of Foreign IT	Promotion Program for Foreign Human Resources

MEASURES FOR JAPAN EMPLOYMENT SUPPORT FOR "HIGHLY-SKILLED FOREIGN PROFESSIONALS"[86]

"Japan Revitalization Strategy 2014 Update" Cabinet Decision on June 24, 2014

To take advantage of "highly skilled foreign professionals," the government considered concrete measures for employment support for international students, identifying issues and planning solutions related to working environments for "highly skilled foreign professionals."

"Japan Revitalization Strategy 2015 Update" Cabinet decision at Jun 30, 2015

Based on the fact that the status of residence for "highly skilled foreign professionals" was established in April 2015, the government promptly set up a mechanism to strategically publicize and aim for dissemination and utilization for the "points-based system for highly skilled foreign professionals."

In accordance with the "Five Commitments for Attracting Foreign Companies to Japan" (March 17, 2015 Foreign Investment Promotion Council decision), the government promotes the improvement of foreign acceptance environment. This includes further acceptance of international students and active support after studying in Japan; the government intends to strengthen employment support for foreign students. There is a 60,000 target for foreign IT resources engaged in the ICT industry by 2020, an increase from the current 30,000.

Ministry of Justice Measures Concerning 'Acceptance of Highly Skilled Foreign Professionals'

1. Points-Based System for Highly Skilled Foreign Professionals

To promote the acceptance of "highly skilled foreign professionals," the government introduced a system to take preferential treatment on immigration control by using a point system. It classified the activities into three categories: advanced academic research activities, advanced specialty and technical activities, advanced management/management activities. According to their respective characteristics, educational background, employment history, yearly salary, and so forth, they will be given preferential treatment when the total of points reaches a certain score (70 points).

Ministry of Foreign Affairs Measures Concerning Strengthening Employment Support for Foreign Students and Overseas Students to Japanese Companies

A project to be newly implemented in accordance with the "Japan Revitalization Strategy 2016" designates top-level universities in Asian developing countries as "partner universities." Students who are expected to graduate or already graduated will be provided research opportunities, especially related to IT, IoT, and AI, among others, in Japan and internship opportunities in Japanese companies. The project aims to accept about 1,000 people from FY17 to FY21.

Participants who have completed a certain training in the "Innovative Asia" will take special additions in the "points-based system for highly skilled foreign professionals." In addition to targeted 12 countries, 14 nations, including ASEAN members Brunei and Singapore, are covered.

6.4 KEY INITIATIVES

Two important strategies taken by the Japanese government relating to ICT talent as well as the promotion of advance technologies are the "Future Investment Strategy 2018" and "Comprehensive Innovation Strategy".

COMPREHENSIVE INNOVATION STRATEGY[87]

The "Comprehensive Innovation Strategy" was decided by the Cabinet on 15th June 2018, as a response to the shortage of the quality and quantity of IT talent. The goal is to train and recruit advanced IT talents on a scale of tens of thousands of people by 2025 and IT talents on a scale of hundreds of thousands of people a year.

FUTURE INVESTMENT STRATEGY 2018[88]

Following the "Japan Revitalization Strategy" from 2014 to 2016 and the "Future Investment Strategy 2017," the "Future Investment Strategy 2018" was decided by the Cabinet on June 15, 2018.

Currently, there is stiff international competition for the acquisition of data, which is the source of the value in the digital age and human resources that create new added value with data and ideas. To nurture human resources and utilize AI technology, the government has added a mandatory subject, "Informatics I," in college and university entrance examinations, established an environment in which all university students can take mathematics and data science, and introduced applied cross-departmental degree programs.

These strategies were decided by the Cabinet as a national strategy in which each ministry or agency implements policies corresponding to their respective roles.

RESPONSIBILITIES OF MINISTRY AND AGENCIES UNDER FUTURE INVESTMENT STRATEGY

- Expansion of School Education
- Promotion of Advance IT Technology Research and Development through Cooperation between Industry, Academia and Government
- Development of Advanced IT Engineers
- Examination of IT Engineers
- Interoperation Among Countries for Certifications
- Expansion of Training Organizations of Cybersecurity
- Provide Support for National Projects for R&D
- Promote Human Resources Measures

The Government of Japan Sets the **Growth Strategy 2018 For Society 5.0**

CABINET

Future Investment Strategy 2018

Cabinet Decision Made on 15 June 2018 by Future Investment Council

Comprehensive Innovation Strategy

Cabinet Decision Made on 15 June 2018 by Council of Science, Technology and Innovation

MINISTRIES AND AGENCIES

- Ministry of Economy, Trade and Industry (METI)
- Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- Ministry of Internal Affairs and Communications (MIC)
- Ministry of Justice
- Financial Services Agency
- National Police Agency

PROGRESSION TOWARDS "SOCIETY 5.0"[89]

Hunting Society (Society 1.0) → Agricultural Society (Society 2.0) → Industrial Society (Society 3.0) → Information Society (Society 4.0)

There are also initiatives specific to certain ICT sub-industries, such as cybersecurity.

CYBER SECURITY TALENT INITIATIVES

CYBERSECURITY STRATEGY (INFORMATION SECURITY POLICY COUNCIL)[90]

The "Cybersecurity Strategy" was decided by the Cabinet on September 4, 2015, with a focus on discovering, developing, and securing ICT talents with outstanding aon the policy created by the Information Security Policy Council, METI, MEXT, the Financial Services Agency, and the National Police Agency are implementing concrete measures to strengthen human resources development.bilities. Based [91],[92]

HUMAN RESOURCE DEVELOPMENT INITIATIVES RELATED TO CYBER SECURITY

Ministry of Internal Affairs and Communications

National Cyber Training Center (Established in April 2017)

CYDER: Cyber Defense Exercise with Recurrence

CYBER COLOSSEO: Practical Exercises of Attack and Defense for Tokyo Olympic and Paralympic Games

SecHack365: Young Security Innovator Development Program

Ministry of Education, Culture, Sports, Science and Technology

Advanced Technology Talent Development Project (enPiT-Pro)

Nurturing Information Security Talents (Maintenance as a security exercise base for all technical colleges)

Ministerial Accreditation System of "Vocational Practice Specialized Course" at Vocational Schools

Information Security, Information Moral Education (Junior High School, High School)

Ministry of Economy, Trade and Industry Industrial Cyber Security Promotion Project

Registered Information Security Specialist **(RISS)**

National Police Agency

Cyber Security Lecture to Technical College

6.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

COUNCIL FOR SCIENCE, TECHNOLOGY AND INNOVATION: 5TH SCIENCE AND TECHNOLOGY BASIC PLAN

The Council for Science and Technology Policy was set up in the Cabinet Office as one of the policy councils during the reorganization of government ministries and agencies in January 2001. The council was reorganized into the Council for Science, Technology, and Innovation in May 2014 to strengthen its functions related to promoting innovation. Under the leadership of the Prime Minister and the Minister of State for Science and Technology Policy, the Council for Science, Technology, and Innovation overlooks all of the nation's science and technology development, formulates comprehensive policies, and coordinates industry players.[93]

The "5th Science and Technology Basic Plan" was set by the Council for Science, Technology, and Innovation in April 2016. Japan's public science and technology administration operates under the basic policies of the Council for Science, Technology, and Innovation chaired by the Prime Minister and works to promote science and technology in coordination with related ministries. Basic plans are made every five years, and four Science and Technology Basic Plans have been established since the enactment of the Science and Technology Basic Law in 1995. The 5th Science and Technology Basic Plan (from 2016 to 2020) took effect from April 2016. In parallel with the five-year plans, the "STI Comprehensive Strategies" is published every two years.

To promote innovation, this plan encourages the formation of places where collecting human resources, knowledge, and funds is made possible. There is also an emphasis on the exchange and movement of human resources beyond organizational barriers. Talent should be able to move freely among companies, universities, and research institutes. The plan also aims at developing human resources with entrepreneurial mindsets.

Science and technology cooperation between emerging countries and developing countries is also encouraged. Japan will strategically establish a framework for the creation of socially inclusive and sustainable innovation. Under the plan, Japan will establish an equal partnership with each country, promote interactive knowledge exchanges, and establish a mechanism to make use of each other's strength.

JAPAN INFORMATION TECHNOLOGY SERVICE INDUSTRY ASSOCIATION (JISA)

"JISA was established in 1984, and its members include leading systems integrators, computer system designers, development and related service providers, and system operation and management service vendors."[94]

Their activities include:

- Surveys and research
- Providing information
- Education and training
- Privacy mark certification
- Communication and exchange among business executives
- International activities
- Regional activities
- Welfare for employees
- Strengthening business fundamentals

They provide these services to over 500 member companies in the technology industry as well as associate members within the banking, insurance, manufacturing, and trade industries. Talent development initiatives under JISA include courses, seminars, training for IT professionals, and symposiums. JISA is also involved in promoting employee welfare through pension and insurance schemes.[95]

" The council was reorganized into the Council for Science, Technology and Innovation in May 2014 to strengthen its functions related to promoting innovation. "

" To promote innovation, this plan encourages the formation of places where collecting human resources, knowledge and funds is made possible. "

JAPAN INFORMATION TECHNOLOGY ENGINEERS EXAMINATION CENTER (JITEC)

The Information Technology Engineers Examination (ITEE) was first administered in 1969, and in 1970, it became a national examination under the former Ministry of International Trade and Industry (now the Ministry of Economy, Trade, and Industry). Japan Information Technology Engineers Examination Center (JITEC) presently administers the ITEE. Since its commencement, the examination has played an important role in the development of IT engineers. IT has grown into one of the largest-scale national examinations in Japan, with approximately 600,000 applicants each year.

The Information Technology Professionals Examination Council (ITPEC) was established in November 2005 to benefit, assist, and advance ITEE in Asian countries. The council agreed to conduct the examination on the same date and time with the same set of questions, so that the examination is consistent among all of the member countries. This consistency enables accurate measurement of the skills of the examinees in any of these countries.
Currently, ITPEC Common Examination has been conducted in the Philippines, Thailand, Vietnam, Myanmar, Malaysia, Mongolia, and Bangladesh biannually, in April and October.

IOT ACCELERATION CONSORTIUM

The IoT Acceleration Consortium will be established in Japan with the aim of creating an adequate environment for attracting investment in the future with the Internet of Things through public-private collaboration. METI and MIC support this consortium.

This initiative was spurred by the development of IoT, Big Data, and artificial intelligence in recent years. While the development of IoT creates new services, there are concerns about existing businesses going obsolete if they are unable to keep up with the changes.

The IoT Acceleration Consortium aims to combine the strengths of government, industry, and academia and build a structure for developing and demonstrating technologies related to the promotion of IoT as well as creating and facilitating new business models.

CONSORTIUM OBJECTIVES

Promote the development, demonstration, and standardization for IoT-related technologies

Promote the creation of various IoT-related projects and recommendations including regulatory reforms necessary to run those projects

WORKING GROUPS

- Technology Development Working Group (Smart IoT Acceleration Forum)
- Advanced Model Business Promotion Working Group (IoT Acceleration Lab)
- IoT Security Working Group
- Promotion of data distribution Working Group
- International Collaboration Working Group

7. MALAYSIA

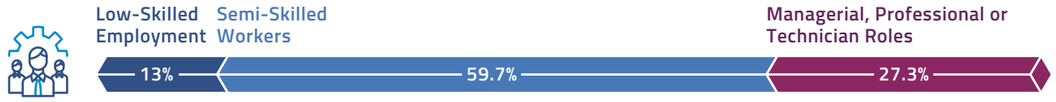
7.1 INTRODUCTION

The total size of labor force in Malaysia is about 14.9 million with an unemployment rate of 3.4%. In terms of employment by skill level, Malaysia's share of high skill employment increased by 1.8 percentage points to 27.3% in the year 2017 compared to 2016. This means that 27.3% of those employed in Malaysia are in managerial, professional or technician roles.

THE TOTAL SIZE OF LABOR FORCE

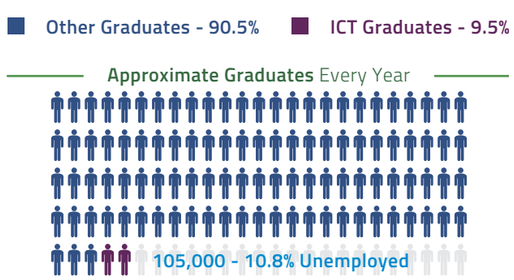
Meanwhile, the share of semi-skill workers is at 59.7% while the share of low-skill employment is at 13.0%.

EMPLOYMENT ROLES IN MALAYSIA



On the other hand, Malaysian Institutes of Higher Learning produces approximately 105,000 graduates every year of which approximately 10,000 graduates have ICT degrees.

GRADUATES PRODUCED BY MALAYSIA INSTITUES OF HIGHER LEARNING



However, enterprises in Malaysia are facing serious challenge in hiring fresh graduates due to mismatch in skills being taught at the universities and the skills that are required in the industry to perform the available jobs. It is one of the major reasons behind higher youth unemployment rate at around 10.8%, which over three times higher than overall unemployment rate. To address these challenges, government and industry initiatives for talent development and policies for cross border talent attraction are of paramount importance as often different economies will be competing for hiring from the same talent resource pools.

7.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

MALAYSIA IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	2,126	2,482	2,902
Cloud Solution Architect	1,218	1,530	1,915
Computer Systems Analyst	12,112	12,485	12,878
Cybersecurity Consultant	1,932	2,307	2,798
Data Scientist	1,063	1,241	1,451
Internet of Things (IoT) Developer	2,183	2,550	2,956
IT Infrastructure Engineer	1,949	2,449	3,064
Mobile and Web Application Developer	17,191	17,313	17,666
Network Engineer	1,461	1,837	2,298
Software Developer	7,267	7,491	7,727
Malaysia Total	**48,502**	**51,684**	**55,657**

7.3 CROSS-BORDER TALENT OPPORTUNITIES

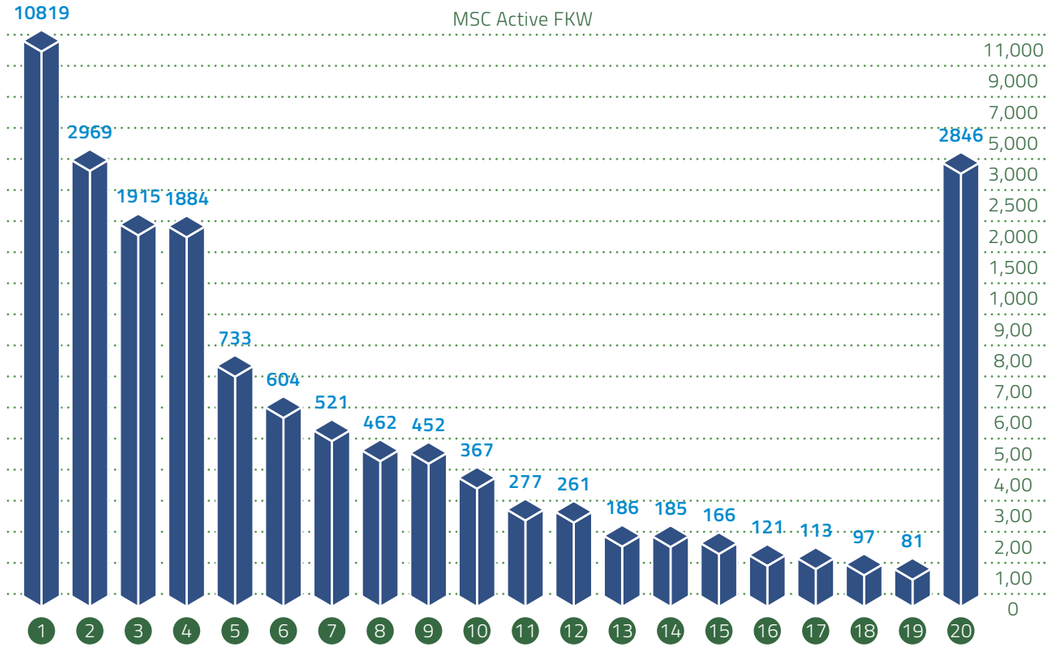
There are 20 Public Universities and 40 Private Universities in Malaysia producing approximately 10,000 ICT graduates every year.

NUMBER OF UNIVERSITIES

To upskill these graduate's Malaysian government has taken many initiatives. We have discussed some key initiatives below:

TOP FKW SOURCE COUNTRIES

1 India	5 Pakistan	9 Vietnam	13 Australia	17 France
2 Philippines	6 Iran	10 UK	14 Sri Lanka	18 Netherlands
3 Indonesia	7 South Korean	11 Nigeria	15 USA	19 Germany
4 China	8 Japan	12 Bangladesh	16 Singapore	20 Others



Disruptive technology may force corporations to tap into a talent pool with technical skills but it doesn't mean that corporations have started reducing their workforce. The numbers have instead increased, especially for tech-skilled workers like graphic designers, data analysts and data engineers. Furthermore, With the rise of emerging technology adoption in the ICT sector and with the ICT talent gap within the country puts Malaysia in a state to leverage on cross border talents. Malaysia have been leveraging on talents from India especially on software development skills as they are more competitive and advance in this area.

Therefore, Malaysia government should emphasize into working permit policies to ensure talents from different parts of the world can contribute their skills for the nation's economy. These can also increase the chance for Malaysian talents to develop their skillset with leveraging on the skillsets that cross border talents can bring to the table.

The Human Resource Ministry should also look into programs that can invite talents from different countries and emphasize on the wage that is provided to this group of people as it is considered as key concern for majority of the talents.

HUMAN CAPITAL DEVELOPMENT IN THE ELEVENTH PLAN, 2016 -2020

The Government has initiated several programmes under 11th Malaysia Plan that focus on accelerating human capital development through four key areas which are:

- Improving the efficiency of labour market to accelerate economic growth:
- Transforming technical and vocational education to meet industry demand;
- Strengthening lifelong learning for skills enhancement; and ⌄ Improving the quality of education system for better student outcomes and institutional excellence.

HRDF is responsible in creating and growing the quality of local human capital through efficient high-skilled training certification programmes and initiatives that is discussed above in this report. This is expected to contribute to a 35% skilled Malaysian workforce and the creation of 1.5 million jobs by year 2020.

Additionally, HRDF continues to be steadfast in its effort towards encouraging employers covered under the PSMB Act 2001 to retrain and upgrade the skills of their local employees, apprentices and trainees in keeping up with the fast-evolving global business landscape while meeting their individual company's aspirations.

HRDF began addressing the needs of critical ICT skills for employees of HRDF-registered employers through the utilization of the 30% HRDF Consolidated Fund under the Industry-Based Certification (INBASE) Programme. As such, a Malaysia Digital Skills Competency Framework ("MyDISC") was developed for Digital Technology whereby several technical domains were identified in areas such as programming, mobile technology / development platform, web development / technologies and software development.

POWERPM LEADERSHIP

PIKOM PowerPM Leadership Course covers a wide spectrum of issues other than standard project management areas that must be addressed in order to obtain the desired business outcome. The course emphasis on leadership and communications as IT practitioners today need to be good in soft skills and EQ (emotional intelligence) as core technical expertise. This unique professional development opportunity offers a platform to meet and interact with experienced Portfolio / Programme / Project Managers, colleagues and peers to share ideas and discuss various opportunities. Participants will also be given hands-on exposure to a real-life PMO tool, in order to broaden their horizons on the alternatives available in this ever-changing, new normal world of Project Management. PLC has trained more than 600 project managers and team leaders and it is one of the most sought after certification in the Malaysian ICT industry.

ASEAN DATA ANALYTICS EXCHANGE (ADAX)

To approach the growth of a digital economy in a holistic manner, MDEC committed itself to nurturing and developing the digital workforce. This ensures that the demands of the current and future industry-relevant talents are met. The goal is to ensure sufficient talent availability, as the Southeast Asian economies head toward a high-income knowledge-based digital economy. The initiatives implemented are designed to satiate the talent skills gap that comes with a booming tech ecosystem.

This led to the creation of the ASEAN Data Analytics eXchange (ADAX), a regional platform that brings together innovative talent and development models and showcases the latest BDA technologies. A national initiative to benefit Malaysia, ADAX was given the task of nurturing the ecosystem of BDA and AI that would contribute to its strategic objectives.

This led to a focus on building a big data community through shared values, skills building, and collaboration around a robust data analytics ecosystem. By piloting advanced data analytics use cases for the ASEAN region and providing a co-working location for BDA start-ups and accelerators.

7.4 KEY INITIATIVES

GLOBALLY RECOGNISED INDUSTRY & PROFESSIONAL CERTIFICATION (GRIP)

This program is initiated and funded by the Malaysian government to ensure local talents are trained and certified. There are several objectives designed under this program and its discussed below:

- To provide opportunity to employees to increase their skills by participating in specific fields to be expert that would enhance their career development and earn higher income;
- To provide employers with skilled workforce that will enable them to explore business opportunities in higher valued chain that is related to Knowledge Intensive activities that are knowledge based, high-tech and high value-added products / activities to be continuously competitive in the global market
- To increase labor supply in the strategic and high impact areas that was identified to reduce country's dependency on external expertise and support the Government's aspiration to achieve developed nation status by the year 2020

GRADUATE EMPLOYABILITY MANAGEMENT SCHEME (GEMS)

This program is designed to discover graduate's employability and effectively match related commercial skills to their career. This helps them discover business acumen and enhance their entrepreneur spirit. They are guided and mentored by industrial professional and business owners in overcoming the challenge in starting their own business. There are several benefits for graduates who participates in this program:

- Able to understand their strengths and weaknesses
- Able to learn effective commercial skills
- Transform feasible ideas to business opportunities
- Understand the real talent within themselves

E-REZEKI

The eRezeki is a national programme based on crowdsourcing concept and its variety of models. The Government of Malaysia via MDEC, has taken a unique country-level approach in developing and managing local crowd-labour or crowd workers, especially since the programme targets to benefit the population in the bottom forty percent of the income strata or referred to as the B40.

The primary focus is to match the local crowd workers with suitable service-based task/job, starting from the introduction of simple digital micro-tasks coming from the more matured crowdsourcing market. One of the key value proposition is indeed about efficiently matching the demand from the crowdsourcing industry with the supply of services from Malaysian citizens and vice-versa. Hence profiling of eRezeki participant is vital and incessant process in the eRezeki system that will enable a proper demand-supply matching function.

The 'eRezeki' Programme is an initiative that can be emulated by other government that has the similar kind of demographics such as Malaysia. These initiatives not only provide a safe and trustworthy source of income for those who has an income below RM 4000 monthly, or also referred to as the Bottom-40 (B40) income group. The B40 community includes blue-collared workers, the unemployed and under-employed, students, housewives, retirees and senior citizens. This initiative will not only help in growing the nation's economy but also provides a higher talent pool who are trained by qualified trainers for the ICT industries.

IAOP (INTERNATIONAL ASSOCIATION OF OUTSOURCING PROFESSIONAL)

Training and certification through IAOP IAOP (International Association of Outsourcing Professional) reflects the highest industry standards and achievement criteria, and are the de facto programs recognized by customers, providers and advisors of outsourcing services. IAOP brings a vast array of educational opportunities to the SSO community. While some lead to professional certification, others give both the individual and company a broader knowledge of the end-to-end standard practices and processes that define a successful outsourcing relationship. The IAOP has been the bridge that leads local outsourcing professionals to the global market and vice versa, ever since they started their first chapter in Malaysia in the year 2008.

MSC MALAYSIA

MSC Malaysia Status is awarded by the Government of Malaysia to eligible local and foreign ICT related businesses. MSC Malaysia Status companies are eligible for attractive incentives, rights and privileges which promote continued growth for businesses, the industry and the Malaysian economy. Currently there are:

MSC MALAYSIA CURRENT STATUS

RM47.1 billion

3,241 MSC

167,044 jobs

Companies with MSC Malaysia Status can source and hire local and foreign knowledge workers to ensure they have the best expertise locally and from around the world to grow their business.

RETURNING EXPERT PROGRAMME (REP)

This programme is initiated to encourage Malaysian abroad in selected fields important to the nation to return and work in Malaysia. This programme is constantly being improved to meet the needs of Malaysian expats.

RETURNING EXPERT PROGRAMME

Till date 4,568 applications are approved since 2011

" The Government of Malaysia via MDEC, has taken a unique country-level approach in developing and managing local crowd-labour or crowd workers "

7.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

Currently there are 3483 training service providers that are recognized by the government through registration with HRDF. Following are the key training providers:

GLOBAL TALENT ACADEMY SDN BHD

Global Talent Academy Sdn Bhd (GTA) is a premier training and certification provider, striving to bring the latest, most innovative learning and education programs to the ASEAN region. Since its inception in 2010, GTA has been committed to providing the highest quality corporate training to graduates, individual professional, organizations and public sectors in Malaysia.

GTA has 8 years of track record in conducting many successful programs including Train and Place for the Ministry of Human Resource, ASET Program for HRDF, GRIP (Globally Recognised International Program) for HRDF, MyProcert program for MDEC and GEMS (Graduate Employability) for Talent Corp. It's strategic partners include MDEC, Pemandu, PIKOM, Outsourcing Malaysia, Skills Johor and SMECorp . GTA is the exclusive corporate and professional development partner of IAOP in Malaysia. IAOP(International Association of Outsourcing Professional) is the global, standard-setting leading professional association and advocate for outsourcing professionals. Courses under

programs are Human Resource, Marketing & Sales, Finance & Accounting, Global Business Services. Certified Outsourcing Specialist (COS) Family of Certifications - The Certified Outsourcing Specialists (COS) family of certifications recognizes individuals primarily involved in the delivery of outsourcing services. Although the primary intent is to serve the needs of the provider community, certifications in this family may also serve the needs of the customer (i.e. shared service centers) and advisory communities. COS family of certifications are aligned with specific jobs areas of responsibility. COS certifications enable individuals, the companies they work for, and the customers they serve to consistently validate a worker's specific knowledge, skills and experience in the delivery of outsourcing services.

IVERSON ASSOCIATES SDN BHD

Iverson Associates Sdn Bhd is the undisputed leader of professional IT training in Malaysia. Iverson has helped hundreds of companies, including Fortune 500 companies, government departments and agencies, government linked corporations as well as many of the Top 100 companies on Bursa Malaysia, to upgrade the IT skills of their employees to maximize their return on investment and gain competitive advantage.

They have set the benchmark for professional IT training in Malaysia. With the best facilities for professional IT training in Malaysia. They also have the largest pool of full-time certified trainers. Iverson is the preferred training provider of many of the world-class companies operating in Malaysia. Today's IT professionals require both technical knowledge and soft skills. Hence, they also offer soft skills training programmes which are complementary to their existing technical training.

GLOBAL KNOWLEDGE NETWORK

Technology and process are crucial for accomplishing organizational objectives, but they've been democratized by the digital revolution. The larger issue are the skill gaps hijacking your technology return on investments. As a result, organizations who are successfully using technology to accelerate success are also successfully transforming the capabilities of their people to maximize investments.

- Quick facts on Global Knowledge Network:
- World's largest dedicated IT training company
- 5,000+ guaranteed to run classes per year
- 3,000+ unique IT courses
- 1,100+ subject matter experts
- 95% overall student satisfaction
- Authorized training partner for Amazon Web Services, Cisco, Google, IBM, ITIL®, Microsoft, Red Hat®, VMware and more.
- Trained in over 100 countries (and in international waters)

ITRAIN (M) SDN BHD

iTrain enables continuous brain to gain through in-demand skills trainings that help talents stay ahead in the digital economy.

Their vision is to bridge industrial leaders and drivers of new technologies with educational pathways to share their unique expertise with the world. iTrain was the first training provider to introduce Google authorized trainings in Southeast Asia (SEA). iTrain have partnered with NVIDIA Deep Learning Institute USA to bring Artificial Intelligence (AI) know-how and advancement to the Southeast Asian region. They have also joined forces with MIMOS to launch IoT trainings in SEA.

iTrain is recognized by the Government of Malaysia, their certifications are HRDF claimable and therefore highly accessible and affordable for employers from private, government and education sectors who wish to keep their workforce trained and updated in the latest digital tech in AI, Data Science, IoT, digital marketing, Mobile App Development, project management, and business proficiencies.

PENANG SKILLS DEVELOPMENT CENTRE

Penang Skills Development Centre (PSDC) is dedicated to meet the immediate human resource needs of the business community and to support and strengthen business requirements. It has attained both national and international recognition as a truly successful example of shared learning and a model institution for human resource development to be emulated within and beyond Malaysia.

Over a period of 29 years, the Centre has trained over 200,000 participants through more than 10,000 courses; pioneered local industry development initiatives; assisted in the input and formulation of national policies pertaining to human capital development and contributed directly to the Malaysian workforce transformation initiatives.

In line with its commitment to facilitate industry growth and development, the PSDC executed its Industry 4.0 initiative in 2016, a strategy that supports the new phase of industrial revolution in Malaysia. Moving forward, the PSDC will expand its role and gear towards becoming the Centre of Excellence for Industry 4.0 in Penang and Malaysia by providing leadership, the right platform for learning of best practices, as well as talent development support through its high-end Shared Services facilities to meet the current needs and demands of the industry.

IN-DEMAND CERTIFICATIONS

1. Project Management Professional (PMP)
1. AWS Certified Solutions Architect
2. AWS Certified Developer
3. Certified Information Systems Security Professional (CISSP)
4. Cisco Certified Networking Professional (CCNP) Routing and Switching
5. ITIL V3 Foundation

PIKOM

The National ICT Association of Malaysia is the association representing the information and communication technology (ICT) industry in Malaysia. It has a total of 1000+ membership comprising companies involved in a whole spectrum of ICT products and service which commands 80% of the total ICT trade in Malaysia. PIKOM is focused to serve the members and industry of :

- Outsourcing Malaysia
- CIO Chapter
- Cybersecurity Chapter
- E-Commerce Chapter
- PIKOM Venture Investment Chapter

PIKOM is a non-profit organization managed by a team of council elected by the members every year during the annual general meeting.

KEY MINISTRIES AND GOVERNMENT BODIES

8. SINGAPORE

8.1 INTRODUCTION

Singapore is located in South East Asia with a robust and growing economy. GDP was reported at USD 323.9 billion USD in 2017. Unemployment is below 5% and is expected to remain stable according to forecast by the International Monetary Fund.

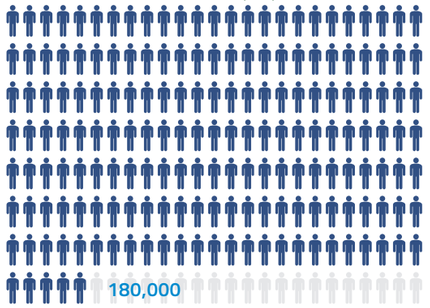
SINGAPORE ECONOMIC SNAPSHOT[96]

SUBJECT DESCRIPTOR	UNITS	SCALE	2015	2016	2017	2018	2019	2020	2021	2022	2023	ESTIMATES START AFTER
Gross domestic product, current prices	U.S. dollars	Billions	304.1	309.8	323.9	349.7	367.8	385.2	401.9	419.2	437.8	2017
Unemployment rate	Percent of total labor force		1.9	2.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2017
Employment	Persons	Millions	3.6	3.7	3.7	3.7	3.7	n/a	n/a	n/a	n/a	2017
Population	Persons	Millions	5.5	5.6	5.6	5.7	5.7	5.8	5.8	5.9	5.9	2017

Singapore is home to approximately 180,000 ICT professional2. The Government and the Industry recognizes their importance to economic development and the future success of business. National and industry development initiatives often include considerations for talent development and talent attraction.

ICT PROFESSIONALS IN SINGAPORE[98]

ICT Professionals Employed in 2017



QUOTATION FROM THE TRANSCRIPT OF PRIME MINISTER LEE HSIEN LOONG'S SPEECH AT SMART NATION LAUNCH ON 24 NOVEMBER

"We need the right organisations, the right skills, the right mindsets to be a Smart Nation. We have to start with our education system. We are equipping students with up-to-date knowledge and skills to use the technology. But schools must also teach students how to create the technology of the future; teach them to code, to prototype and build things, to fail fast and learn quickly, to use the latest gadgets, the latest tools and be up with the latest technology."

- Prime Minister Lee Hsien Loong

*Image taken from TIME

8.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

The demand for ICT talent in Singapore is expected to rise in light rapid technology adoption across the board and the digitalization efforts by the government and industry alike.

OVERVIEW OF SINGAPORE'S ICT INDUSTRY[99]

ICT industry's revenue grew by a compound annual growth rate of 18% per annum from 2010 to 2015

Estimated revenue of the ICT Industry is SGD189.6 billion in 2015

ICT Sector contributes 8% of Singapore's gross domestic product

QUOTATION FROM THE TRANSCRIPT OF PRIME MINISTER LEE HSIEN LOONG'S SPEECH AT SMART NATION LAUNCH ON 24 NOVEMBER

"One important advantage which we have which we must take full advantage of is to use technology extensively and systematically, particularly IT. Not just piecemeal, individual gadgets, individual programmes and systems – that we are already doing, and all sorts of devices and applications have technology and IT in them. I am sure just in this room if we add all our handphones together we will have terabytes of storage and gigabytes of processing power but we have to do this systematically, to make the most of the potential, to integrate all of the technology and possibilities into a coherent and comprehensive whole. This will make our economy more productive, our lives better, and our society more responsive to our people's needs and aspirations."

- Prime Minister Lee Hsien Loong

*Image taken from TIME

DIGITALIZATION OF SINGAPOREAN INDUSTRIES

The Ministry for Communications in Information announced several plans to transform the economy into a leading digital economy. These plans are guided by the Digital Economy Framework centered on 3 action pillars[100].

GUIDING PILLARS OF SINGAPORE DIGITAL ECONOMY FRAMEWORK

Accelerating the Digital Transformation of Industries

Transformation roadmaps for every major industry with the focus on adopting digital technologies

Support for SMEs to go digital

Transforming the Infocomm Media (ICM) Industry to Drive Economic Growth

Position the ICM industry as a significant contributor to economic value

Position the ICM industry as a nexus for outstanding talent

Position the ICM industry as a "frontier" for new technologies such as Artificial Intelligence (AI), Data science, Cybersecurity, and the Internet of Things (IoT)

Sharpening the Nation's Competitive Edge

Encouraging business to adopt business model that leverage digital for growth

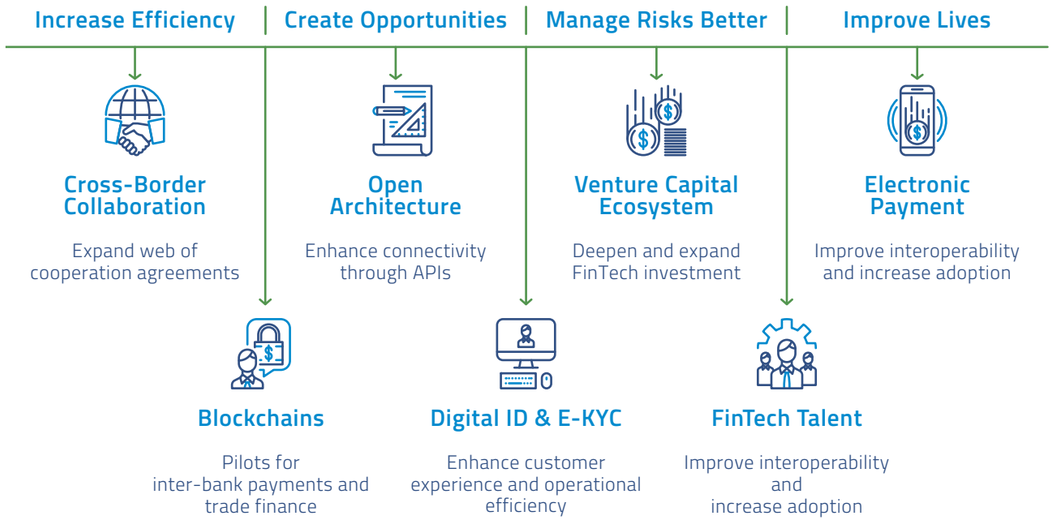
Encourage digital champions, new talents and innovations to as a means to tackle real business problems

The transformation initiatives in the ICM industry[101] are expected to contribute to IT talent demand significantly. Overall, the ICM industry it poised to create more than 13,000 jobs at the PMET level and employing more than 200,000 workers by 2020.

GROWING FINTECH INDUSTRY WITH A DEMAND FOR TALENT IN EMERGING TECHNOLOGIES NEED FOR DIGITAL TALENT[102]

The FinTech Industry lies at the cross-roads of many emerging technologies. The government is interested in positioning the national as an international FinTech hub that would place it in competition FinTech leaders in the China, US, and Japan.

FOCUS AREAS OF SINGAPORE'S FINTECH INDUSTRY



Digital transformation across industries in Singapore will make an impact on the demand for talent with digital skills that are relevant to the trends in the market. Studies done in 2015 and 2017 by Robert Walter's highlighted that companies continue to invest in digitalization and consequently demand more professional with a broad digital skillset. Areas highlighted include:

DIGITAL SKILLS IN DEMAND

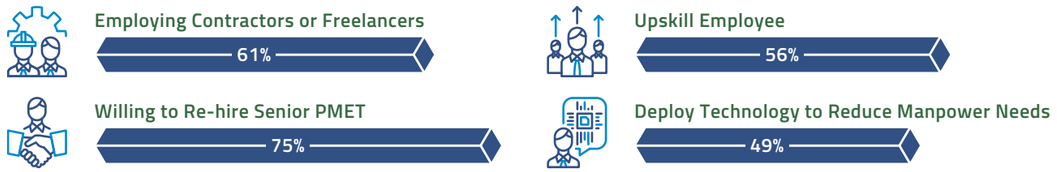
INDUSTRIES DRIVING DIGITAL TRANSFORMATION

DEMAND FOR UP SKILLING WHEN TALENT SUPPLY IS SHORT[103]

A study by SGTech revealed that information and communication companies in Singapore are facing a talent crunch. The survey also looked at the strategies these companies are employing in light of their recruitment difficulties.

Among the responses are up skilling their existing employee and re-hiring senior or retired professional, managers, executives and technicians ("PMETs"). Some companies are even exploring the use of technology to fill in the talent gap.. The long-term impact of these measures on the industry as a whole remains to be seen. Companies would need to consider new talent in addition to re-skilling and up-skilling the existing workforce.

MEASURES TAKEN BY INFOCOMM COMPANIES FACING TALENT SHORTAGES



SINGAPORE IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	2,475	2,808	3,146
Cloud Solution Architect	3,871	4,768	5,803
Computer Systems Analyst	14,358	14,961	15,628
Cybersecurity Consultant	2,760	3,257	3,867
Data Scientist	1,238	1,404	1,573
Internet of Things (IoT) Developer	2,407	2,801	3,273
IT Infrastructure Engineer	6,193	7,629	9,284
Mobile and Web Application Developer	12,575	12,517	12,827
Network Engineer	4,645	5,722	6,963
Software Developer	8,615	8,977	9,377
Singapore Total	**59,137**	**64,844**	**71,740**

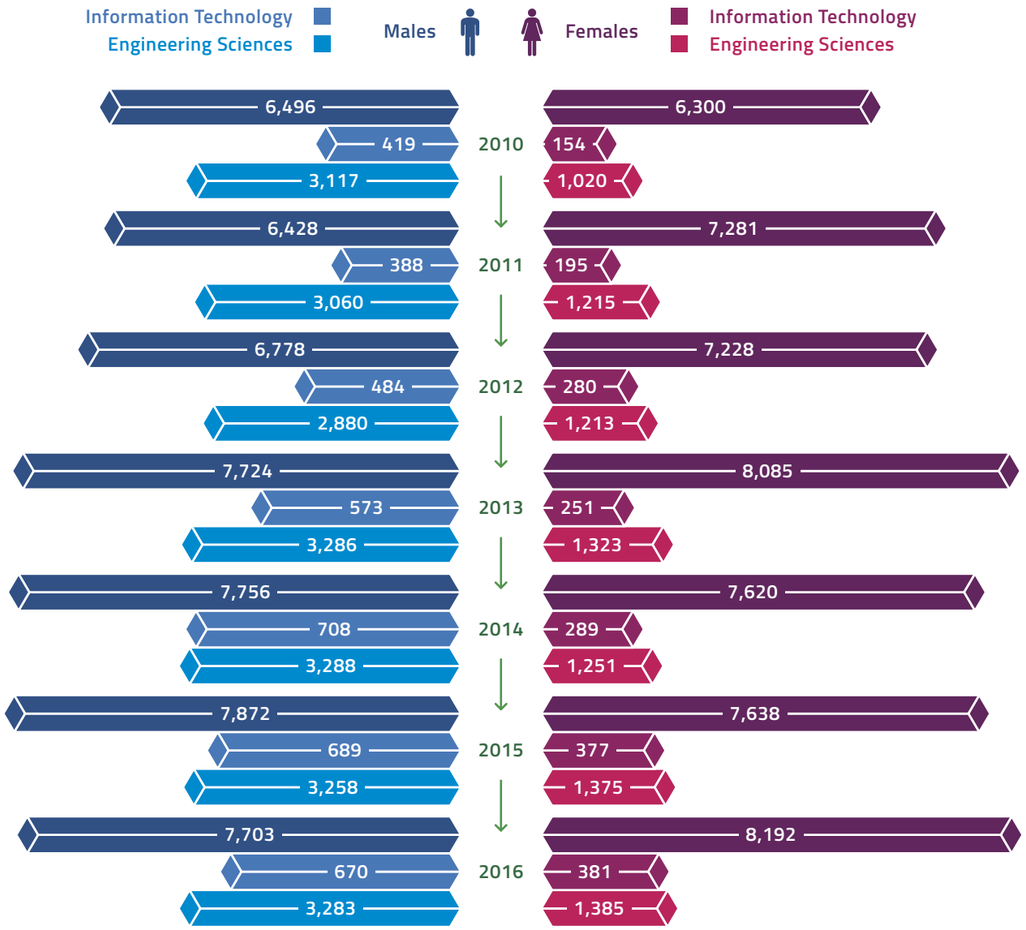
The enrollment of students in ICT specific fields of study is still low compared to other fields such as the Humanities and Social Sciences and Business and Administration.

ENROLMENT IN UNIVERSITY FIRST DEGREE COURSES BY TYPE OF COURSE[104]

TYPE OF COURSE	2010	2011	2012	2013	2014	2015	2016
Engineering Sciences	17,294	17,426	18,007	18,073	18,438	18,431	18,656
Humanities & Social Sciences	9,694	9,689	10,087	10,645	11,291	11,915	12,495
Natural, Physical & Mathematical Sciences	7,640	7,822	7,883	7,855	8,145	8,226	8,267
Business & Administration	6,426	5,780	6,073	6,188	6,577	7,138	7,514
Accountancy	3,203	3,871	4,001	4,042	4,368	4,723	5,090
Information Technology	3,207	3,643	3,853	4,058	4,152	4,575	4,865
Architecture & Building	1,786	1,857	1,829	1,883	1,990	1,973	1,980
Health Sciences	1,064	1,139	1,293	1,441	1,498	1,567	1,860
Medicine	1,305	1,328	1,374	1,469	1,585	1,719	1,845
Applied Arts	1,076	1,179	1,347	1,492	1,578	1,599	1,628
Law	1,423	1,448	1,474	1,491	1,514	1,550	1,593
Mass Communication	675	673	678	702	729	776	774
Education	1,841	1,837	1,609	1,338	1,103	978	752
Services	299	827	1,047	922	679	725	737
Dentistry	184	190	201	207	216	219	220

The overall graduation figures for Information Technology and Engineering Courses have also been relatively flat since 2010.

GRADUATES FROM UNIVERSITY FIRST DEGREE COURSES BY TYPE OF COURSE AND SEX[105]



Considering that tertiary-level educational institutions play an important role in developing ICT talent. There are a few scholarships that help encourage more citizens to take up ICT courses.

ICT RELATED SCHOLARSHIPS IN SINGAPORE

[106]Smart Nation Scholarship

For Singaporean Citizens

For study of ICT programs at local or foreign universities

Eligible for career opportunities within the Government Technology Agency of Singapore, Cyber Security Agency of Singapore and Info-communications Media Development Authority of Singapore

Skillfuture Study Awards[107]

For Singaporeans working in the ICT sector

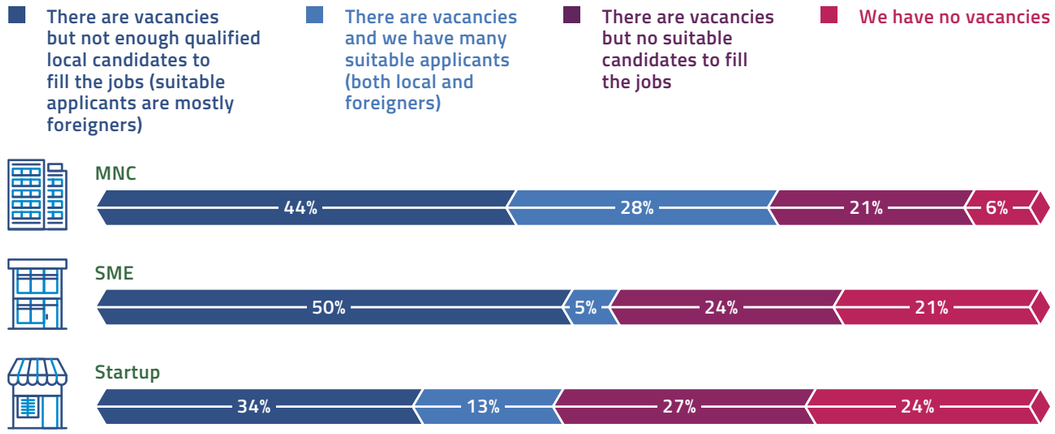
For bachelors and masters level courses approved by the Info-communications Media Development Authority of Singapore

SGTECH INDUSTRY SURVEY 2017[108]

SGTech conducted a survey of over 180 companies within the Singapore information and communication ("Infocomm") industry. The purpose of the survey was to understand some of the challenges faced by companies within the industry. The survey revealed that Singapore Infocomm companies have a demand for talent with IT and business skills but are often unable to find suitable candidates. 75% of the companies expressed their concern of not being able to recruit the "right talent". Compared to well establish companies, new companies in the market such as start-up are facing the most difficulty in the Singapore talent marketplace. Up to 91% of start-ups list "recruiting the right talent" as their "gravest concern".

TOP 3 CONCERNS OF SINGAPOREAN INFOCOMM COMPANIES, 2017

HIGHLIGHT OF SGTECH INDUSTRY SURVEY, 2017



TOP 5 IT POSITION WITH TALENT SHORTAGE

- Programmers **52%**
- Business Development **50%**
- Cyber Security Specialists **40%**
- System Architects **38%**
- Engineers **36%**

8.3 CROSS-BORDER TALENT OPPORTUNITIES

The Singaporean Government addresses the need for top quality talent by encouraging promising students from other nationalities to pursue their education in Singapore. Through the Ministry of Education, outstanding students from ASEAN nations are awarded scholarships to pursue their education in Singapore leading to a Singapore-Cambridge General Certificate of Education Advanced Level. This creates a pipeline of students who are well prepared for entrance into Singaporean institutes of higher education and some may elect to pursue ICT related courses[109].

Scholarships are also available at the tertiary level. These scholarships are often offered through a tertiary level institution. Some scholarships are also targeted at programs that are specifically relevant to Singapore's ICT talent demands.

EXAMPLES OF SCHOLARSHIPS FOR INTERNATIONAL STUDENTS IN SINGAPORE

- National University of Singapore PhD in Data Science Scholarship[110]
- National University of Singapore ASEAN Undergraduate Scholarship[111]
- National University of Singapore Science & Technology Undergraduate Scholarship[112]
- Nanyang Technological University Research Scholarship[113]
- Nanyang Technological University Undergraduate Scholarship[114]

8.4 KEY INITIATIVES FOR TALENT DEVELOPMENT

THE INFORMATION, COMMUNICATION AND MEDIA INDUSTRY GOES DIGITAL

The Info-communications Media Development Authority of Singapore "IMDA" is a prominent statutory body in Singapore that is at the forefront of many technology development initiatives in the economy. In addition to regulating the infocomm and media industries, IMDA has been responsible for steering the economy's technology future through national masterplans such as Intelligent Nation 2015 and the Digital Economy Framework. The organization also led efforts to digitalize government services in Singapore until the role was handed over to the newly formed Government Technology Agency of Singapore ("GovTech") in 2016[115].

IMDA recognizes the importance of developing outstanding talent to support its plans to contribute to both the nation's and the industry's growth. The Infocomm Media Industry Transformation Roadmap highlights the focus areas of their initiatives[116] including:

INFOCOMM MEDIA INDUSTRY TRANSFORMATION ROADMAP TALENT HIGHLIGHTS

- Positioning the industry as a provider for good jobs and a better quality of life
- Training and professional development for ICM skills
- Developing a Skills Framework
- Nurturing talent in Artificial Intelligence

These initiatives are expected to have a positive impact on attracting talent to join the industry as well as equip themselves with the technical skills demanded by the industry. Financial Services as a Driver for Advance IT Talent[117]

The Monetary Authority of Singapore's Financial Services Industry Transformation Roadmap places a strong emphasis on the adoption of technology and the development of the FinTech segment within the industry. The role of talent in the development of the financial services industry is huge as the industry lies at the intersection of many emerging technologies such as blockchains, secure digital ID, completely electronic payments and cyber security.

FINANCIAL SERVICES INDUSTRY ANNUAL GROWTH TARGETS

- **3,000 jobs created**
- **1,000 jobs in FinTech created**
- **2.4% growth in productivity**

FINANCIAL SERVICES INDUSTRY FOCUS ON JOBS AND SKILLS

- Strengthen HR practices within the industry
- Deepening of IT specialist skillsets
- Building pipeline of Singaporean finance leaders
- Expansion of current talent pool
- Reskill PMETs

SECURITY INDUSTRY IS SERIOUS ON TALENT[118]

A strong and talented workforce within the security industry is pivotal for the growth of the digital ecosystem in Singapore. The security industry ensures that the immense number of digital transactions that occur daily through the nation's financial services, eGovernment service and telecommunication services are reliable, secure and trustworthy.

The Security Industry Transformation map recommends the industry's workforce need to have skills that are in demand. Several initiatives listed include:

SECURITY INDUSTRY INDICATIVES FOR TALENT DEVELOPMENT

Enhanced Skills Training

Provision of a Work-Learn Technical Diploma (WLD) in Security Systems Engineering that combines practical on the job training with a solid theoretical foundation

Training for emerging skills, one initiative is a SkillsFuture Series which offer courses in areas such as Data Analytics and Tech-Enabled Services

Skills Framework for Security

Common skills language for individuals, employers, and education and training providers

Facilities skills recognition

Guides the design of training programs for skills and career development

Deepen skills for a lean workforce

Enhance business competitiveness

Increase employability

New Specialist Diploma for Security Consultancy

Security industry professional may take this part time course over a period of one year to specialize in security assessment and consulting

Topic covered include risk assessment, building security, legislation, security technologies, and project management

8.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

PROFESSIONAL TRAINING PROVIDERS AND FACILITATORS

SKILLSFUTURE SINGAPORE

SkillsFuture is a brand attached to various programs, initiatives and funding related to talent development in Singapore. The programs under SkillsFuture are provided by both private and government organizations. Similarly, the initatives under SkillsFuture is overseen by the Future Economy Council[119] whose members include representatives from government ministries, the academia, and private businesses[120]. The overall governance of SkillsFuture lies with the Ministry of Education[121].

There are programs under SkillsFuture for everyone within the talent ecosystem. This includes students, graduates, experienced professionals, training providers and employers. There are programs that specifically target the development of ICT talent.

ICT PROGRAMS UNDER SKILLSFUTURE

SkillsFuture for Digital Workplace

Equip beneficiaries with the foundations in digital technology skills such as data analytics and cloud

TechSkills Accelerator (TeSA)

A collection of various training programs to upskill existing IT programs with in-deman skills

TECHSKILLS ACCELERATOR(TESA) TESA

TeSa is a 2-year old programme that was first announced in the 2016 Budget as a collaborative initiative between various stakeholders in the ICT talent ecosystem. The common goal for that brings together the Government, industry players and the National Trades Union Congress is the enhancement of ICT talent development and employability.

TeSa is led by the IMDA in collaboration with other nationwide talent initiatives such as Workforce Singapore (WSG) and SkillsFuture Singapore (SSG) to offer various training and educational programmes for citizens from all levels of ICT skills. These programmes are tailored to relevant industry and talent trends to meet the demand for ICT talent within Singapore's vast ICT industry.

The initiatives go beyond just equipping the right talent with the right skills. Through partnerships with industry players and industry association such as SGTech, TeSA is able to facilitate the transition from education to employment. TeSA's integrated career services provides job matching, group mentoring, leadership programmes, career fairs and career coaching.

> *" SkillsFuture is a national movement to provide Singaporeans with the opportunities to develop their fullest potential throughout life, regardless of their starting points. "*

WORKFORCE SINGAPORE (WSG)

The Ministry of Manpower drives its talent development initiatives through Workforce Singapore. The objective of the program is to improve job-matching, increase job quality and ensure adequate supply of talent to meet the demand from businesses[122]. The program is driven by the mission to enable "individuals to adapt and employers to transform" and the vision for "every individual in a fulfilling career with progressive employers".

> *" WSG will promote the development, competitiveness, inclusiveness, and employability of all levels of the workforce.*
>
> *This will ensure that all sectors of the economy are supported by a strong, inclusive Singaporean core. "*

WSG provides services for individuals, employers and training providers.

SERVICES OFFERED BY WSG

Individuals
- Training Grants
- Course Directory
- Employment Assistance
- Programs carried out in collaboration with SkillsFuture

Employers
- Funding
- Hiring Assistance
- Advisory Services
- Training Programs

Training Providers
- Funding
- Accreditation
- Training for Adult Educators

WSG has also introduced a skills framework for ICT jobs and skills. The framework that was launched in 2017 covered over 100 job role and over 80 ICT skills. Roles related to emerging technologies are also part of the new framework such as chief digital officer, data scientist and cyber risk analyst[123].

SGTECH

SGTech is a technology industry trade association with over 700 members. The organization represents a wide range of companies including startups and multinational corporations. Within SGTech, there are committees that focus on digital technologies relevant to Singapore's ICT industry[124]. They are:

- Cloud & Big Data Chapter (CBDC)
- Cyber Security Chapter (CSC)
- Digital Transformation Chapter (DxC)
- Singapore Enterprise Chapter (SEC)
- AI & High-Performance Computing Chapter (AI&HPC)
- Smart Nation Chapter (SNC)
- Data Centre Committee (DCC)
- Talent & Capabilities Committee (TCC)

SGTech works closely with SkillsFuture and WorkForce Singapore on their national programs such as the Tech Skills Accelerator and the Capability Transfer Programme. Other talent related initiatives by SGTech include:

- Structured Internship Program
- TalentGugu - Job-matching Platform
- Proxor Certified Examination Centre
- SME Talent Program
- TeSA Pilot Immersive Programme
- PMax

NATIONAL TRADE UNION CONGRESS

The National Trades Union Congress is an organization that represents multiple trade unions in Singapore and maintains a network of professional associations and partners. NTUCs objective is to "help working people of all collars, ages and nationalities achieve gainful employment through better jobs, and a better living through higher wages so they can live a better life"

QUOTATION FROM KWONG YUK WAH, CIO OF NTUC IN COMPUTERWEEKLY.COM INTERVIEW[30]

"My goal is to exploit ICT as a strategic enabler that will take the labour movement to new heights. I am also a strong believer of being an early adopter of new technologies to gain the first-mover advantage. However, I can't exploit technologies alone. I have been getting very strong top management support which is very critical, but not enough. Our strong partnership with business units and the willingness of business users to exploit new technologies to gain a competitive advantage are very crucial."

- Kwong Yuk Wah, CIO of NTUC

*Image taken from MIS Asia

Due to its wide representation and involvement in Singapore's labor force, NTUC is a partner is many national-level talent initiatives including SkillsFuture. Privately, it has established the NTUC Learning Hub. The skills development center has a long history that goes back to 1982 when NTUC has a Computer Training Centre. Today, the IT Academy within the Learning Hub offers a wide range of programs including those targeted at cutting edge digital skills. Partners such as Cisco, Oracle, Microsoft and PRINCE2 ensures these course are relevant to the industry needs and widely recognized[31].

ICT COURSE AREAS

- Technical Courses for Beginners
- Cybersecurity and Information Governance, Risk and Compliance (GRC)
- Network and System Administration
- Workplace IT Skill
- Programming and Software/Web/ Mobile Apps Development
- FinTech
- IT Service Management, IT Governance and Enterprise Architecture
- ERP Applications
- Database Administration and Development
- Data Analytics, Business Intelligence, AI/Machine Learning
- Project Management, Agile and Scrum
- Coding
- Internet-of-Things (IoT)
- Cloud
- E-Commerce

SELECTED PARTNERS

Adobe, AUTODESK, android, Apple, CISCO, Microsoft, ITIL, PRINCE2, ORACLE

9. SRI LANKA

9.1 SRI LANKA'S OVERVIEW

Sri Lanka is under the category of middle income country, with a population of 21.4 million people per capital Gross Domestic Product GDP in 2017 of US$4,065.[143] In 2017, the reported labor force size in Sri Lanka is 8,666,844. This comprises people from the age of 15 and older who meet the requirement of the International Labor Organization definition. The employment rate in Sri Lanka has decreased to 95.5% in the first quarter of 2018 from 96% in the last quarter of 2017, however the unemployment rate is at 4.5% in first quarter of 2018 and 4% in the last quarter of 2017.[144] There are over 80,000 ICT employed talent and earned yearly export revenue of US$850 Million in 2015 (Central Bank figures for 2014) in Sri Lanka. The Industry in Sri Lanka has a vision to become a US$ 5 Billion industry and to create 200,000 jobs by 2020.[145]

9.2 FUTURE INDUSTRY DIRECTION AND IMPLICATION TO TALENT DEMAND

Sri Lanka's ICT sector has an estimated revenue of US$5 billion and approximately 300 ICT companies and which is also known as being the Asia's ICT/business process management (BPM) center of excellence. To improve the system, the government must sustain with the global demand by fuelling industry growth. This requires investment in youth and creating awareness about opportunities in ICT. The industry needs to safeguard diversity and inclusion to ensure a healthy and sustainable pipeline of talent.

Sri Lanka Association of Software and Service Companies' (SLASSCOM) vision is by 2022 as an aspiration that foresees the Sri Lanka IT sector becoming a US$5 Billion industry which creates 200,000 jobs which will make the market a competitive advantage in the IT and Business process outsourcing industry. Sri Lanka also acts as an offshore development center for the fortune 500 companies.[146]

The state-owned Information and Communication Technology Agency (ICTA) is at the forefront of driving IT and implementing programs to ensure IT development in cities and villages. This involves in a five-pronged strategy of the e-Sri Lanka initiative, which encompasses building information infrastructure and an enabling environment, developing ICT human resources, modernizing the Government, delivering citizen services, leveraging ICT for economic and social development, and promoting Sri Lanka as an ICT destination.[147]

The Sri Lanka Government has taken the initiatives to incorporate ICT education into the school curriculum since 2006.148 The computer literacy rate in the first half 2017 was 28.3%, an increase of 0.8% year over year (YoY). With an approximate of 4,500 schools in Sri Lanka has been equipped with ICT facilities. Educators are being trained well to provide students with comprehensive ICT learning and training courses. This was initiated by the Ministry of Education. This initiative has given the educators the assistance of developing a pragmatic approach to ICT training through the Intel Teach program conducted with the help of the University of Moratuwa.[149]

As of 2006, ICT has become a mandatory course for most provinces in Sri Lanka as part of the school curriculum implemented at the National College of Education preservice. **Schoolnet, managed by the Education for Knowledge Society Project (EKSP) and the Ministry of Education is one of the largest computer network Sri Lanka, where it connects 1,500 school.** The Intel Teach program is now executed in 1,500 schools, reaching 1 million students. In 2018, the General Education Modernization Project (GEM) will be initiated to transform and expand the curriculum of the general education in keeping with the transformation taking place in Sri Lanka's society and economy. This system will help broaden choices at the General Certificate of Education (GCE) A-Level from the different streams offered and the learning materials will be developed digitally with focus of schools located at disadvantage regions.

ICT UNIVERSITIES IN SRI LANKA

The university-level degree programs in IT and software engineering have been offered at state universities for over four decades. Sri Lankan state universities produced 2,173 engineering and computer science graduates and 528 postgraduates in computer science and engineering in 2015, whereas 10,806 undergraduates were enrolled to the engineering and computer science faculties in eight Sri Lankan universities.[150]

The next section displays the survey results on higher educational institutes in Sri Lanka listed according to their index.[151]

EDUCTIONAL INSTITUTIONS IN SRI LANKA I SURVEY RESULTS

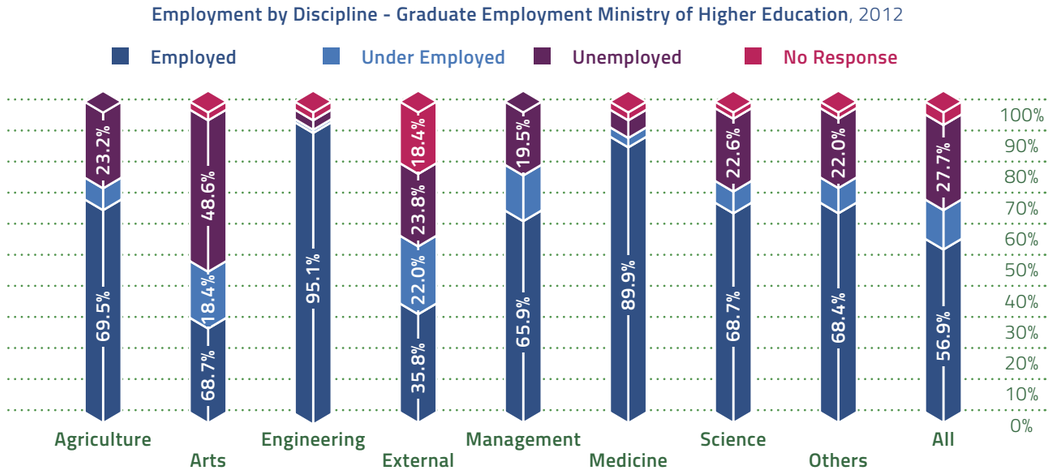
INSTITUTION	INDEX
SRI LANKA INSTITUTE OF INFORMATION TECHNOLOGY (SLIIT)	1,105
CEYLON-GERMAN TECHNICAL TRAINING INSTITUTE	697
NATIONAL INSTITUTE OF BUSINESS MANAGEMENT (NIBM)	695
BRITISH COLLEGE OF APPLIED STUDIES	655
AQUINAS COLLEGE OF HIGHER STUDIES	642
BRITISH COUNCIL	574
ASIA PACIFIC INSTITUTE OF INFORMATION TECHNOLOGY (APIIT)	467
ROYAL INSTITUTE OF COLOMBO	442
ESOFT METRO CAMPUS	424
AUSTALIAN COLLEGE OF BUSINESS AND TECHNOLOGY (ACBT)	380
NATIONAL SCHOOL OF BUSINESS MANAGEMENT (NSBM)	374
JAYASEKERA MANAGEMENT CENTRE	336
SOUTH ASIAN INSTITUTE OF TECHNOLOGY AND MEDICINE (SAITM)	292
ARTHUR C CLARKE INSTITUTE FOR MODERN TECHNOLOGIES	208
ANC EDUCATION	204
SRI LANKA INSTITUTE OF TOURISM AND HOTEL MANAGEMENT	195
OCBT CAMPUS	181
LONDON BUSINESS SCHOOL (LBS)	168
BANDARANAIKE INTERNATIONAL DIPLOMATIC TRAINING INSTITUTE	163
ACADEMY OF DESIGN (AOD)	136
INSTITUTE FOR ACCOUNTING STUDIES (IAS)	121
SINGAPORE INFORMATICS	113
LANKA INSTITUTE OF FASHION TECHNOLOGY	111
INSTITUTE OF MANAGEMENT OF SRI LANKA (IMSL)	93
AMERICAN COLLEGE OF HIGHER EDUCATION (ACHE)	91
INSITITUTE OF JAVA & TECHNOLOGICAL STUDIES (UTS)	90
CITY SCHOOL OF ARCHITECTURE	87
BUSINESS MANAGEMENT SCHOOL	87
INSTITUTE OF PERSONNEL MANAGEMENT (IPM)	87
WISDOM BUSINESS ACADEMY	84
INSTITUTE OF BANKERS OF SRI LANKA (IBSL)	84
ASPIRATIONS INTERNATIONAL ACADEMY	83
COLOMBO INSTITUTE OF RESEARCH AND PSYCHOLOGY	82
SRI LANKA INSTITUTE OF MARKETING (SLIM)	80
INSTITUTE OF COMPUTER AND MANAGEMENT	71
INSTITUTE OF PSYCHOLOGICAL STUDIES	58
OXFORD COLLEGE OF BUSINESS	52
METROPOLITAN COLLEGE	46
ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA (AATSL)	45
PEOPLE'S ACADEMY OF TERTIARY AND HIGHER EDUCATION	42
BRITISH INFORMATICS OF COMPUTER TECHNOLOGY	37
ACADEMY OF DIGITAL SCIENCE	36
AIMS COLLEGE	33

Although not all the engineering graduates who passed from Sri Lankan state universities would be employed in IT and computer science, a large amount of undergraduates with software engineering and electronics degrees are working in local public and private sector organizations.

In the interim, several private universities recognized by the University Grants Commission and Ministry of Higher Education and Highways also produce many IT and computer science graduates who enter the local job market annually.

The next chart shows Sri Lanka's employability rate by disciplines. Engineering has the highest percentage of graduates being employed in the country. The result was by the Ministry of Higher Education and Highways.

EMPLOYMENT BY DISCIPLINE (%)



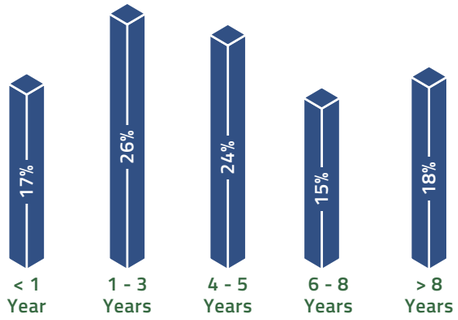
More IT graduates in the technology areas of artificial intelligence (AI) and robotics are being trained by experts from around the world and viewed as an opportunity for the next upsurge.

THE NUMBER OF SRI LANKANS HOLDING IT OR BPO JOBS HAS ALMOST DOUBLED FROM 34,000 IN 2006 TO 63,000 IN 2011.[152]

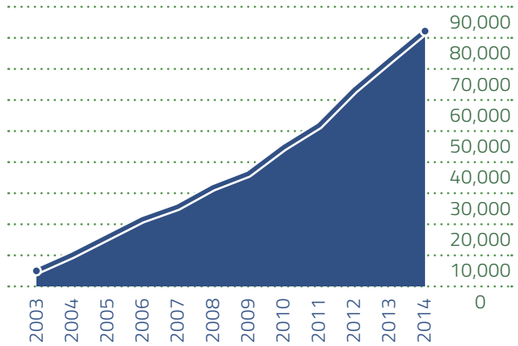
WORK EXPERIENCE

In 2013, IT professionals with one to five years of experience made up 67% and professionals with more than five years of experience accounted for 33% of the workforce.

IT PROFESSIONAL YEARS OF EXPERIENCE



OVERALL GROWTH OF IT WORKFORCE



NUMBER OF IT WORKFORCE

LANGUAGE SKILLS

International language skills are critical for global IT and business process outsourcing (BPO) countries. Nearly 2 million Sri Lankans speak English that has been taught widely in the country because of the British colonial ruling. English is mainly used at the business environment. The country produces 400,000 English speaking, IT-literate individuals a year.

MINISTRY OF EDUCATION DRIVES TALENTS IN SRI LANKA

As of 2015, the workforce in the ICT industry is over 80,000, with a 13% average YoY growth. The workforce has skills in all areas of interest, including social, mobile, analytics, cloud, web, design, enterprise applications, IT infrastructure, project management, and business analysis.

Community-driven training and development culture strengthen the learning process and the growth of the workforce on several technical and nontechnical topics. In addition, thought leadership sessions organized by industry associations, such as SLASSCOM and Federation of Information Technology Sri Lanka (FITIS), and professional bodies, such as the British Computer Society (BCS) and the Computer Society of Sri Lanka (CSSL), have brought down many high-profile personalities.

The demand for ICT talent in Sri Lanka has been maintaining an upward trend in annual figures, reaching the US$1 billion mark in 2017. More than 300 companies and 80,000 tech-savvy professionals are employed in the sector. The industry targets to achieve US$5 billion in exports, provide 200,000 direct jobs, and groom 1,000 start-ups by 2022.[153]

There are more than 300 IT and BPO companies that operate in Sri Lanka. The sector generates more than US$400 million in exports. There are many renowned international companies that have also set up their IT and BPO centers in Sri Lanka, such as HSBC, Hewlett Packard (HP), Motorola, and so forth.

> *" More than 300 companies and 80,000 tech-savvy professionals are employed in the sector. The industry targets to achieve US$5 billion in exports, provide 200,000 direct jobs, and groom 1,000 start-ups by 2022. "*

*Image taken from Lanka Business News

Sri Lanka's first IT technology park caters to the needs of the IT/BPO industry, with modern office space, advanced infrastructure, and professional facilities management. Clients are predominantly multinational and national IT and BPM companies that serves clients globally. The objective of this technology park is to provide advanced infrastructure and facilities for enterprises without having the new start-ups worry about ancillary support.

This center is a creative and innovative thinking ground for new businesses to thrive. A platform to enable start-ups to excel as the incubator scheme is set up to provide start-ups with the right prospect to nurture. The park is eventually transitioning into the green building sector, already having two buildings that are Leadership in Energy and Environmental Design (LEED)–certified with energy-efficient systems. This also means that it will help start-ups save cost.

TRACE TECHNOLOGY PARK

TRACE

Technologically Re-Awakening Culture of Excellence (TRACE), now called Trace Expert City, was set up with the mindset that an IT park or innovation park is a growing business globally and in Sri Lanka. Its goal is to foster innovation and creativity in the country while making it easier for graduates and professionals in Sri Lank to seek work opportunities.[154]

TAX INCENTIVES

Tax incentives for IT companies are also substantial. The corporate income tax rate of 35% will be reduced to 28%. Moreover, BPO and IT companies will be leveraging on incentives, which will effectively lessen the tax rate to zero for most investors. [155]

TAX HOLIDAYS

New firms with an investment of more than US$250,000 are eligible for tax exemptions. Differential duty rates have been recommended primarily to promote investment in sectors such as ICT but considering that this sector is knowledge intensive as opposed to being capital intensive, investment types allowed for tax incentives need to include intellectual capital and proprietary technologies. Since getting started does not require much capital in this sector, and as all transactions happen in an intangible form (over data links), a more effective incentive regime may be required. Employment outcomes will be made one of the eligibility criteria with respect to such incentive schemes as:

- 4-12-year tax holidays for new investments
- Concessionary corporate tax rate of 12% for exporters

These tax incentives have the potential to increase IT talent.[156]

RESEARCH AND DEVELOPMENT

Research and development (R&D) activities are also on the rise. Sri Lanka is home to 29 research institutes and 119 science and technology institutions, although expenditure on R&D remains low, at 0.16% of the gross domestic product (GDP), according to a 2014 report published by the Ministry of Technology and Research. The private sector has increasingly moved to meet public spending shortfalls. Motorola Solutions operates one of its global R&D centers in the country, focusing on embedded software development for its enterprise services division, whereas Zone24x7, which is based in the United States but operating out of Sri Lanka, provides hardware designs and new technology to vendors and banks, many of which are Fortune 500 companies.[157]

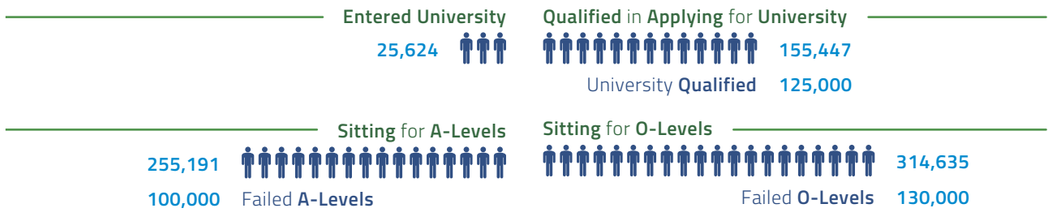
With IT development progressively targeted by the public sector as a support for the entire socioeconomic development in Sri Lanka, large incentives are offered to new ICT firms. With an ongoing evolution from service provision to product development, the IT sector is dignified for fast and significant growth in the coming years. As internet penetration and digital literacy continue to progress, the sector is well on its way toward meeting its US$1 billion export goal, with the next phase of its development expected to see increasingly large international firms establish operations in the country, allowing the industry to retain its top talent and keep it at the forefront of the region's technological innovation.[158]

SRI LANKA IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	211	244	284
Cloud Solution Architect	237	297	360
Computer Systems Analyst	6,871	6,946	6,918
Cybersecurity Consultant	471	552	654
Data Scientist	79	92	106
Internet of Things (IoT) Developer	385	440	505
IT Infrastructure Engineer	569	712	864
Mobile and Web Application Developer	111,119	11,177	11,102
Network Engineer	426	534	648
Software Developer	4,123	4,167	4,151
Sri Lanka Total	**24,491**	**25,160**	25,591

Labor market inadequacies are dampening productivity. The change of Sri Lanka's demographic, with a low birth rates in current times, has caused a rapidly aging population and a shrinking labor force, an issue exacerbated by outmigration. A low female labor force participation rate (LFPR) of 35.9% in 2016, just half that of males, is another key limitation to labor force growth. A huge informal sector that accounted for 60% of the workforce in 2015, the enforcement of labor laws, including those provided with social protection, is low. There is one sector in which the labor law is practically nonexistent, within the organized sector, the rigidity of the labor market is due to labor laws that are outdated which hinders productivity growth and hampers international competitiveness. Low proportion of high-skilled workers, persistent mismatches between labor supply and demand, and high unemployment among females, the youth, and the educated also adds up to the subject matter.[159]

PERFORMANCE IN NATIONAL EXAMS, 2015



Sri Lanka's has a low tertiary enrolment rate. Of people aged 20–24 years, 5% were enrolled into a university, 8% are enrolled into other education institutions, and only 3% were enrolled in technical education and vocational training (TVET). These supporting figures shows that the enrolment rates in Sri Lanka are low compared with other countries in the region.

Sri Lanka's gross tertiary enrolment rate is 21%, which is below the 22% average in lower-middle income countries and 44% average in upper-middle income countries is 44%, according to the World Bank's World Development Indicators of 2014.

The ICT workforce is about 80,000 in Sri Lanka, and the industry will require an upsurge of at least 20,000 annually. There is a gap of 10,000 skilled ICT laborers each year and the ICT Industry Skills Council is looking into bridging the gap by producing a huge number of specialized skilled workforce at an affordable cost. The council, together with the tertiary, vocational, and training sectors, is prepared to satisfy the country's criterion. This will be done in collaboration with industry, government, academia, and donor agencies.

Nonetheless, we do not see strong programs that encourage females to join the IT workforce or take up IT tertiary courses.

The ICT Industry in Sri Lanka needs a more robust talent supply, both in terms of quality and quantity. First, jobs that entail highly skilled IT talents with degree-level training and lower-skilled jobs that focuses mainly on non-ICT, BPO, government, and nongovernmental (NGO) organizations take into consideration 50% of the ICT job market in Sri Lanka. TVET institutions supply the skill requirement, whereas universities and higher education institutes prepare graduates for highly skilled jobs.

The issues faced by Sri Lanka in the scarcity of ICT talents are the low number of graduates produced, low new entrants into the ICT sector, low supply of talents with the right degree and skill sets to capture the market, and low number of females in the workforce.

Even though the number of female graduates is increasing, there is still a very low number of females entering the ICT industry in Sri Lanka.[160]

9.3 CROSS- BORDER TALENT OPPORTUNITIES

Digitalization has brought the current era to a new avenue with the rapid change in environment, which is a challenge for organizations to keep up with. However, the number of skilled talents is growing slower than before. Not only does Sri Lanka have a finite talent pool, the quantity of people that are being employed for highly skilled work, such as software engineering, is too little. Still, it is a vastly sought-after job and can be billed up to US$60,000 per annum. In consequence to the niche market, it is essential to obtain admission of foreign talent from the other economies.

Cross-border talent is another way of helping IT and tech specialists of Sri Lanka. This will create an opportunity for organizations to be more competitive and streamline the process of tapping into a pool of talents to flourish and help solve the challenge. The scarcity of skilled talent is the largest impairment to growth. This has been challenging for businesses to operate.

Border control needs to be more at ease for the benefit of foreign direct investments (FDIs), which will help foster jobs and growth. ICT or even technology service will potentially bring in expertise so long as it produces profits and exports, pays taxes, and contributes to Sri Lanka's economy. Organizations will have to sieve the right talent and have the employment procedure more prudently.

Sri Lanka could also ease the entree of local companies to foreign expertise by introducing simpler visa procedures, which are presently intricate and burdensome for foreign employees in Sri Lanka, limiting FDI, especially for smaller ventures, such as in tourism.

The SLASSCOM tech industry body of Sri Lanka is encouraging the opportunity for foreign skilled talent. It has the vitality to expedite innovation for the sustainability and growth of the tech industry. These skilled migrant workers can benefit from tech companies by adopting new technology, nurturing talents, and fostering the revenue of the company. SLASSCOM is doing its part to unravel the opportunity to position the country as an innovation center and digital gateway to Asia.

However, talent arbitrage is now making headlines and Sri Lanka needs to increase the supply so local companies can grow faster and foreign companies will invest here.

AVERAGE WAGE[161]

Annual Wages

1 $1,012 Vietnam	4 $1,524 Philippines	7 $2,772 Egypt	10 $6,708 Malaysia
2 $1,272 Pakistan	5 $1,584 **Sri Lanka**	8 $4,716 China	11 $7,641 Mauritius
3 $1,440 Bangladesh	6 $1,620 India	9 $4,860 UAE	12 $32,769 UK

IT Programmer

1 $7,800 Bangladesh	4 $10,170 India	7 $13,894 Egypt	10 $33,704 Mauritius
2 $8,683 Pakistan	5 $11,291 Vietnam	8 $16,868 Malaysia	11 $40,504 UAE
3 $8,996 **Sri Lanka**	6 $11,371 Philippines	9 $23,576 China	12 $44,297 UK

BPO Analyst

1 $3,574 Vietnam	4 $4,653 Philippines	7 $5,913 Egypt	10 $14,145 Mauritius
2 $4,104 **Sri Lanka**	5 $5,374 Pakistan	8 $9,121 China	11 $17,895 UAE
3 $4,200 Bangladesh	6 $5,451 India	9 $10,398 Malaysia	12 $28,679 UK

Accountant

1 $4,691 Pakistan	4 $8,121 Philippines	7 $10,956 China	10 $45,434 UK
2 $5,518 Vietnam	5 $8,194 Egypt	8 $14,271 Malaysia	11 N/A Bangladesh
3 $5,977 **Sri Lanka**	6 $10,123 India	9 $25,974 UAE	12 N/A Mauritius

Compensation includes base salary plus benefits, tax, and bonus; estimates are used when data is not available; salaries do not reflect fully loaded seat costs; accountant salaries not available for Bangladesh and Mauritius.

Note: BPO is business process outsourcing.
Sources: Economist intelligence Unit 2011, Mercer HR Consulting 2011, Watson Towers 2011; A.T. Kearney analysis.

Sri Lanka has direction to flourish in becoming a major player in the ICT and BPO industry, the wage is much lower than the wage in India. People are moving out of the country with the right skill set to a country that offers better pay.

9.4 KEY INITIATIVES

In Sri Lanka the government body responsible for ICT development body is Information and Communication Technology Agency of Sri Lanka (ICTA) is an agency owned by Sri Lanka's government which heads the ICT initiatives. The agency's responsibility is to drive all ICT projects and policy that is mandated by the government. With the mission of transforming Sri Lanka into a digitally inclusive country.

TALENT DEVELOPMENT INITIATIVES BY ICTA

ICTA is promoting IT education in Sri Lanka by contributing to the government education policy in Sri Lanka. The plan is to commence a large national level initiative across all levels of education sector, to prepare the future generation for global job opportunities. This will facilitate the growth of the future workforce and also bridge the gap of shortage of skilled talents.

FUTURE CAREERS

Future Careers aims to expand the talent pool available in the industry and focus on connecting the Sri Lankan youth for future job opportunities in the knowledge services industry for them to become truly global citizens. It targets people aged 15–18 and young undergraduate students. The platform creates a dialogue between the IT/BPO professionals and students opening vistas of knowledge sharing and experience with the Future Careers audience, including teaching faculty members. Students can also join online at www.FutureCareers.lk to learn about the industry.

SLASSCOM invites industry professionals to also join to encourage and offer their support and guidance to new entrants to the industry. Future Careers' Facebook page provides a real-time platform to connect everyone interested in IT and BPO industry jobs to people who are already in the industry. It is on a mission to build the largest real Facebook wall.

DIRECT LINK INITIATIVES

One of the key prerequisites for the growth to realize is the acceleration of human resources capacity development in the industry. The SLASSCOM DirectLink program objective is to collaborate in enhancing the talent pool available to the IT and BPO industry through knowledge sharing, curriculum development support, and various other activities. SLASSCOM DirectLink provides a platform for the industry and academia to engage in a sustained manner.

The key ministries and educational bodies in Sri Lanka play an important role in nurturing the future talents with the right capabilities and preparing them for diversification of future jobs.

Teachers in Sri Lanka will also be provided with comprehensive training on all aspects of ICT training, with the aid of the Ministry of Education. These ICT teachers will also be provided with continuous assistance to undergo ICT curriculum in schools.[162]

SKILLS GAP ANALYSIS OF CURRENT SRI LANKAN MARKET

ICTISC requires a demand planning mechanism that will cater to the current and, more importantly, the future demand based on structured market intelligence from research and ICT professional networks. Although catering to the current demand, as technology is futuristic, the skills business must have a separate focus on preparing the nation toward futuristic technology and disruption. Demand planning shall be conducted once every six months and will be established based on an online demand planning and gap analysis system.[163]

PILOT PROJECT FOR GRADUATESHIP PROGRAM

Operating in parallel to curriculum development, the pilot project on the graduateship program is a result of the Board's decision to conduct a project to implement solutions identified by the council to bridge the skills gap in the ICT education sector. To identify the possibility of reaping benefits, the council expects to run a pilot project in selected centers of Vocational Training Authority (VTA), National Apprentice and Industrial Training Authority (NAITA), and Department of Technical and Educational Training (DTET). The pilot project will have three major outcomes, namely, the training of teachers competent and well-versed in the revised curricula of the National Vocational Qualification, the delivery of courses with quality, and on-the-job training or an internship that would help students get hands-on experience of theory in practice and, in turn, hold the industry responsible to intervene and ensure that students are given training opportunities and are not left underemployed.[164]

" The agency's responsibility is to drive all ICT projects and policy that is mandated by the government. With the mission of transforming Sri Lanka into a digitally inclusive country. "

9.5 KEY TRAINING PROVIDERS AND IN-DEMAND CERTIFICATION

The Ministry of Science, Technology, and Research directs the formulation and implementation of policies related to implementation, regulation, and growth of technology and scientific research in the country.

GOVERNMENT BODY	RESPONSIBILITY
Ministry of Education	Formulation and implementation of policies related to primary and secondary education in Sri Lanka
Sri Lanka Institute of Advanced Technological Education	A statutory body in Sri Lanka coming under the purview of the Higher Education Ministry and offering higher national diploma courses
Education for Knowledge Society Project (EKSP)	To help the Ministry of Education in quality, relevance, effectiveness and equity of access to secondary and tertiary education, in particular in rural and disadvantaged locations
Information and Communication Technology Agency of Sri Lanka (ICTA)	

The government has also launched several programs to improve quality certification in the IT and BPO industry. The government provides substantial grants to support training and quality enhancements. ICTA has helped more than 30 companies and the International Organization for Standardization (ISO) to achieve Capability Maturity Model Integration (CMMI) compliance.

FEDERATION OF INFORMATION TECHNOLOGY INDUSTRY SRI LANKA (FITIS)

FITITS is the core body of ICT sector in Sri Lanka which overlooks segments such as hardware, software, training and education, communication and professionals within the country. The body has accord to the evolvement of the ICT landscape in Sri Lanka. There are 200 active business firms in the industry as members to the body. The core objective is to get it members to reach greater heights in their business. This will be done by advocating, setting public policy, developing skilled talents, marketing events and to provide business development opportunities is local and foreign markets.

FITIS initiative, INFOTEL 2018- 'Towards Digital Economy' is the development for a conducive economy for Sri Lanka which features ICT education and training, software solutions, hardware and digital devices, ICT education and training, mobile computing, system integration, computer gaming, cloud computing and emerging technologies.

COMPUTER SOCIETY OF SRI LANKA (CSSL)

CSSL is a private ICT professional body and in Sri Lanka. The professional body aids the promotion of the professionalism and standard in the ICT Sector. The purpose of this professional body to develop the ICT sector in Sri Lanka by means of knowledge sharing, cultivating and exchanging information and ideas. CSSL is also working closely with the Accreditation board strengthen and standardize ICT degree and other related examinations to reach the global level.

TERTIARY AND VOCATIONAL EDUCATION COUNCIL (TVEC)

The Tertiary and Vocational Education Council is a statutory body established in 1991. It is responsible for the "policy formulation, planning, quality assurance, coordination and development of tertiary and vocational education in the country." The Council also maintains a database of certified and accredited courses as training providers to ensure that students have access to quality education[165].

TECHNICAL AND VOCATIONAL EDUCATION

Education programs in Sri Lanka's technical and vocational education (TVE) sector range from short-term certificate programs and apprenticeship training to bachelor's degrees in applied disciplines. In 2009, Sri Lanka established a National Vocational Qualifications Framework (NVQF). These qualification are categorized into 7 levels which is tied to the level of experience and responsibility the qualification is suited for.[166]

NATIONAL CERTIFICATES (NVQF 1 TO 4)	These entry-level programs typically have a strong practical focus and are concentrated in crafts and trade fields. There is no clearly defined program length. Programs offered in Sri Lanka range between a few months and three years, based on industry needs. Admission may be based on O-levels, even though some programs have no formal admission requirements.
NATIONAL DIPLOMAS (LEVELS 5 AND 6)	These are one- and two-year programs typically offered in technical fields and trades as well business-related fields, such as accounting or marketing, for example. Admission is typically based on O-levels or an NVQF level-3 or -4 certificate. The program length is clearly defined at 60 credits (one year) at level 5 and 120 credits (two years) at level 6.
LEVEL 7 BACHELOR'S DEGREES	Vocational Bachelor of Technology degrees (3 years, 180 credits) and Special/Honours Bachelor of Technology degrees (4 years, 240 credits) are awarded by the University of Vocational Technology (UNIVOTEC). The programs are designed to be entered on the basis of an NVQF level-5 qualification, whereas holders of a level-6 qualification may be granted exemptions.

Under the Tertiary and Vocational Education Council, there are 4 industry council responsible for overseeing policies and initiative in the construction, manufacturing, ICT and tourism industries.

ICT INDUSTRY SKILL COUNCIL (ICTISC)

ICT Industry Skill Council (ICTISC) is one of skill council under the TVEC with the belief that the national competency development is a collaboration of multiple stakeholders. This platform is for stakeholders to identify the national goals to avoid duplication of effort by different parties. The council will link up industry, industry bodies, government bodies,

Government training arms, private training arms, academia, and workforce under a defined set of national goals.[167]

One of the goals of ICTISC is to bridge the talent gap in the ICT industry and ensure that demand for ICT skills in the growing economy is met. Some of the services and initiatives under ICTISC are[168]:

- Providing ICT career and training handbooks
- Training of ICT trainers
- Endorsement of National ICT curriculum
- Validating and Endorsing ICT industry reports
- Releasing periodic ICT workforce survey
- Guiding and drafting policies and programs to align the demand and supply of ICT skills
- Providing guidance and advisory for national education system in order to prepare students for ICT industry

10. SOUTH KOREA

10.1 INTRODUCTION

South Korea has rapidly developed over the past few decades and is now home to many of the world's most widely known technology companies such as Samsung, LG, Sky Hynix and Hyundai. GDP was reported at USD 2,154 billion in 2017. Unemployment is below 5% and is expected to remain stable according to forecast by the International Monetary Fund.

SOUTH KOREA ECONOMIC SNAPSHOT[127]

SUBJECT DESCRIPTOR	UNITS	SCALE	2015	2016	2017	2018	2019	2020	2021	2022	2023
Gross domestic product, current prices	U.S. dollars	Billions	1,382.8	1,411.0	1,538.0	1,693.2	1,777.7	1,864.0	1,957.4	2,055.4	2,154.6
Unemployment rate	Percent of total labor force		3.6	3.7	3.7	3.6	3.3	3.2	3.1	3.1	3.1
Employment	Persons	Millions	26.2	26.4	26.7	26.9	27.1	n/a	n/a	n/a	n/a
Population	Persons	Millions	51.0	51.2	51.5	51.7	51.9	52.1	52.3	52.5	52.7

10.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

South Korea has a reputation for innovation, with many of the biggest technology players such as Samsung, LG and SK Group originating from the country. The ICT industry is expected to continue to grow if they can keep up with the global competition especially in emerging technology areas.

FUTURE ICT DEMAND IN SOUTH KOREA

South Korea aims to create 260,000 jobs in the information and communications technology (ICT) sector by 2022

The Ministry of Science and ICT will have to move together with the "Fourth Industrial Revolution" plan of radically shifting the economic landscape and changing the nature of jobs, requiring policymakers to face challenges in human resources development and job creation. There are also plans to create 27,900 positions in the unmanned vehicle sector, along with 12,000 research positions and 10,000 laboratory researchers.[128]

TECHNOLOGY PARK PANGYO TECHNO VALLEY

To maximise growth potential in the field of high-tech technology

Supporting 34 start-ups

Actively promoting their entrance into global business networks

Various support facilities: R&D Center or Public Support Center

Play a big role in innovation, creating new jobs and as a hub for technology start-ups

*Image taken from Mooyoung Architects & Engineers

TAX INCENTIVES

The South Korean government provides incentives for global headquarters and R&D centers to attract high value–added foreign investment. The incentives include:

- Tax deduction on investments
- Income tax incentives
- Expansion of tax breaks from high-risk investments to other young companies based on criteria to be set by the government
- Corporate tax incentives[129]

PUBLIC INVESTMENTS

Public institutions are expected to invest more than 30 trillion won in innovation growth by 2022. The government has selected 8 leading areas to lead the Fourth Industrial Revolution. These areas are smart cities, autonomous driving cars, drones, construction automation, zero energy architecture, virtual terrestrial space, smart logistics, and intelligent railroad.

Last year, the invstment amount of public institutions in these industries was 1.4 trillion won. 6 trillion won worth of additional investment yearly is expected to be allocated from 2018 to 2022.

According to the JustLanded.com portal, the following information technology focus job areas are in demand:[130]

Database Administrators

- Information System Analysts
- Internet Consultants
- It System Consultants
- Network Specialists
- Programmers
- Web Designers
- Web Masters

SOUTH KOREA IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	4,841	5,276	5,880
Cloud Solution Architect	3,379	3,935	4,515
Computer Systems Analyst	35,236	36,035	36,818
Cybersecurity Consultant	4,933	5,287	5,651
Data Scientist	2,075	2,261	2,520
Internet of Things (IoT) Developer	19,797	22,877	26,072
IT Infrastructure Engineer	5,406	6,296	7,223
Mobile and Web Application			
Developer	45,920	45,972	46,637
Network Engineer	4,055	4,722	5,417
Software Developer	21,141	21,621	22,091
Korea Total	**146,781**	**154,283**	**162,823**

Challenges faced by South Koreans:

- Change in demographic due to low birth rate and aging population
- High youth unemployment rate and lack of adequate jobs
- Generation gap in human competence
- High potential of job creation in the fields of science and technology but the supply would not be enough to meet the market needs

INNOVATIVE GROWTH YOUTH TALENT CONCENTRATION TRAINING (IGYTCT) PROGRAM

The Innovative Growth Youth Talent Concentration Training (IGYTCT) Program is a new project that will be launched this year (24 billion won in 2018) to address job vacancy. The project aims to eliminate job mismatch through project-oriented software training for prospective graduates and job candidates and to train key talents in preparing for the Fourth Industrial Revolution.

Recently, the youth unemployment problem has risen to become a social problem. Alongside the shortage of manpower in the business field, job mismatch also poses to be a serious problem for university graduates.

There is an expected lack of 250,000 talents in the Fourth Industrial Revolution in artificial intelligence (AI), blockchain and industrial personnel (2018–2022) over the next five years. This shortage of talent is expected to continue, while sourcing employment adequately meeting practical requirements from enterprises is a pending issue.

The Innovative Growth Youth Talent Concentration Training (IGYTCT) Program aims to discharge working professional staff who put themselves into the field immediately in the eight core field areas associated with the Fourth Industrial Revolution (Artificial Intelligence, Blockchain/Fintech, Big Data, Cloud, AR/VR, Smart Factory, Autonomous Car, Drones). This project-based education differs greatly from the general lecture-based education method.

The executing agency should be a consortium of domestic and foreign educational institutions such as universities, research institutes, and large and small companies to jointly enable the close linkage between educational institutions and industries from curriculum development to employment. [131]

10.3 CROSS-BORDER TALENT OPPORTUNITIES

INSTITUTE FOR INFORMATION & COMMUNICATION TECHNOLOGY PROMOTION CENTER (IITP)

IITP has various programs and policies to promote cross-border talent opportunities. They include[132]

1. Promoting advance level courses for foreign students
2. Support foreign students to participate in research and development projects in businesses
3. Financial support for carrying out projects (up to 750 million won in 2018)
4. Promote utilization of foreign ICT talent for advance skills where there is a shortage of talent or lack of local universities providing such talent[133]

10.4 KEY INITIATIVES FOR TALENT DEVELOPMENT

South Korea's key ICT-related agencies, the Ministry of Science, ICT and the South Korea Communications Commission, have adopted as a top priority plans to foster new industries in response to the Fourth Industrial Revolution.

The Ministry of Science, ICT announced its 2017 goal as "leading the development of an information society through science, technology, and ICT innovation." To achieve its goal, the Ministry announced the following four strategies: (1) consolidation of the start-up ecosystem; (2) strengthening of R&D capabilities; (3) creation of new industries and services through integration and innovation; and (4) intelligent informatization to preemptively address the coming challenges of the Fourth Industrial Revolution.

" The Innovative Growth Youth Talent Concentration Training (IGYTCT) Program is a new project that will be launched this year (24 billion won in 2018) to address job vacancy. "

The Ministry announced plans to pursue and to fund the following initiatives and programs to further these four strategies:[134]

Proliferation of Creative Economy through Consolidation of the Startup Ecosystem

Operate future technology fund #1, #2 and #3 total of USD126 million

Establish "PanGyo Creative Economy Valley" as the center of Global Startup Innovation

Strengthening of R&D Capabilities

Expand fundamental research by encouraging open public participation through competition total of USD741 million

Establish "The First Research Fund in My Life" 1000 projects, total of USD25 million

Expand Programming-focused Universities - 20 Programming-startup Labs - 17

Creation of New Industries and Services through Integration and Innovation

Commercialization of future growth engines in 10 areas, including smart cars, intelligent IoT, advanced functional drones, and others

Invest in New Medicine total of USD28 million and Medical Equipment total of USD20 million

Expand IoT networks by private investment; Establish pilot projects using commercial clouds for education, finance, medical areas by May

Fund Software Companies total of USD33 million and increase the Digital Content Fund total of USD92 million

Accelerate space development, such as lunar exploration with NASA; and expand exports of Small and Medium Nuclear Power Reactors

Intelligent Informatization to Preemptively Address the Fourth Industrial Revolution

Encourage more use of public data storage, to promote data distribution and utilization

Improving regulations of VR and O2O

Proliferation of intelligent fusion services in industries such as manufacturing, medical, public transportation, smart home and others

Establish nationwide intelligent information society

The government has invested a total of 2.2 trillion won in the research and development (R&D) of intelligent technology by 2022 and decided to revamp the R&D system centered on researchers so as to stimulate inventive and challenging research.

In addition to fostering 46,000 people in intelligent R&D core talents, the company should expand its job safety network by strengthening its shift training and expanding employment insurance in response to changes in the employment structure.

In addition, the company will work on the creation of an industrial ecosystem through the commercialization of the world's first 5G mobile communication (March 2019) and the development of major industry-specific big data-specialized centers.

The company will also start work on re-designing sector-specific regulations and systems in the direction of innovation in the next year by introducing a "regulated sandbox" that alleviates regulations under the existing laws and regulations for new industries.

The innovation adventure fund, which invests in new business with high risk but high reward in case of success, is set to 10 trillion won and the prospect of the Fourth Industrial Revolution by sector is included in the priority purchase of public institutions up to 15% in 2022 (from 12% in 2016).

In the medical field, expansion nationwide in the electronic communication of medical information, customized diagnosis and treatment, and innovation of new drug development based on artificial intelligence (AI) will be promoted. The goal is to extend average life expectancy by 3 years and increase the health industry export by 30%.

The government plans to eliminate the welfare blind spot by introducing nursing care and nursing support robots in the welfare field, assisting elderly people with dementia, and improving dementia prediction by 18%.

In the city, the government will implement a sustainable smart city model expanding intelligent smartphones based on autonomous control, solve urban problems, and realize a life revolution in the home.

In manufacturing, the goal is to expand smart factories and to create "manufacturing as a service."

In the transportation sector, traffic congestion is expected to be reduced by 10% and traffic accidents by 5% by expanding intelligent traffic lights and advancing the prediction of accident risk. Semi-autonomous vehicles capable of running highways will be commercialized. Autonomous ships will be adopted in an aim to grow the current market by 20 times.

In the field of defence, intelligent defence monitoring and AI-based intelligent command system will be introduced to increase the unmanned rate to 25% by 2025 to respond to the reduction of troop resources.[135]

ANNOUNCEMENT OF INVESTMENT MORE THAN KRW 30 TRILLION IN INNOVATION GROWTH BY 2022 REGARDING 8 KEY LEADING BUSINESS

KEY AGENDA	PLAN
Untra Connected Intelligence	Establishment of national big data support system (Deployment of public & private Big data specialized center, etc.), Deployment of core network infrastructure (commercialization of 5G for the first time in the world), training of core manpower (46,000 experts by 2022)
Smart Factory	Deployment of pilot project of factory by industry and size (50 factories by 2022) Operation of smart factory fund (2018, KRW 330B), smart factory-based technology R&D (2018, KRW 4B)
Smart Farm	Preparation (Establishment of smart farm incubation center) => Start up (fund for agri-food venture) => Support for establishment of entrepreneurial ecosystem to growth (technical support such as R&D voucher)
Fin Tech	Establishment of regulatory sandbox (Special Act on Financial Innovation Support), Guarantee of self-determination of personal information (Mandatory provision of personal information to the third party when customer requests), Strengthening the base for utilizing Big Data
New Business of Energy Industries	Promotion of large-scale projects utilizing public institution sites, reinforcement of participation incentives for local residents and general public (e.g. deductions for agricultural land use charge), maintenance of construction location regulation
Smart City	Demonstration project of smart city(2022), Smart City Renewal New Deal Project (5 regions in 2018), Smart City-based technology R&D (2018, KRW 7.7 billion)
Drone	Expansion of R&D of technology development (ultra-precise GPS correction system-based traffic management system), establishment of demonstration infrastructure (expansion of flight test site), support of market development (3700 units by 2022, organization of drone military unit)
Autonomous Vehicle	Expansion of R&D of technology development (related to core parts such as high-resolution camera and radar), expansion of demonstration infrastructure (test bed (Hwaseong K-City), demonstration project (Pangyo, Pyeongchang))

ROLE OF THE GOVERNMENT IN SOUTH KOREA[136]

South Korea's Ministry of Science and ICT to Cultivate Talents in the preparation of preparation for the 4th Industrial Revolution

- The establishment of 12 "University ICT Research Centers" in several the country's top universities
- These centers are intended to recruit and nurture fresh talent in critical technologies

The 12 selected Universities as ICT Research Centers:

- **Kangwon National University,**
- **Korea University,**
- **Kookmin University,**
- **Sogang University,**
- **Sejong University,**
- **Soongsil University,**
- **Ajou University,**
- **Pohang University of Science and Technology (Postech),**
- **Korea Advanced Institute of Science and Technology KAIST)**
- **Korea Polytechnic University,**
- **Hoseo University.**
- **Ajou University will host 2 separate ICT Research Centers focusing on different technologies at its Suwon campus.**

Roles & Responsibility of the Institute of Science and Technology

Signed a business agreement with the Ministry of Science and ICT (MSIT) for change and cooperation.

The Ministry of Science and ICT and Korea Advanced Institute of Science and Technology (KAIST), Gwangju Institute of Science and Technology (GIST), Daegu Gyeongbuk Institute of Science and Technology (DGIST), Ulsan Institute of Science and Technology (UNIST), and Union of Science and Technology (UST) announced the reorganization of Role and Responsibility (R&R) and concluded a business agreement to implement this.

There has been a continuing need for the public to continue to change and innovate according to the rapidly changing policy environment, such as the arrival of the Fourth Industrial Revolution and the decline of the school-age population * as the higher education institutions receive government funding.

* (18-year-old school population forecast) 697,000 in 2010 → 501,000 in 2020 → 448,000 in 2030 the core mission of the organization (see Annex) set the key six kinds of information

* ① Re-establish R&R to lead the Fourth Industrial Revolution of people-centered ② Strengthen autonomous innovation, responsibility, and ethical management ③ Intensify I-KOREA 4.0 and concentrate job creation capacity ④ Create national task performance achievement ⑤ Improve the quality of life and national benefit ⑥ Enhance collaboration between institutions

- KAIST installs 30 industry custom artificial intelligence (AI) programs until 2021 to support the retraining of AI associated industry workers
  - In 2021, aiming to become the top 20 University of Science (QS World University Rankings, currently 40th), KAIST does worldwide convergence collaborative research such as basic research hub building, new-generation collaborative laboratory operations, and intensive investment in KAIST's 10 research fields.

- GIST is fostering students start-up enterprise by leveraging the highest level of entrepreneurship infrastructure and founded a one-stop platform for residents (Creative Space G, planned to open in July 2018) to provide up to 600 new jobs by 2023.

- The DGIST will conduct practical research, which is the strength of DGIST, by setting up an open convergence research group (CoE) as a unified cross-disciplinary research model, and expand technology-based start-up companies from 28 companies to 45 by 2021.

- The UNIST plans to expand the number of UNIST Family * companies from 41 currently to 100 by 2022, and to support 10 local competitive but small technology-based companies with innovative technology commercialization and investment linkage.
  * Supports research and development and resolving companies' difficulties through 1: 1 matching including patents, research personnel, and research equipment.

- UST establishes and operates a major based on a national strategic sector or issue areas flexibly and plans to maximize the difference with other universities through project-based field-oriented training in use of personnel and equipment.
  * Example ICT fields are artificial intelligence and machine running, environmental fields such as fine dust, and safety fields such as earthquake and radiation

" There has been a continuing need for the public to continue to change and innovate according to the rapidly changing policy environment, such as the arrival of the Fourth Industrial Revolution "

- The above four institutes agreed to open up resources including education, research, and start-up infrastructure to the public and take the lead in realizing the university's social value.

- They will provide free access to library integrated portal service (Starlibrary, https://starlibrary.org), free open online lecture service (Star-mooc, https://www.starmooc.kr), artificial intelligence training for industry, one-stop platform support for start-up support to the public and will strengthen social responsibility.

SCHOOLS IN SOUTH KOREA

The Ministry of Education (MOE) will develop general ICT in education policies, and oversee and regulate the entire project. The City and Provincial Offices of Education will lead informatization projects throughout kindergarten, elementary, and secondary education; universities will implement informatization projects throughout higher education; while affiliate organizations, based on their respective tasks and functions, will support but not be limited to informatization services in various areas, including kindergarten, elementary and secondary education, higher education, special and lifelong education, vocational education, international cooperation, and faculty training.

CLASSIFICATION	SUBJECT	DOMAIN	CONTENTS
Elementary School	Practical Course (Grades 5~6)	Life & Information	▪ IT devices & cyber space ▪ Production & use of multimedia materials
Middle School	Technology & Home Economics (Grades 1~3)	Information Communication Technology	The world of ICT ▪ Computer & communication ▪ Information & communication technology experience & problem-solving activities
High School	Information (Optional)	Information Science & Information Communication Ethics	▪ Information science & Information society ▪ Ethical use of Information ▪ Side-effects of Information society & preventative plans
		Configuration & Operation of Information Devices	▪ Composition & operation of computers ▪ Understanding operating systems ▪ Understanding networks
		Representation & Management of Information	▪ Data & Information ▪ Binary representation of Information ▪ Structuralizing of Information
		Problem-solving Methods & Procedures	▪ Problem-solving ▪ Trouble shooting procedures ▪ Basis of programming

BASIC DIRECTION

1 On-campus personnel/ bachelor's system reorganization, dedicated personnel, and R&D fund support

2 R&D support from the university to the center in the neighborhood → **2.1** Ideas exchange; **2.2** Networking (university -enterprise -investor); **2.3** Growth of entrepreneurship and business to support this through; **2.4** Creating jobs

10.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

JOB CREATION POLICY IN ICT

Ministry of Science ICT is responsible for the creation of jobs based on science and technology and ICT. The Ministry of Science and ICT has developed the world's top R&D investment, human resource, and robust manufacturing base, and has achieved a high level of job creation potential through the advent of the 4th industrial revolution and the spread of open platforms.

Under the vision of "Science and Technology-based Jobs Leading Innovative Growth", the Ministry will promote key strategies of "Creating Job Creation Infrastructure and Creating ICT Based Jobs

"PROMOTION STRATEGY- CREATING JOB CREATION INFRASTRUCTURE"

With the demand of more than 200,000 new talent by 2020, the gap between supply and demand can be reduced by the reorganization of the curriculum and vocational training under the cooperation of the related ministries.

In order to nurture professional manpower such as artificial intelligence (AI) and software (SW), the ministry will establish a graduate school specializing in intelligence information and expand SW-oriented universities up to 39 in the year 2020.

FIELD	MAIN CONTENT
Intelligence information	Reorganization of IT Research Center (ITRC) Specialization of intelligence information Establishment of graduate school for developing top-level experts in intelligence information field (~ 22 years)
Software	Expanding SW-oriented university (20 in '17 30 in '19) Training 20,000 core SW specialists and convergence talents to create new industries and jobs (~ 22 years)
Information Security	Until 2022, key talents are cultivated through the development of industry-academy cooperation curriculum and the establishment of a graduate course in information security cooperation between industry and academia,

The educational content developed in relation to the 4th Industrial Revolution was released on the online platform (titled 'Star-Mooc') to expand the accessibility of the public.

In particular, plans will be made to reduce ICT R&D projects in connection with additional hiring of outstanding researchers so that R&D projects can be linked to job creation in the field.

Through the amendment of the Information and Communications Convergence Law, the government introduced negative regulatory principles for new industries and local jobs, and uncovered projects to apply the regulatory sandbox, which demonstrates innovative new technologies and services under limited conditions despite existing regulations.

"PROMOTION STRATEGY- CREATING ICT-BASED JOBS"

The government aims to promote the artificial intelligence R&D project and foster big data specialist centers, and to foster ICT-based convergent contents. It promotes the employment of derivative industries such as network equipment by early commercialization of core infrastructure such as 5G network ('19) and 10G Internet service ('18).

FIELD	MAIN CONTENT
A.I	Fostering artificial intelligence experts in Korea through the launch of the AI Strategic National Strategic Project and the flagship project, and open algorithm and computing power infrastructure.
IoT	Fostering artificial intelligence experts in Korea through the launch of the AI Strategic National Strategic Project and the flagship project, and open algorithm and computing power infrastructure.
Big Data	Raising the competitiveness of data industry by fostering big data specialist center and advancing data platform
Cloud	Establishing Cloud Demonstration District

CLASSIFICATION	MAIN ROLES & RESPONSIBILITIES
Ministry of Science, ICT	Oversee national informatization policies
Ministry of Education (MOE)	Oversee education informatization master plan
Universities	Plan & execute informatization projects throughout higher education
City & Provincial Offices of Education	Plan & execute informatization projects throughout kindergarten, elementary & secondary education
Affiliated Organizations	▪ Support MOE, Universities, City & Provincial Offices of Education ▪ Plan & Execute Informatization Projects assigned to respective organization

National IT Industry Promotion Agency (NIPA), together with the Information and Communication Technology Promotion Center (IITP), contributed to the creation of jobs in the government, supporting projects with a total of over US$895 million including regional software (SW), ICT convergence, research and development (R&D) and will create jobs by selecting business operators.[137]

In the case of R&D projects, the government plans to reduce private contributions to be paid by private companies when recruiting young people, and to support labor costs for participating researchers at start-up companies.

The Software Policy Research Institute (SPRi) also plans to publish research results so that government, schools, and corporations can respond in a proactive manner by forecasting and analyzing future jobs[138].

THE FEDERATION OF KOREAN INFORMATION INDUSTRIES (FKII)

FKII is a federation that represents the ICT industries in South Korea. They provide various services to its members and are active in building the local ICT industry. Among their activities are[139]:

- Driving innovation in the ICT industries through industry-wide strategic recommendation and provision of up to data
- Ensuring the industry remains competitive and building a market for Korean ICT products and services
- Support the South Korea ICT industry to go global
- Talent development within the ICT industry
- Taking on special projects from time to time

FKII TALENT DEVELOPMENT INITIATIVES

As part of their support towards a modernized and future-oriented ICT industry, FKII participates in developing the talent that will drive and support this vision. Their activities include[140]:

- ICT mentoring programs
- ICT internship and apprenticeship programs
- CIO Academy
- ICT training programs
- ICT competition (World Embedded Software Contest)

SOFTWARE PRACTICAL CAPACITY ASSESSMENT 'TOPCIT'

The demand for institutions and companies for the 'TOPCIT', a software-licensed qualification system managed by the government (the Ministry of Science, ICT and Future Planning, or MSIP, and the Information and Communication Technology Promotion Center, or IITP), is increasing.

Test of Practical Competency in ICT (TOPCIT) is a performance-evaluation-centered test designed to diagnose and assess the competency of information technology specialists and software developers, which are critically needed to perform jobs on the professional frontier.

The interest in TOPCIT is not only a matter of recruiting companies but also of expanding alliances with universities. Currently, 62 universities have signed contracts for the introduction and utilization of TOPCIT. TOPCIT has been used as a verification tool for the workforce in the industry. In the academe, it has been used in the curriculum plan that reflects the demand of the industry.[141]

10.6 KEY MINISTRIES AND GOVERNMENT BODIES THAT DRIVE TALENT STRATEGY AND DEVELOPMENT

CLASSIFICATION	MAIN ROLES & RESPONSIBILITIES
Ministry of Science ICT	Developing science and ICT policies including HRD
Ministry of Education	Overseeing education policy in elementary, middle, high school and universities
Information and Communication technology Promotion Center (IIPT)	Executing HRD programs

National IT Industry Promotion Agency (NIPA), together with the Information and Communication Technology Promotion Center (IITP), contributed to the creation of jobs in the government support projects with a total of over USD 895 million including regional software (SW), ICT convergence, research and development (R&D) and to create jobs by selecting business operators. In the case of R&D projects, government plans to reduce private contributions to be paid by private companies when recruiting young people, and to support labor costs for participating researchers at startup companies.

The Software Policy Research Institute (SPRi) also plans to publish research results so that government, schools, and corporations can respond in a proactive manner by forecasting and analyzing future jobs.

Although public sector jobs grew by 29,000 jobs in 2016, they accounted for 8.9 percent of jobs in the second year. The general government (excluding public enterprises) accounted for 7.6% of all jobs. Less than half of the Organization for Economic Cooperation and Development (OECD) average (18.1%). The government's response to the policy goal of creating public jobs attracts attention. Compared with OECD countries, the ratio of general government jobs in Korea is very low. In the OECD countries, the average general government job rate is 18.1% Korea, meanwhile, recorded 7.6% in 2015 and last year, at 42% of the OECD average. The public-sector accounts for a relatively small proportion of the total number of jobs, which means there is room for future employment expansion. President Moon said he will increase the number of public sector jobs by 810,000 during his five - year term.

11. TAIWAN

11.1 INTRODUCTION

From 2008 to 2015, Taiwan's annual economic growth rate reached about 2.8%, and the proportion of agriculture in GDP fell from 35% in 1952 to 5%. Taiwan's electronics industry plays a pivotal role in the world economy, and a certain number of computers or electronic components are produced in Taiwan. Foreign trade is an important economic lifeline of Taiwan. In the past, the United States and Japan have been Taiwan's top two trading partners for a long time. Now, the focus of the market and talents is transferred to mainland China. The GDP in 2017 is about 2.6%. In the future, Taiwan's relatively flexible Taiwan dollar exchange rate will stabilize the overall import and export performance of Taiwan. The average GDP of Taiwan is estimated to be around 2.5% from 2018 to 2019.

	2017 GDP (M/USD)	2017 GROWTH RATE	2017 GDP PER CAPITA	2017	2018 (E)	2019 (I)
Taiwan	579,302	2.6	24,577	571,453	588,277	604,859

Source: Dgbas.gov.tw

LABOR FORCE PARTICIPATION RATE

YEAR	TAIWAN'S POPULATION ('K)	LABOR ('K)		
		TOTAL	EMPLOYMENT	UNEMPLOYMENT
2011	23077	11,200	10,709	491
2012	23148	11,341	10,860	481
2013	23218	11,445	10,967	478
2014	23262	11,535	11,079	457
2015	23319	11,638	11,198	440
2016	23364	11,727	11,267	460
2017	23404	11,795	11,352	443

Source: stat.gov.tw

ICT INDUSTRY IN TAIWAN

In 2015, service industry investment accounted for 49.8% of domestic fixed investment, but it was lower than other advanced countries, indicating that service industry investment needs to be strengthened.

Manufacturing investment accounted for 44.9%, ICT industry investment accounted for about 30%, both higher than the industry's overall industry GDP (30.1% and 16.5%, respectively)

Taiwan's industrial investment is mainly based on hardware manufacturing. Facing the rapid development of digital new economy, software and system services are increasingly important.

11.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

ICT Job Supply from university has ICT oriented education, but the graduate will increase steadily each year.

EDUCATIONAL DEPARTMENTS	2015	2016	2017E	2018F	2019F
Math & Statistics Depts	3,467	571,453	588,277	604,859	604,859
Computer Science Dept.	15,954	16,101	16,533	16,913	17,133
Engineers Dept.	65,001	66,171	67,350	68,575	69,809
Total	84,422	85,774	87,412	89,060	90,550

Source: www.edu.tw

In response to the technological development trend of artificial intelligence (AI), the Office of the Science and Technology Conference of the Executive Yuan plans to train 21,000 AI talents by 2021 and promote the AI innovation platform. It is expected to develop more than one-hundred AI application solutions.

FOUR-YEAR AI DEVELOPMENT PLAN

To promote 21,000 AI talents in four-year span, the plan includes looking for 20,000 talents in smart technology application, and 1,000 talents in high-level research.[169]

The Ministry of Technology provides 121 grants to college and vocational schools in 2017[170]

1. School of Management
2. School of Design
3. School of Information System
4. School of Tourism
5. School of Social Science
6. School of Communication
7. School of Education and Foreign Language
8. School of Health Technology
9. School of Law
10. School of International Studies

Advance Research (PhD Researcher)	RECRUIT/ EDUCATE/ TRAINING RESOUCES	INDUSTRY-UNIVERSITY COOPERATIVE PROGRAM RESOURCES
High-Level Talents & Engineers (University)	Ministry of Economic Affairs assists recruitment	1. Ministry of Education organizes research projects 2. Ministry of Science and Technology
Basic Technology / Service Talents (Technical & Vocational School)	1. Ministry of Economic Affairs organizes industry talents development program 2. Ministry of Labor organize training program	Ministry of Education, Labor & Economic Affairs organizes cooperative program
Craftsman / Operator (Technical & Vocational School)	Ministry of Labor organize training program	Ministry of Education, Labor & Economic Affairs organizes cooperative program

TAX INCENTIVES FOR SPECIAL ZONES

The following tax incentives are offered to businesses in science parks, export processing zones, and agricultural technology parks, along with businesses in logistics centers and free trade zones.[171]

Indirect Tax Incentives	Export Processing Zones	Science Park	Agricultural Technology Parks	Bonded Factories	Bonded Warehouses	Logistics Centers	Free Trade Zones
Import of Raw Materials and Machinery from a Foreign Country	Duty free Commodity tax free VAT free				Duty free, Commodity tax free, VAT free, Tobacco and alcohol tax free No tobacco health and welfare surcharge No trade promotion service fee No port dues		-
Import of Goods for Use in Operations	-						Duty free, Commodity tax free, VAT free, No trade promotion service fee No port dues
Import of Fuel, Materials and Semi-Finished Materials	Duty free Commodity tax free VAT free			-	Duty free, Commodity tax free, VAT free, No trade promotion service fee No port dues		-
Import of Self-Use Machines. Equipment	Duty free Commodity tax free VAT free			Duty free, Commodity tax free, VAT free, No trade promotion service fee	-		Duty free, Commodity tax free, VAT free, No trade promotion service fee No port dues
Export of Products/ Services to a Foreign Country	0% VAT (commodity tax free, no specifically selected goods and services tax)						
Purchase of Raw Materials, Fuel, Supplies, Semi-Finished Materials, and Machinery from a Non-Bonded Area in Taiwan	0% VAT						

OTHER TAX INCENTIVES: R&D

To promote industrial innovation, if a company or limited partnership has not committed severe violations of environmental protection, labor, or food safety and health laws, it may take a tax credit of 15% of R&D expenditures applied in one year or a tax credit of 10% over three years. The tax credit serves to offset R&D from the payables for the current year and may not exceed 30% of profit-seeking enterprise income tax due for the current year.

If a Taiwan national, company, or limited partnership receives revenue from the licensing of intellectual property obtained from conducting its own research within the range of the self-developed IP, it may deduct up to 200% of the amount of the R&D expenses for that year from the amount of taxable income for that year. Companies or limited partnerships may elect to either double this deduction or choose the investment deduction described in the previous paragraph.

SMEs that meet a designated investment amount for innovation and R&D activities can avail themselves of a tax credit of up to 30% of the current year's profit-seeking-enterprise income tax, in accordance with the Act for Development of Small and Medium Enterprises. They can do this by selecting one of the following two tax credits: (1) 15% of R&D expenses applied to the current year, and (2) 10% of R&D expenses applied for three years, however, the deductible amount may not exceed 30% of the current year's profit-seeking enterprise income tax.[172]

LOW-INTEREST LOANS

INCENTIVES

Loans for promoting industrial innovation or R&D: Applicable to all innovation and R&D projects relating to internet, manufacturing, technical services, distribution services, and cultural and creative industries. Loans can be up to 80% of total expenses of the approved plan up to a maximum amount of US$2.1 million per loan. Government assistance must first be deducted.

Preferential loans for companies in agricultural technology parks: Loans of up to US$2.6 million are available for the development or purchase of factories or related facilities and equipment, along with operational revolving funds. If the company is 50% or more foreign-owned, its investment in the park must be at least US$2.6 million and its paid-in capital must be at least US$0.98 million.

Loans for production, marketing, operations and R&D by farmers' associations and agricultural enterprises: Loans of up to US$1.6 million are available for production, marketing, operations, and R&D by farmers' associations and agricultural enterprises engaged in businesses that promote government agricultural policy.

Loans for machine and equipment upgrades: Loans are available primarily for the purchase of automated machinery and equipment, pollution prevention equipment, and energy efficient equipment. The loans provided for each investment plan shall not exceed 80% of the total cost of the plan, and the total loans provided to each applicant shall not exceed US$13 million. For plans on the purchase of pollution prevention equipment, the maximum investment value is US$32 million.

Project financing to assist with corporate mergers and acquisitions: Financing provided is primarily to assist enterprises with merger, acquisition, and split-up plans. Financing for each plan shall not exceed 70% of the total cost of the plan. Total financing provided to each applicant shall not exceed US$32 million.

REQUIRED PROFESSIONS

Power Supply Design Engineer

Study power supply, transformer, battery charging technology, control circuit specification design, manufacturing and testing

Circuit Design Engineer

Research, design and development, simulation and verification circuits, etc.

Firmware and Driver Design Engineer

Integrated development of embedded systems, development and testing of hardware and software modules, analysis and resolution of system problems

Institutional Design Engineer

Institutional design analysis and improvement, new product design and part size setting, development and production of new parts with molds

Systems Integration Design Engineer

Application design and development engineer

Software and hardware integration development engineer

TAIWAN IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	1,656	1,803	1,995
Cloud Solution Architect	2,528	3,214	4,018
Computer Systems Analyst	13,217	13,259	13,421
Cybersecurity Consultant	1,880	2,080	2,320
Data Scientist	828	902	998
Internet of Things (IoT) Developer	5,449	6,213	7,059
IT Infrastructure Engineer	4,044	5,143	6,429
Mobile and Web Application Developer	16,468	16,080	15,991
Network Engineer	3,033	3,857	4,821
Software Developer	7,930	7,956	8,053
Taiwan Total	**57,032**	**60,505**	**65,104**

The working-age population aged 15 to 64 in Taiwan reached 1,1795,000 in 2017. It is expected to decline in 2018, with an average annual decline of 180,000. In the next 50 years, the working population in Taiwan will be reduced by half. Half of the working population will be in the middle and upper age groups of forty-five to sixty-five years old, and the government must respond as early as possible.

Although the most fundamental way to solve the aging crisis is to increase the fertility rate, the National Development Council will start from improving the labor participation rate and recruiting talents, that is, loosening restrictions on foreigners to slow down the impact of the natural decline of the Taiwanese labor force on the economy.

The Ministry of Education (MoE) is responsible for setting and maintaining education policies and managing public institutions of education throughout Taiwan. The education system comprises:[173]

BASIC EDUCATION:

- Elementary education (six years)
- Junior high school education (three years)
- Senior secondary education (three years of either senior vocational schools or senior high schools)
- Higher education institutions, including colleges, universities, institutes of technology, and graduate schools and postgraduate programs

Ministry of Education
(Taiwan, R.O.C.)

The 17th Mid-Term Plan - "Four-Year National Development Plan (2017–2020)": Following the President's philosophy of national governance and the Premier's administrative guidelines, as well as taking into account international development trends and important domestic issues, the plans set out the national development vision, objectives, and strategies and will serve as the overarching policy blueprint of the government over the next four years.

Internal Issues

Shortage of manpower and talent:
Population aging; talent loss

Investment stimulation and industrial upgrading:
With re-industrialization in Europe and North America and the rise of China's autonomous supply chain, industrial transformation is urgently required.

Salary level and income distribution:
Employee remuneration as a percentage of GDP continues to fall. Attention needs to be paid to issues regarding low salaries for young people and wealth concentration.

1. INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE (ITRI)

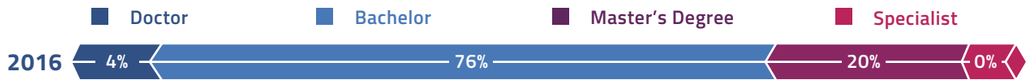
The ITRI and the Institute For Information Industry(III) are the two major institutions in Taiwan that promote and educate the industrial innovation. Under the trend of software and hardware integration, the Institute of Industry and Innovation Talents Training Center is established by integrating the resources and energy of both parties. In line with the government's "Digital Countries · Innovative Economic Development Program" and "Five Plus Two Industry Innovation R&D Programs" and other government policies. ITRI College will continue to educate relevant talents in emerging key areas such as digital transformation, smart machinery, green energy technology, smart networking, and artificial intelligence. Training courses to shorten the gap between Taiwan's key industry professionals and improve the quality of relevant talents to help Taiwan's industry successfully grasp future opportunities and have a place in global competition.

INFORMATION ON SUPPLY OF TALENT: EXCELLENT LABOR FORCE

Taiwan's excellent labor force is boosted by its universal education system, which each year adds more than 300,000 new graduates at the junior college and university level or above. In 2016, 5.57 million employed persons, or 49.45% of the labor force, had at least a college degree.

In the World Economic Forum's "Global Competitiveness Report 2017–2018," Taiwan's ranking for labor market efficiency is number 25 out of 137 economies. This ranking is attributed to a tax system that encourages people to work and an increase in the labor participation rate among women. The government continues to promote world-class universities and research centers that will turn Taiwan into an East Asian center for higher education and a major exporter of Chinese-language education. By drawing on these resources, multinational enterprises can satisfy the manpower needs associated with entering the Asia-Pacific market. [174]

	2012	2013	2014	2015	2016
No. of Universities	71	70	71	71	71
No. of Graduates	309,333	311,041	309,849	309,277	304,649



11.3 CROSS- BORDER TALENT OPPORTUNITIES

OTHER TAX INCENTIVES - BIOTECHNOLOGY AND NEW PHARMACEUTICAL INDUSTRIES

For biotechnology and new pharmaceutical companies, 35% of R&D and employee training expenditures may be claimed as a deductible expense against the current year's payable business income tax. If the current fiscal year's expenditure on R&D or employee training exceeds the average amount spent in the previous two fiscal years, half of the excess amount may be claimed as a deductible expense.

When for-profit enterprises invest in the founding or expansion of biotechnology or new pharmaceutical companies and also have been or become a registered shareholder for a period of three years or more, 20% of the amount invested may be claimed as a deductible expense against their payable business income tax.[175]

LAND AND MANAGEMENT FEE INCENTIVES FOR EXPORT PROCESSING ZONES

2. INCENTIVES IN KAOHSIUNG SOFTWARE PARK

LAND RENT INCENTIVE MEASURE	INCENTIVES
Enterprises in the Park (That Lease-to-Build) 555 Incentive 006688 Incentive	50% discount on land rental during construction is given. There is a limit of three years, and it can only be used one time for each plot of land. The "006688" land rental incentive plan is offered at the start of operations. It can only be used one time for each plot of land. The plan offers a 40% land rental discount during years 1 and 2 and a 20% discount during years 3 and 4. Standard rent is charged starting year 5.
Enterprises in the Park (That Purchase a Buildings from a Developer) 006688 Incentive	The "006688" land rental incentive plan is offered at the start of operations. It can only be used one time for each plot of land. The plan offers a 40% land rental discount during years 1 and 2 and a 20% discount during years 3 and 4. Standard rent is charged starting year 5.

3. INCENTIVES IN TAICHUNG SOFTWARE PARK

LAND RENT INCENTIVE MEASURE	INCENTIVES
Developers 555 Incentive	50% discount on land rental during construction is applied. There is a limit of three years, and it can only be used one time for each plot of land. Standard rent is charged starting from when the first enterprise begins using the building (when the enterprise completes tax registration with the National Taxation Bureau).
Enterprises in the Park (That Purchase a Building from a Developer) 006688 Incentive	The "006688" land rental incentive plan is offered at the start of operations. It can only be used one time for each plot of land. The plan offers a 40% land rental discount during years 1 and 2 and a 20% discount during years 3 and 4. Standard rent is charged starting year 5.
Enterprises in the Park (That Lease-to-Build) 006688 Incentive	The "006688" land rental incentive plan is offered at the start of construction and operations. It can only be used one time for each plot of land. The plan offers free land rental during years 1 and 2, a 40% discount during years 3 and 4, and a 20% discount during years 5 and 6. Standard rent is charged starting year 7.
Park Management Fee (Limited to Business Operators Approved to Operate in the Taichung Software Park Before December 31, 2021)	Years 1 and 2: 40% discount on the management fee Years 3 and 4: 20% discount on the management fee Year 5 and After: Standard fee is charged

INVESTMENT WITH GOVERNMENT PARTICIPATION

The National Development Fund targets the Six Emerging Industries, the Four Major Smart Industries, and key service sectors, with government-held shares not to exceed 49% of the total equity of the invested enterprise. Moreover, the government has allocated US$325 million each for investment in SMEs, cultural/creative industries, strategic services, and strategic manufacturing industries, **therefore the expect of demand to increase emerging skill for example IoT, Big data and so sort will be vital.**

11.4 KEY INITIATIVES

The Executive Yuan announced the new budget for the first phase (September 2017 to December 2018) of the three programs for the development of the prospective infrastructure for talent development. There are 12 projects that make up the three programs. The total funding for the first program is budgeted at US$210 million, of which US$136 million is used for the talent cultivation.

TALENT CULTIVATION	US$136 MILLION
Optimize the technical school practical training plan	US$77 million
Promote international school and industry cooperation plan	US$21 million
Youth technology innovation and entrepreneurship incubator plan	US$8 million
Key industry high-level talent cultivation plan	US$13 million
Young scholars development plan	US$16 million

Source: Dgbas.gov.tw

Due to the advent of the Internet of Things (IoT) era, Taiwan attaches great importance to mobile, 5G, and artificial intelligence (AI) to create strong demand for the related talents. Taiwan's mobile talents must have product hardware and circuit design, product aesthetics, and creative design process capabilities. Cross-device user interface design and 5G talents must have communication protocol and software design capabilities, antenna, and RF design capabilities, as well as new embedded software technology. In addition, AI-related talents must have user experience design capabilities, computational thinking skills, and scientific data exploration/analysis.

However, there are very few graduates who study in these areas, and companies from neighboring countries such as Singapore, South Korea, and Hong Kong are actively coming to Taiwan to recruit information, technology, and other talents, which causes a serious shortage of talent supply and demand in Taiwan.

" There are 12 projects that make up the three programs. The total funding for the first program is budgeted at US$210 million, of which US$136 million is used for the talent cultivation."

	The Plans	Convenient/ Friendly environment	Import overseas talents
National Development Council	Contact Taiwan Improve Talents Stay Plan	Establish friendly living environment for foreign talents staying in Taiwan.	
Executive Yuan	Global Investment Promotion and Talent Service Center	Deregulate investment requirement of over 6 million.	Introduce key technologies and young entrepreneurs to Taiwan (with Silicon Valley)
Executive Yuan	Act for the Recruitment and Employment of Foreign Professionals	Ease of parents', spouses', and children's residence requirements; and provide retirement, health and tax benefits	Ease of working visa and living regulation requirement
Ministry of Science and Technology	Subsidy to recruit guest science and technology talents Leaders in Future Trend (LIFT)		Recruit talents to work in Taiwan, overseas second-generation youth (18~30 years old) returning to Taiwan; LIFT program to call on the talents of Taiwan to study abroad, return to the country to contribute their skills, and look-forward application trends back to Taiwan, and conduct in-depth exchanges with domestic industry, academia, and research circles
Ministry of Education	Taiwan Experience Education Program (TEEP) Yushan Project		Attract foreign youths to come to Taiwan to experience its culture through vocational training, short courses, research, or professional internships, supplemented by Chinese language studies and cultural activities Including "Yushan Scholars", "Higher Education and Deep Cultivation Plan", and "Professional Academic Research Plus 10% Increase" plans
Ministry of Economic Affairs, Industrial Development Bureau	Taiwan-Japan OB Network Industrial Cooperation Plan		Recruit key industry retired craftsmen; introduce key technologies from abroad and train high-level talents (such as Japanese machine industry retired craftsmen, Indian software talents, etc.) to provide assistance and employment awards for SMEs (such as interviewing transportation fees, etc.)
Ministry of Economic Affairs, Dept. of Investment Services	Hi Recruit-Contact Taiwan ASEAN Strategic Partner Program		Taiwan ASEAN Investment Strategy Partner Forum invites experts and scholars from Southeast Asia

11.5 ORGANIZATION INVOLVE IN TALENT DEVELOPMENT

1. INSTITUTE FOR INFORMATION INDUSTRY (III)

On May 17, 1979, the 1631th Council of the Executive Yuan passed the "Science and Technology Development Program" and decided that the government and the private sector jointly set up the "Information Industry Industry Council". On July 24th of the same year, under the vigorous efforts of Mr. Li Guoding, Mr. Li Guoding, he created a consortium with the purpose of "promoting the effective application of information technology, enhancing the overall competitiveness of the country, shaping the environment and conditions for the development of information industry, and enhancing the competitiveness of the information industry." Institute for Information Industry (III).

For more than 30 years, the Council has participated in the planning and development of various information industry policies, the development of forward-looking research and development, the popularization and deepening of information applications, the cultivation of information technology talents and the participation in national information infrastructure. Affirmed by all walks of life. In recent years, the policy committee has responded to rapid changes in the environment, and its objectives and tasks are as follows:

Advance the innovation and application of China's Republic of China's information technology, and assist in the development of digital economy

2. TZE CHIANG FOUNDATION OF SCIENCE AND TECHNOLOGY) (TCFST)

In 1973, the National Tsinghua University Alumni Donation Fund established the “Secondary Industrial Science and Technology Service Agency”, which initiated the road of scientific research and development and talent cultivation. In January 1997, it was renamed the Tze Chiang Foundation of Science and Technology, referred to as the Self-Strengthening Foundation (TCFST), to open a new page of national science and technology development with a more complete corporate organization and enterprise management.

In response to the development and demand of the technology industry, they help students acquire new technologies and concepts, enhance their knowledge and skills, and implement them in the workplace to enhance the work results and performance of the students and promote the rapid development of the industry. At the same time, it has become a global knowledge learning center and knowledge transfer platform.

3. DIGITAL EDUCATION INSTITUTE (DEI)

The promotion of the information industry and the development of the information society are the two main purposes of the establishment of the Information Industry Council. Adhering to this aim, the Digital Education Institute (referred to as the Institute of Education and Research) is actively investing in the analysis of industry and technology trends, and the investigation of corporate and social needs, as the development direction of information talent cultivation, learning technology research, campus industry counseling, etc.. It is hoped that the Institute will become the model institution for the cultivation of energy-enhancing entrepreneurship and the main driving force of the smart campus industry.

Taiwan faces a demographic shift in the working-age population, and because of this, it has established a legal system for foreign talents, visas, residence, health insurance, taxation, and pensions. Foreign middle-level technical talents in Eight Majors areas of technology, economy, education, culture and art, sports, finance, law, and architectural design are welcomed in Taiwan and can enjoy medical and tax services benefits.

> *“ Advance the innovation and application of China's Republic of China's information technology, and assist in the development of digital economy ”*

PURPOSE OF MAKING THE ACT FOR THE RECRUITMENT AND EMPLOYMENT OF FOREIGN PROFESSIONALS

The Act for the Recruitment and Employment of Foreign Professionals passed its 3rd reading in the Legislative Yuan on October 31, 2017. Promulgated by the President on November 22, it received the Executive Yuan’s green light to go into effect from February 8, 2018. The Act’s liberalizing contents and purposes are as follows:

Easing Rules for Stay of Parents, Spouses and Children

Easing rules for spouses and children of permanent resident foreign professionals to apply for permanent residency

Easing rules for spouses and children of foreign senior professionals to co-apply for permanent residency

Issuing personal work permits for qualifying adult children of permanent resident foreign professionals

Extending maximum length of family visit VISAs for lineal ascendants from six months to one year

Easing Work, VISA and Residency Rules

Issuing Employment Gold Cards to foreign special professionals

Issuing personal work permits to foreign freelance artists

Opening for foreign teachers with specialist knowledge or skills to teach in buxibans

Issuing employment-seeking VISAs to foreign professionals

Providing Pension, Health Insurance and Tax Benefits

Enabling permanent resident foreign professionals to join the new labor pension system, and enabling foreign public school teachers to receive monthly pension payments

Enabling the spouses and children of employed foreign professionals to be included in National Health Insurance coverage without a 6-month wait

Giving foreign special professionals a tax break of having income tax assessed on only half of their salary above NT$3 million for first three years in Taiwan

Aimed at building a friendlier work and residency environment, to induce foreign professionals to come to Taiwan and stay

THE ACT'S RECRUITMENT TARGETS, AND SUBSIDIARY REGULATIONS & AUXILIARY MEASURES

. The Act's recruitment targets are: Foreign professionals, foreign special professionals, and foreign senior professional
2. The Act contains 22 articles, involving the purview of 12 central goverment agencies, and requiring the making or amendment of 11 sets of subsidiary executive instruments (as detailed in the Appendix).
3. For more details, please refer the NDC dedicated webpage. For the Employment Gold Card application process, please go to the Ministry of the interior's Application Window for Foreign Professionals.

FOREIGN PROFESSIONALS

Means those engaging in professional work as listed in Article 46 Paragraph 1 Subparagraphs 1 to 6 of the Employment Services Act + freelance artists + buxiban teachers with specialized knowledge or skills.

FOREIGN SPECIAL PROFESSIONAL

After combining and balancing the current information provided by all central competent authorities on industry characteristics and needs, the proposed standards for qualification as a foreign special professional included national academicians, winner of well-known international awards, persons recommended by credible associations, persons of international repute who have held office in an overseas professional body, and executives serving at an important supervisory level or above.

FOREIGN SENIOR PROFESSIONAL

Means "senior professional personnel as needed by the State" as currently specified by Article 25 Paragraph 3 Subparagraph 2 of the Immigration Act, such as having distinctive talent in S&T R&D or managerial work at a special technology center or S&T institute, possessing unique capabilities in science, research, industry, commerce that enable the person to make substantial contribution to Taiwan's economy, industry, education or welfare, or having earned an award in an international competition.

Foreign recruitment targets

COMPREHENSIVE SERVICES

- Free professional matchmaking and website registration
- Provision of foreign professionals with variety of services in Taiwan (environment, arrival, residence, visa, work permit, labor, insurance and national health insurance, education for children, jobs)
- Personnel recruitment evaluation and solutions
- Professional recruitment-related government regulations[176]

RECRUITMENT MODEL :

InvesTaiwan Service Center (ITSC)

1 One -stop service center

2 ProjectManager offers customized services from beginning to end

(1) Job-matching services
(2) Comprehensive consultation services
Assisting professionals in evaluation before arrival, administrative application procedures, and relevant information in daily life, etc
(3) Tracking outcomes

Overseas Recruitment Services

1 32 mission worldwide with recruitment service windows

2 Each window has a network of talented professionals (Technology, academe, economy and trading overseas Chinese and foreigners etc)

National-level Network Platform (Department of Investment Services "Contact Taiwan")

1 Interactive job-matchmaking services

2 On-line consultation for working in Taiwan and other relevant inquiries about the daily life

Focussing on specific experts and cooperating with overseas mission of the Ministry of Foreign Affairs, the Taiwan External Trade Development Council, and private resources such as recruitment agencies to establish an efficient operation.

12. THAILAND

12.1 INTRODUCTION

The Labor Force Survey in May 2017 showed that the population aged 15 years and older is about 55.92 million. Of this, 37.98 million are in the labor force or available for work. About 37.10 million are employed, 501,000 are unemployed, and 375,000 are seasonally inactive, while 17.94 million are not in the labor force or not available for work, such as housewives, students, or elderly.

THE LABOR FORCE SURVEY IN MAY 2017

PERCENTAGE OF WORKFORCE

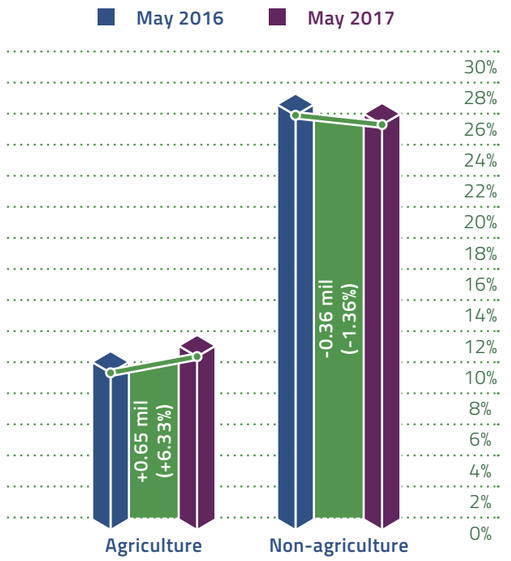
BREAKDOWN OF WORKFORCE

There are 37.10 million employed persons, of which 10.92 million are in agriculture and 26.18 million are in non-agriculture sectors, respectively.

Compared with May 2016, the number of employed persons in the agriculture sector increased by 0.65 million (from 10.27 million to 10.92 million) while the non-agriculture sector decreased by 0.36 million (from 26.54 million to 26.18 million).

These clearly indicates enterprises in Thailand are facing serious challenges in hiring fresh graduates due to lack of basic skills such as programming and a strong foundation in core subjects such as advanced mathematics.

THE NUMBER OF EMPLOYED PERSONS IN THE AGRICULTURE SECTOR



12.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

THAILAND IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	1,962	2,329	2,779
Cloud Solution Architect	1,756	2,101	2,485
Computer Systems Analyst	15,118	16,015	16,865
Cybersecurity Consultant	942	1,104	1,309
Data Scientist	981	1,164	1,389
Internet of Things (IoT) Developer	4,133	4,661	5,271
IT Infrastructure Engineer	2,810	3,362	3,977
Mobile and Web Application Developer	27,395	28,933	30,535
Network Engineer	2,108	2,522	2,982
Software Developer	9,071	9,609	10,119
Thailand Total	**66,275**	**71,800**	**77,711**

SOFTWARE PARK THAILAND

Software Park Thailand is an organization under the National Science and Technology Development Agency (NSTDA). It is responsible for supporting and strengthening the software industry, be it procurement of human resources, marketing, and securing investment and even the latest technology. This park aims to help each stakeholder in Thailand's software industry, from manufacturing to agriculture to the services sector: software can help increase these industries' efficiency and their potential. The government aims to grow the domestic software industry and instill confidence in this industry for overseas operators.

The vision and mission of the Software Park are as follows

- To be the region's number one organization supporting entrepreneurs and help create a strong world-class software industry that will enhance the strength and competitiveness of the Thai economy
- Promote transfer of technologies and IT management through high-end training course for IT professionals
- Promote quality standard improvement of local companies to the international level
- Promote and support collaboration with both local and international alliances for new market opportunities in Thailand and overseas
- Promote the usage of technology to all sectors to help increase productivity and competitiveness

350
Companies that participate in the project

3000
Income from creating jobs.

3500
An emplyment

Digital Park Thailand is a new economic cluster strategically located on the Eastern Economic Corridor (EEC) that aims to be the destination for global players and digital biz innovators. The park itself plays an important role as an ASEAN Economic Community (AEC) data hub with ultra-high-speed broadband infrastructure powered by CAT, including international submarine cable station, datacenter and satellite earth station, thus, Digital Park Thailand is fully capable to serve even the most stringent demand of global digital players.. The government will provide a maximum incentive package with both tax and non-tax measures, including RDI regulatory exemption, ease to do business, and privileges for investors and digital specialists. The park is going to be Thailand's premier digital showcase and will pioneer testbeds and the adoption of state-of-the-art digital technologies, Internet of Things (IoT), and artificial intelligence.

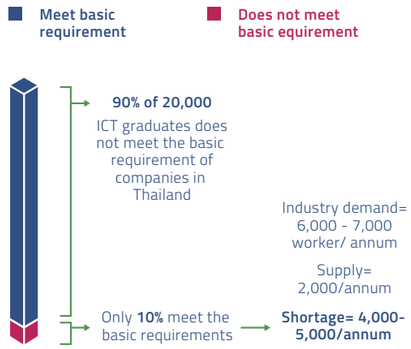
DIGITAL PARK THAILAND

Thailand is still facing talent shortage especially with the rise of emerging technology in the ICT industry. The gap in supply is due to Thai graduates lacking essential working skills. Many of them do not have enough skills to respond to the talent demand required in the country. This might be the consequence of the education system, talent initiatives, and other related resources that do not reflect the country's expectations and requirements. There is also a major gap between education institutes, businesses, and industries that results in low-skilled ICT talents. Furthermore, the education system in Thailand is seen to have an ordinary quality at all levels and a low level of technological readiness.

The new model of the education system, known as Education 4.0, focuses more on personalized learning that could help bring out the best talent from each graduate and build them to be more knowledgeable and skillful. It is imperative for the Thai government, with other responsible units whether public or private, to put in education program development because education is deemed a principal activity that develops skilled graduates to obtain a high-quality workforce.

90% of the 20,000 ICT graduates each year are unable to meet the basic qualifications or requirements of companies in Thailand. The entire industry will need about **6,000 to 7,000** workers annually, which translates to a skills shortage of **4,000–5,000** a year. To address these challenges, government and industry initiatives for talent development and policies for cross-border talent attraction should be given emphasis by the Thai government.

Gap Analysis for ICT Talent



The government should develop a collaboration program with the private sector and the education institutions to build a comprehensive road map for skills development that is consistent with and targeted to support its growth and development vision for the economy. Where resources permit, consideration should be given to set up one-stop service agencies, with sufficient autonomy and authority, to manage the various facets of the skills challenges.

12.3 CROSS-BORDER TALENT OPPORTUNITIES

There are 16 Public Universities and 55 Private and Regional Universities in Thailand producing approximately 20,000 ICT graduates every year.

NUMBER OF UNIVERSITIES

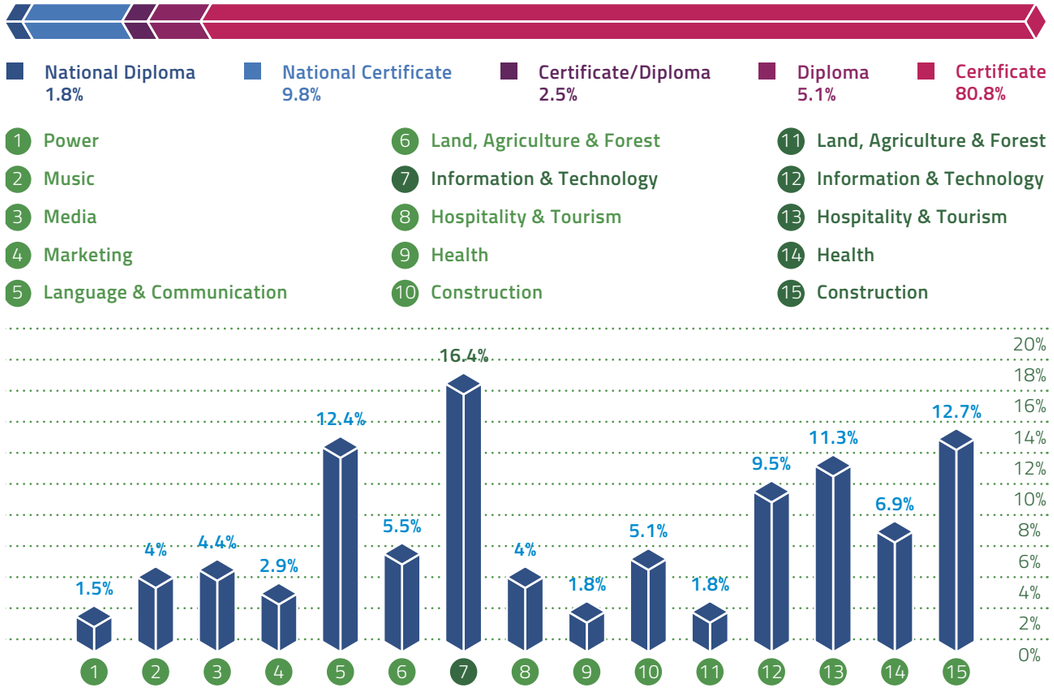
In Thailand, job vacancies for unskilled workers were found to be more prominent than those for skilled workers. Even though there are 20,000 graduates produced every year by these universities, many graduates still lack basic skills such as English language and numerical skills, including technical skills such as competency in computers and information technology (IT). Besides that,, the lack of non-cognitive skills such as creativity/innovative skills and leadership and communication skills are also a contributing factor to the poor quality of the labor force.

This leads ICT organizations to fill in vacant jobs by hiring workers from outside the region or from neighboring countries. The immigration of foreign workers plays an important role in reducing the shortage. The Thailand government should therefore emphasize working permit policies to ensure talents from different parts of the world can contribute their skills to the nation's economy. This can also increase the chance for Thailand talents to develop their skill sets by leveraging on those that cross-border talents can bring to the table.

The Ministry of Digital Economy and Society (MDES) should look into programs that can invite talents from different countries and emphasize on the wage provided to this group, which is a key concern for most of these talents.

12.4 KEY INITIATIVES

TVET PROGRAMMES



SKILLS TRAINING PROGRAM (STP)

STP is an intervention that aims to address the immediate human resource requirement in the labor market. The objective of the program is to provide employable skills to youth in the private sector, thereby contributing to private sector development.

The STP was initiated in the 9th National Development Plan. It is flexible in its implementation and mode of training delivery. Whereas the earlier STP was more training-based, the program in the 11th plan is employment-oriented. The STP is also effective in addressing the immediate short-term gap in the labor market, which otherwise cannot be met by other institute-based programs.

SECTOR	IN-COUNTRY	EX-COUNTRY	TOTAL
Trading & Services	178	30	208
Construction	295	80	375
Tourism & Hospitality	616	160	776
Health	5	267	272
ICT & Media	1,523	272	1,795
Arts and Craft	28	20	48
Production and Mining	0	3	3
Finance	190	0	190
Total	**2,835**	**832**	**3,667**

Source: Information provided by DHR, MoLHR July 2015

COURSE	MALE		FEMALE		TOTAL	
	NUMBER	%	NUMBER	%	NUMBER	%
Accounting	19	4.1	31	9	50	6.2
Beautician	1	0.2	1	0.3	2	0.2
Carving	30	6.5	0	0	30	3.7
Cooking	17	3.7	5	1.5	22	2.7
Handcrafts	17	3.4	108	31.2	123	15.2
Driving / Machine Operations	40	8.6	0	0	40	5
Electrical	54	11.6	33	9.6	87	10.8
Food	13	2.6	21	6.1	33	4.1
Housekeeping	2	0.4	13	3.2	13	1.6
Information Technology	19	4.1	24	7	43	5.3
Language Learning	5	1.1	1	0.3	6	0.7
Mechanical	127	27.3	46	13.4	173	21.4
Masonry	4	0.9	4	1.2	8	1
Painting	28	5.8	3	0.9	30	3.7
Plumbing	12	2.6	17	5	29	3.6
Security Guard	3	0.6	0	0	3	0.4
Tourism	52	11	7	1.7	57	7.1
Welding	3	0.4	6	1.7	8	1
Woodwork	19	4.1	23	0.4	41	5.1
Total	**465**	**100.0**	**343**	**100.0**	**808**	**100.0**

DEPA DIGITAL MANPOWER FUND

This is a funding program by Digital Economy Promotion Agency (DEPA) to develop and produce manpower in digital industry and innovation. The goals of the fund are as follows:

This fund focuses on the above areas and helps to promote, support, and implement human resource development with regard to digital industry and innovation. This initiative also supports the strategy of the national policy in building ICT talent.

CONNEXT ED

The project aims to develop a network of new-generation leaders who will play an important role in driving sustainable education in Thailand. This will be achieved through knowledge sharing and strategic planning in academic development with school administrations. The CONNEXT ED Project is a response to three of Thailand's needs: minimizing inequality in society, developing people's potential, and increasing competitiveness, which are all related to the country's human resource development strategy. It also involves activities in line with the United Nations Sustainable Development Goals (SDGs).

A total of 3,342 schools nationwide are participating in the project's first phase.

"The CONNEXT ED Project is a response to three of Thailand's needs: minimizing inequality in society, developing people's potential, and increasing competitiveness"

12.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

There are multiple institutes that focus on building ICT talent across the nation. They have taken several steps from theoretical learning to practical learning. Below are the participating institutes, academies, and training centers:

NSTDA ACADEMY

NSTDA ACADEMY's mission is to strengthen research, development, design and engineering (RDDE) and technology transfer and to support necessary S&T human resource development (HRD) and infrastructure development (infra) facilitated by efficient internal management. This academy focuses on computer system programs related to network, programming, and databases.

NESTEC ACADEMY

NECTEC is a statutory government organization whose main responsibilities include undertaking, supporting, and promoting the research and development of electronics and computer technologies. NECTEC also provides linkage between research communities and industries through the established industrial clusters and program. NECTEC was transformed into a national technology center under the National Science and Technology Development Agency (NSTDA) and the Ministry of Science and Technology.

Research, development, design, and engineering

Human resource development

Technology transfer to industries and communities

Policy research and industrial intelligence and knowledge infrastructure

IN-DEMAND CERTIFICATIONS

1. Project Management Professional (PMP)
2. AWS Certified Solutions Architect
3. AWS Certified Developer
4. Certified Information Systems Security Professional (CISSP)
5. Cisco Certified Networking Professional (CCNP) Routing and Switching
6. ITIL V3 Foundation

KEY MINISTRIES AND GOVERNMENT BODIES

13. VIETNAM

13.1 INTRODUCTION

Vietnam is a coastal country located in Southeast Asia. It is widely known as a tourist hotspot attracting visitors from all over the world. Vietnam's economy experienced a great year in 2017[177], with GDP growth above 5% and inflation remaining below 4%. The International Monetary Fund reports that the economy benefited from the following areas.

MACROECONOMIC ENVIRONMENT OF VIETNAM, 2017

GDP was reported at USD 220 billion USD in 2017. Unemployment is below 5% and is expected to remain stable according to forecast by the International Monetary Fund.

VIETNAM ECONOMIC SNAPSHOT[178]

SUBJECT DESCRIPTOR	UNITS	SCALE	2015	2016	2017	2018	2019	2020	2021	2022	2023	ESTIMATES START AFTER
Gross domestic product, current prices	U.S. dollars	Billions	191.5	201.3	220.4	240.8	264.9	290.6	316.8	344.7	373.8	2017
Unemployment rate	Percent of total labor force		2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2016
Population	Persons	Millions	91.7	92.7	93.6	94.6	95.5	96.4	97.3	98.2	99.1	2016

ICT WORKFORCE

The hardware and electronic sub-industries account for most of the ICT workforce. This trend is driven by heavy investment from electronic enterprises such as Samsung. Growth was recorded for ICT workforce in the software segment a there is a growing software outsourcing services sector, particularly app mobile developers.

ICT WORKFORCE BY INDUSTRY SEGMENT[179]

INDUSTRY SEGMENT	2015	2016	
		Workforce	% ratio
Hardware, electronic	533,003	568,288	72.8%
Software	81,373	97,387	12.5%
Digital content	44,320	46,647	6.0%
ICT Services	62,888	68,605	8.8%
Total ICT human resource	**721,584**	**780,926**	**100.0%**

13.2 FUTURE INDUSTRY DIRECTION AND IMPLICATIONS TO TALENT DEMAND

According to the Ministry of Information and Communication, the total ICT workforce in Vietnam will be between 1 to 1.2 million by 2020. Thus, Vietnam needs to develop around 400,000 IT talent by 2020.

One Government initiative to boost the ICT industry is "Industrial Information Centers" initiative. These centers will focus on the production and provision IT products and services. The government will provide a number of incentives to attract IT companies to operate from within the center.

INCENTIVE OFFERED AT INDUSTRIAL INFORMATION CENTERS

INFRASTRUCTURE

Provide supports for investment in technical infrastructure (inside and outside) in public transportation systems connected to the industrial information center

Incentive for electricity, water and telecommunications usage

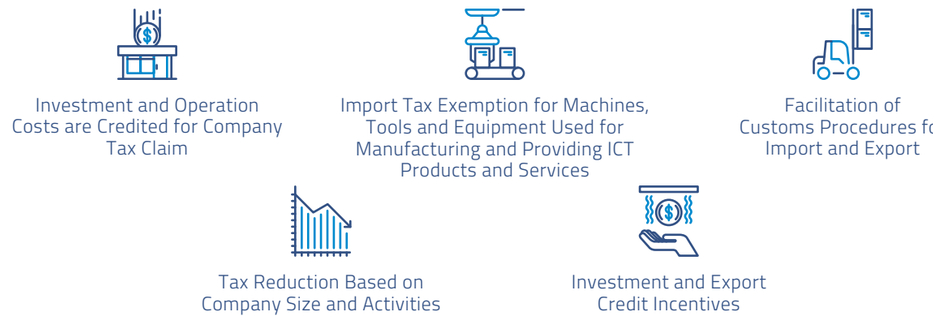
LAND RENTAL FEE

CREDIT AND CAPITAL

Fund Raising

Credit Investment Incentives from Government

MINISTRIES AND AGENCIES



Tax incentives are not confined to just companies operating from technology parks or information centers. There are nationwide tax incentives scheduled to enhance the development of the IT industry as a whole. The new Resolution "41/NQ-CP" provide tax incentives for both of IT companies and IT workforce.

INCENTIVE PROVIDED BY THE GOVERNMENT

Reduce 50% of personal tax income for:

Staff with the appropriate skill and experience in research, application development, managing and operating equipment, production line and information security system management

Highly skilled ICT staffs

FOCUS AREA OF IT TALENT DEMAND

Growth within the electronic and semi-conductor assembly in Vietnam with strong investment from Samsung and Nidec.

Increasing number of software companies. The number of software companies risen by 124% between 2012 - 2015, according to Vietnamworks, the leading HR recruit agency.

Vietnam continue to be attractive destination for outsourcing services with demand coming from Japan and U.S.

The IT adoption of local companies (digital transformation, industry 4.0, security) as well as increasing investment through FDI .

Rising trend of founding new startup.

FOCUS AREA OF IT SKLLS DEMAND

According to Vietnamworks, JavaScript, PHP, C#, HTML5, Java, C++, SQL, CSS, C and Objective-C are within the top 10 ICT skills with JavaScript having the highest demand

Project management professional and experienced IT engineer with certification in agile methodologies and technologies by Cisco, Microsoft and Amazon Web Service are also in demand

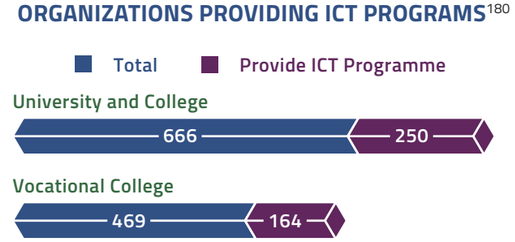
Data scientist, block chain, fintech, e-commerce, database management, mobile platform, games and network security have high demand in 2017

VIETNAM IN-DEMAND JOBS 2018-2020

	2018	2019	2020
Business Intelligence Consultant	456	541	664
Cloud Solution Architect	710	938	1,213
Computer Systems Analyst	9,598	10,362	11,039
Cybersecurity Consultant	527	618	733
Data Scientist	228	271	332
Internet of Things (IoT) Developer	1,867	2,120	2,407
IT Infrastructure Engineer	1,136	1,501	1,941
Mobile and Web Application Developer	19,807	20,846	21,849
Network Engineer	852	1,126	1,456
Software Developer	5,759	6,217	6,623
Vietnam Total	**40,940**	**44,540**	**48,257**

ICT related majors is not the most popular major among student. It accounts for only 12.6% of new student enrollment annually despite institutions providing ICT programs.

ORGANIZATIONS PROVIDING ICT PROGRAMS[180]

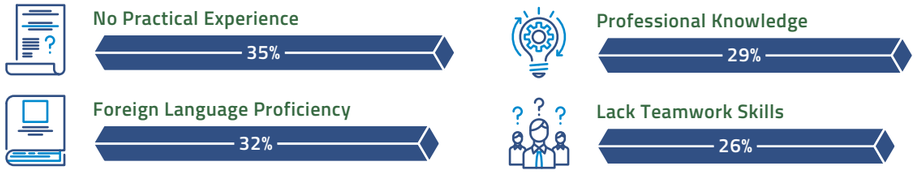


UNIVERSITIES AND COLLEGES	Figure	2016
Total universities and colleges	Unit	666
New Student Enrollment	Person	421,601
Total Enrollment	Person	1,759,449
Total universities and colleges provide ICT programs	Unit	250
Target enrollment for ICT programs	Person	68,883

VOCATIONAL TRAINING COLLEGES	Figure	2016
Total vocational colleges	Unit	469
Annual new students enroll	Person	238,655
Student studying	Person	432,519
Total vocational colleges provide ICT programs	Unit	164
Target enrollment for ICT Programs	Person	18,311

According to analysis of Vietnamworks, if the current ICT talent supply grows annually at 8%, Vietnam will have a shortage of 70,000 ICT talent. Recruiters also indicate that there may be a skill shortage among ICT workers. The quality of Vietnam IT workforce is not strong based on feedback from recruiters. Ho Chi Minh Computing Association indicates that new graduates have several weaknesses making them less marketable.

SKILL SHORTAGES IN VIETNAM'S IT GRADUATES



13.3 CROSS-BORDER TALENT OPPORTUNITIES

At the moment, Vietnam has no specific strategy or regulation about the cross-border talent for the IT human resource.

Currently the government is focused on receiving human resource training through initiatives such as the Japanese Official Development Assistance (ODA) program. Other forms of assistance received include:

- From 2006, Japan International Cooperation Agency (JICA) provides ICT training courses for students at the Hanoi University of Science and Technology. The objective of the project is to develop a high-quality ICT workforce. It also includes a language component in the program to improve proficiency in English or Japanese. The annual enrolment target increased from 120 to 200 due to the effectiveness of the project.
- Between 2013 - 2015, Australia supported Vietnam by providing AUD 100 million for the Human Resource Development under the Australia - Vietnam Joint Aid Program Strategy. Australia will spend around AUD 220 million on HRD assistance for Vietnam from 2014-20 which support skills training for tertiary level graduates.

Recently, the Ministry of Education and Training requested that Vietnam's institutions needs to develop the policies to attract Vietnamese scientist from oversea and IT experts to participate in training the local IT workforce. This new direction will open more cross boarder talent opportunities in the ICT field.

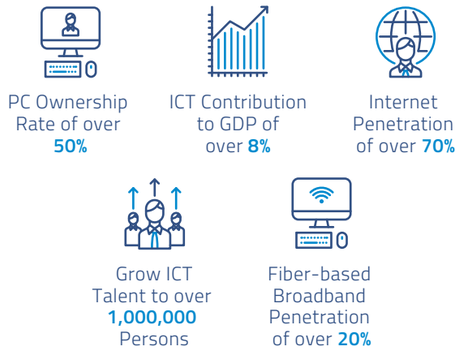
Foreigners working can stay and work in Vietnam as long as they need.

13.4 KEY INITIATIVES FOR TALENT DEVELOPMENT

The Vietnamese Government recognizes the role of ICT in Vietnam's transformation into a global knowledge-based economy. Policies regarding ICT have been codified in the 2011 Master Plan on Information Technology[181].

Other government direction relating to talent development include "Decision 698/QD-TTg" signed June 2009 with aim to improve the quantity and quality of ICT HR and "Decision 392/QD-TTg" signed Mach 2015 to align with new ICT industry development strategy

ASPIRATIONS OF VIETNAM FOR 2020



ICT INDUSTRY DEVELOPMENT TO 2020 AND VISION TO 2025

ICT Talent Development

Ensure sufficient human resources for domestic and foreign markets with over 70% of the labor force in trained in some aspect of ICT

Strengthen the capacity and improve the quality of ICT training for training institutions, with priority given to large universities.

Within high schools there should be staff capable of teaching ICT subjects. All high school students should learn some aspect of ICT.

Standardize training programs, textbooks, teaching materials, equipment for training and research on IT.

Create stronger linkages between training providers and businesses

Support for practical training for students

Organize short training courses to improve knowledge, management, professional skills, soft skills and foreign language

Develop and implement IT human resource skills standards and provide certifications

ICT training for the officer, civil servants, government staffs with the addition of open source software content

Assist IT development in the midland and mountain areas with the fund support from state for the local authority

Special Economic Zones in the form of Information Technology Centers and Software Parks provides the appropriate infrastructure and attracts investment and operations of ICT enterprises through the provision of various incentives. These areas have attracted more than 30,000 ICT talent.

INFORMATION TECHNOLOGY CENTER & SOFTWARE PARK

Several Information Technology Centers and Software Parks are already in operation and have attracted a number of IT companies and more than 30,000 IT talent.

INFORMATION TECHNOLOGY CENTERS STATISTICS

INFORMATION TECHNOLOGY CENTER	2015	2016
Number of information technology center investment approved	3	4
Number of companies operating in the information technology center	300	> 700
ICT human resource working	20,000	36,000

Among the Information technology center that have been approved are the Hoa Lac High Tech Park, Cau Giay Hanoi, Saigon Hi Tech park, Danang High Tech Park. By the end of 2017 3 high tech zones in Hoa Lac, Saigon and Danang will have 217 investment projects with a registered capital of nearly USD 10 billion and they will have created over 50,000 jobs according to the Ministry of Science.

HOA LAC HIGH TECH PARK, HANOI

Specific mechanisms and policies under review by the Ministry of Finance included:

New investments will enjoy 10% company income tax rate for 15 years, 4-year tax exemption, and 50% tax reduction in next 9 years

New projects with 4,000 VND and above in investment will enjoy 10% company income tax for 30 years, 4 years of tax exemptions, and 50% tax reduction in next 9 years

Import tax exemption on fixed assets

5-year import tax exemption for materials, parts and components which are not produced domestically

Current tenants include Hanwha Aero Engines, Viettel Corp, Viettel - CH Datacenter, FPT Software, FPT University and Vietnam HTM Mechanical Ltd

DANANG HIGH TECH PARK

New investments will enjoy 10% company income tax rate for 15 years, 4-year tax exemption, and 50% tax reduction in next 9 years

For new project with 3,000 VND total investment above: enjoy 10% company income tax for 30 years, 4-year tax exemption, and 50% tax reduction in next 9 years

Import tax exemption for fixed assets and materials, parts and components which are not produced domestically

OTHER PARKS

Quang Trung Software Park	155 Companies	20,755 Workforce
Danang Software Park	75 Companies	2,400 Workforce
Future: Can Tho FPT Complex and Software Park	USD 60 Billion invested Space for companies and university	Space of 3,000 workforce Space for 5,000 students
Future: Hanoi Software Park by Hannel	Space for software outsourcing, R&D, IT Services and BPO companies	

" Other government direction relating to talent development include "Decision 698/QD-TTg" signed June 2009 with aim to improve the quantity and quality of ICT HR and "Decision 392/QD-TTg" signed Mach 2015 to align with new ICT industry development strategy "

13.5 ORGANIZATIONS INVOLVED IN TALENT DEVELOPMENT

The "Political Bureau of the Central Committee" is the main source for strategic direction related to Vietnam's ICT workface development. Several other Government bodies play an important role as well.

GOVERNMENT BODIES RESPONSIBLE FOR IT AND IT TALENT DEVELOPMENT IN VIETNAM

The Ministry of Education & Training	Master plan of IT human resource development Guide schools and institutes to build and execute the IT human resource development plan Standardize the IT training program in areas such as skills, testing and certification Develop policies to enhance the IT human resource development Organize IT teaching and training for students
The Ministry Information and Communication	Deploy the information system about demand of IT human resource and organize the assessment the status of IT workforce Implement research and forecasting the IT workforce; support the institutes and government for IT resource usage
The Ministry of Finance	Coordinate with the Ministry of Planning and Investment and the Ministry of Education and Training in balancing and synthesizing resources of the annual State budget plan for implementing. The Ministry of Finance also have key role in promoting the IT human resource development through approving incentives such as company and individual tax income, credit, land fees, etc.
The Ministry of Labor - Invalids and Social Affairs	Provide the IT, electronic and telecommunication training courses for college and vocational level Implement vocational IT training on IT based on the contracts between institute, enterprises and agencies having demand for IT human resource.
Ministry of Home Affairs	Lead and coordinate with the Ministry of Information and Communication and the Ministry of Education & Training to build requirements for the IT director of government departments: title, responsibilities and standards Incentives and policies for IT staffs and IT director working for state companies and government departments
Agencies	Vietnam Software Association (Vinasa), Ho Chi Minh City Computer Association (HCA), Quang Trung Software Park, Hoa Lac High Tech Park, Saigon Hi Tech Park, Vietnam Association for Information Processing (VAIP)

VIETNAM SOFTWARE AND IT SERVICE (VINASA)

The "Political Bureau of the Central Committee" is the main source for strategic direction related to Vietnam's ICT workface development. Several other Government bodies play an important role as well.

SAMSUNG

February 2018, Samsung signed the MOU contract with the Post Telecommunications Institute of Technology (PTIT) to provide IT training for students. The focus of this program is on developing highly skilled IT engineers and software developer workforce.

POSTS AND TELECOMMUNICATIONS INSTITUTE OF TECHNOLOG

Posts and Telecommunications Institute of Technology (PTIT) was established under "Decision No. 516-TTg" dated July 11, 1997 on the basis of the rearrangement of four members of Vietnam National Posts and Telecommunications Group (Vietnam Posts and Telecommunications Corporation). PTIT has two campuses (one in Hanoi and one in Ho Chi Minh City) with over 29,000 students and 700 graduated students per year.

PTIT has being plays an important role in meeting the talent demands of the technology industry. They provide skilled human resources for the most major high-tech companies like Viettel, Samsung Vietnam, FPT, and VNPT.

THE CORPORATION FOR FINANCING AND PROMOTING TECHNOLOGY (FPT)[182]

The Corporation for Financing and Promoting Technology is one of the largest companies in Vietnam with a revenue of almost USD 2 billion in 2017. It employs over 33,000 people and has presence in 33 countries worldwide. The company is involved a wide number of technology sub-industries including IT service, system integration, telecommunications and sale & distribution of technology products. The company is also involved in a wide-range of education and training activities including education at the secondary, tertiary and vocational level.

FPT EDUCATION RESOURCES

2 International Student Development Centers

58 International Partners

18 Training Facilities Located in Hanoi, Ho Chi Minh, Danang, Can Tho and Highland Region

According to the company's report, in 2017 new student enrollment reached 12,500 persons, an increase 53% compared to 2016. The total student studying at FPT University reached 24,700, risen 27% compared to 2016. By 2020, FPT University target to have 100,000 students by expanding the education level including high school and secondary school, as well online study.

FPT University and their other education business are main resource for ICT talent to the various business units of FPT Corporation. They provide training in software outsourcing, system integration, software development, telecommunication, digital content, trading and other areas. Other FPT education resources are FPT education's Funix, FPT Polytechnic, FPT Aptech, FPT Jetking, Nanoversity, BTEC, FSB and FPT High School.

To improve the quality of training, FPT coordinates with international institutes and IT companies.

- October 2017, FPT University signed a cooperation agreement about training and developing of human resources in the high technology field through the exchange and scholarship.
- May 2017 FPT Corp and Siemens agreed the digital training program for FPT staff that focus on cloud tech

" According to the company's report, in 2017 new student enrollment reached 12,500 persons, an increase 53% compared to 2016. "

RECOMMENDATIONS FOR CROSS BORDER ICT TALENT DEVELOPMENT AND ACQUISITION WITHIN ASIA PACIFIC ECONOMIES

REGIONAL CHALLENGES

Data collated and information derived in this research from each of the 13 economies clearly shows that each of the economy is experiencing different levels of maturity and state of embracing the digital agenda including the end "date" in arriving to a relatively mature digital economy wherein benefits and rewards can be derived for its people and country. These gaps are perhaps originated from their legacy disparity of their respective "brick and mortar" economies in the region.

Another challenge faced by the nations in this region is the diversity in languages and culture, giving rise to differing values resulting in priorities not aligned with other countries even to the extent of between neighbouring nations.

Language differences also pose barriers to greater collaborations in particular communicating strategic issues and challenges (of which intensity and intent are often lost in translations). English language being a domineering language especially for the technology development world is also a stumbling block for some countries in the region. This can potentially represents the biggest hurdle in skills transfers, re-skilling, and new skills transition.

Unlike the political landscape of the Euro zone where political systems are more opened, in Asia Pacific until recently absolute rule still exist in certain countries. Given such a scenario, it will be difficult for countries to collaborate when the political agendas are very different.

Current data availability and data quality especially on the digital economy in some economies are also hard to secure, making it extremely challenging to identify the root causes and let alone proposing solutions. The saying "You Don't know what You Don't know" is indeed real. Further the challenge of translating local data into English language can be costly, time consuming and prone to inaccuracy including the availability of the currency of data may also be hampered.

COUNTRY-CENTRIC PROGRAMS

Given the inherent challenges identified above, what are the potential collaborations that the countries in this region can implement? There are certainly no lack of programs and initiatives on a country-centric level and the research also reveal programs that have already been implemented successfully and have yielded positive outcome in a short span of time.

Some of these notable key initiatives by the respective counties are listed below for quick reference:

Australia	National Innovation and Science Agenda
Bangladesh	Skill development as part of Access to Information (a2i) Project
China	13th Five-Year National Science and Technology Innovation Plan National Artificial Intelligence New Generation Open Innovation Platform
India	Futureskills
Indonesia	The Center of Training and Development on Information and Communication Technology
Japan	Future Investment Strategy 2018
Malaysia	Human Resource Development Fund (HRDF) Returning Expat Program (REP)
Singapore	SkillsFuture Singapore (SSG) TechSkills Accelerator (TESA)
South Korea	The Innovative Growth Youth Talent Concentration Training (IGYTCT) Program
Sri Lanka	SLASSCOM DirectLink
Taiwan	Global Investment Promotion and Talent Service Center
Thailand	CONNEXT ED
Vietnam	Posts and Telecommunications Institute of Technology (PTIT)

For more details refer to chapter 5 of this report.

RECOMMENDATIONS FOR CROSS-BORDER COLLABORATIONS

1. **Advocate ease of working visas and policies amongst ASEAN countries and Asia Pacific region.**

   Governments needs to collaborate and have a common set of policy to achieve this as organizations face challenges in finding the desired ICT talent within home country. It is ideal scenario that all the jobs are filled by local talent, but it is a herculean task to find all the talent within the country without effecting growth potential. Hence, companies are compelled to look for desired talent from across the borders. There are cost benefits also associated with such a move as certain country's professionals can be hired for lower wages as compared to local talent with similar skillset. Therefore, governments should provide support in terms of ease of granting work visas to organizations who are facing skillset shortage in their country and needs to hire talent from another country primarily because of skillset shortage and not necessarily because of low wages to earn increased profits.

   Governments should identify skills that have shortage of required resources and grant work visas only to professionals with the required skillset in these areas. Countries such as Australia, Canada, New Zealand, Singapore, Malaysia, Finland and Denmark have already implemented successful skilled work visas & migration programs. They are already reaping benefit of having a talented pool of workers in terms of sustained economic growth compared to countries who are not very open and supportive of foreign knowledge workers. Therefore, ASOCIO should advocate ease of work visas for professional with skillset that have shortage in a member economy.

2. **Introduce cross-border inter-varsities interns or exchange programs.**

   Governments can initiate this recommendation, but the academia and universities need to implement the programs. It is important for students to get exposure in different economies and cultures to adopt and learn from the best practices of others.

3. **Organise collaborative regional talent events and fairs in major cities.**

   Finding the required skillset within one country is very challenging hence organizations require foreign knowledge workers. ASOCIO can take active part by helping organizations identify talent with in-demand skillset among the professionals of member economies. It can then organize job fairs in collaboration with enterprises for prospective employers to evaluate and hire these required professionals. Since ASOCIO is advised to work closely with government on talent development and job creation policy making process, it can work as a facilitator to highlight the challenges faced by organizations in acquiring desired talent and at the same time help them acquire it from the bigger pool of talent made of up professionals from ASOCIO member economies.

4. **Advocate an alignment of government policies on the ICT certification, training and tertiary qualifications.**

   It is imperative for successful development of ICT talent to have correct policy alignment to avoid mismatch between skillset development and industry requirements. Policies needs to be updated on regular intervals with consultations from industry and academia along with benchmarking against the best practices.

5. **Standardise ICT job designations, roles and functions across the region allowing portability of talent across borders.**

   ASOCIO member associations can work on setting up standardised ICT job designations, roles and functions across the region allowing portability of talent across borders. This step will be highly beneficial in acquiring desired talent across the borders and will make the process simpler and efficient.

6. **Create a regional data and research agency to collect, manage and report on the state of skills and talent including brain-drain out of the region.**

   There is shortage of quality data on state of skills and talent. This step will provide factual data on talent to all member economies and will be very useful in policy making and measuring impact of initiatives. To achieve this a collaboration between the private and public sectors will be ideal way to move forward.

7. **Create online collaborative learning and training portals that can be accessed by all countries across the region including standardising the certification process.**

   Governments should embark on initiatives for educating and training the graduates and current employees for in-demand ICT talent areas. ASOCIO member associations can study and advise governments on development of new or collaboration with existing online learning platforms such Coursera, Udemy and Khan Academy etc to build and deliver courses that are required to teach and enhance the desired in-demand skillset. Language is a big barrier in certain countries for not being able to fully exploit the benefits provided by existing online learning platforms. Government initiatives can help in providing courses in local languages especially in countries such as Thailand, Vietnam, Indonesia, Malaysia and Bangladesh.

8. **Organise annual government-to-government summit addressing the Human Resources and future talent development issues.**

   For any successful collaboration and policy formation it is essential that representatives of governments should regularly meet their counterparts. Hence, government-to-government summits must be regularly organized with ASEAN and across the Asia Pacific region. ASOCIO member associations may help facilitate these summits.

9. **Create a Human Resource Fund based on contributions by companies who have cross-border business activities in the region and any certified training programs attended by the staff from the eligible organizations can claim a rebate depending on the program.**

   Human Resource Development Fund (HRDF) in Malaysia is based on the same concept. It is recommended that this initiative can be emulated at regional level as it has experienced tremendous success in developing ICT talent within Malaysia.

10. **Identify key private sector training and certification companies from respective countries and assist them in promoting across the region focusing on economies that are most lacking in in-demand ICT skills.**

    This report lists key training providers from 13-member economies along with in-demand certifications. ASOCIO member associations can utilise these competent training providers to help organise trainings for talent development within their country.

11. **Conduct a regional ICT salary comparison study of the various levels from entry to senior managers to better understand the inter-country gaps of salary compensation taking into account Purchasing Power Parity (PPP) reflecting the exchange rate.**

    As mentioned earlier, availability of quality data on talent is one of the key issues that hinders in formation of effective policies on ICT talent development except in some countries in Asia Pacific. ICT salary comparison study can be undertaken by a regional research agency in collaborations with ASOCIO member associations in the region. It will provide guidance to governments, enterprises and employees along with helping in setting correct salary standards**.**

12. **Advocate strongly that ICT talents and Human Resources priorities must be high on the agenda of all the Governments in the region and set up a regional Talent Advisory Council (TAC) to advice on this agenda.**

    Unless something is deemed important chances are high that desired results will not be achieved by mere half-hearted initiatives and efforts. Talent development is a serious issue and needs due recognition and considerations. Future generations and prosperity of countries depends on it. Therefore, it is paramount to have talent development as one of the key agenda of Governments.

13 **A realistic vision be developed to act as a beacon for direction and decision of future initiatives and programs.**

   To accomplish a goal, it is imperative to first set realistic goals. Policies, initiatives and programs all require regular monitoring, evaluation and decision making to be able to produce any significant results. Therefore, Governments, academia and enterprises should collectively work together along with ASOCIO member associations as facilitator and intermediary to achieve the vision of sustained economic growth propelled by skilled workforce and equal job opportunities for all within Asia Pacific.

WHAT CAN GOVERNMENTS DO?

It is imperative to advocate ease of working visas and consistent policies amongst ASEAN countries. Governments must collaborate and have a common set of policy on this. Collectively they can develop a realistic vision to act as a beacon for direction and decision of future initiatives and programs. Industries and Governments can then drive this with the associations as intermediary. To facilitate this, it is recommended that a regional Talent Advisory Council be formed to be responsible in driving this initiative in the region. This council will also facilitate the annual Government-to-government summit on regional talent initiatives.

A major hurdle to regional cross-border collaborations is the inherent of very divisive laws and policies relating to foreign workers including expatiates across countries in Asia Pacific. These laws and policies are very arcade and in most cases out of date. They are prominently based on the old economy of workers movement across borders and the main objective is to protect local citizens' employments including mitigating the 'threats' and risks of foreigners learning these "local" skills and repatriate back to their homeland. Often these policies are centred around menial and physical skills and traits which are more relevant in a commodity, agriculture and traditional brick and mortar industry as opposed to the current pursuit of a knowledge-based economy.

Even when Malaysia moves towards a manufacturing economy in the 1960s, the policies were very much geared toward unskilled labour to cater for the demand of workers in factories and manufacturing hubs. It was only in the late 1990s when the Multi Super Corridor (MSC) initiative, the brain child of the current Prime Minister of Malaysia that there was a Bill of Guarantee that allows foreign companies to apply for multiple working visas with ease for their expatriates in their companies on the condition that they are set up in the MSC locality.

Whilst the laws of individual country can be different, it is imperative that the countries in the region to come together and have an agreement of a set of conducive principles which will be the guide to the formulations of laws in the respective countries which are consistent and aligned to the ultimate objective of an ease in cross border movement of talents in the region.

Some examples of these guiding principles can include

1. Standardisation of job name conventions, roles and functions.
2. Definitive sets of talent requirement (as outlined in this report).
3. Identify the target fields of Expertise required,
4. Aligned Compensation based on parity ration and other factor.
5. Demand and Supply of the respective country.
6. Standardisation of types of certification, tertiary curriculum (where practical) and upskilling training programs including certification authorities.
7. Funding sourcing and allocation strategy (e.g. a regional HR Development Fund).

WHAT CAN INDUSTRY, BUSINESSES AND ACADEMIA CONTRIBUTE?

One of the main reason that influence talent moving across borders is the compensation disparity between countries. Whilst we are not advocating all countries should pay the same compensations as there are other factors like exchange rates, cost of living and the demand and supply, a more aligned and consistent level of compensations within the region will be more conducive in mitigating the risks of brain-drain in the region. A more critical problem will be brain drain out of the region. Another challenge is the portability of skill sets from one country to another without extensive check and verifications of an individual credentials.

Hence it will be insightful to firstly understand and conduct a regional ICT salary comparison study of the various levels from entry to senior managers of inter-country gaps of salary compensation taking into account Purchasing Power Parity (PPP), and other factors. There will be enough data in the country to support this study. However the challenge will be in standardising the definition of the different levels of expertise and designations to allow a realistic comparison. On a bi-lateral there are already initiative in standardising on a country-to-country basis such as India and Japan which has already been done successful.

A regional research agency can perhaps undertake this initiative in collaborations with other associations in the respective countries in the region including a standardisation of the different levels and designations.

Most of the Talent fairs that are prevalent today is very much on a country-centric basis and focus on the demand of specific country. It would be most strategic and relevant if Talent, HR fairs and events can be hosted across the region with a standard message promoting cross-border talent movements in the region.

To facilitate this, a regional online collaborative and training portal is also recommended to be set up to allow communication not just for talent workers but also for companies in the region who are sourcing for the talents. The training portal can also be used to promote certifications, specialized training and upskilling programs by service providers including certification authorities in the region.

At the academia level, universities should also collaborate with industries and businesses in the region to facilitate internship programs across the region giving exposure not only from the business but also a different country environment experience. There are already private agencies who are promoting Australian students to undertake internships in another country in Asia Pacific. This will be a very effective long term strategy in promoting cross border talent development in the future when these students graduated from their studies.

CONCLUSION

It is important to note that whilst there is a list of proposition of collaborations here, implementing them will require commitments, collaborations, capital, concurrence, co-existent, and common goals (the six Cs of key success factors)

Succinctly they include the following :

1. Concurrence on the importance of the "Talent" agenda by all policy makers in the region
2. Acceptance that effective collaborations is the only option to leap-frog and overcoming these challenges
3. Availability of regional funding for programs and initiatives
4. Involvement of Government, Industries, Academia and Associations are critical and imperative in the entire value chain.
5. Effective prioritising of the recommendations in terms of important and urgent criteria.

It is important to realise that to pursue a national digital agenda successfully for the economy it is imperative that you also need a clear and effective Talent fulfilment strategy collectively for the country for the medium and long term.

Based on the research data, there are certainly ample opportunities for cross border talent development and acquisitions in the region across the 13 economies identified. One can simply emulate others individually to gain short term resolutions to your skills gaps and deficiencies or a comprehensive and effective collaborations across the region which will perhaps yield a more sustainable outcome.

APPENDICES

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