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NATIONAL IT - BPM WORKFORCE SURVEY 2019

INFORMATION AND COMMUNICATION TECHNOLOGY AGENCY OF SRI LANKA

National IT-BPM Workforce Survey 2019

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List of Abbreviations

ABPMP	Association of Business Process Management Professionals
ACTOS	Association of Computer Training Organization in Sri Lanka
ACTOS	Association of Computer Training Organization in Sri Lanka
AI	Artificial Intelligence
AR	Augmented Reality
BFSI	Banking-Financial Services-Insurance
BLS	Bureau of Labour Statistics
BOI	Board of Investment
BPESA	The Business Process Enabling South Africa
BPM	Business Processing Management
BPO	Business Process Outsourcing
CAGR	Compound Annual Growth Rate
CBSL	Central Bank of Sri Lanka
CEE	Central and Eastern Europe
CEO	Chief Executive Officer
DCS	Department of Census and Statistics
EDB	Export Development Board
EU	European Union
FAO	Finance and Accounting Outsourcing
FITIS	Federation of Information Technology Industry Sri Lanka
GLSI	Global Service Location Index
GOSL	Government of Sri Lanka
GSA	Global Sourcing Association
HR	Human Resource
IBPAP	Information Technology and Business Process Association of the Philippines
ICT	Information and Communication Technology
ICTA	Information and Communication Technology Agency of Sri Lanka
IDC	International Data Corporation
ILO	International Labour Organization
IoT	Internet of Things
IR4	Fourth Industrial Revolution
ITeS	IT-enabled Services
KIIS	key informant interviews
KPO	Knowledge Process Outsourcing
LGN	Lanka Government Network
LPO	Legal Process Outsourcing
MIS	Management Information System
NA	Not Applicable
NASSCOM	National Association of Software and Services Companies
NES	National Export Strategy
NOA	National Outsourcing Agency
OECD	Organization for Economic Cooperation and Development
PG	Postgraduate
PhD	Doctor of Philosophy

PRC	People's Republic of China
SDGS	Sustainable Development Goals
SLASI	Sri Lanka Association of Software Industry
SLASSCOM	Sri Lanka Association of Software and Service Companies
SLICTA	Sri Lanka Information and Communication Technology Association
SLSIC	Sri Lanka Standard Industry Classification
SLT	Sri Lanka Telecom
SMP	Service Management Program
SOES	State Owned Enterprises
SSC	Shared Service Centres
ToT	Training of Trainers
TVEC	Tertiary and Vocational Education Commission
TVET	Tertiary and Vocational Education and Training
UGC	University Grant Commission
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
US	United States
USAID	United States Agency for International Development
VR	Virtual Reality

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Executive Summary

The ICT workforce in Sri Lanka is undergoing deep structural changes at a time when the global ICT sector experiences a period of transition. The overall strength of the workforce has grown from 82,854 in 2014 to 124,873 in 2018 which amounts to a growth of 50.7%. This represents a compound annual growth rate (CAGR) of 10.80%. It is projected to increase further to 146,089 in 2019. The most important fact is the structural change that has taken place in respective shares of major employers in the total workforce. ICT companies have become the dominant employer with a share of 65.5% of the workforce, overtaking non-ICT companies (22%) by a wide margin. Government organizations and BPM companies have reported 7.1 % and 4.2 % shares, respectively. Parallel to this, the BPM workforce in the country has increased from 17,427 in 2014 to 25,510, which represents a growth of 46.2%. It implies that the BPM workforce has grown at a CAGR of 9.99%.

The composition of the ICT workforce in terms of the share of workers in different job categories and gender distribution has undergone significant changes since the last workforce survey. The dominance of software engineering category increased further from 21% in 2013 to 36% in 2018. Its share has gone even higher (46%) in ICT companies followed by software quality assurance (15%), jointly covering more than 60% of the workforce in ICT companies. The main job categories in non-ICT companies are technical support (47%) and client support (16%). The gender composition of the workforce has improved from 29% female participation in 2013 to 34% in 2018. As in 2013, BPM companies maintained a situation of near gender balance in BPM workforce with over 48% female participation.

The quality of the workforce as indicated by qualifications and experience has improved significantly since the last survey. The share of employees with a Bachelor's degree or above has increased from 63% in 2013 to 85% in 2018. The highest share of graduates was reported from ICT companies (>90%) while in other major employers it increased over 50%. Bachelor's degree has become the standard entry qualification for majority of job categories in all major employer categories.

Demand for graduates has increased from 6,246 in 2014 to 21,216 in 2019. The survey also reported an increase in supply of the total number of graduates produced by training organizations from 6,611 in 2014 to 9,076 in 2019. The quality of the training staff in ICT training organizations has improved significantly in terms of academic qualifications and experience. Despite the growth in numbers of graduate output, however, the projections indicate a situation of a widening gap between demand and supply of ICT workforce in the country. This implies that the training system of ICT in the country is not geared to cater for the market demand by producing sufficient numbers of graduates; a key challenge that calls for urgent attention of policy makers, ICT industry stakeholders as well as educationists in the country.

01. Introduction

01. Introduction

The Government of Sri Lanka (GOSL) has declared the ambition of transforming Sri Lanka into a 'Knowledge Economy'. The information and communication technology (ICT) has a major role to play towards achieving this national goal. Besides being a force of technological progress, the ICT has become an important sector in the global economy, creating wealth and prosperity around the world. In Sri Lanka also, the ICT sector has shown its potential for contributing to the growth of national economy both directly and indirectly through attracting investment, earning foreign exchange, creating employment, increasing productivity and promoting innovation. According to Central Bank of Sri Lanka (CBSL); the telecommunication, computer and information services represent a key growth component within the service sector that generated US$ 995 million earnings in 2018. Earnings from the ICT sector have been growing steadily at 7-8% annual rate despite relative slowdown in other sectors of the economy. The ICT sector has become the fifth largest source of foreign earnings in the country in a relatively short period of time.

In addition to direct and indirect contributions to economic growth as a key driver, the ICT sector has the potential to generate a diverse range of social benefits to citizens by connecting people to global systems of knowledge and enhancing social inclusion and justice. Realizing the potential of ICT to contribute economic and social development, the UN targets to 'Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020' under the Goal 9 of the Sustainable Development Goals (SDGs) dedicated for 'Industry, Innovation and Infrastructure'.

The Information and Communication Technology Agency (ICTA) is the national mandate holder entrusted with the mission to *'Transform Sri Lanka towards a creative knowledge-based society through digitally empowered citizens'.* To fulfil this broad national obligation, the ICTA has focussed its efforts on eight core areas, namely; digital connectivity, digital society, digital commerce, digital government, digital security, digital jobs and opportunities, digital legislation, and digital content. Ensuring the availability of skilled ICT workers in sufficient numbers and quality is a critical factor that determines the success of achieving the knowledge economy. The ICTA has recognized the importance of developing ICT human resources in the country for leveraging the growth of the sector from the beginning and introduced various projects and programmes to fulfil this requirement. The *ICT Workforce Survey* is one major initiative implemented by the ICTA towards this direction.

The *National ICT Workforce Survey* was initiated by the Sri Lanka Information and Communication Technology Association (SLICTA) in 2004 with the support of USAID, recognizing the scarcity and poor quality of available information on ICT workforce in Sri Lanka. It helped fulfil a vital information gap hitherto experienced by stakeholders in ICT industry. In 2007, the second survey was implemented by SLICTA with the financial support of USAID and technical support of ICTA. Thereafter, the ICTA took over the responsibility of this initiative as the sole sponsor and conducted third and fourth rounds of the survey in 2010 and 2013. The *National National IT-BPM Workforce Survey 2019* is a continuation of this worthy effort for the fifth time with the aim of enriching stakeholders in the industry with up-to-date information.

Since its first appearance in 2004, the *ICT Workforce Survey* has established its position as a vital source of information among key stakeholders in the industry, furnishing them with essential decision-making information for planning and designing their activities. The information from the survey has been found to be beneficial for users such as investors to assess the workforce situation to support their investment decisions; policy makers to evaluate the impacts of policies, plans, programmes and projects; donors to assess on development assistance needs; employers to make recruitment decisions; training organizations to design curricula and course contents, and; students to decide on selection of courses with high market demand and employability. The continuation of the survey with periodic intervals enables comparison of the latest information with the information from past surveys. It increases the value of the survey as a source of longitudinal information, helping to understand the dynamic nature of ICT workforce and identify changes undergone by the workforce over time.

The *National IT-BPM Workforce Survey 2019* provides an update of the situation of workforce together with changes undergone since the last survey conducted in 2013. The ensuing period after the last survey is a critical time during which the global ICT sector experienced rapid changes that have given rise to the holistic transformation, now widely known as 'Fourth Industrial Revolution (4IR)'. Rapidly occurring technological innovations constantly altered business environment attracting new investments on businesses supported by emerging technologies such as artificial intelligence (AI), internet of things (IoT), virtual reality (VR) and augmented reality (AR). Market innovations enabled by development of ICT such as digital e-commerce platforms have opened the opportunity for companies and organizations to tap international customer bases and clientele, simultaneously increasing the competitiveness of markets too. It has become vital for businesses to understand the impact of IT on their domain of activities to build and shape new strategies to uphold business goals and survival. Both IT and non-IT businesses have realized the importance of adopting new-generation technologies for improving the efficiency and quality of business thereby creating demand for ICT workers, particularly for workers with skills in new technologies. The ICT sector of Sri Lanka also is experiencing these changes in many ways and major shifts in demand for ICT workforce in terms of skills and technical knowhow are imminent. Hence, the Nat*ional IT-BPM Workforce Survey 2019* provides an update to relevant stakeholders on demand and supply situation of ICT workforce in a period of transition.

1.1. Aims and Objectives

The main objective of the *National IT-BPM Workforce Survey 2019* is to gain an understanding on the nature of changes in the extent and composition of ICT workforce in Sri Lanka since the last survey. The intention is weighing that information against the capacity of training facilities to supply workers in sufficient numbers and quality in demand. In essence, it aims to capture and reflect on dynamic changes that take place in a period of rapid technological transformation.

Information generated in the survey is expected to :

- Create a realistic picture about the conditions and trends in demand for and supply of ICT human resources
- Provide useful insights for policy makers to undertake human resource planning and formulate relevant policy interventions in ICT sector
- Offer decision-support data for potential investors to make rational decisions on investment in ICT sector
- Assist universities and other ICT training institutions to improve the design of their curricula, offering courses with high demand in the market
- Provide information for donors and development partners to design their development assistance schemes for maximum positive outcome
- Provide guidance to students to make better decisions regarding career paths which will lead to future employment opportunities in ICT and BPM industries

To achieve these expectations, the National IT-BPM Workforce Survey 2019 has been designed to replicate and build upon four previous rounds of survey in 2004, 2007, 2010 and 2013 thereby enabling comparative longitudinal assessment of changes that has taken place in the ICT workforce.

1.2. Scope and Coverage of the Survey

1.2.1 The Scope

The scope of the survey includes the following major areas.

Strength of the ICT workforce: The survey focussed on estimating the total strength of ICT workforce in the country based on the sample data collected from main categories of employers. Strength of workforce in major employer categories also was estimated separately.

Composition of workforce: The composition of ICT workforce was analysed using the sample data. The parameters used for analysing the workforce composition are gender, age and job categories.

Quality of the Workforce: Quality of workforce was evaluated based on the information collected in the survey. The quality of the workforce was assessed in terms level of educational qualifications and experience.

Demand and supply situation of ICT workforce: Total demand for and supply of ICT graduates were estimated based on information collected from ICT employers and training institutes to evaluate the demand-supply gap. Also evaluated were skills in demand in terms of essential and complementary skills.

Change in the situation of ICT workforce over time: The study evaluated the changes in the strength, composition and quality of workforce over time by comparing the findings of the current survey with information from the past surveys.

The ICT workforce was defined in the survey to cover dedicated employees who undertake ICT related specialist job functions. Accordingly, any person involved in ICT related tasks or producing ICT related output as his/her primary job function is considered a member of the ICT workforce. Similarly a Business Processing Management (BPM) worker is identified as a person employed in a IT-enabled service (ITeS) organization whose main job function involves carrying out tasks outsourced by clients using IT services. The job functions undertaken by ICT workforce were described under fourteen job categories that classify a diverse range of job titles within them (Appendix 4). It is a technical classification of job functions that does not take the seniority in hierarchy or experience into account. The ICT workers are expected to possess at least few essential skills to fulfil these job functions. A list of 53 skills was identified and they were classified under core (20), soft (7) and technical (26) skills separately. To fulfil a given job function, one or few of these skills may be required as essential skills or complementary skills. These are considered the skills demanded by employers and offered by training organizations in their training courses. These definitions and classifications are consistent with those adopted in past *ICT Workforce Surveys*.

1.2.2 The Coverage

To fulfil the above scope, the survey collected data from employers that provide employment to ICT workforce in the country. The coverage of the survey included the following major categories of employers. The details of the sampling distribution are given in Table A1 of Appendix A.

- ICT companies
- Business process management (BPM) companies1
- Non-ICT companies
- Government organizations
- Training institutions (Degree awarding or equivalent) of ICT

[1] This category has been identified as business process outsourcing (BPO) in the past workforce surveys. The term BPM is now used more frequently since many value-added versions of outsourcing have been enabled by recent advances in ICT. The BPM is also known as IT-enabled services (ITeS).

[2] ICT product is an output of ICT company which include hardware, software and any ICT-related service.

They include ICT service providers (ICT companies) and users (BPM companies, non-ICT companies, government organizations) of ICT products as well as the trainers (training institutions) of ICT workforce. Jointly they offer a wide range of employment opportunities for workers trained in ICT skills. Hence, they constitute the sample frame of the ICT Workforce Survey. A brief overview of these major categories of employers is given below.

ICT Companies: ICT companies offer a diverse range of ICT products[2] that includes hardware and software products and a range of ICT-based services which provides IT and networking solutions for customers in Sri Lanka and abroad. There are many ICT companies that earn foreign exchange by supplying services to overseas clients. Besides earning foreign exchange and creating job opportunities, the ICT companies have become a main channel of transferring innovative technologies developed in advanced industrial economies into the country. The ICT companies include both relatively large business entities that offer their products to customers such as major companies and public sector organizations as well as small businesses that cater to retail markets or small-scale customers. The latter can be identified as an 'informal' subsector of the industry. Even though the exact total number of ICT companies is not available from any official source, the industry related sources informed that Sri Lanka currently has around 600 companies which offer ICT products to domestic and/or international markets.

BPM Companies: BPM companies are either subsidiary units or independent third-party service providers to which specific business operations in supply chains of large companies have been outsourced. Outsourcing allows contracting firms to increase profits by focusing more on their core businesses while creating numerous business opportunities for external parties. Outsourcing involves both offshore as well onshore outsourcing and the primary motivation behind offshore outsourcing is cost-cutting on salaries and associated costs. As a result, countries with skilled workforces with low wage rates have become attractive BPM destinations creating job opportunities to both ICT and non-ICT workforce. Outsourced operations may include back office operations such as human resource management, finance and accounting as well as customer-related front office operations such as call centres. The BPM industry has evolved rapidly with new advances in ICT and manyvalue-added services such as finance and accounting outsourcing (FAO), legal process outsourcing (LPO) and knowledge process outsourcing (KPO) have come into operation. Sri Lanka has emerged as an important BPM destination during the recent past. Several well-known international companies have outsourced their operations to BPM companies in Sri Lanka. Over the years, BPM companies have become an important source of employment for ICT workforce in Sri Lanka. As in the case of ICT companies, the exact number of BPM companies is not available from any official source and sources from the industry suggest that the number is in the range of 80-100.

Non-ICT Companies: The use of ICT has become widespread in all sectors of the economy and a large number of companies that offer goods and services other than ICT related products also use ICT facilities for production and delivery of their output to customers. As a result, many non-ICT companies maintain in-house ICT facilities and recruit dedicated ICT staff. Previous surveys confirm that ICT workforce in these companies has steadily been growing from 6,500 in 2004 to 37,000 in 2013. The survey continued to cover a cross section of non-ICT companies from six sub sectors, namely; apparel, finance-insurance-banking, agriculture including fisheries, manufacturing and engineering, trade and freight forwarding, and tourism and hotels. The total number of non-ICT companies are far too numerous than ICT or BPM companies and no reliable source with a list of currently operational companies exists. Hence, a list of non-ICT companies has been compiled to facilitate the data collection from this category of employers in the past surveys and the *National IT-BPM Workforce Survey 2019* used an updated version of this.

Government organizations: Government organizations are another important category of employers for ICT workforce. They include central government organizations, provincial councils and local government authorities. The central government organizations include ministries and line agencies dedicated to different subjects and the network of regional administration bodies comprised of 25 district secretariats and 331 divisional secretariats. Line agencies under ministries include departments, statutory bodies (e.g. authorities, boards etc.) and public enterprises. In addition, there are 9 provincial councils with provincial ministries, line

agencies and local government authorities (i.e. municipal councils, urban councils and pradeshiya sabhas) coming under them. Nearly all these government organizations have in-house ICT facilities developed to varied levels of sophistication together with limited cadres of ICT staff to handle those facilities. An increasing number of government organizations are taking steps to digitize their systems while some organizations already offer e-services to citizens. The number of organizations that offer e-services is gradually increasing and programmes implemented by the ICTA to facilitate e-governance are accelerating this process. Hence, the public sector organizations constitute an important category of employers for ICT workforce and the demand for ICT workers from the government sector can be expected to increase in the future. A list of government organizations compiled from official sources was used as the sample frame for the survey.

The above four categories of organizations represent potential employers that offer job opportunities for ICT workforce in Sri Lanka. Hence, they represent the demand-side of the job market for ICT workers. Being a group of skilled workers, the supply of ICT workforce is heavily dependent on ICT training organizations. Besides serving as the supply pipeline of the ICT workforce, ICT training organizations also employ ICT professionals with advanced academic qualifications in teaching/research staffs as well as operational staffs that manage in-house ICT systems.

ICT Training organizations: There are four major types of ICT training institutes in Sri Lanka: government universities, private degree awarding institutes, government vocational and tertiary training institutes and private diploma and certificate awarding training institutes. They both offer postgraduate courses on ICT too. Private degree awarding institutes include 17 University Grant Commission (UGC) recognized institutes of which 8 institutes offer degree and postgraduate courses on ICT and computer science. In addition, there are several other institutes that award degrees on fields relating to ICT in affiliation with foreign universities. These courses can be completed in Sri Lanka or in affiliated institutes abroad. In addition, there is a wide network of government vocational and tertiary education institutes that offer courses leading to IT diplomas and certificates. The *ICT Workforce Survey* has continuously covered ICT training organizations as the supply source of ICT graduates. An updated list of government universities and private degree awarding institutes compiled using information from UGC and the training chapter of Federation of Information Technology Industry Sri Lanka (FITIS) was used as the sample frame.

1.3. Overview of the methodology

The *National IT-BPM Workforce Survey 2019* is a sample survey of which the target population comprised of employers of ICT workforce in Sri Lanka. It is a cross-sectional survey that used statistical procedures of random sampling based on a sampling frame continuously updated in every round of the survey. It covered 5 major categories of employers that offer employment for ICT workers in Sri Lanka, namely; ICT companies, BPM companies, non-ICT private sector companies, government sector organizations and ICT training organizations. To ensure representativeness and statistical validity, the sample was further stratified in to sub-categories within major employer categories, especially non-ICT companies which are too numerous and scattered over a wide range of sectors. Information from government and industry related sources, business directories and information published by various organizations were used to update the sample frame.

Data collection from major employer categories was undertaken using structured questionnaires. Given the variations found in ICT workforce among major employer categories, three separate questionnaires have been used to capture data from different categories of employers. Questionnaires were revised and some modifications have been introduced to capture the emerging trends in workforce over previous rounds of survey. However, to ensure the longitudinal continuity of information, the consistency of questionnaires was maintained by retaining some core structural features of the questionnaires across successive rounds of survey. Data collection was done by interviewing heads of ICT divisions or other senior managers of respective organizations to ensure the accuracy and reliability of data. Strict quality checking procedures has been maintained throughout the process of data collection and processing. In order to enrich and supplement quantitative information gathered in the survey, 30 key informant interviews (KIIs) were also conducted covering all employer categories using a qualitative data gathering instrument with key discussion points.

Respondents for KIIs were drawn from opinion leaders in the industry that comprised of key officials such as CEOs, HR Managers, IT Managers, Chief Innovation Officers from major ICT and BPM companies, non-ICT companies, government organizations and training institutes.

Information collected from the sample of major categories of employers provided the basis for estimating the total strength of ICT workforce together with the total demand for and supply of ICT workers in Sri Lanka. In addition, the composition and quality of the total workforce have been analysed using sample data. Since the *National IT-BPM Workforce Survey 2019* is a continuation of the periodic workforce survey conducted four times previously, it also allowed evaluating changes that has taken place in extent, composition and quality of the workforce over time. However, the information was not collected from the same set of respondents across different rounds of survey. Hence, it does not allow the data to be used as time series or panel data. More details of the survey methodology are presented in the Appendix 2 of the report.

1.4 Organization of the report

The report begins with a global overview of the ICT sector workforce. It is followed by a review on Sri Lanka's ICT sector and the workforce. A section that presents survey findings about extent, composition and quality of the workforce comes next. The next two sections present projections of demand for and supply of ICT graduates. The penultimate section analyses the gaps in demand and supply. This section also includes an analysis of the mismatch in demand and supply of skills. An overall conclusion about the findings of the survey is presented in the final section of the report.

02. Global Overview of IT-BPM Sectors & Workforce

02. Global Overview of IT-BPM Sectors & Workforce

Sri Lanka's ICT workforce, especially those employed in ICT and BPM companies, is closely connected to the global ICT market and other industry verticals serviced by them. Hence, a brief overview of global ICT and BPM industries and workforce employed by them would help gaining a better understanding about opportunities and challenges faced by Sri Lanka's ICT workforce. This section provides a broad overview of conditions and trends observed in global ICT and BPM sectors and workforces employed by them based on a desk review undertaken using online resources[3].

2.1 Global ICT and BPM sectors

The global ICT sector is comprised of ICT services and ICT manufacturing subsectors. The ICT services subsector has key industries of tele-communication, computer programming, consultancy and related activities, data processing/hosting and related activities and web portals, software publishing, wholesale trading of information and communication equipment, and repair of computers and communication equipment. The ICT manufacturing subsector is comprised of manufacturing of computers and peripheral equipment, manufacturing of communication equipment, manufacturing of electronic components and boards, manufacturing of magnetic and optical media and manufacturing of consumer electronics. According to the *Information Economy Report 2017* published by the United Nations Conference on Trade and Development (UNCTAD), the value addition of two sub sectors jointly accounted for US$ 5.1 trillion of which ICT services subsector is leading with a contribution of two thirds of the total value added. These figures were estimated for 2014 based on data available from major producers in two subsectors and the total value addition of ICT sector was equivalent to 6.4% of the global GDP that year.

The global ICT sector is rapidly being transformed by innovations of new generation technologies. New investments are mostly made on businesses supported by emerging technologies such as AI, IoT, VR and AR. According to the International Data Corporation (IDC), a premier global market intelligence firm, the industry is about to spend $5 trillion in 2019 which is an overall growth of 5% from 2018. Of this, spending on new technologies is expected to rise by 16% while the growth of spending on traditional ICT is predicted to remain at 3% as in previous years.

Developments in ICT have opened the opportunity for BPM to grow into a extensive industry with a market of its own, creating a demand for a skilled workforce. According to Telivisory, a market intelligence firm, the global outsourcing market has doubled from US$ 52 billion in 2001 to 104 billion in 2014. The *BPM-Global Market Outlook (2017-2026)* predicts that BPM would grow at 15.5% compound annual growth rate (CAGR) from 2017 to 2026. Traditionally this market comprised of a mix of businesses of which low-end ventures such as call centres contributing to the lion's share. However, with the advent of new technologies and innovations in business processing, more and more high-end applications of BPM have emerged. As a result, global BPM found applications in many industry verticals such as banking-financial services-insurance (BFSI), telecommunications, retailing, manufacturing, legal services, quality assurance and healthcare services.

2.2. Employment in ICT sector

ICT professionals are employed over a broad spectrum of industries that include ICT firms as well as non-IT organizations. As far as information on ICT workforce is concerned, despite multiplicity of sources, systematically compiled statistics are available only for major developed countries in the EU and Organization for Economic Cooperation and Development (OECD). Statistics on developing countries are highly fragmented and information discussed in global reviews is mostly restricted to few major players such as China and India. Even though there are individual country reports from few countries such as Malaysia, they do not provide sufficient information to develop a comprehensive, truly global picture on workforce and employment in ICT. This situation is clearly reflected in the *Information Economy Report 2017* published by the UNCTAD where it

refrained from making a direct estimate of global ICT workforce, discussing the situation based on data from major countries or groups such as EU.

In spite of limited availability of comparable statistical data, online sources help to identify broad global trends in the employment in ICT and BPM sectors. Nearly all sources indicate that employment in ICT sector is growing since 2013 with a sustained job creation in ICT services and software, spreading their influence across a wide range of economic sectors. According to a study conducted by CompTIA, the *2015 Industry Outlook*, the USA employs roughly 6 million ICT workers across a range of industries from technology to healthcare, finance and education. By 2020, employment in information and computer technology (ICT) in the USA is expected to increase by 22% according to the U.S. Bureau of Labour Statistics (BLS) employment projections. The BLS studies further indicate that in USA, 80% of the IT workforce was men, in 2017. Job categories such as computer network architects and computer control programmers employed 96% and 90% men respectively. The highest number of female employment could be found in the categories of computer operators (60%), mathematicians (52%) and operations research analysts (52%).

Eurostat, the open data portal of EU, reports that there are 8.4 million ICT specialists across 28 EU countries that amounted to 3.7 % of the total EU workforce in 2017. The highest shares of ICT specialist were reported from the UK (19.4%), Germany (18.6%) and France (11.8%). Moreover, the same source reports that number of ICT specialists in the EU grew by 36.1 % from 2007 to 2017, over 10 times as high as the growth (3.2 %) of total employment during the same period. According to the *Digital Pulse Report* published by the Australian Computer Society, Australia saw the creation of 40,000 tech jobs during the period of 2015 and 2016, and IT services exports grew by 12% to $2.8 billion. In 2018, the IT service exports have grown to $3.2 billion and 22,300 new jobs were created.

Scattered information is available on employment of ICT professionals in developing countries. The *Information Economy Report 2017* of the UNCTAD reports 3.2 million are employed in ICT services in India in 2015 followed by 1.2 million in Brazil, 541 thousands in Indonesia and 470 thousands in Nigeria. These numbers remained less than 1% of total workforces of these countries. The UNCTAD also reports 3.4 million workers in 'telecom and computer services' in China in 2015. This information is based on International Labour Organization (ILO) data and national reports. According to *Future of Jobs in India: A 2022 Perspective,* published by industry stakeholders, India has one of the largest ICT workforces in the developing world with 2.71 million workers in 2017 excluding BPM workers. In Malaysia, the *Digital Talent Report 2017* has projected 15 % growth in demand for ICT employment from 355,000 in 2017 to 540,000 in 2020, excluding the employment in ICT manufacturing and trade. It is estimated that by 2020, the digital workforce of Malaysia will contribute up to 20% of the national GDP. Among the job skills mostly in demand are software development, database management, networking and network security.

Many non-IT organizations are going digital as they realize the benefits of digitization for increased efficiency and customer convenience. There is an increasing demand for graduates with skills on coding, programming, database, data analytics, machine learning and cybersecurity. The health and financial sectors are the fastest growing segments of non-IT sectors that hire ICT professionals.

2.3. Employment in BPM sector

The global BPM sector has also experienced major transformations over the past few years, as the sector is gaining more stability and maturity while gravitating towards high-end services. The BPM market has expanded rapidly from the early 1990s, with India emerging as the largest exporter among developing countries. Since then, Philippines, People's Republic of China (PRC), Mexico and Eastern European countries have joined the market as significant players. These countries have been successful in the market due to the availability of skilled labour, low-cost business environments and supportive government measures. Overall, BPM industries in major supplier countries have developed skilled workforces. Therefore, any country hoping to capitalize on this growing market, it is imperative that a strong skilled workforce is built up through specialized training.

The two largest players in the BPM market come from Asia, namely, India and the Philippines. In 2017, India reported US$ 26 billion BPM exports with around 1.15 million individuals employed in the sector. India still continues to dominate the global BPM market with a sizeable share while other players are offering strong competition. The government of Philippines has recognized the BPM sector as one of the best-performing employment generating activities with 1.3 million employed in 2017. The country is the world leader in voice-based services while also making improvements in non-voice and complex process outsourcing, which has shown a promising growth. The Philippine BPO industry generated $23 billion in revenues in 2017 and is projected to reach $40 billion revenue at the end of 2022.

A relative new comer to the BPM market is Africa. The continent has a population of over 300 million fluent in spoken English and a significant talent having being educated in world class universities. The BPM in Africa has grown at a rate of 22% over the past 5 years, which is higher than the global growth rate. South Africa was awarded the 'Offshoring Destination of the Year' at the 2016 Global Sourcing Association (GSA) awards in London. The Business Process Enabling South Africa (BPESA), which operates in multiple capacities of investment promotion agency, national trade association and networking body for the industry; has taken several steps to increase the employment in the sector.

Outside Asia and Africa, Central and Eastern Europe (CEE) has become another emerging region in the BPM market. Poland has the largest BPO market in the CEE region with a total of 1,236 BPO, shared service centres (SSC), IT and research and development services centres operating in 2018 with a total employment of 279,000. The workforce is made up of skilled bilingual or trilingual employees and wages are generally lower than surrounding CEE countries. The workforce is technically proficient as 10% of all EU university graduates come from Poland every year, out of which 40,000 are ICT graduates.

2.4. Emerging technologies and employment in ICT

Newly emerging technologies appear to have a complex impact over ICT workers around the world. According to *Future of Jobs Report 2018* published by the World Economic Forum, four specific technological advances—high-speed mobile internet, AI, big data analytics and cloud technology—are set to dominate the 2018–2022 period as key drivers of business growth. The *World Development Report 2019* published by the World Bank on the theme of 'Changing Nature of Work' envisages that adoption of emerging technologies and new business models, especially digital platform-based business models, are likely to change the demand for skills in a significant manner. This would reshape the skills need for work leading to a decline in demand for less advanced skills that can be replaced by technology while increasing the demand for jobs with advanced human skills. However, the report also surmises that the threat to jobs from technology is usually exaggerated.

On the one hand, as technologies such as automation and artificial intelligence are taking over routine jobs, the threat of job losses looms large. On the other hand, despite predictions about stagnant hiring, ICT firms appear to hire in large numbers due to creation of new jobs. Both outcomes highlight the necessity of restructuring the profile of skills of ICT workforce around the world. The report on *Future of Jobs in India: A 2022 Perspective* predicts that in 2022, 10-20% of IT-BPM workforce in India would be deployed in new jobs that did not exist in 2017 while 60-65% would be employed in jobs with radically changed skill sets. It also predicts that around 20-35% workers employed in IT-BPM sectors in 2017 will face existential threats. It is expected that 10-20% of the ICT-BPM workforce in 2022 would be relating to new roles like 3D designers, AI research scientists and language processing specialists, implying the necessity of re-skilling the current workforce.

The BPM sector is expected to be impacted significantly by digital and automation trends with 70-75% jobs requiring new skill sets by 2022. Capitalizing on new technologies and re-skilling of the workforce will help BPM companies to capture business opportunities especially in technology-focused sectors like banking, insurance and financial services (BFSI).

However, this is a challenging prospect given the prevailing circumstances. According to the Association of Business Process Management Professionals (ABPMP), globally there is a limited number of academic institutions/universities with programs in BPM. This is a disconcerting factor since the industry has a pressing need for skilled employees in vast numbers.

From the side of the government, the *Information Economy Report 2017* of UNCTAD highlights the necessity of introducing policies in areas of education and skills development, labour market reforms and science and technology innovation. The report stresses the need for adjusting education and training systems to teach skills required in digital economy. These changes should not target only young people entering job markets but also the existing workers by retraining them on new skills and preparing them for lifelong learning to ensure flexibility and adaptability of skills to face the fast changing job market conditions.

From the side of business, companies are realizing the necessity of major re-skilling programmes in order to prepare the workforce for the future. Many ICT service providers plan to tackle this problem through the offering of 3-6 month short-term training programmes to new recruits. This approach has its strengths as well as weaknesses. These trainings consume companies' time and money, while providing only a basic orientation to new technologies and business models. As a result, this approach to re-skilling employees is not sustainable in the long run as organizations will not be able to keep up with the rapid pace of technological change.

Alternatively, ICT and non-ICT organizations are looking to recruit ready-to-go employees. These employees are products of universities, vocational training centres or specialised training institutions. To spread awareness, ICT companies and government agencies have started career/education/awareness fairs in many countries. These have increased the awareness on ICT and BPM industries among the youth. In India, the National Association of Software and Services Companies (NASSCOM) is creating new partnerships with universities and other higher-education establishments through its internal skills council in order to introduce new courses and curricula. Industry employers are looking for analytics and design thinking skills in their recruits to compete in the global ICT and BPM industries. In the Philippines, the Information Technology and Business Process Association of the Philippines (IBPAP) is pursuing the Service Management Program (SMP) in high-educational institutions, with 3,000 expected interns to join the BPM firms every year. The 'Philippines IT-BPM Roadmap 2022' has been developed with the aim to accelerate the growth of the BPM industry ensuring that Filipino talent is employable and is in high demand in the future.

03. Overview of Sri Lankan ICT Sector and ICT Workforce

03. Overview of Sri Lankan ICT Sector and ICT Workforce

Sri Lanka's ICT sector is catering to both domestic and international markets in ICT products. The demand for domestic market originates from local ICT users such as households, non-ICT private companies and government organizations. Unlike household users, private companies and government organizations are institutional users. They maintain own in-house ICT facilities while some companies outsource ICT-based functions to external parties that provide IT and networking solutions. Therefore, besides making demands for ICT products in domestic market, they also create demand for ICT workforce for running their own systems. As a result, non-ICT companies and government organizations constitute two major categories of employers for the ICT workforce in Sri Lanka.

In addition to supplying for the domestic ICT market, Sri Lanka's ICT companies are catering to the demands of the international market for ICT products. Of the two broad sub sectors of the global ICT market—i.e. manufacturing and services sub sectors, Sri Lanka's ICT firms are catering mainly to demands arising from ICT services sub sector. Simultaneously, Sri Lanka's BPM companies cater to the demand for ICT-enabled services arising from several industry verticals of global value chains. Export destinations for ICT and BPM companies in Sri Lanka include North America, the EU, Australia, East Asia, the Middle East, Africa and the Nordic region.

Sri Lanka has captured the attention of global industry analysts as a preferred destination for ICT and BPM industries. Favourable rankings by a number of global industry watchers are indicative of this.

- Ranked among the top 10 emerging global destinations by Global Services Magazine
- 'Offshore Destination of the Year' by National Outsourcing Association of the UK in 2013 and 2014. Shortlisted for the Award in 2015
- Ranked in Gartner's 30 'Leading Locations for Offshore Services' positioning among the Top 6 in Asia Pacific in 2016
- Ranked 11th in the A.T. Kearney's Global Services Location Index (GSLI) in 2017
- Ranked 12th in the top destinations in IBM Global Location Trends Report in 2012
- Ranked 16th in the Tholon's top 100 outsourcing destinations in the world in 2016

International consultancy firms, multilateral agencies such as the World Bank as well as key informants interviewed in the survey have identified a number of factors that help successful operation of ICT and BPM industries in Sri Lanka. Cost competitiveness in terms of wages and other associate costs compared with alternative destinations is the most important factor among them. This is complemented by the versatile talent pool, improved ICT and other infrastructure facilities, good business standards and healthy industrial culture as well as relatively better conditions for living and doing business in Sri Lanka.

3.1. ICT Sector's Contribution to National Economy

The ICT sector has emerged as an important source of foreign exchange for Sri Lanka during the last decade. It has shown promise for adding high value to the economy with high paying jobs among other economic sectors. According to CBSL, earnings from the export of telecommunication, computer and information services have increased to US$ 995 million in 2018. This is a 7.5 % growth from US$ 920 million in 2017. Of the total earnings in 2018, US$ 848 million (85%) was earned jointly by ICT and BPM companies while telecommunication contributed to US$ 147 million (15%). The sector has grown 120% over the past five years, becoming the fifth largest source of foreign earnings in the economy. Impressive export performance led the GOSL to recognize the importance of ICT and BPM industries and they have jointly been identified as one of the six priority sectors in the National Export Strategy (NES) prepared by the Export Development Board (EDB). The high growth performance together with national and international recognition have raised the confidence of industry players encouraging them to set ambitious targets of becoming a US$ 5 billion industry creating 200,000 direct jobs and enabling the launch of 1,000 start-ups by 2022.

3.2. Key Players Involved in ICT Workforce

Sri Lanka's ICT sector is comprised of companies that are catering to both domestic and international markets serving with ICT products. Looking from the perspective of ICT workforce, three major types of players involved in the sector can be identified as employers that provide job opportunities for the ICT workforce in Sri Lanka. They are:

- Suppliers of ICT products (i.e. ICT companies);
- IT-enabled services (i.e. BPM companies), and;
- Major users of ICT products and services (i.e. non-ICT private companies and government organizations).

3.2.1. Suppliers of ICT products (ICT Companies)

According to industry sources, Sri Lanka has around 600 ICT companies. They offer a wide range of products for both domestic and global ICT markets. Products listed in industry-related sources include; big data solutions, business solutions and MIS, client-server architecture, cloud services, e-business development, ERP software, ICT infrastructure and services, IOT, IT education and training, mobile application development, payments processors, real-time systems, software development, systems integration and web development and marketing. Some ICT companies in Sri Lanka serve as offshore development centres for major companies from USA, UK, Australia, Sweden, Norway, Japan, etc. Sri Lanka's ICT sector is aligned more with the services subsector of global ICT market than the manufacturing subsector. As a result, ICT companies in Sri Lanka create job opportunities mainly for workers with skills demanded by ICT service industries.

Table 1 provides a profile of information collected on ICT companies in the *National IT-BPM Workforce Survey 2019*.

Table 1: Profile of ICT companies

Parameter	Type	%
Ownership	Local	60.49
	Foreign	22.22
	Joint (Local & foreign)	17.28
Clientele	Local	24.69
	Foreign	23.46
	Joint (Local & foreign)	51.85
Products offered	IT Services	46.9
	Software Services	71.6
	Software Products	66.7
	Communications Equipment	16.0
	Technology Hardware, Storage & Peripherals	19.8
	Electronic Equipment, Instruments & Components	11.1
	Telecommunication	9.8
	Networking & Server solutions	22.2
	Semiconductors & Semiconductor Equipment	-
	Other	6.2

Major countries of export	EU (46.9%), Australia (27.1%), U.K. (25.9%), USA (25.9%), Singapore (19.7%), Maldives (16.0%), Canada (9.8%), Bangladesh (9.8%), India (8.6%)	
Location	Head Office in Colombo	90.12
	Head Office outside Colombo	9.88
	Branch offices in Colombo	8.6
	Branch offices outside Colombo	11.1

According to information given in the table, 60% of ICT companies are locally owned. There are about 22% foreign owned companies while the rest are local and foreign joint ventures. A large majority (90%) of them are Colombo based with 11% having branch offices outside Colombo. Of the total employees inclusive of non-ICT staff, 95.5% are Colombo-based. The remaining 4.5% is scattered around the country of which Jaffna (1.04%), Galle (0.98%) and Kandy (0.87%) are the most prominent places outside Colombo.

Just over half of them (52%) cater to demands from both local and foreign customers. About 25% of companies supply for the local market only, while another 23% supply exclusively for export markets. According to Table 1, 72% of the companies offer software services followed by software products (67%) and IT services (47%) as the main products. Networking and server solutions (22%), technology/hardware storage and peripherals (20%) and communication are among other significant products offered by ICT companies in Sri Lanka.

According to the survey, the workforce in ICT companies is comprised of 99.8 % Sri Lankan nationals. The share of foreigners was less than 0.2%. Of the total number of senior staff of ICT companies, 21.7% were females. A limited number of ICT companies reported staff based in locations outside Sri Lanka which amounted to 3.8 % of locally based workforce. Only 17% Sri Lankans occupied positions in locations outside Sri Lanka and the majority of staff (83%) was comprised of foreign nationals.

3.2.2. IT enabled services (BPM companies)

Sri Lanka has emerged as a leading outsourcing destination in the world as marked by the number of international rankings and awards related to the global BPM industry. Sri Lankan BPM companies offer a variety of services to many international companies with globally known brands. They cater to a number of industry verticals in global value chains that include banking and financial services, healthcare, manufacturing, shipping and logistics and telecommunication. Some international companies have established outsourcing operations in Sri Lanka as captive BPM firms. Quality workforce has been identified as an important factor that enhances Sri Lanka's position in BPM market. For instance, Sri Lanka annually produces a large number of accounting professionals qualified in British Accounting System making the country an attractive destination for financial and accounting outsourcing (FAO). BPM companies offer job opportunities to both ICT and non-ICT workers. Non-ICT BPM workers handle job functions that cater to the needs of respective industry verticals while ICT workers maintain and operate ICT and networking facilities that enable BPM services. A profile of information collected on BPM companies in the survey is presented in **Table 2**.

Table 2: Profile of BPM companies

Parameter	Type	%
Ownership	Captive	33.3
	Non-captive	38.1
	Both	28.6
Clientele	Local	52.38
	Foreign	38.10
	Joint (Local & foreign)	9.52
	Local	9.52
	Foreign	57.14
	Joint (Local & foreign)	33.33
Products offered	Agriculture including Fisheries (AGR)	9.52
	Apparel (APP)	14.29
	Banking and financial services	57.14
	Construction, Engineering, & NGOs	14.29
	Healthcare	28.57
	Insurance	14.29
	Manufacturing	19.05
	Retail and utilities	14.29
	Shipping and logistics	23.81
	Telecom and media	23.81
	Tourism and Hotels	9.52
	Other (Specify)	19.05
Major countries of export	Australia (38.1%), U.K. (33.3%), USA (23.8%), New Zealand (14.3), Singapore (14.3%), Norway (9.5%), Sweden (9.5%), Japan (9.5%), Hong Kong (9.5%), China (9.5%)	
Location	Head Office in Colombo	95.24
	Head Office outside Colombo	4.76
	Branch offices in Colombo	28.57
	Branch offices outside Colombo	19.05

Table 2 shows that 33.3 % of BPM companies in Sri Lanka run as captive BPM operations while 38.1 % companies offer BPM services as third-party operators. Another 28.6 % offers both captive and non-captive services. The majority (52%) of companies are locally owned. There is a significant share of foreign owned companies (38%) with 10% local-foreign joint ventures too.

A large majority of BPM companies (95%) has their Head Offices in Colombo with a few companies (19 %) having branch offices outside Colombo. Unlike in ICT companies, a relatively larger share of employees (26.1%) of BPM companies is based outside Colombo. The most important location outside Colombo is Kurunegala where 21.9% employees work. In addition, BPM workforce was reported from Galle (3.65%) and Kandy (0.5%) also.

BPM companies serve both local and foreign customers. However, only 9% of companies have an entirely local customer base while 57% of companies serve exclusively for foreign clients. The rest (33%) have both local and foreign clients. Sri Lankan BPM companies serve a number of industry verticals. Of them, banking and financial services represent the most prominent type having served by 57% of companies. Health services (29%), shipping and logistics (24%), telecommunication and media (24%) and manufacturing (19%) are among the other significant industry verticals catered by Sri Lankan companies.

As in the case of ICT workforce, over 99.9% of the BPM workforce comprised of Sri Lankan nationals. Foreign nationals' share was around 0.07%. The share of females in the senior staff of BPM companies was 21.7% which is similar to that of ICT companies. Limited number of companies has placed a few Sri Lankans in locations outside the country which amounted only to 0.02% of the locally based workforce.

3.2.3. Use of ICT in Other Economic Sectors

Major ICT users in Sri Lanka include non-ICT private sector companies and government organizations. Many private companies and government organizations have own in-house ICT facilities and dedicated ICT staff to assist operations and maintenance of facilities.

Private sector users (Non-ICT companies)

According to the Economic Census 2013-2014 by the Department of Census and Statistics (DCS), Sri Lanka has 1.02 million economic establishments around the country of which 2,414 have been categorized as large-scale enterprises. In addition, there were 10,408 establishments identified as medium-scale enterprises. These enterprises were classified under 17 Sri Lanka Standard Industry Classification (SLSIC) categories. The categories with the largest number of enterprises classified under them were wholesale and retail trade (41%) and manufacturing (24%). It has been observed that a growing number of companies belonging to all major sectors in the economy use ICT facilities to supply goods and services to their customers. Economic growth has led to the increase in the number of business entities, extended the scale of operations and expanded customer/client bases of these enterprises. Use of ICT has become widespread in all stages of business operations such as production, delivery and marketing. As a result, many companies maintain their own ICT facilities and have recruited dedicated ICT staffs thereby offering job opportunities to skilled ICT workforce in the country. Many of the large-scale enterprises and a significant share of medium-scale enterprises are among the companies that provide employment for the ICT workforce.

Observations and KIIs conducted in the survey has informed that some companies resort to cloud computing facilities replacing in-house facilities while some others are outsourcing ICT-based business operations to external parties thereby offering business opportunities for ICT and BPM companies too. The *ICT Workforce Survey* has continuously covered a cross section of non-ICT companies from selected business sectors that include apparel, finance-insurance-banking, agriculture, manufacturing, shipping and freight forwarding, hotel services and tour operators, construction and architecture, and wholesale and retail trade. The past surveys have reported that the ICT workforce in non-ICT companies has grown rapidly from 6,500 in 2003 to 37,000 in 2013.

Government organizations

Public sector organizations are another important category of ICT users. They include organizations coming under the central government and provincial councils. Public sector comprises of a hierarchy of organizations. At the top most level of this hierarchy are the ministries mandated for broad subject areas of government involvement. The ministries have various line agencies to handle specialized areas within their broad mandates. The line agencies within a ministry may include government departments and state-owned enterprises. The State owned enterprises (SOEs) include statutory boards and institutions (e.g. Authorities, Boards, Institutions) and public enterprises (e.g. State Banks, Corporations, Government Companies). The above-mentioned hierarchy describes the central government organizations. In the level of central government, there are nine provincial councils with provincial ministries and line agencies coming under them. **Table 3** gives a summary of the hierarchy of government organizations.

Table 3: Hierarchy of government organizations

Type of spending units	Number of units
Ministries (including non-cabinet ministries)	36
Departments	121
State owned enterprises	341
Special spending units	22
Provincial Councils	9
Provincial ministries and line agencies	286

Source: Adapted based on the information from Department of Management Services (2017) and Ministry of Provincial Councils and Local Government

Altogether, government organizations constitute a major category of employers for the ICT workforce. All government organizations use ICT facilities at varied levels of sophistication for internal operations as well as for offering services to citizens and businesses including online services. A growing number of public organizations are launching e-government operations and the ICTA is making a significant effort to facilitate this process. With the expansion of e-government capacity of public sector organizations, they can be expected to offer an increased number of job opportunities for the ICT workforce in the country. The *ICT Workforce Survey* has covered the public sector organizations from the first survey in 2003 using a sample of public sector organizations. Past survey findings show that the strength of the ICT workforce in government organizations has grown from 1,500 in 2003 to 5,900 in 2013.

3.3. Suppliers of ICT Workforce: ICT training organizations

ICT training organizations are the primary source of supply of ICT workforce. In addition, they provide employment for professionals with advanced academic qualifications as trainers and researchers. There are four major types of ICT training institutes in Sri Lanka:

- Government universities
- Private degree awarding institutes
- Government vocational and tertiary training institutes
- Private non-degree awarding training institutes

There are 15 government universities in Sri Lanka with 89 faculties and 511 academic departments. In addition, 19 institutes offer postgraduate level training for a wide range of specialized areas. According to statistics published by the University Grants Commission (UGC), 12 universities have produced 1,153 computer science and IT graduates in 2017. Information published in university websites suggest that 26 faculties offer degree courses on computer science and information technology supported by 29 departments and schools. In addition to IT major courses, there are degree programmes with strong IT components combined with engineering, management and mathematics/statistics subjects. UGC statistics inform about 12 postgraduate programmes where students can study on science/IT related fields. Few universities also offer post-graduate diplomas on ICT and diploma and certificate courses which are below the level of degree courses.

In addition to government universities, there are a number of private degree awarding institutes that offer courses leading to Bachelor's and postgraduate level qualifications on computer science and IT. Out of them, 8 institutes offer degree and postgraduate courses that have been recognized by the UGC. There are also private degree awarding institutes that offer courses on IT and related subjects with the affiliation of foreign universities.

These courses can be completed in Sri Lanka or in affiliated institutes abroad. Other than degree courses, private training institutes also offer a large number of courses leading to diploma, higher diploma or trade certificates. Trainees of some of these courses can continue up to degree courses in the same institute or others. The ICT Workforce Survey has covered the supply of ICT graduates from both government universities and private training organizations in previous surveys. Figures indicate that supply of graduates into the workforce has trebled from 2,200 to 6,600 during the period of 2003-2013.

The government has also taken steps to develop a network of tertiary and vocational education and training (TVET) centres around the country. These training institutes are run by both government and non-state education providers (e.g. private sector and NGOs). The TVET institutes offer courses on ICT (TVET-ICT) up to the National Vocational Qualifications Level 6 (NVQ L6) which are below the Bachelor's degree level. The courses at NVQ L5 and NVQ L6 correspond to Diploma and Higher Diploma level qualifications. According to a recent study[4] conducted on skills need and skills gaps in ICT sector, in 2015, there were 18,000 and 7,500 TVET-ICT trainees graduated from government and non-state training institutes, respectively.

3.4. Highlights of the previous ICT Workforce Surveys: 2004-2013

According to ICT Workforce Surveys conducted in 2004, 2007, 2010 and 2013; the strength of the overall workforce has grown from 15,000 in 2003 to 83,000 in 2014. This was more than a growth of 5 times. This growth has been contributed by all four sub sectors, namely; ICT companies, non-ICT companies, government organizations and BPM companies. The highest growth rate was reported from non-ICT companies closely followed by ICT companies. The figures also indicate some slowing down during the period of 2006-2009 which recovered thereafter entering an accelerated phase of growth after 2011.

The BPM sub sector was firstly covered in the *ICT Workforce Survey 2010*. Since then, it has become a permanent component of the survey. Surveys conducted in 2010 and 2013 have reported a steady growth in ICT workforce in BPM companies from 1,700 in 2009 to 4,000 in 2013. During the same period strength of non-ICT workforce in BPM companies had grown from 11,400 in 2009 to 16,350 in 2013.

As far as the composition of workforce is concerned, 'programming/software engineering' remained the dominant job category employing over one fifth of the total workforce all throughout. Its position has been maintained mainly due to high demand for this category from ICT companies which always remained more than one third of the workforce in ICT companies. The job categories 'technical support' and 'systems and network administration' has also maintained their position as important job categories due to high position they occupied in non-ICT and government cadres. The relative positions of other job categories have changed over time. The gender composition in the workforce has improved progressively from 21% in 2009 to 29% in 2013.

Throughout the period, supply of graduates has increased progressively. However, the supply could not match the demand except in 2009 indicating a situation of scarcity relative to demand. Only positive balance was reported in 2009, having the supply exceeding the demand for graduates. This has to be viewed in the light of slowing down of the growth reported in 2006-2009 period. Despite the improvements in numbers of supply, however, the quality of the workforce appeared to have remained a major concern of employers as highlighted by many respondents. Despite the fact that attrition rates have fluctuated over time, they remained consistently below 15%. Compared with most other Asian destinations it can be considered low.

[4]An assessment on skills need and skills gaps in information and communication technology sector (2017)

04. ICT Workforce: Strength, Composition and Quality

04. ICT Workforce: Strength, Composition and Quality

This section examines the strength, composition and quality of the ICT workforce. It also covers the non-ICT workforce in BPM companies. The section begins with an account on the strength of workforce estimated based on sample data. It also evaluates the historical growth of workforce since 2003 based on past survey information. The composition of the workforce is analysed based on relative shares of workers occupied in different job categories (service lines in case of BPM), gender and age distribution. The quality of workforce is examined as reflected by educational qualifications, experience and employees that use emerging technologies. Finally, the steps taken by employers for motivation and retention of workforce are discussed.

4.1. Strength of the ICT workforce

Sri Lanka's ICT workforce has grown by 42,019 employees since the last projection of 82,854 in 2014 to reach 124,873 in 2018 (**Figure 1**). This implies 50.7 % growth during the period concerned at CAGR of 10.8%. It indicates a slowdown in the growth of ICT workforce compared with the period of 2010-2013 which recorded a CAGR of 14.4%. Nevertheless, figures represent a reasonable growth considering the global and domestic economic conditions that prevailed during the period. Despite early expectations about accelerated economic growth that was fuelled by post-conflict growth boom experienced during 2010-2012, Sri Lanka's economy started to slow down from 2013 onwards. High growth performance previously experienced at 6-8% after 2009 has dropped to the level of 3-4% after 2013. This unfavourable economic situation prevailed throughout the entire period since the last workforce survey.

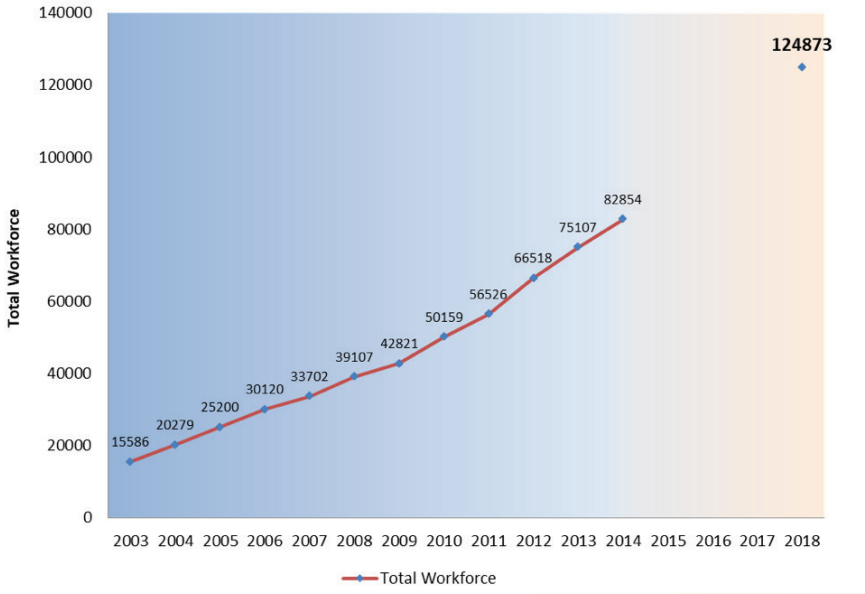

Figure 1: Current strength and growth of the ICT workforce

As far as external economic situation is concerned, during the period between two surveys, global economy has slowly been recovering from the shock experienced after global economic crisis in 2007-2009. Major markets for Sri Lanka's ICT products in North America and Europe experienced slow growth during this period in general, closing to a full recovery around early 2018. Some European countries experienced relative stagnation compared with North America or Asia with possible subduing effect on demand from the Europe. On the other hand, the period overlapped with gradual unfolding of revolutionary changes in the global ICT sector spearheaded by emerging new-generation technologies widely known as 4IR as discussed earlier with a mixed bag of results over the ICT workforce. The full implications of these complex forces of influence can only be understood by looking at the details about workforce situation in major employer categories.

4.1.1. Strength of the ICT workforce by major employer categories

Workforce situation in major employer categories indicates about a drastic structural change. Nearly the entire growth experienced by the workforce during the period appeared to be predominantly contributed by ICT companies which have more than doubled from 33,918 in 2014 to 81,741. According to **Figure 2**, the most dramatic change was experienced by non-ICT companies, which have actually encountered a negative growth of high order. Figures indicate that ICT workforce in non-ICT companies have dropped from the projected level of 37,921 in 2014 to 27,514 in 2018 indicating 27.4 % decline, overall. Slight growth is indicated for government organizations and BPM companies compared with drastic changes experienced by ICT and non-ICT companies which are in opposite directions. Overall this has changed the composition of ICT workforce in favour of ICT companies increasing their share from 40.8 % in 2013 to 65.5 % in 2018. On the other hand, the share of non-ICT companies has dramatically dropped from 47.8 % in 2013 to 22.0 % in 2018.

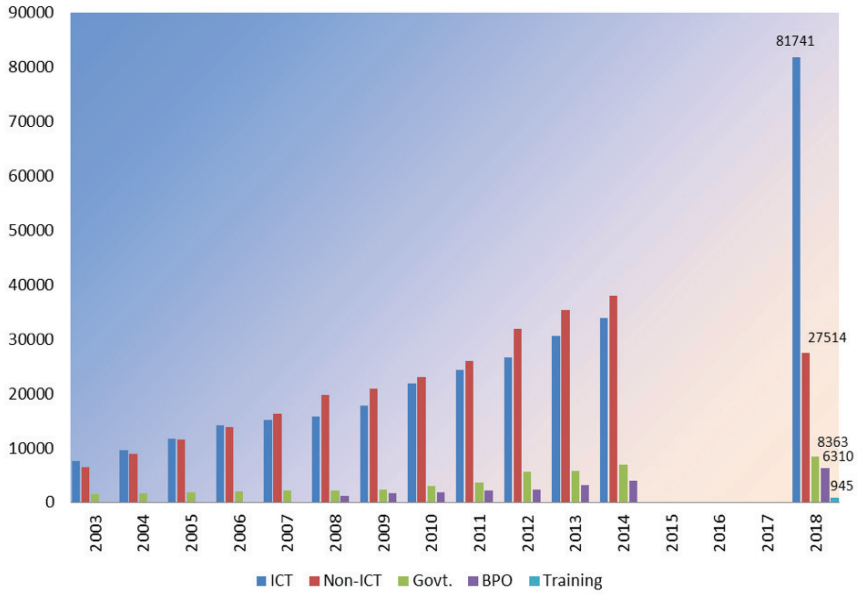

Figure 2: Current strength and growth of the ICT workforce by major employer categories

The drastic structural shift can only be explained by taking the revolutionary changes undergone by the ICT sector globally, into account. High growth of workforce in ICT companies indicates that despite the international and domestic economic slowdown, the industry has been enjoying significant growth in both domestic and global markets. High export performance reported by the CBSL during the period also confirms this. This implies that revolutionary changes taking place in the global ICT sector has positively influenced the Sri Lanka's ICT sector despite the slowdown observed in the economy, overall.

To understand the nature of changes involved in ICT workforce, an analysis of the contribution to workforce by companies established in different time periods was undertaken. In case of ICT companies, the sample included the following profile of companies according to the year of establishment: established in 2000 or before (30.9%); 2001-2005 (12.3%); 2006-2010 (28.4%); 2011-2015 (24.7%); and 2016 and after (3.7%). The shares of total workforce employed and average number of workers reported by companies established in different time periods indicate that the oldest companies established in 2000 or before have the highest share of the ICT workforce with 55.9% of employees with 247 workers per company. This has changed in companies established in subsequent periods as follows; 2001-2005 (10.4% share with 115 workers per company), 2006-2010 (26% share with 125 workers per company), 2011-2015 (7.1% share with 39 workers per company), and 2016 and after (0.7% share with 25 workers per company). This implies that the highest contribution to the employment in ICT sector has been made by the oldest and well-established companies. Compared with them, recently established companies appeared to be relatively smaller in size with lesser number of employees.

On the other hand, it suggests that the same factors have influenced the non-ICT companies to cut down their ICT workforces significantly. Slow growth and stagnating demand in other economic sectors has created pressure for non-ICT companies to cut down their cost including the cost on ICT facilities and staff. Nevertheless their efforts are somewhat eased by emerging developments such as cloud computing which helped them to reduce cost on in-house ICT facilities and cadre. Given the cost and technical complexities involved in handling new technology internally, non-ICT companies appear to have resorted to outsourcing some of the ICT-based functions to ICT companies, retaining only limited cadre to handle in-house operations. Hence, the drop experienced in the ICT workforce in non-ICT companies need not to be viewed entirely on a negative light. Moreover, the growth experienced by ICT companies appears to have partly compensated for this loss.

This explanation was confirmed to a certain extent by the analysis of the workforce by companies established in different time periods. The following profile was reported from non-ICT companies according to the year of establishment: established in 2000 or before (58.4%); 2001-2005 (5.8%); 2006-2010 (12.6%); 2011-2015 (8.9%); and 2016 and after (4.7%). Of them, the highest contribution to the workforce was reported from the oldest companies established in 2000 or before, employing 79.5% of ICT workers in non-ICT companies with 11 workers per company. This changes with companies established in later periods as follows; 2001-2005 (8% share with 4.2 workers per company), 2006-2010 (8.1% share with 5.3 workers per company), 2011-2015 (7.1% share with 3 workers per company), and 2016 and after (0.7% share with 2 workers per company). This situation indicates that ICT workforce in non-ICT companies is mainly concentrated in older companies and newly established companies have recruited progressively declining numbers of ICT employees over time.

4.2. Strength of the BPM Workforce

Figure 3 shows the trend observed in the BPM workforce in the country. According to this, the BPM workforce in the country has increased from 17,427 in 2014 to 25,510 in 2018. This amounts to a growth of 46 % at CAGR of 9.99%. This represents a slight acceleration of growth compared with the period of 2010-2013 which reported a CAGR of 8.62%.

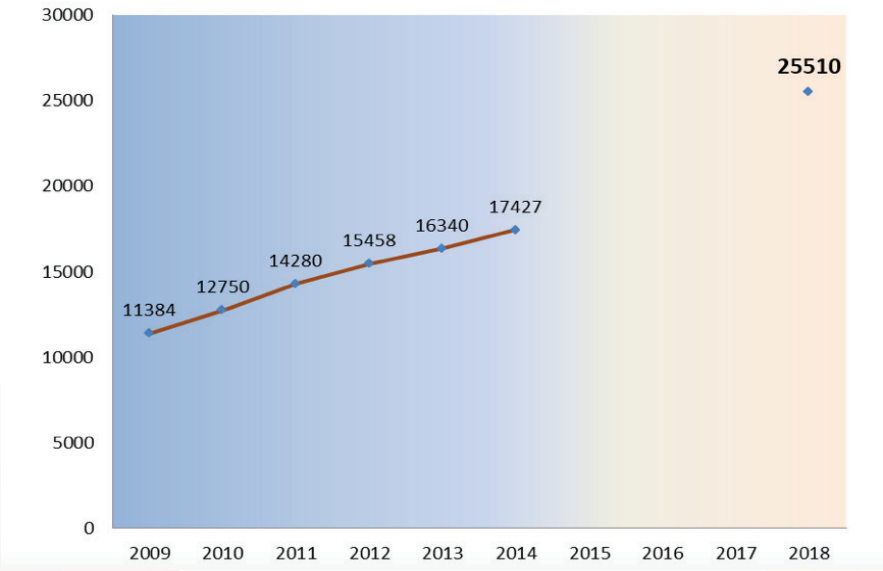

Figure 3: Current strength and growth of BPM workforce

The figures indicate that the BPM workforce has experienced reasonable growth during the period despite global economic slowdown. It appears that the pressure created due to slow growth and suppressed demand has prompted global companies in several industry verticals to cut down their cost thereby creating an indirect boost for offshore outsourcing companies. As a result, BPM companies in Sri Lanka have enjoyed an opportunity which is confirmed by their sound export performances, too.

Analysis of distribution of the BPM workforce according to the year of establishment of companies reported the following profile: established in 2000 or before (4.8%); 2001-2005 (23.8%); 2006-2010 (28.6%); 2011-2015 (38.1%); and 2016 and after (4.8%). These figures indicate that, the BPM industry in the country has grown after 2000 and the majority of BPM companies have been established after 2005. The workforce shares and the average number of BPM workers in companies established in different time periods were as follows: 2000 or before (5.1 % share with 676 workers per company); 2001-2005 (25.5% share with 676 workers per company); 2006-2010 (39.9% share with 881 workers per company); 2011-2015 (29.3% share with 485 workers per company); and 2016 and after (0.2% share with 29 workers per company). This represents a significantly different scenario compared with ICT companies.

4.3. Composition of the ICT and BPM workforces

The composition of the workforce was analysed based on the relative shares of workers occupied in respective job categories in the total workforce and the distribution of gender and age. In case of the BPM workforce, composition was analysed using relative shares of workers occupied in different service lines.

4.3.1. Composition of Job categories of ICT workforce

Figure 4 shows the overall composition of ICT workforce. According to this, software engineering (39%) and software quality assurance (15%) are the job categories occupied by the highest shares of workers. Altogether, they amounted to more than half (54%) of the total workforce. Staff occupied in IT and technical support (9%), client support (8%) and business analysis (6%) were the next prominent job categories of the workforce. The least represented job category was data scientists (<1%) followed by IT service management and governance specialists (1%). The composition with high relative shares of workers in software related job categories confirms the importance of software products and related services as the key ICT products offered by ICT companies in Sri Lanka as shown in **Table 1**.

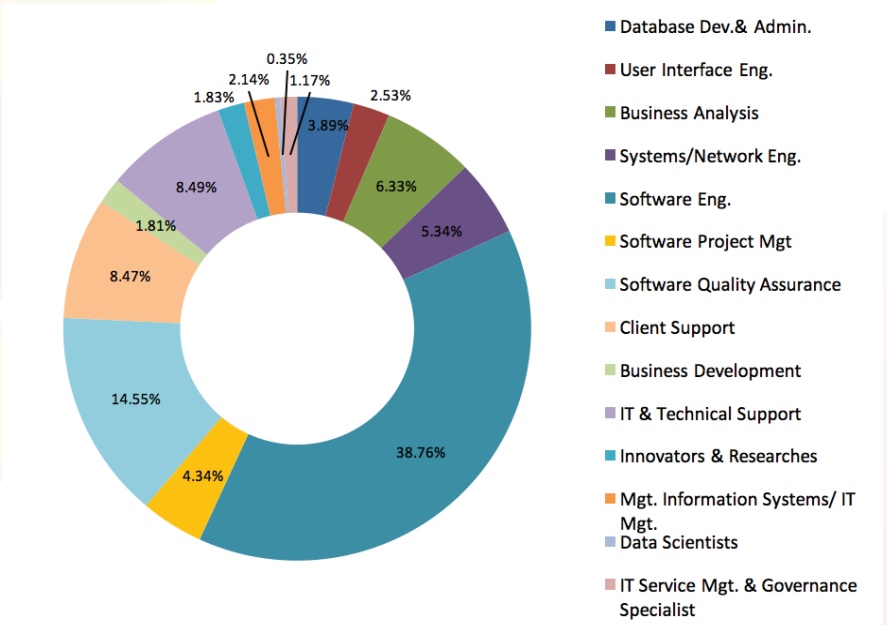

Figure 4: Composition of ICT workforce by job categories

However, the composition of ICT workforce varies significantly across major employer categories. In the case of ICT companies, relative shares of software engineering (45%) and software quality assurance (17%) goes even higher exceeding over 60% workforce in ICT companies (**Figure 5**). Relative shares of IT and technical support (4%), client support (6%) and other job categories declines proportionately while business analysis (6%) remains the same.

In contrast, IT and technical support (47%) and client support (19%) were the most important job categories reported for non-ICT companies. Altogether they constitute two thirds of the ICT cadre in non-ICT companies. Database development and administration (7%), management information systems and IT management (6%) and system and network engineering (6%) are the other important job categories for non-ICT companies.

The situation varies further in the case of government organizations. The existing pattern there is somewhat similar to non-ICT companies, having IT and technical support (20%) and client support (17%) reported as the job categories with the highest shares of employees. However, significantly high shares of ICT employees were reported under database development and administration (14%) and software engineering (14%) followed by business analysis (8%) and system and network engineering (7%). Overall, the composition of the ICT workforce in government organizations appears to represent an intermediate position between relatively more skewed compositions of ICT and non-ICT private companies. The data scientists were the lowest occupied job category in the case of all three types of employers.

The job categories considered in the current survey and the survey conducted in 2013 were not identical; changes in the composition are not directly comparable. Nevertheless, in 2013 also software engineering and software quality assurance held dominant positions in ICT firms. The current survey indicates that their positions have strengthened further. In the case of non-ICT companies and government organizations, systems and network administration followed by technical support were the major job categories reported in 2013. In 2018, IT and technical support has become the dominant category for both types of employers followed by client support. Moreover, in 2013, non-ICT companies and government organizations had closely similar compositions, unlike in 2018.

As far as gender distribution in different job categories are concerned, a clear male dominance can be observed in all job categories except in the case of client support (female 59.4%) in non-ICT companies and client support (female 61.6%) and business analysis (female 64.7%) in government organizations. In terms of relative shares of different job categories among females, there were a few job categories of which respective shares exceed that of corresponding shares for males. However, this varies according to the type of employer. In the case of ICT companies; business analysis, software quality assurance and client support shows higher relative shares among females (9.1%, 19.1% and 12.2% respectively) compared with corresponding shares among males (5.1%, 12.5% and 6.8% respectively). A similar situation can be observed for database development and administration (19.1% among females vs. 11.9% among males), business analysis (9.1% vs. 7.2%), client support (28.0 % vs. 10.6%) and business development (6.1 % vs. 4.2%). As for the government organizations, client support (28.90 % vs. 12.3%) and business analysis (3.5% vs. 1.3%) indicated higher relative shares among females compared with corresponding figures among males.

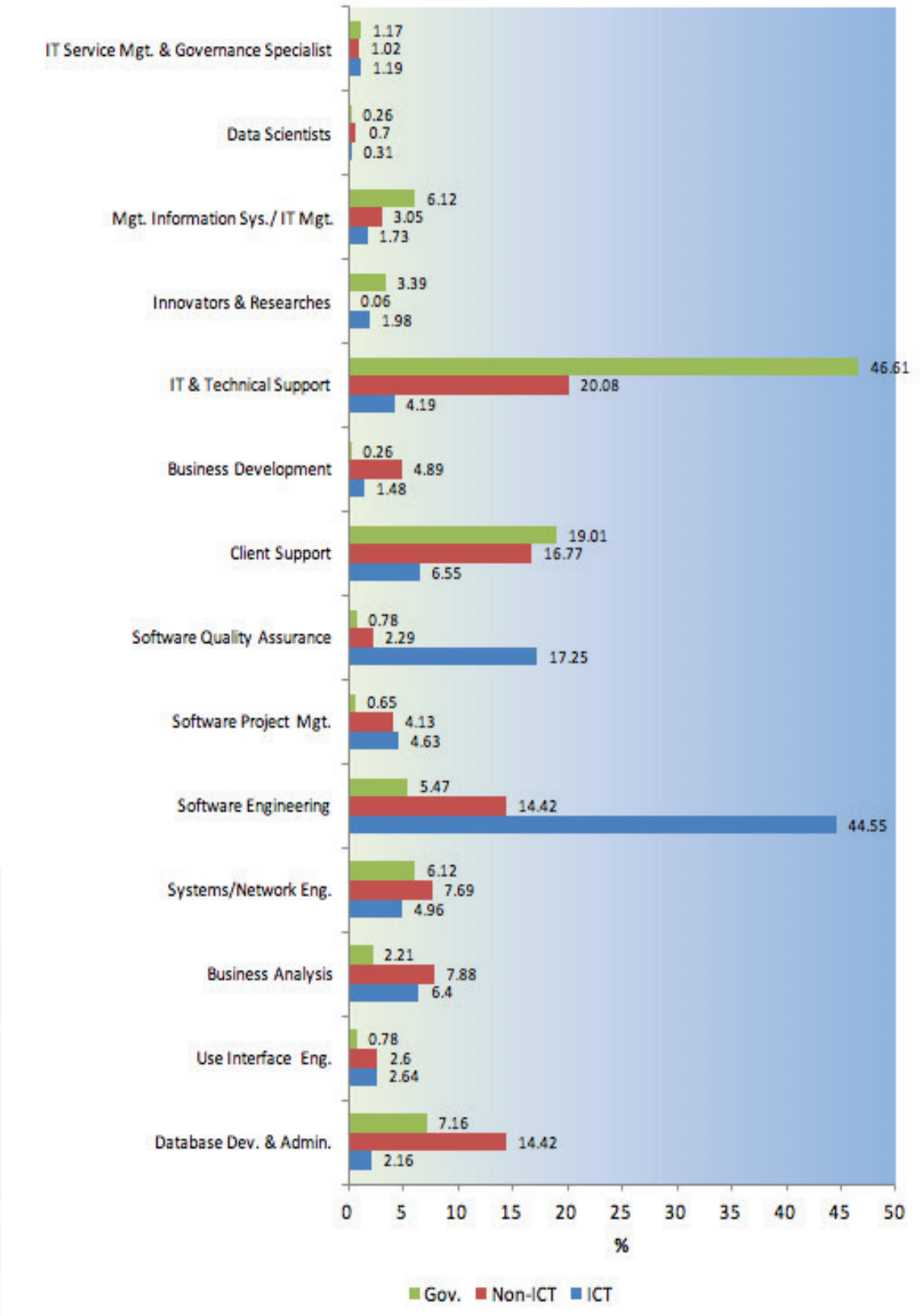

Figure 5: Composition of job categories by major employer categories

The distribution of job categories has further been analysed in the case of ICT companies to identify their involvement in different ICT products. Accordingly, relative shares of workers of each job category allocated in major ICT products have been analysed. **Figure 6** shows the results of this analysis.

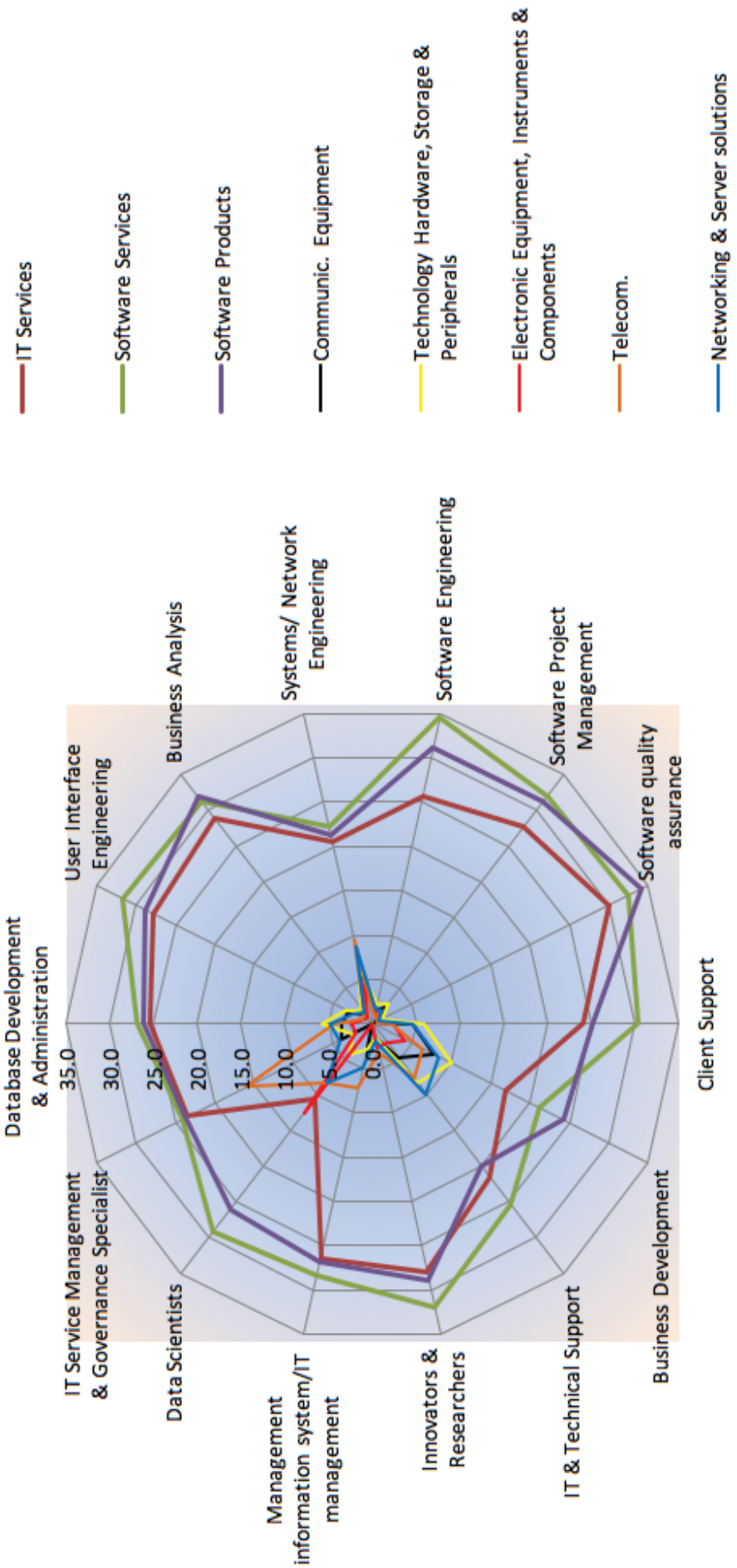

Figure 6: Distribution of job categories among major ICT products

Figure 6 indicates that, workforce in all job categories are concentrated in three ICT products namely, software services, software products and IT services. Except in the case of the share of data scientists in IT services, over 15% of workers in all job categories has been allocated in these three products. Relative shares of all job categories vary in the range of 15-35% within these three ICT products. Relative shares of software engineering, software quality assurance and software project management exceed over 30% in the cases of software products and software services. The lowest relative shares reported for three major ICT products are data scientists (for IT services), IT and technical support (for software products) and systems/network engineering (for software services). Relative shares of job categories allocated to other ICT products remain lower than 10% in general for all job categories except in very few occasions (e.g. ICT service management and governance specialists for telecommunications).

4.3.2. Composition of BPM workforce by service lines

The composition of BPM workforce in terms of relative shares of service lines is shown in **Figure 7**. It shows that document management (29%) and finance and accounting (24%) jointly account for more than half of the BPM workforce. They were followed by customer services (12%) and data analysis (7%).

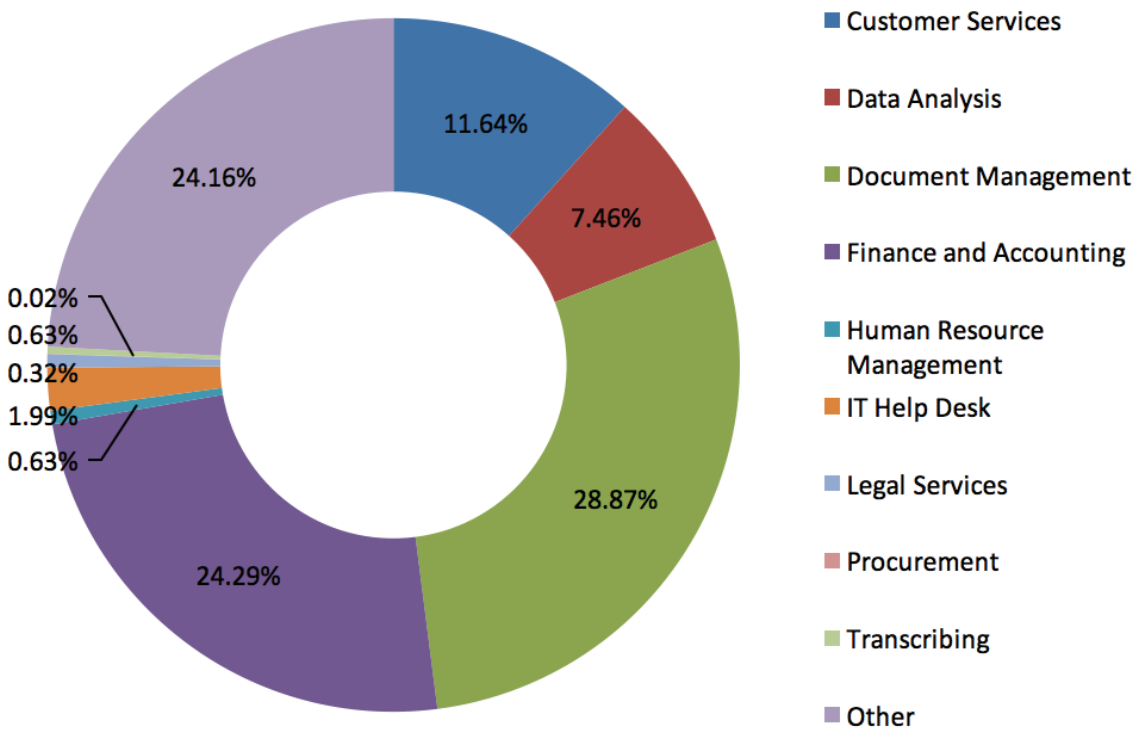

Figure 7: Composition of BPM workforce by service lines

Under the relatively large 'other' category, following service lines were newly reported, though in small shares; remote tech support, research and analytics, technical roles, publishing services, AIP and data digitization and handling shipping documentations. No comparison with past data was possible in case of composition of BPM workers since the previous workforce surveys had not covered this aspect. A clear female dominance was reported in case of document management (32.7% females vs. 25.5% males). Marginal cases of female dominance can be observed in cases of legal services and transcribing.

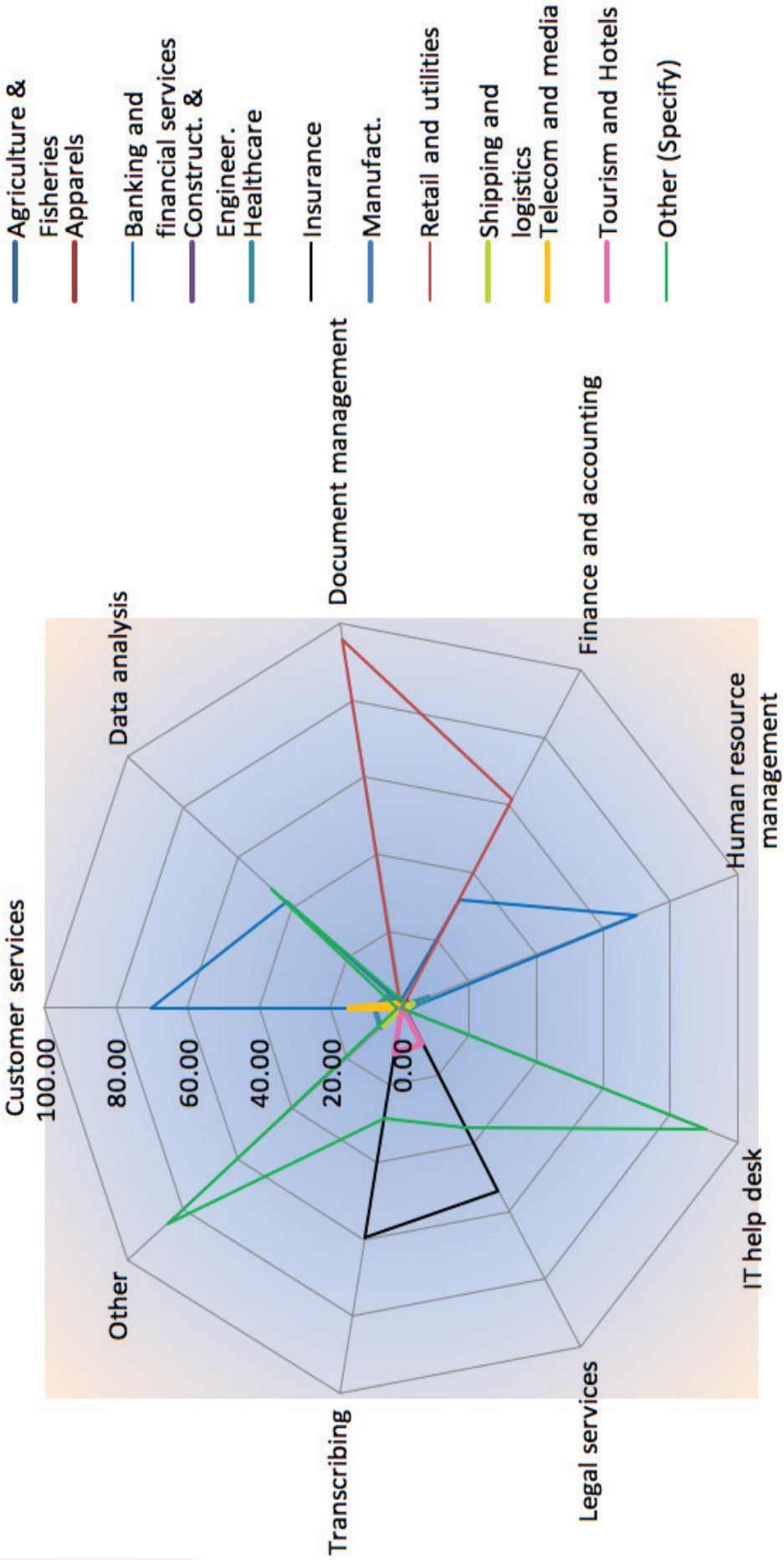

Figure 8: Distribution of service lines among Industry verticals

The distribution of service lines of BPM companies across different industry verticals has been analysed. This is similar to analysis of job categories in ICT companies across different ICT products. Relative shares of workers allocated in major industry verticals from each service line have been analysed and the results are shown in **Figure 8**.

Unlike in the case of ICT job categories, Figure 8 indicates that BPM service lines are asymmetrically distributed among industry verticals. For instance, the industry vertical of retail and utilities has absorbed large shares of workers in document management and finance accounting service lines. The support of other service lines demanded by this industry vertical appears to be minimal. Similarly, transcribing and legal services are allocated mainly in insurance vertical. In case of banking and financial services, key service lines involved are customer services, finance accounting, human resource management and data analysis.

4.3.3. Gender composition of ICT and BPM workforces

The overall gender composition indicates that Sri Lanka's ICT workforce is still a male dominant workforce (**Figure 9**). Two thirds of ICT jobs are occupied by males. However, Figure 8 indicates that the composition varies significantly across major employer categories.

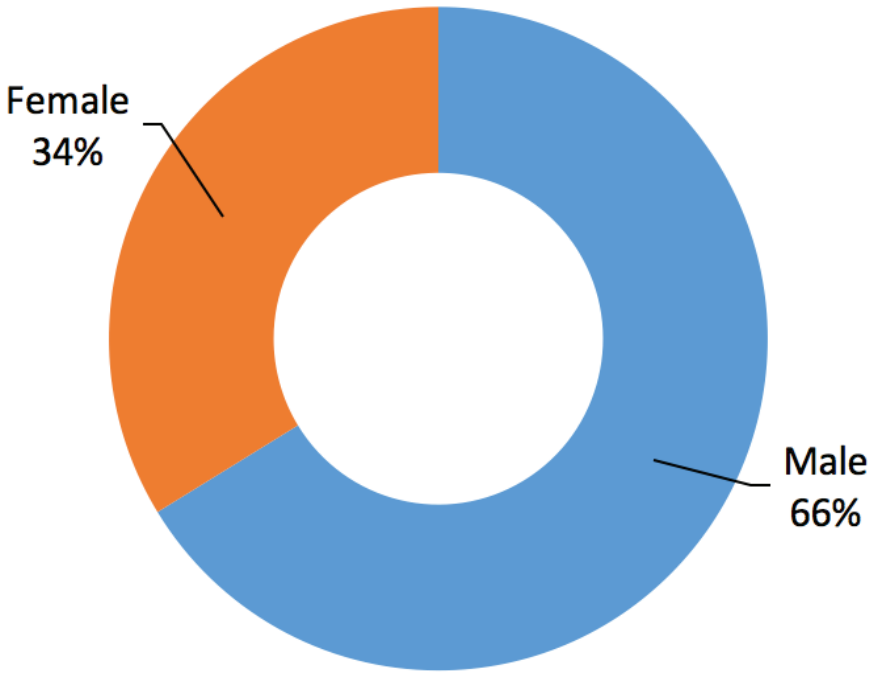

Figure 9: Gender Composition of the ICT workforce

According to Figure 10, the lowest share of female employees (29.4%) was reported from ICT companies. The share increases to 35.6% in non-ICT private companies. It has reached just over 40 % in government organizations. The composition has come very closer to a situation of gender-balanced workforce in BPM companies, having a share of 48.6% female employees.

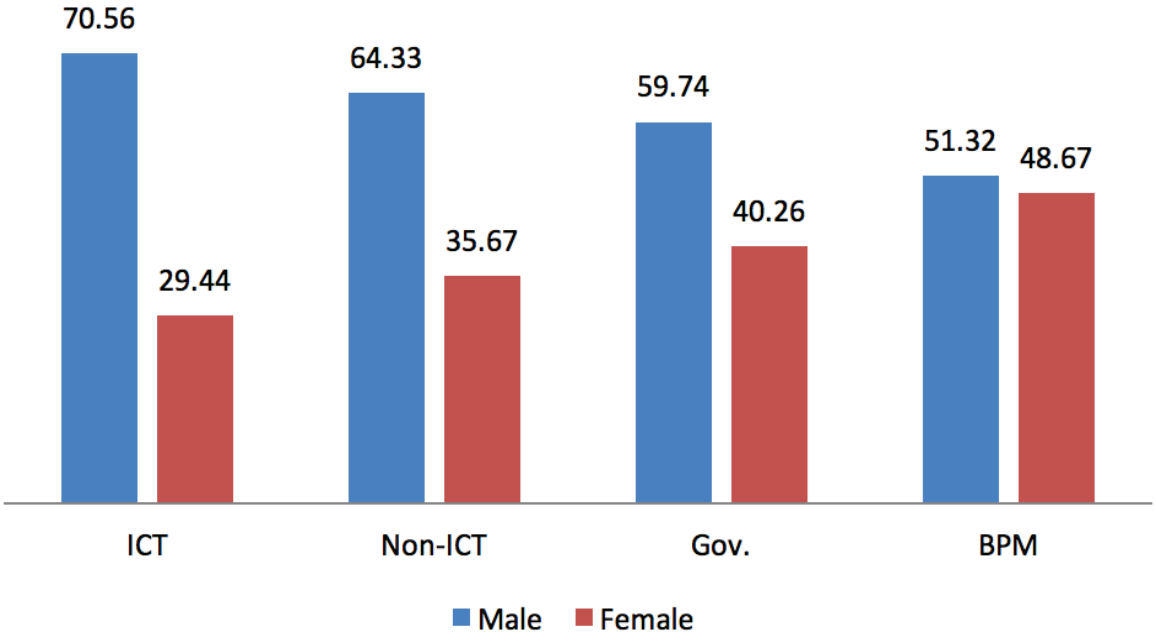

Figure 10: Composition of job categories by major employer categories

Comparison with past surveys indicates that the gender composition of the ICT workforce has improved progressively over time, overall as well as in major employer categories. The overall composition has improved from 21% in 2010 through 29.7 in 2013 to 34% in 2018. Among major categories of employers, the highest improvement can be observed in non-ICT companies of which the share of female ICT employees has almost doubled from 18.8% in 2013 to 35.7% in 2018. The ICT and government organizations have also seen slight improvements while the BPM companies have maintained the near gender-balanced situation as in 2013.

4.3.4. Composition of ICT and BPM workforces by age categories

Figure 11 shows the composition of workforce in terms of distribution of age categories. It indicates that 93% of the ICT workforce in Sri Lanka comprises of workers below 45 years of age. Of this, 69% are below 35 years; workers of 25-34 year age category being the highest segment of workforce. The ICT workforce in Sri Lanka is a relatively young workforce with only 7% over 45 years of age.

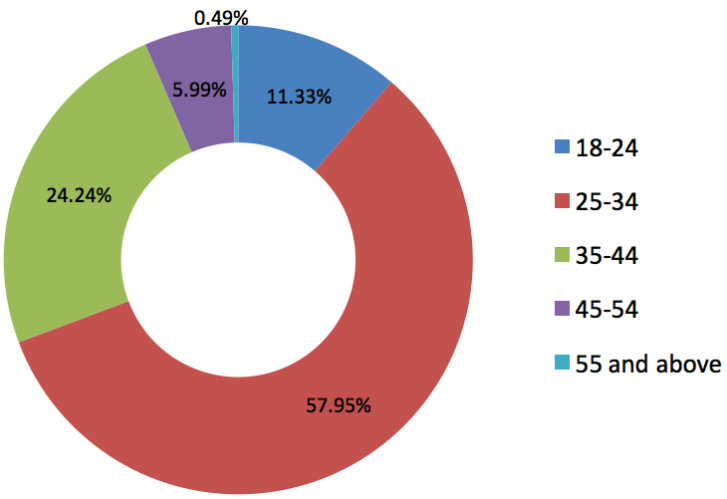

Figure 11: Composition of age categories in the ICT workforce

The composition of age categories shows significant variation among major employer categories. Nearly the same pattern can be observed among ICT and non-ICT companies with minor variations (**Figure 12**). Both groups have over 50% in the age category of 25-34 while nearly a quarter of the workforce is in the category of 35-44 age group. In contrast, the majority (51.3%) of ICT workers in government organizations belonges to the age category of 35-44 followed by the 25-34 year category (29.6%). A significant share (nearly 18%) of workers over 45 years also was reported from government organizations.

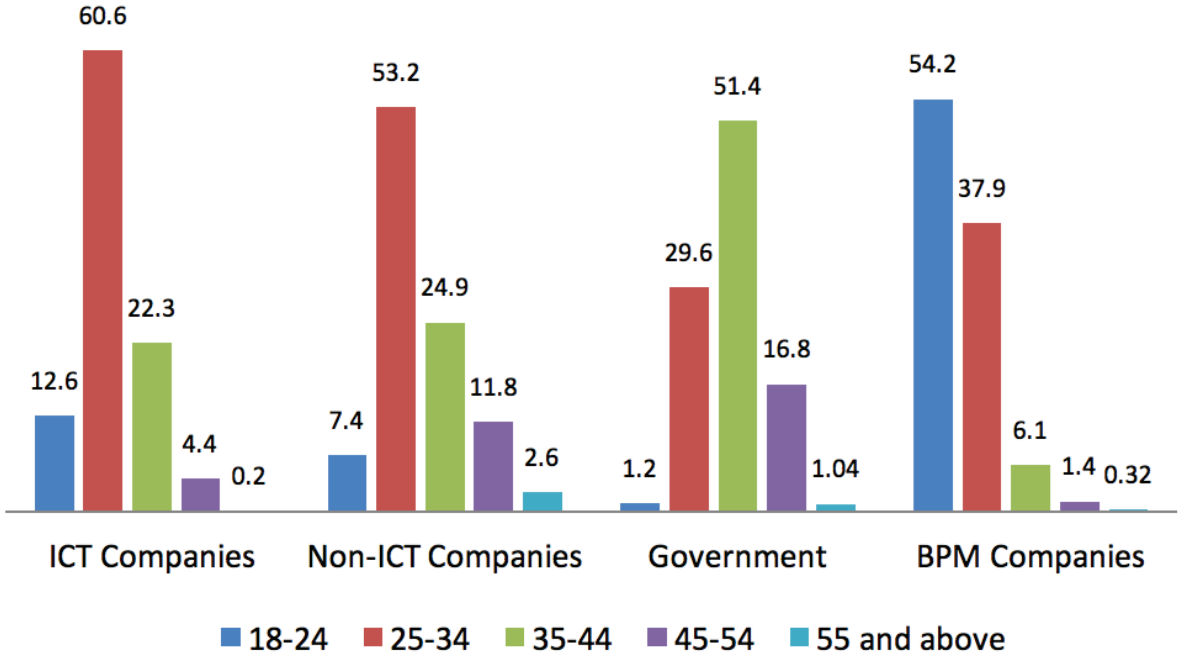

Figure 12: Composition of age categories by major employer organizations

The BPM workforce in the country shows a skewed distribution in terms of age categories, having the majority (54.2%) reported from the lowest age category of 18-24 years. This is followed by the age category of 25-34 (37.8%). Overall, the BPM workforce is relatively younger than ICT workforce having 93% of workers under 35 years of age.

4.4. Quality of the ICT Workforce

The quality of the ICT workforce is reflected by the level of education, experience and skills in emerging technologies. Information on educational qualifications, level of experience and skills in selected emerging technologies was gathered from the survey. This section presents an analysis of these parameters to evaluate the quality of ICT and BPM workforces.

4.4.1. Quality of the workforce: Educational qualifications

Figure 13 presents the overall profile of qualifications of the workforce. Nearly two thirds of the (64.2%) workforce are Bachelor's degree holders. Taken together with Masters (6.9%), PG Diploma (2.5%), non-IT graduates (10.4%) and PhD (0.1%) holders; nearly 85% of the ICT workforce in the country have qualifications at the Bachelor's degree level or above. Only around 15 % employees have qualifications below the degree level of which 4.3% are experienced self-learners without any formally acquired qualifications.

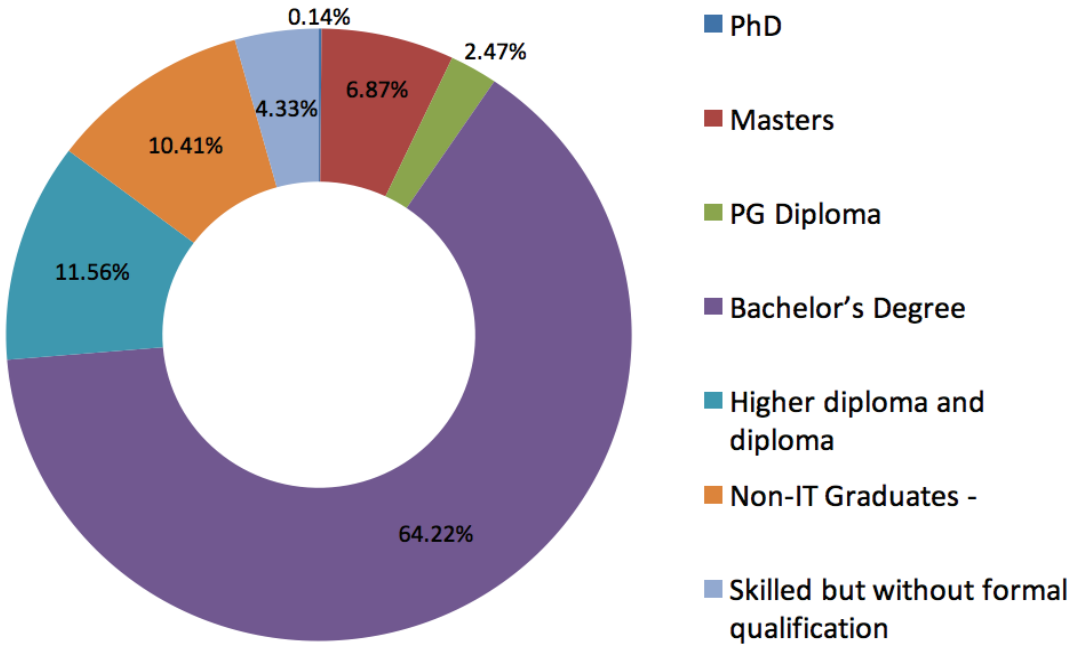

Figure 13: Profile of qualifications of ICT workforce

Gender distribution of the qualification profile indicates that in all categories the share of male workers is higher than female workers (**Figure 14**). Under all qualification levels, males have over a 65% share which has increased to 74% and 95% at Masters and PhD levels, respectively. Females reach the highest share of 35% in the case of PG Diploma level.

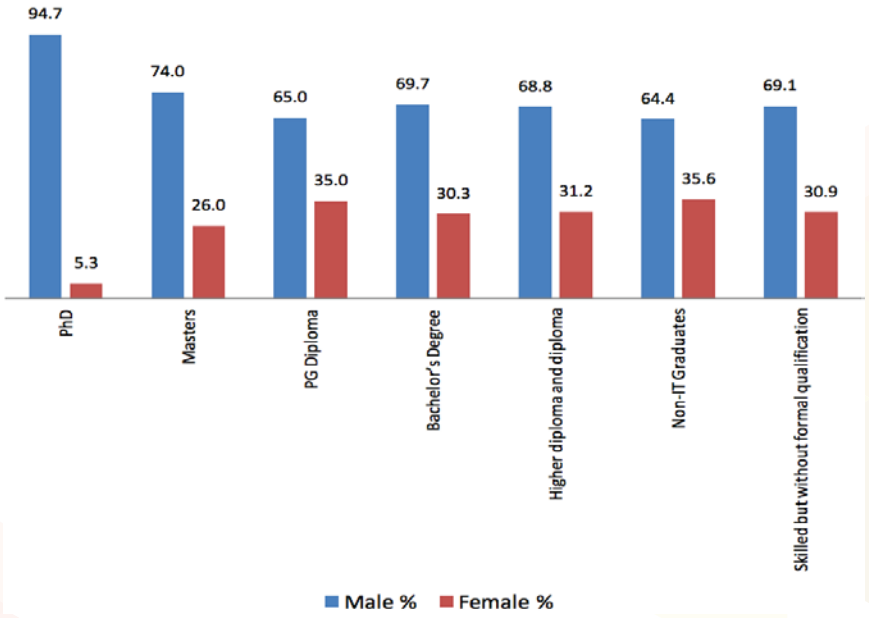

Figure 14: Profile of qualifications by gender

The respective share of each category of educational qualifications among female workers was analysed. It reported the following composition; Bachelor's degree 63.3%, non-IT graduates 12.0%, Higher Diploma and Diploma 11.7%, Masters 5.9%, skilled but without formal qualifications 4.3%, PG Diploma 2.8% and PhD 0.02%. These figures indicate that the distribution of qualifications among female workers is quite similar to that of the overall distribution of qualifications in ICT workforce as shown in **Figure 13**.

As far as distribution of educational qualifications among major employer categories are concerned, ICT companies show a superior profile of qualification than non-ICT companies or government organizations

(**Figure 15**). In ICT companies, the share of employees with the qualification of degree or above reaches over 90% with only 8.7% non-IT graduates among them.

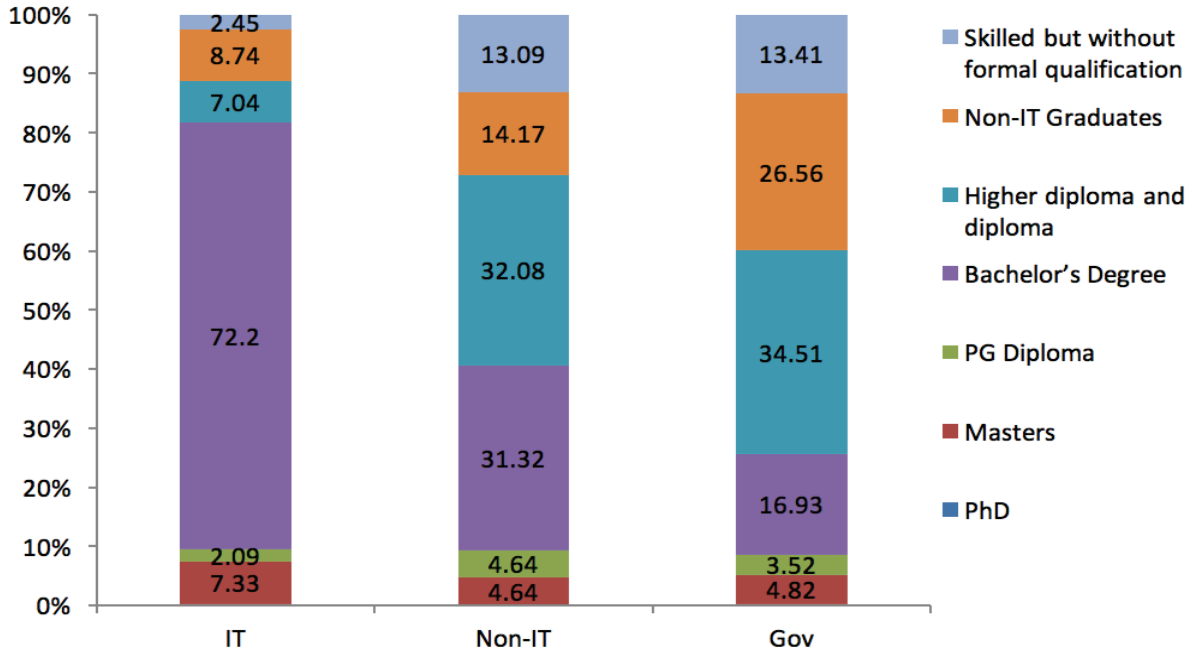

Figure 15: Qualifications of ICT workforce by major employer categories

In the case of Non-ICT companies and government organizations, their qualification profiles appear to be quite similar to each other, having 45-48% of ICT jobs occupied by non-graduate employees. One significant difference between the two employer categories was that non-ICT companies have a higher share of Bachelor's degree holders in ICT (31.3%) among graduate employees while government organizations have a bigger share of non-IT graduates. Overall share of graduate employees were at 55% and 52% levels in non-ICT companies and government organizations, respectively.

Comparative assessment with past survey information indicates that the quality of the ICT workforce has significantly improved in terms of educational qualifications. In 2013, overall share of employees with a degree level qualification or above constituted at 66% of the workforce which has increased to 85% in 2018. In ICT companies this share has increased from 70% to 90% whereas for non-ICT companies and government organizations the share has increased from 30-35% to 50-55% range.

4.4.2. Quality of the workforce in Experience

According to **Figure 16**, workers with 1-3 years of experience comprise 40 % of the workforce while another 30% has 3-8 years of experience. The share of less than 1 year is around 11%. Nearly 20% of workers have more than 8 years of experience, a quarter of which having more than 12 years of experience. Overall, 80% of the workforce has less than 8 years of experience, which implies Sri Lanka's ICT workforce is relatively a young workforce.

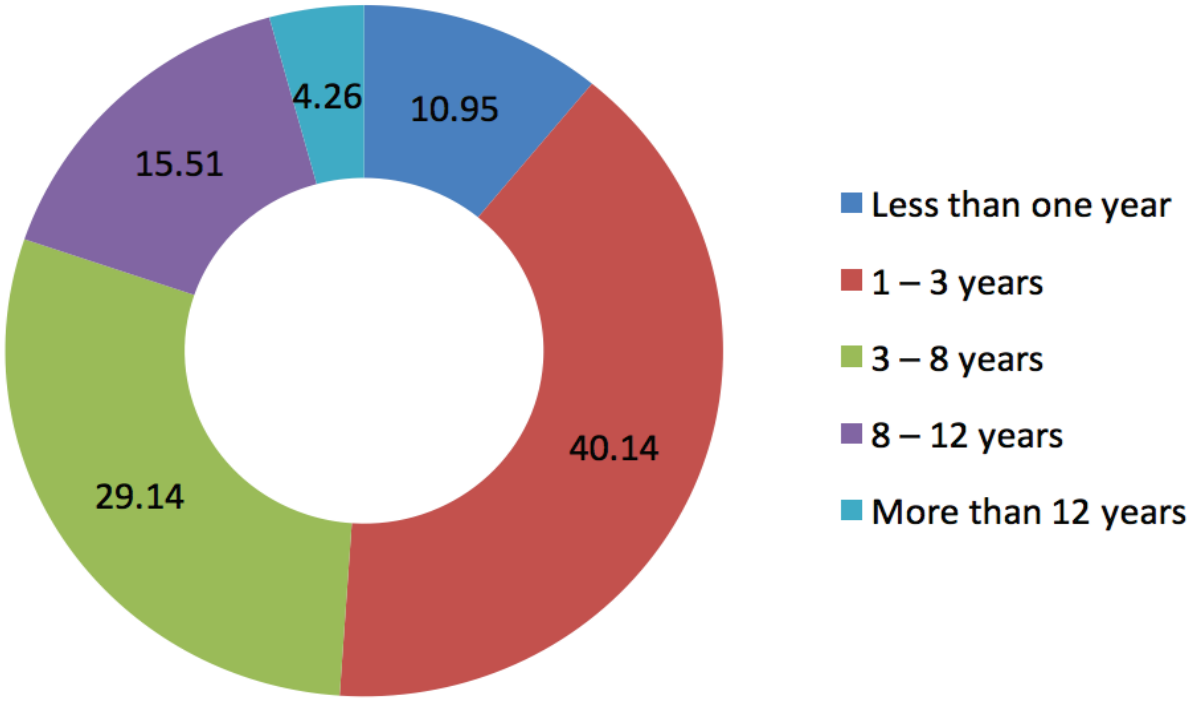

Figure 16: Experience profile of ICT workforce

Figure 17 shows that the share of female employees remains around 40 % in all experince categories except for the higest expereince category of more than 12 years. In this category, the share falls to 33.7%. This implies that the gender distrbution of employees receruited in the workforce during the last 10-12 years remained relatively stable at 60:40 male-female ratio.

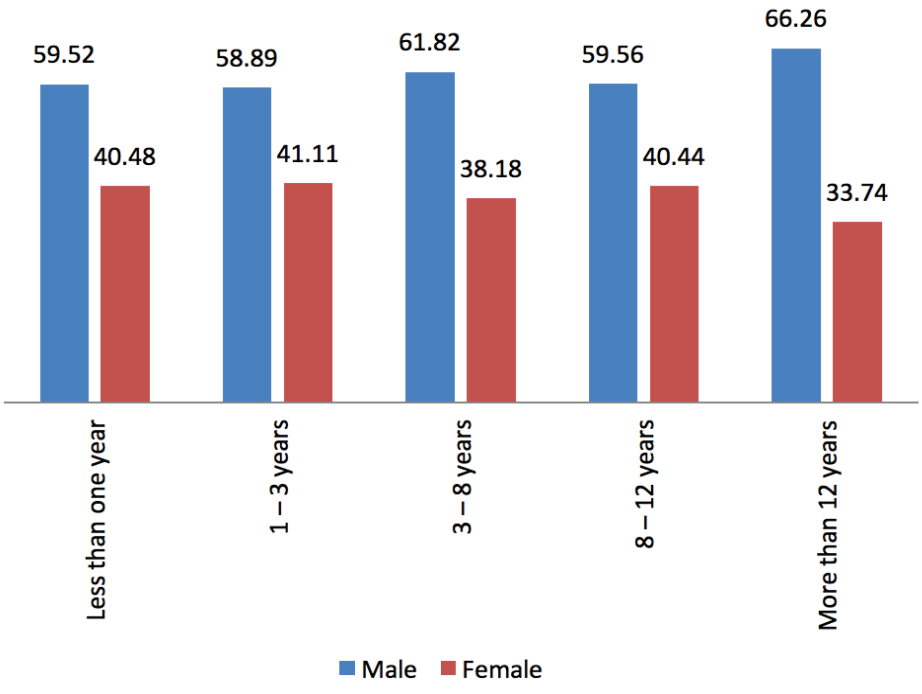

Figure 17: Experience profile of ICT workforce by gender

An analysis of respective shares of each category of experience among female workers was carried out. The reported figures were as follows: 0-1 year 13.0%, 1-3 years 40.5%, 3-8 years 30.3%, 8-12 years 11.6%, and above 12 years 4.7%. Comparison of these figures with the overall distribution given in Figure 16 suggests that the distribution of experience among female workers follows a pattern quite similar to the overall distribution of experience in the ICT workforce. Minor variations were reported in experience categories of 0-1 year and 8-12 years where the share of 0-1 year category was slightly higher among female workers.

The profile of experience shows some variation across major employer categories (**Figure 18**). Experience profiles of ICT and BPM companies indicate some similarities in distribution, especially in main categories of 1-3 years and 3-8 years of experience. However, the workforce of ICT companies appears to be relatively young, having a higher share of workers with less than 1 year of experience whereas BPM companies have a more significant 8-12 year category. In non-ICT private companies and government organizations, a higher share of employees falls under 3-8 years of experience category. Government organizations appear to have a workforce with a more mature profile than other employer categories.

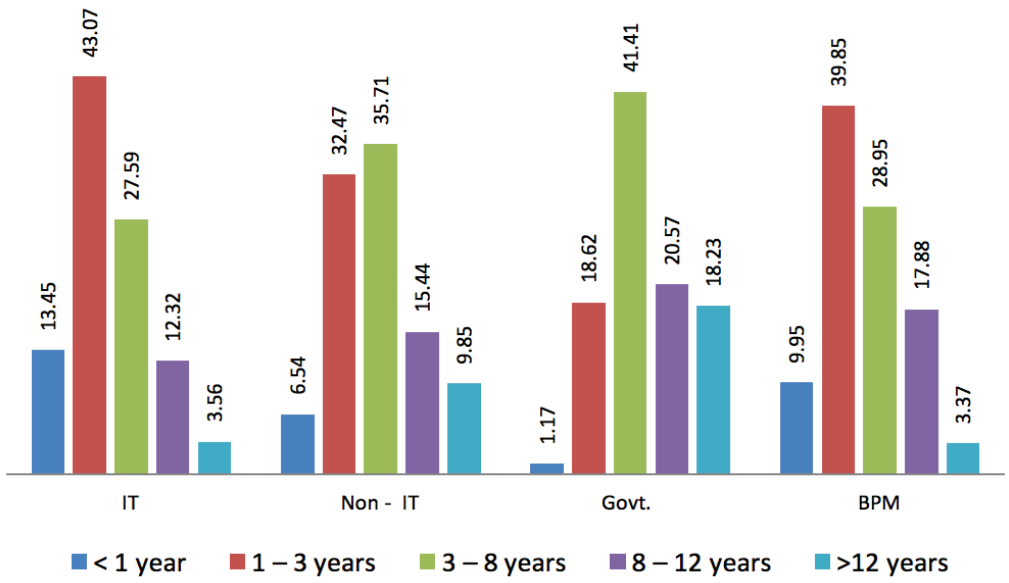

Figure 18: Experience of workforce by major employer categories

When compared with 2013, the ICT workforce as a whole has become more mature, having middle experience categories becoming more prominent than the lowest experience category while the share of higher experience categories over 8 years of experience also has increased. For instance, in 2013, ICT companies had a workforce with 90% below 8 years of experience and 22% with less than 1 year. In 2018, workers with more than 8 years of experience have increased over 15% while less than 1 year of experience category shrinked to 13%. The same process of maturing can be observed among all employer categories.

4.4.3. Quality of the workforce: Skills in emerging technologies

Given the growing importance of emerging technologies in the ICT sector, the level of skills on emerging technologies can also be considered as a parameter reflecting the quality of workforce. The survey has reported that a segment of the total workforce in each type of employer is occupied in emerging technologies. The share involved in emerging technologies was the highest in ICT companies, having over a quarter of the workforce (26.7%) reported as using emerging technologies. The respective shares fell significantly in other employer categories with 7.4% in non-ICT companies and 9.4% in government organizations.

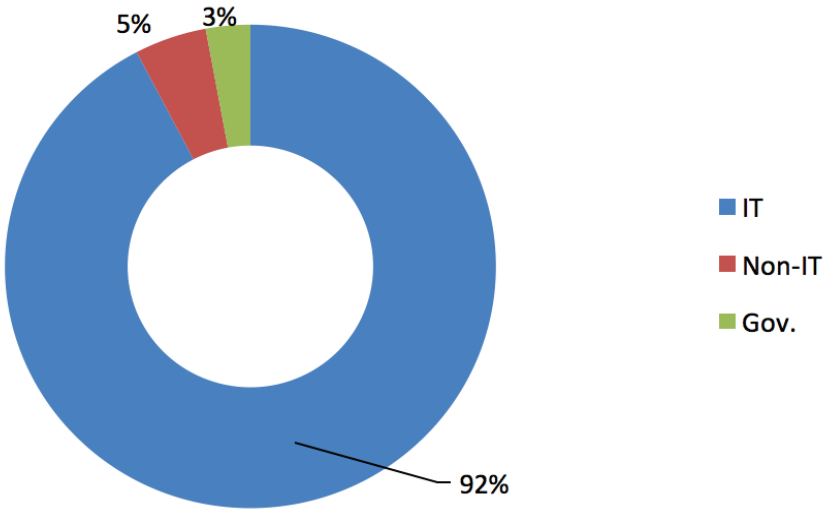

Figure 19: Distribution of employees that use emerging technologies among major employer categories

As far as overall distribution of employees involved in emerging technologies is concerned, the ICT companies show an overwhelming dominance with 92% (**Figure 19**). The shares of non-ICT companies and government organizations were reported at 5% and 3%, respectively.

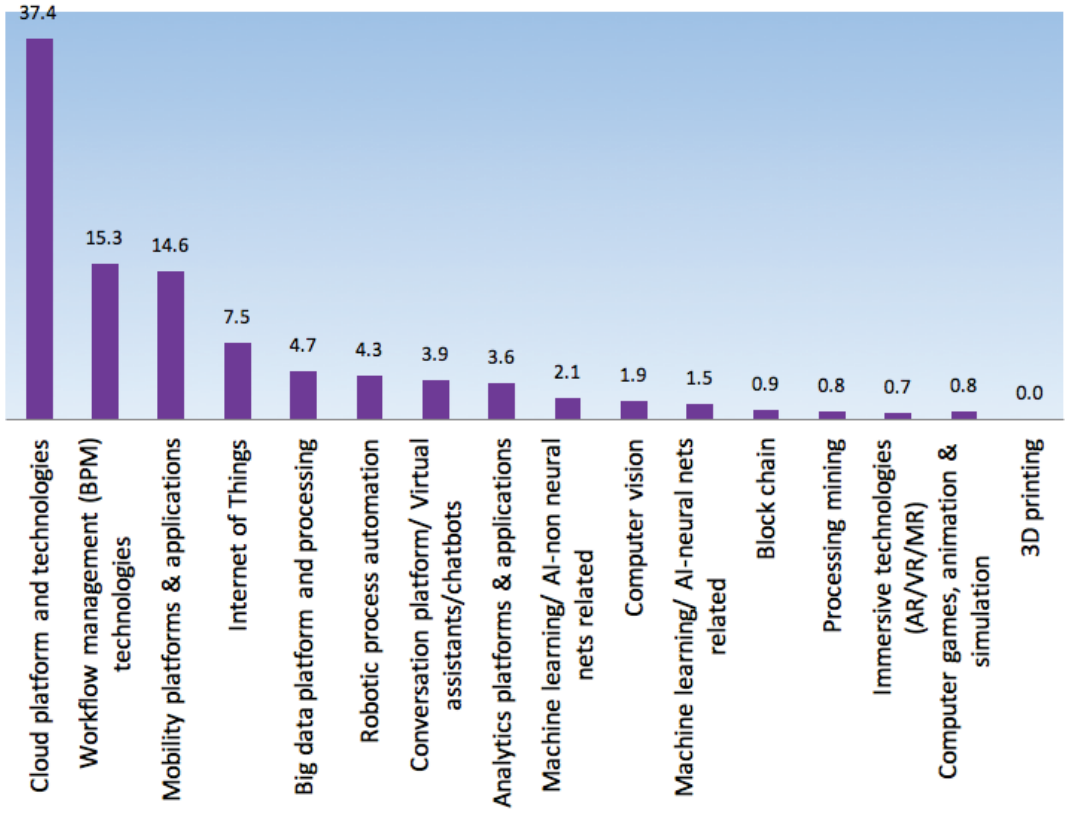

Figure 20: Occupation in emerging technologies

Figure 20 shows the shares of employees involved in different emerging technologies. According to that, cloud platform and technologies (28.9%), workflow management technologies (11.8%) and mobility platforms and applications (11.3%) have emerged as the most widely used new technologies. Altogether, they amount to over half of the employees involved in new technologies. Relatively minor shares of employees were reported under other selected technologies having less than 5% except in the case of IoT (5.8%). Few companies have reported a significant number of workers under 'other' category also, without specifying the technologies concerned.

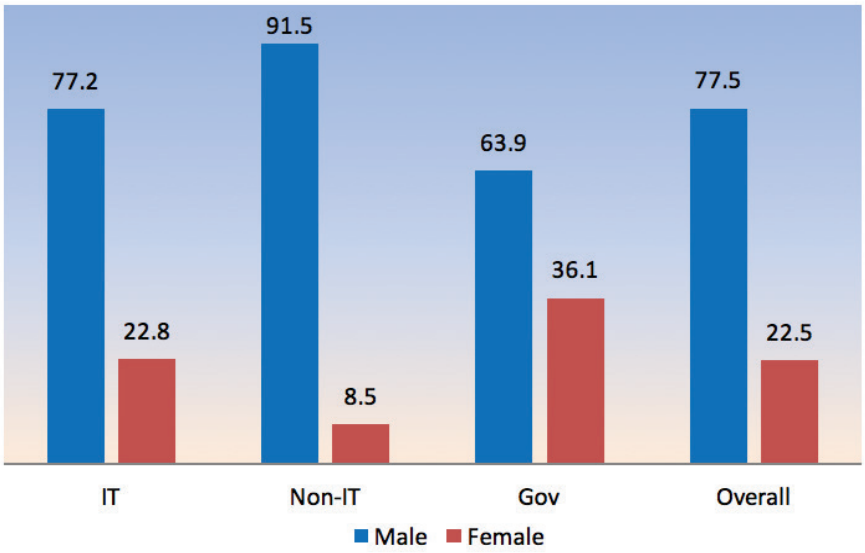

Figure 21: Occupation in emerging technologies by gender

The involvement in emerging technologies is dominated by male workers (**Figure 21**). In the case of ICT companies, the share of male employees was reported at 77.2%. This increases to 91.5% in non-ICT companies. The highest level of female involvement (36.1%) was reported from government organizations.

The involvement of female workers in emerging technologies was analysed further and major technologies occupied by women were identified as follows: cloud platform and technologies 31.8%, workflow management technologies 20.7% and mobility platforms and applications 13.8% and IoT 10.1%. These were the same categories which emerged in the overall distribution shown in Figure 20 also with relative shares over 5%. The relative shares of female involvement in all other emerging technologies fell below 5% as in the case of overall distribution. This suggests that distribution of female workers in different emerging technologies is quite similar to overall distribution even through the 'other' category reported a higher share than the cloud platform and technologies.

4.4.4. Quality of BPM workforce: Educational qualifications

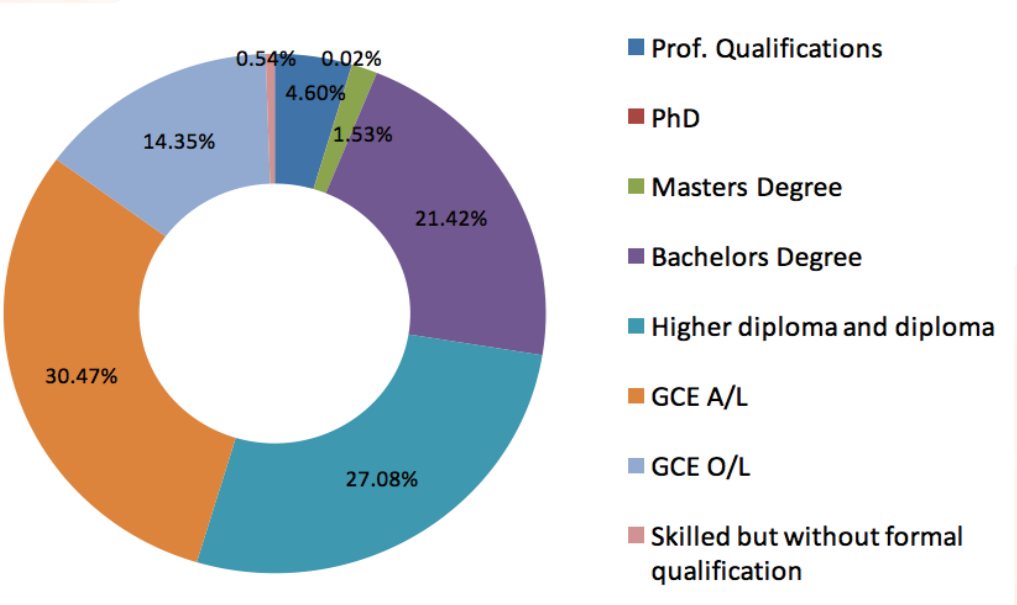

Figure 22: Profile of qualifications of BPM workforce

Figure 22 shows the profile of qualifications of the BPM workforce. The share of workers with Bachelor's degree or above represents only 23% of the workforce. The largest share (30.5%) possesses GCE /AL qualifications followed by 27% with Higher Diploma and Diploma level qualifications. The BPM workforce also has

14.3% with GCE/OL qualifications. Overall, it indicates that the BPM workforce possesses a relatively lower level of educational qualifications compared with the ICT workforce.

4.5. Motivation and Retention of the Workforce

Workforces are dynamic entities and membership of them changes over time due to leaving the jobs by existing cadre and new recruitments. Workers tend to move away from companies looking for better career prospects as well as due to unsatisfactory conditions in working places. The quality of ICT and BPM workforce is determined to a certain extent by retaining a balanced profile of experience through continuous development of skills of workers, offering opportunities for career advancement and providing incentives for the retention of workforce.

4.5.1. Level of attrition

The survey explored about the attrition of workers. It shows that the level of attrition varies across different employer categories. The highest level of attrition of the ICT workforce was reported from ICT companies (9.7%). Nevertheless, the attrition level of ICT companies remained almost the same as 2013. In the case of non-ICT companies the level has increased from 1.3% in 2013 to 5.5% in 2018. The lowest attrition level (0.7%) was reported from government organizations, showing a decrease from 2.6% in 2013.

Compared with the ICT workforce, the BPM workforce has reported a higher level of attrition amounting to 15.4%. It exceeds the level reported by any category of employers in the ICT workforce. Nevertheless, this represents a drop from the attrition level of 18.2% reported in 2013.

4.5.2. Means of skill development for career advancement

Table 4 shows the priorities assigned by the largest number of companies/organizations in respective employer categories for the purpose of skills development considered in career advancement in their companies/organizations. It indicates that skills development through increased academic qualifications is the key mean available for career advancement in ICT companies, non-ICT companies and government organizations. Acquiring professional qualifications was reported the second priority option in all three employer categories. In the case of ICT companies and government organizations, formal in-house training was identified as the third priority option. Trade certificate is the option ranked third by non-ICT companies.

Table 4: Priority means of skill development for career advancement

Employer Category	Means of skill development for career advancement		
	Priority Rank 1	Priority Rank 2	Priority Rank 3
ICT companies	Academic qualifications	Professional qualifications	Formal in-house training courses
Non-ICT companies	Academic qualifications	Professional qualifications	Trade certificate
Government	Academic qualifications	Professional qualifications	Formal in-house training courses
BPM Companies	On the job training	Professional qualifications	BPM-related trade certificate
Overall	Academic qualifications	Professional qualifications	Formal in-house training courses

In contrast, on-the-job training was reported the priority mean for career advancement in BPM companies. This indirectly implies that the BPM companies give more priority for experience. Professional qualifications and formal in-house training were ranked second and third, respectively.

4.5.3. Incentives offered for the retention of workforce

Information gathered from the survey indicates that incentives offered for retention of the workforce vary significantly across different levels of experience as well as among different employer categories. **Table 5** shows the types of incentives identified as the 'most important' by the highest number of respondents under each employer category. Accordingly, training has been identified as the most important incentive for workers with less than 1 year of experience by all employer categories. However, incentives vary significantly at higher levels of experience among different employer categories. In the case of ICT companies, challenging jobs and overseas exposure were considered the most important incentives for middle-level experience categories, indicating a more dynamic working environment. In contrast, a good working environment and a clear career path were identified as more important incentives for the middle-level experience cadre by respondents from non-ICT companies and government organizations. Good employer-employee relationships and medical insurance were the key incentives considered as most important for workers at higher levels of experience in ICT, non-ICT and government organizations.

Table 5: Most important incentives offered for retention by different employer categories

Level of experience	ICT Companies	Non-ICT Companies	Government	BPM Companies
Up to 1 year	Training	Training	Training	Training
1 to 3 years	Challenging job	Good working environment	Clear career path	Clear career path
3 to 8 years	Overseas exposure visit	Good working environment	Good working environment	Good compensation plan
8 to 12 years	Good employer – employee relationship	Good employer – employee relationship	Good working environment	Stability of company
Over 12 years	Medical insurance	Medical insurance	Medical insurance	Job security

In BPM companies, incentives identified for two lower levels of experience are similar to those of government organizations. From the third category of experience onwards, however, incentives identified for BPM workforce vary significantly from the ICT workforce. While good compensation has been identified as the most important incentive for BPM workers with 3-8 years of experience, the workers at higher levels of experience give priority to the stability of their companies and job security.

4.5.4. Maternity benefits offered for female employees

In the case of government organizations, the maternity related matters are handled by standard rules applied across all government organizations. However, maternity related matters appear to be a critical factor that determines the female workforce in private sector companies in general. Retaining female employees after maternity is usually a challenge for companies in all economic sectors.

The survey explored the situation in female participation and maternity in ICT and BPM workforces. As described in Section 4.3.3, the ICT workforce is a male dominant workforce overall as well as among major employer categories and the ICT companies has the lowest share of female employees. According to the survey, 4.13% of female employees in ICT companies have gone on maternity leave in 2017. Of this, a large majority (3.97%) have returned to their work, only a minor share reported as leaving jobs after maternity. A similar situation can be observed in BPM companies also where 1.84% female employees went on maternity in 2017 and 1.59% reported back to work.

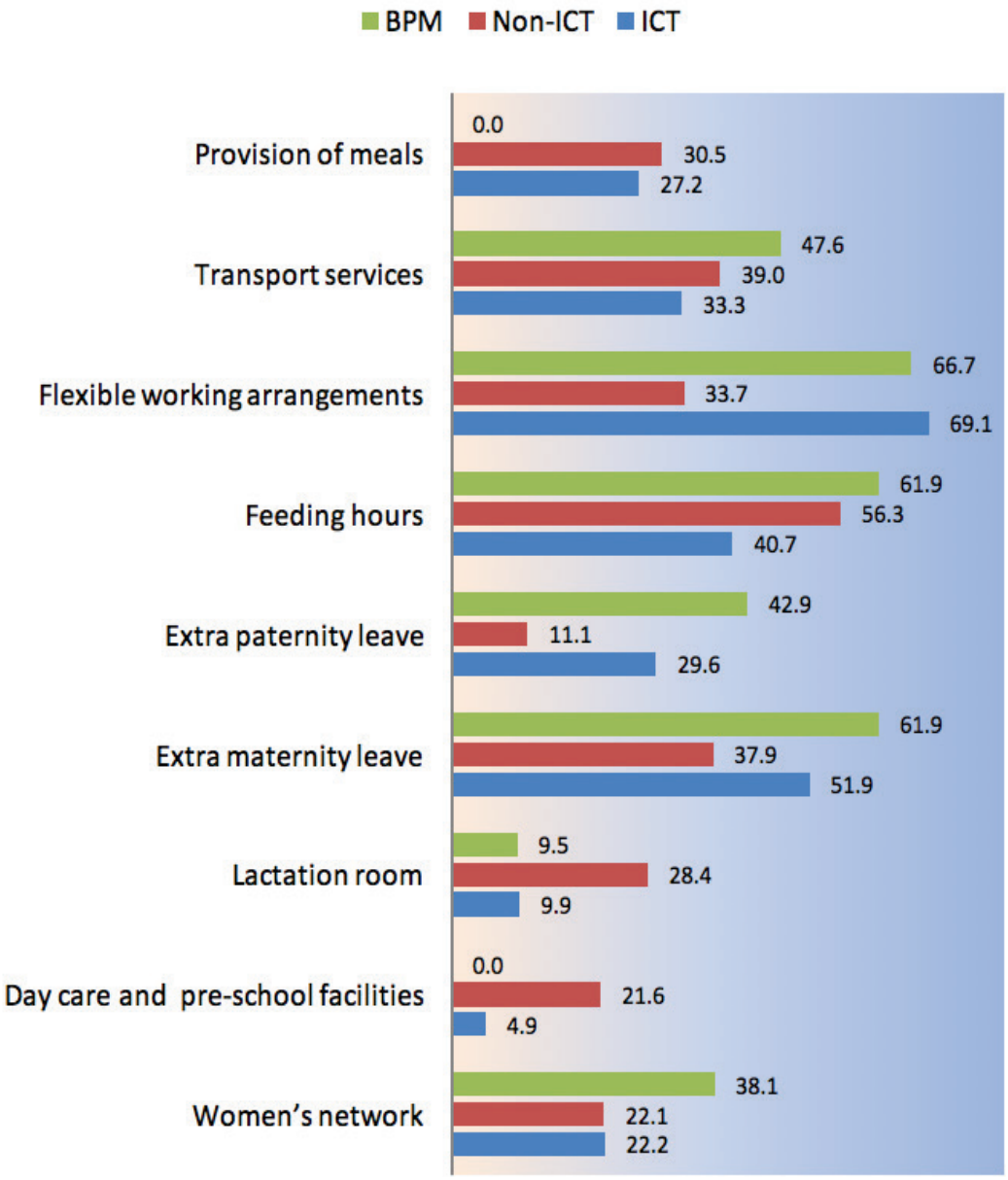

Figure 23: Incentive to motivate the retention of female workers

Three categories of employers belonging to the private sector, namely ICT companies, non-ICT companies and BPM companies have provided certain incentives for retaining female cadre in their companies (**Figure 23**). Flexible working arrangements, feeding hours, extra maternity leave and transport services are among the more important incentives provided by all three types of employers. The BPM companies appear to feature more prominently in terms of incentives provided to females, such as provision of meals, day care, free school facilities and lactation rooms.

05. Demand for ICT Workforce

05. Demand for ICT Workforce

This section examines the demand for graduates in the ICT workforce in 2019, which was estimated by extrapolating the expectations expressed by companies/organizations in the sample to the total population of the workforce. In addition, it also analyses the demand by job categories and service lines, major skills, qualifications and the demand for emerging technologies. The qualifications in demand were assessed on the basis of entry level qualifications required for different ICT job categories and BPM service lines.

5.1. Total Demand for ICT Graduates

Figure 24 shows the demand for graduates by major employer categories for 2019. The total demand was estimated at 21,216. It shows that ICT companies dominate with a demand for 14,898 graduates which amounts to 70.2 % of the total demand indicated for 2019. The lowest demand is expected from BPM companies.

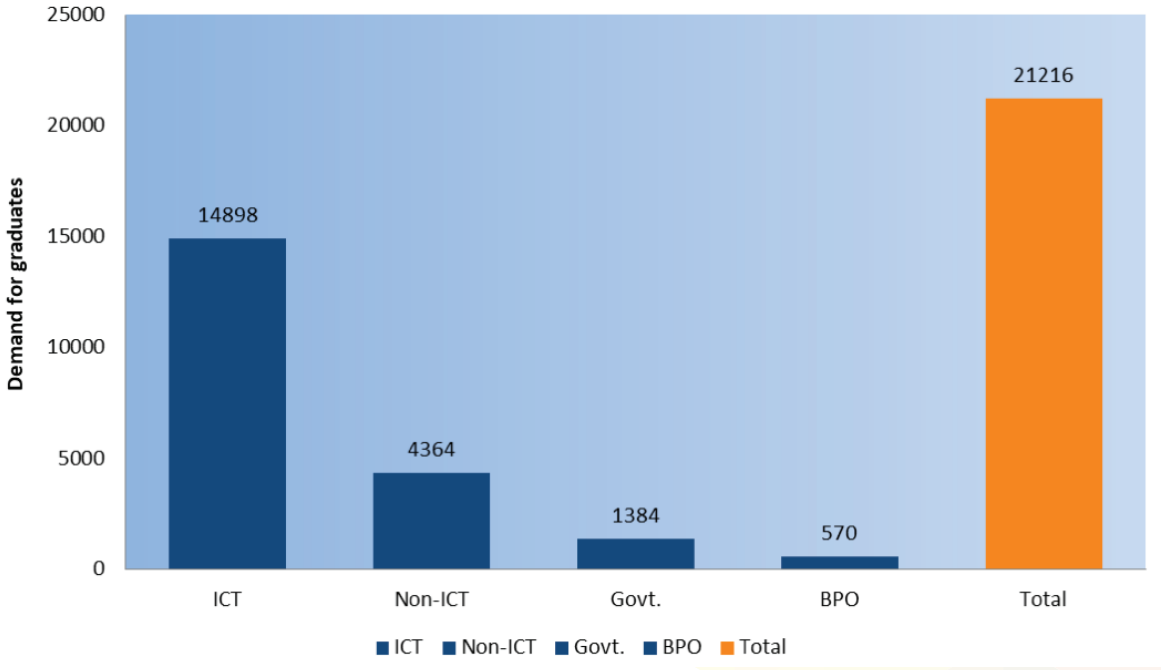

Figure 24: Demand for graduates

While this pattern is consistent with the drastic structural changes that took place in the workforce in recent years, it deviates significantly from the situation reported in 2013 survey. In 2013, non-ICT companies also contributed to a significant share of the total demand for graduates projected for 2014. Nevertheless, some mild forewarning about the ensuing scenario appeared to be embedded in the projection for 2014 as indicated by lower demand from non-ICT companies than ICT companies. This is despite their position as the dominant employer, which was too early to detect at that time.

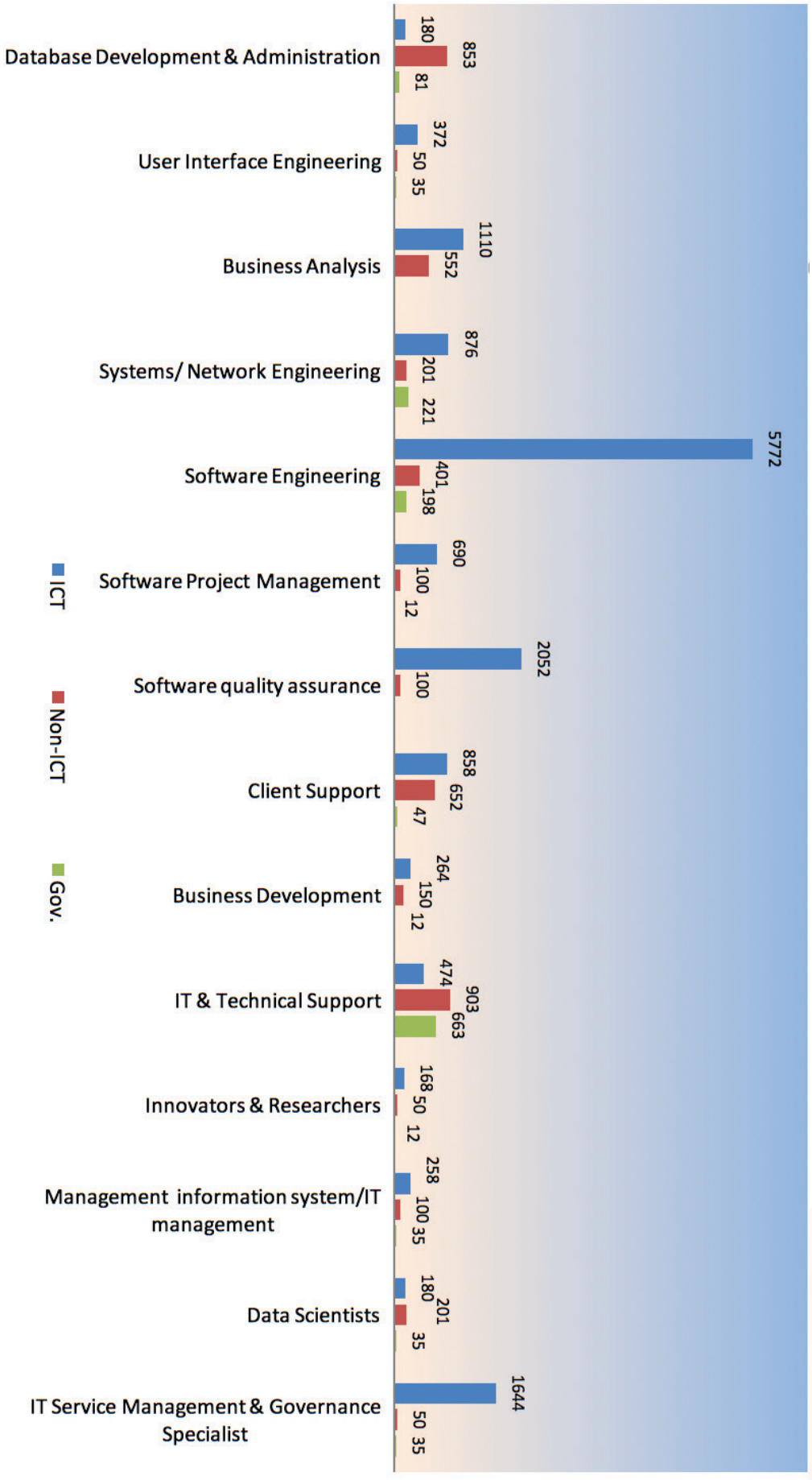

Figure 25: Demand by different job categories

5.2. Demand by jobs categories

Figure 25 shows the demand for different jobs by major employer categories. Confirming the dominant positions of software engineering and software quality assurance, the highest demand was placed on these two job categories in 2019 as well. However, significant demand was indicated for IT service management and governance specialists from ICT companies which is one of the least occupied job categories in the workforce at present. The ICT companies have also placed significantly high demand for business analysts. In the case of non-ICT companies and government organizations, the highest demand is for IT and technical support which is currently the dominant job category of these employers. In addition, non-ICT companies have placed significantly high demand for database development and administration, client support and business analysis categories.

5.3. Demand for BPM workforce

As far as demand by service lines in the BPM workforce is concerned, the finance and accounting commands the highest demand (**Figure 26**). This is followed by data analysis and customer services. At present, data analysis is relatively a less prominent service line in the industry. Interestingly, a very low demand is indicated for document management, the service line with the highest share of employees, currently. It seems that the industry is saturated with workers of this service line. Customer services and legal services are the other two service lines that command reasonable demand in 2019.

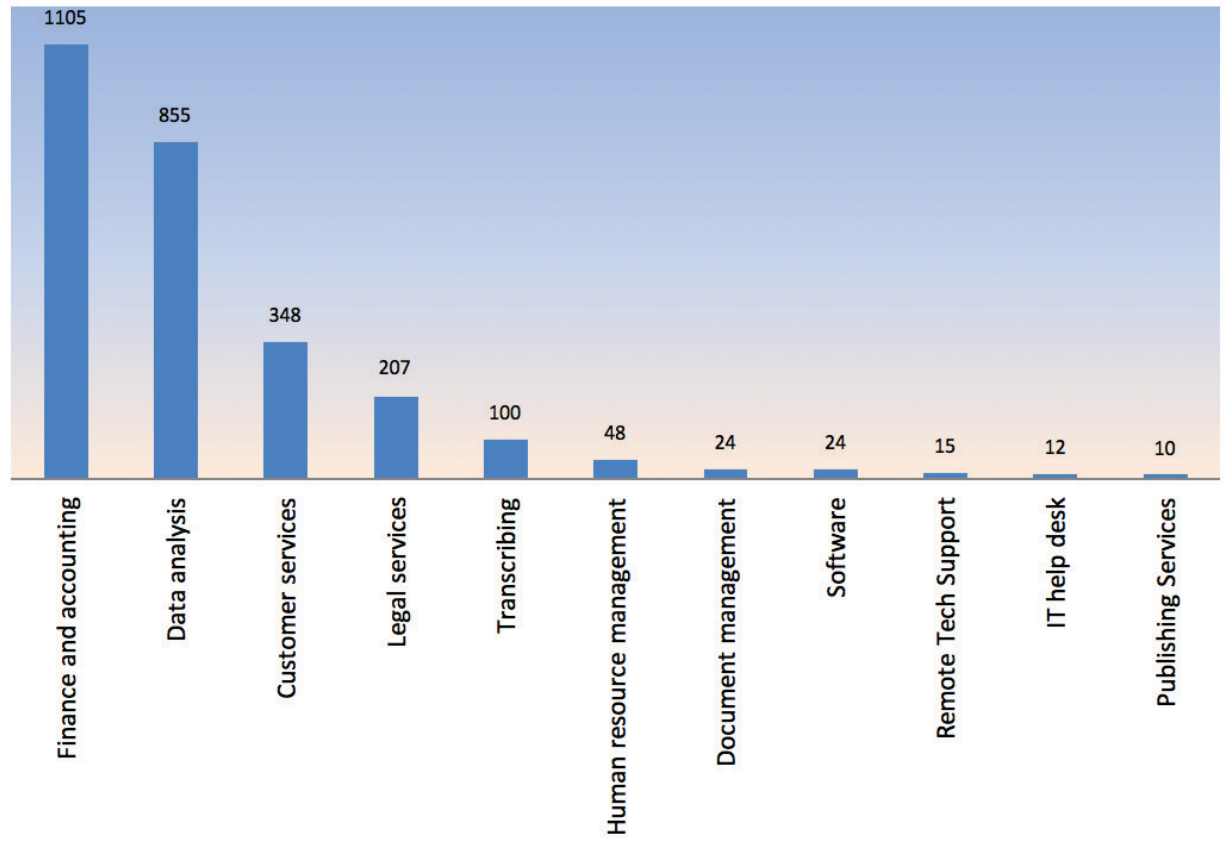

Figure 26: Demand by different service lines

5.4. Skills in Demand

Table 6 shows skills in demand as indicated by respondents from respective categories of employer organizations. It shows the skills identified by the highest number of respondents from each type of organization, classified under the three skills categories, namely; core skills, soft skills and technical skills. Of the three skills types, the demand for soft skills from all employers appears to be fairly uniform with communication skills, creative thinking and team work featuring high among all employers.

Table 6: Skills in demand for ICT workforce

	Core	Soft	Technical
ICT Companies	System Analysis Business analysis & process engineering Project management Programming Systems design	Communication skills Creative thinking skills Team working Professional ethics Interpersonal skills	SQL Server Oracle C# HTML Java
Non – ICT Private Companies	Business analysis & process engineering Database design & administration Customer service Hardware engineering & maintenance System analysis	Communication skills Creative thinking skills Team work Interpersonal skills Proficiency in English language	MS Windows SQL Server PHP Oracle Linux
Government Organisations	Hardware engineering & maintenance Database design & administration Programing Network implementation Business analysis & process engineering	Communication skills Team work Systems / application support Professional ethics Creative thinking skills	MS Windows SQL Server PHP MySQL C#
Overall	Business analysis & process engineering Database design & administration Hardware engineering & maintenance Customer service System analysis	Communication skills Creative thinking skills Team work Interpersonal skills Professional ethics	SQL Server MS Windows Oracle PHP C#

Nevertheless, similar uniformity cannot be observed in the case of core skills and technical skills demanded by major employers. System analysis is the key skill in demand under core skills category from ICT companies followed by business analysis and process engineering, project management, programming and system design. Of them business analysis and process engineering is the only skill that was shared by both types of employers though at different levels of priority. On the other hand, non-ICT private companies and government organizations share two types of skills, namely; database design and administration and hardware engineering and maintenance, which are not among the top priorities of ICT companies.

Similarly, SQL server is the only technical skill demanded by all three categories of employers; being the top priority of ICT companies and the second priority of both non-ICT private companies and government organizations. Non-ICT private companies and government organizations share MS Windows as the first priority and PHP as the third priority which are not in the priority list of ICT companies. On the other hand, HTML and Java, two skills in the priority list of ICT companies, are not in demand by either non-ICT companies or government organizations as priorities.

It is useful here to compare these findings with the *SLASSCOM ICT/BPM Hot Skills Survey 2018*. The SLASSCOM survey has examined skills under three categories, namely; top trending technologies, top frameworks/ platforms/libraries, and top programming languages. All three categories were assessed under two criteria— 'currently in use' and 'to be newly used within next 6-18 months'. The SLASSCOM survey identified SQL, Java script, Java, C#, PHP as the 'top programming languages currently in use'. Of them; SQL, Java, C# and PHP were identified among key technical skills in the current survey also though in different orders of priority given by major employer categories. The Java script was not included in the skills list used in the current survey. Therefore, it was not reported under key skills in demand. The industry stakeholders identified this as a limitation of the survey and emphasized the necessity of updating the skills list in future workforce surveys. In addition, they also proposed programming languages such as R, Python and Perl which are fast becoming popular in the industry also to be included in the list for future surveys. These languages have been identified as 'top programming languages to be used within next 6-18 months' in the SLASSCOM survey.

Table 7: Skills in demand for BPM workforce

Service line	Rank of the skill in 1-3 position by frequency			
	English language proficiency	Technical Knowledge	Communication Skills	Professionalism
Customer Services	1	3	2	-
Data Analysis	3	1	2	-
Document Management	2	3	1	-
Finance and Accounting	2	1	-	3
Human Resource Management	3	2	1	-
IT Help Desk	3	1	2	-
Legal Services	1	-	2	3
Procurement	1	2	3	-
Transcribing	3	1	2	-
Other	2	1	2	-

The survey explored the demand for four major skills/attributes identified to be important for delivering specific service line activities in BPM companies, namely; English language proficiency, technical knowledge, communication skills and professionalism. **Table 7** presents the rankings offered by the highest number of respondents for a given skill under a specific service line. It shows that English language proficiency has been ranked number 1 for service lines of customer service, legal services and procurement. Technical knowledge was ranked first for data analysis, finance and accounting, IT help desk, transcribing and 'other' service lines in general. Communication skill was ranked as the top priority for document management and human resources management. Professionalism has not been identified as a critical attribute required for any of the service lines.

5.5. Qualifications in demand: entry level qualifications

The survey also examined the entry level qualifications demanded by ICT companies, non-ICT companies and government organizations when recruiting workers for different job categories. Survey findings suggest that ICT companies and government organizations demand Bachelor's degree as the entry level qualification for all job categories. In the case of non-ICT companies, the majority identified that professional and trade certificates are still good enough for handling IT and technical support activities in their companies. Comparison of these findings with past survey results indicates that ICT companies and non-ICT private companies have raised the demand for entry level qualifications. Given the fact that selected job categories in two surveys were not identical, a precise comparison is not possible. Nevertheless, companies demanded below Bachelor's level qualifications for more job categories in 2013.

The survey also examined the entry level qualifications adopted by BPM companies when recruiting employees for different service lines. Eight out of 10 service lines require a Bachelor's degree as the entry qualification. Nevertheless, document management and customer service, two service lines with a high share of employees (jointly occupy 41% of the workforce) still require Advanced Level as the entry level qualification.

5.6. Demand for emerging technologies

Three employer categories have a demand for workers with skills in emerging technologies. The total demand for emerging technologies was estimated at 5,323 which amount to 25.1% of the total demand for graduates in 2019. Of the total demand of emerging technologies, a substantial share (76.6%) originates from ICT companies. The relative shares of non-ICT companies and government organizations were at 20.6% and 2.7%, respectively.

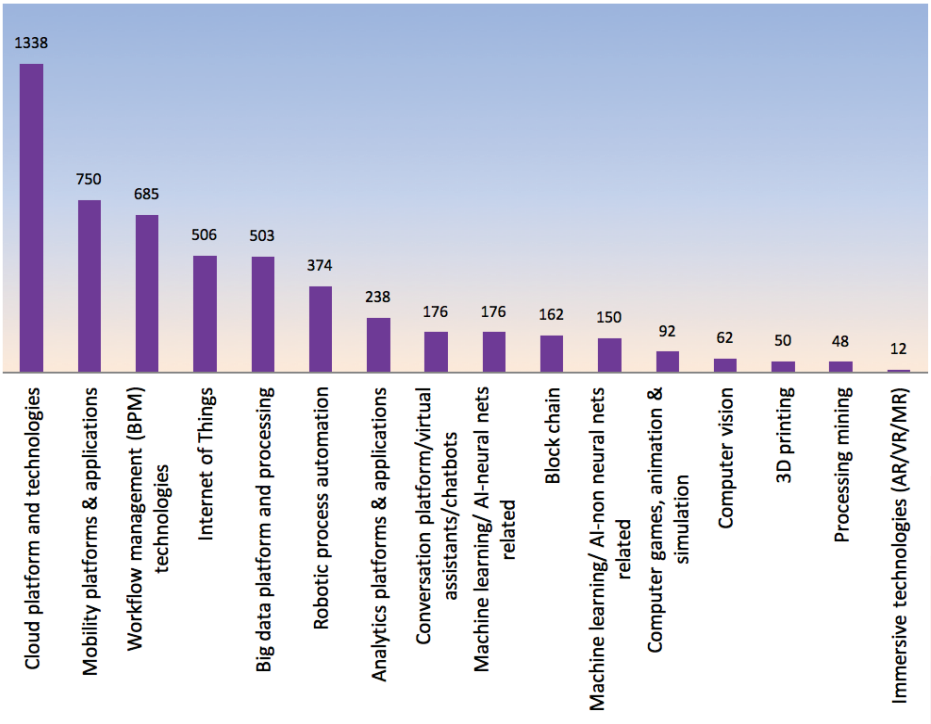

Figure 27: Demand for emerging technologies

Among the emerging technologies with the highest demand are cloud platforms and technologies (25.1%), mobility platforms and applications (14.1%) and workflow management and technologies (12.9%). Big data platforms and processing and IoT commands are nearly at the same level (9.5%) of demand.

06. Supply of the ICT Workforce

06. Supply of the ICT Workforce

The situation with the supply of ICT workforce is assessed in this section. It covers the overall supply of workers with degree level qualifications and the supply by level of qualifications. It also covers the supply of skills offered at different levels of qualifications. Finally, it focusses on the quality of the training staff that provides skills and knowledge to the ICT workforce in the country as reflected by the profile of academic qualifications and experience of the staff.

6.1. Total Supply of ICT Graduates

6.6.1. Estimated supply of ICT graduates

The overall supply of the workforce at the degree level and above has increased from 7,010 in 2014 to 12,307 by 2018 (**Figure 27**). This indicates a marginal growth compared to the growth in workforce and demand. This supply is produced from both government universities and private degree awarding institutes. The total supply considered here includes ICT major graduates as well as graduates trained in relevant disciplines such as engineering, mathematics and management with a significant ICT subject component (ICT non-major with 50% or more).

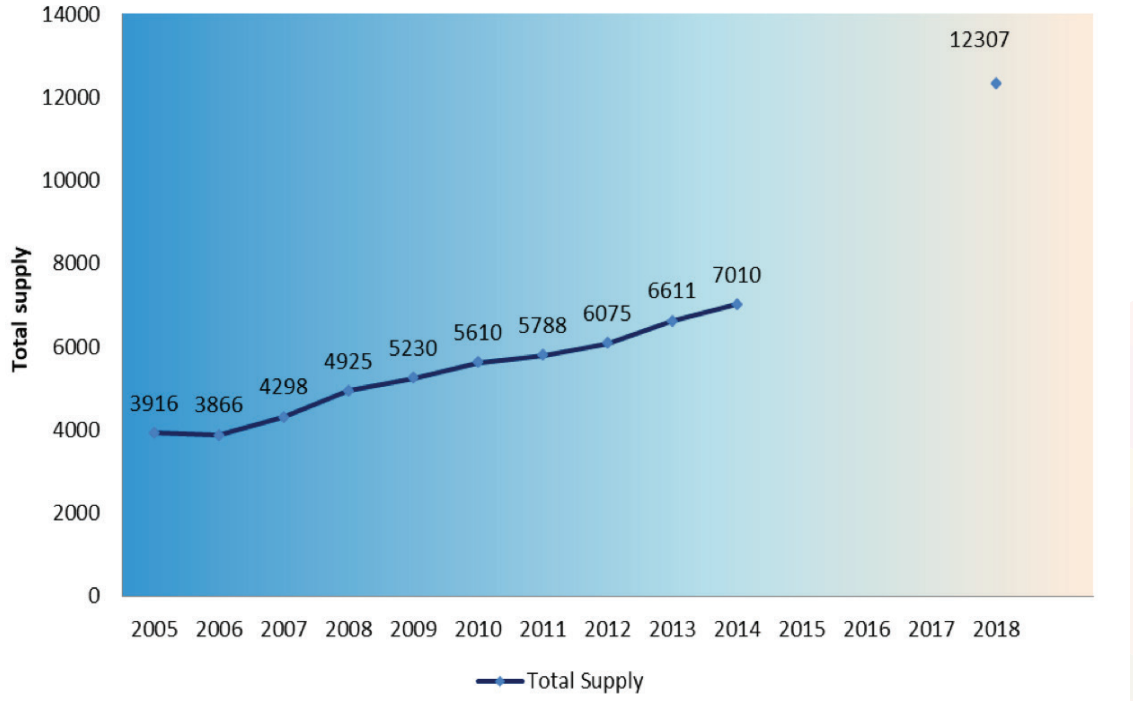

Figure 28: Supply of graduates

The marginal improvement in the supply situation as shown by **Figure 28** indicates that the training system of ICT graduates has not been geared in a sufficient scale to meet the challenge during the period concerned. This is confirmed by concerns raised by some respondents in KIIs conducted parallel to the survey.

Figure 29 shows the breakdown of overall supply of graduates by level of qualifications. It shows that the supply of workers with postgraduate qualifications (PhD, Masters and PG Diploma accounts for 6 %. The share of PhD qualified persons remained as low as 0.01 %

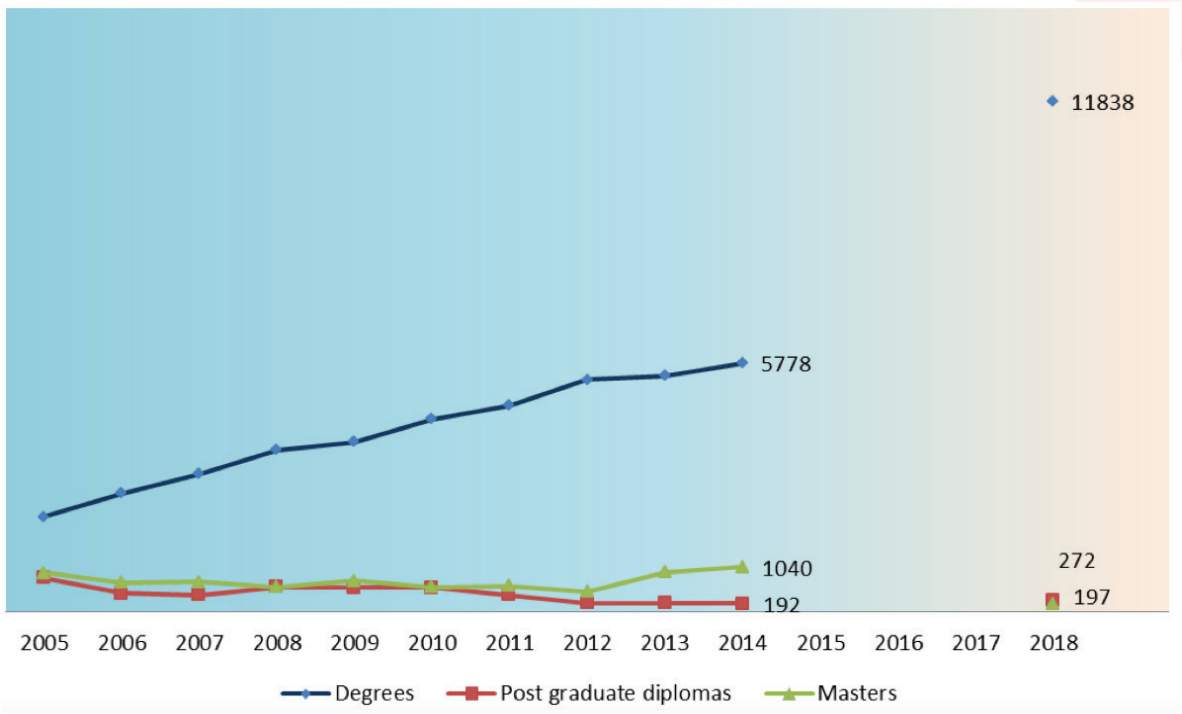

Figure 29: Supply of graduates by level of qualifications

A significant structural change has taken place in supply of the graduates too. According to past workforce surveys, government universities remained the main source of supply of ICT major as well as ICT non-major graduates. **Figure 30** shows that this situation has reversed and private degree awarding institutions produce a higher share of ICT trained graduates in Sri Lanka now. It also shows the female and differently-abled persons in the supply stream of ICT trained graduates in the country. In all categories, share of males exceeded females by a significant margin. The private degree awarding institutes have trained a significant number of differently-abled persons also.

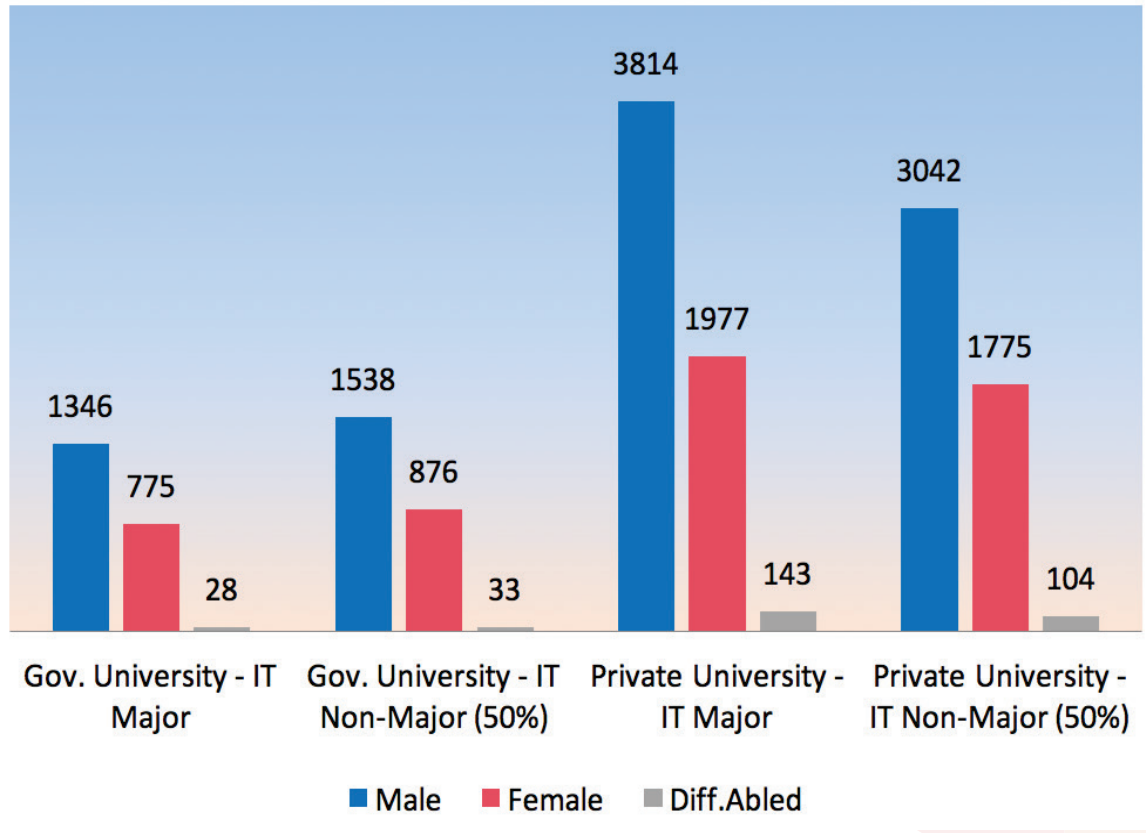

Figure 30: Supply of graduates by training institutes and degree programmes

Figure 31 shows the gender distribution of the overall supply stream of ICT trained graduates in the country. According to these figures, female graduates account for 35% of the total supply. The overall distribution of gender in the supply stream of ICT trained graduates appears to be almost identical to gender distribution in the ICT workforce. This implies that the gender distribution of ICT workforce is largely determined by the supply of graduates from the level of training institutes and therefore any intervention focussed at improving the gender balance should be at the stage of enrolment in training institutes itself.

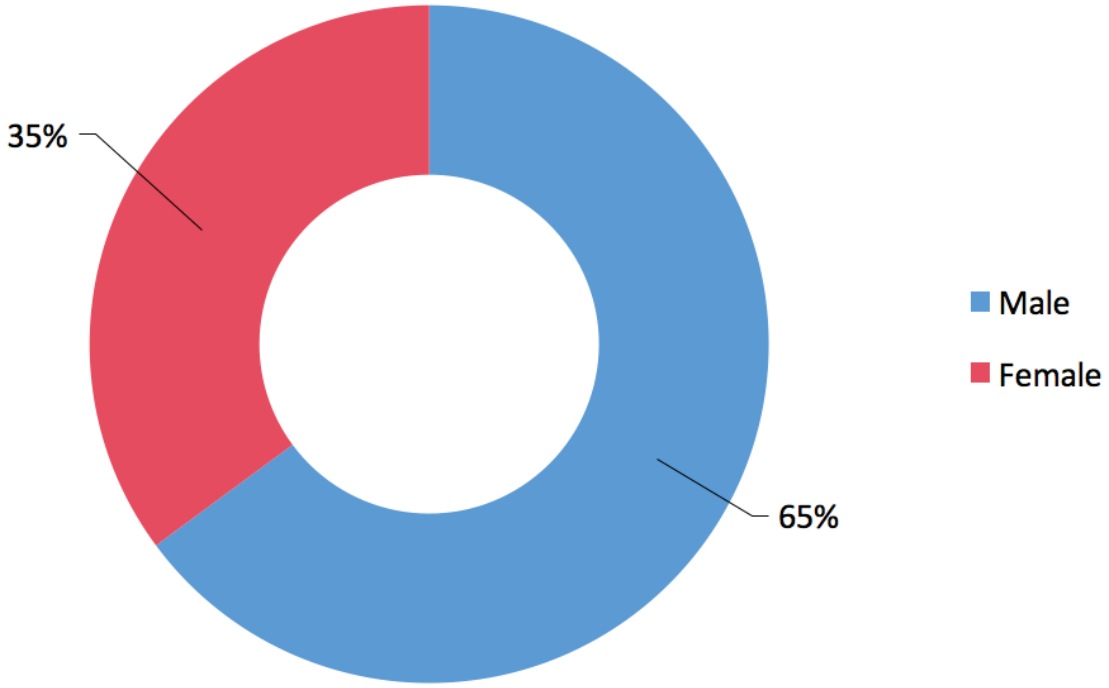

Figure 31: Gender distribution of supply of graduates

6.1.2. **Supply projected for 2019**

A total supply of 9,076 ICT trained graduates was projected for 2019 according to the information provided by the training organizations. This projection of supply includes both ICT major and ICT non-major graduates.

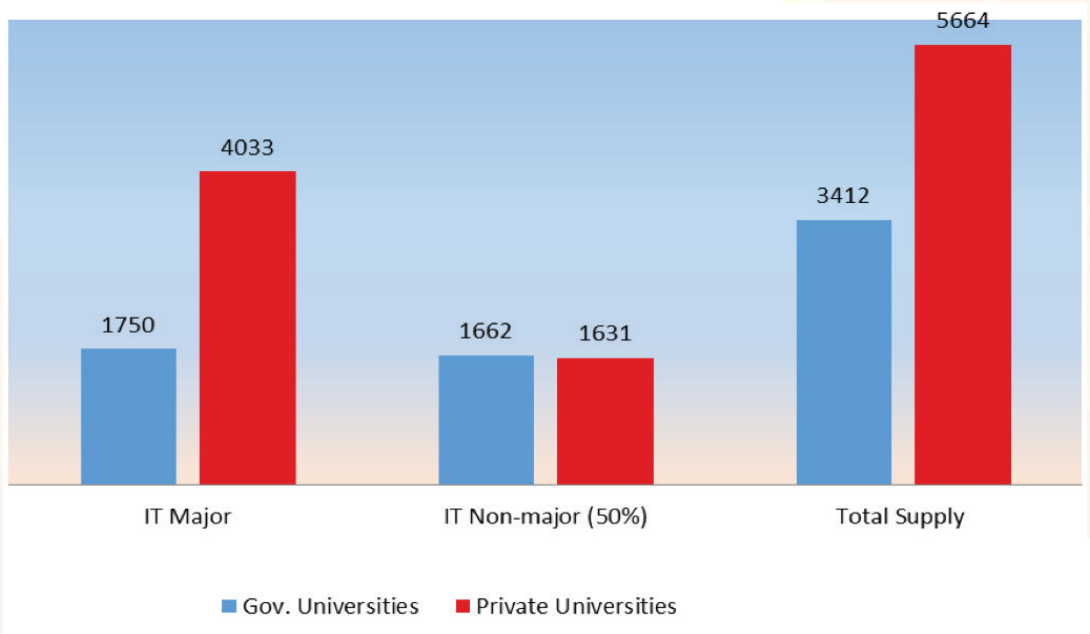

Figure 32: Supply projection for ICT trained graduates in 2019

Of the total supply, the ICT major graduates constitute a share of 63.7%. The supply comes from both government universities and private degree-awarding training institutes. Private institutes have the higher share (62.4%) of this supply. The difference between private and government universities comes mainly from ICT major graduates while the numbers of ICT non-major graduates produced by government universities and private institutes are very close to each other.

6.2. Supply of Major Skills

Table 8 presents the skills identified as top essential skills and top complementary skills by training organizations for different types of courses. It shows that in Diploma, Advanced Diploma, Degree and Masters Courses; systems analysis, system design and programming feature as the top essential skills though in a different order of priority. However, a significant variation can be observed in skills identified as top complementary skills for four types of courses. For Diploma and Advanced Diploma Courses; mainly technical skills have been identified as top complementary skills. Unlike in the case of essential skills, they vary from each other. In the case of Degree and Masters Courses, soft skills have been identified as the top complementary skills. For Masters Courses all identified complementary skills are soft skills.

Table 8: Essential and complementary skills taught in different courses.

Type of courses	Top essential skills taught	Top complementary skills
Diploma courses	Systems Analysis	PHP
	Systems Design	SQL Server
	Programming	HTML
	Systems/application admin	Java
	Interpersonal Skills	Oracle
Advanced diploma courses	Systems Analysis	C++
	Systems Design	NT
	Programming	C#
	Database design and admin	
	Network design	
Degree courses	Systems Design	Java
	Programming	C++
	Systems Analysis	Communication Skills
	Network design	Team working
	Database design and admin	Creative thinking Skills
Master courses	Programming	Creative thinking Skills
	Systems Design	Communication Skills
	Systems Analysis	Professional Ethics
	Project management	Interpersonal Skills
		Team working

A comparison with the 2013 survey indicates that nearly the same list of essential skills had been identified for Degree courses. Some variations can be observed in the lists of essential skills for other courses. In the case of complementary skills, soft skills had been featured more prominently in all types of courses in 2013 unlike in 2018.

6.3. Quality of Staff

This section discusses the qualifications and experience of academic staff of training institutes. Essentially, it provides an idea about the quality of staff that produces the ICT workforce in the country. In the final count, it determines the quality of the workforce as well.

6.3.1. Qualifications of staff

Nearly two thirds of the training staff possesses postgraduate qualifications (**Figure 33**). They include 15% PhD holders and 49% Masters and PG Diploma holders. The rest (36%) is qualified at Bachelor's degree level.

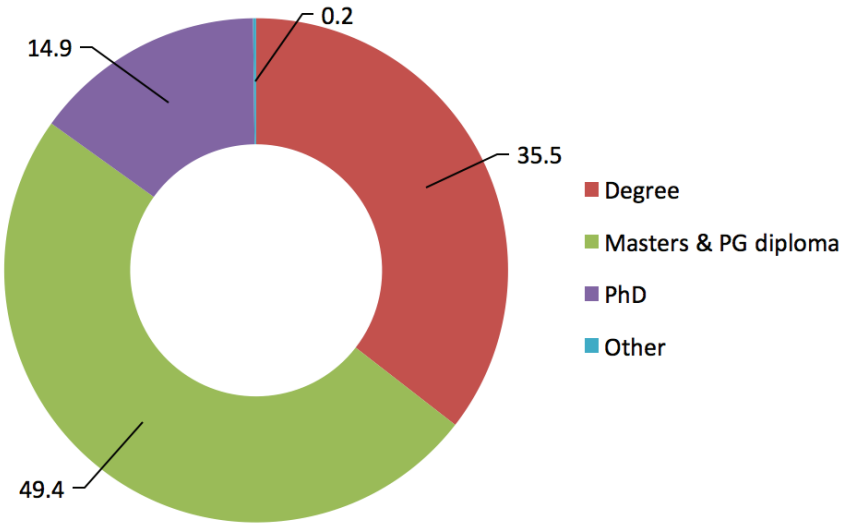

Figure 33: Qualifications of training staff

Compared with the situation reported in 2013, this represents a huge improvement in the quality of academic staff. In 2013, 43% of training staff were having qualifications below the degree level. However, this should be interpreted carefully since a higher share of TVET institutes was included in the sample in the 2013 survey compared with the sample of training institute in the current survey.

6.3.3. Experience of staff

As far as experience of the staff is concerned, the situation suggests a balanced distribution of staff among different experience categories (**Figure 34**). Of the total training staff, the highest share (38%) comprised of 3-8 years of experience category followed by 1-3 years of experience category (25%). The staff with more than 8 years of experience amounted to 25% of which 11% were having over 12 years of experience. The staff with less than 1 year of experience was only 12%.

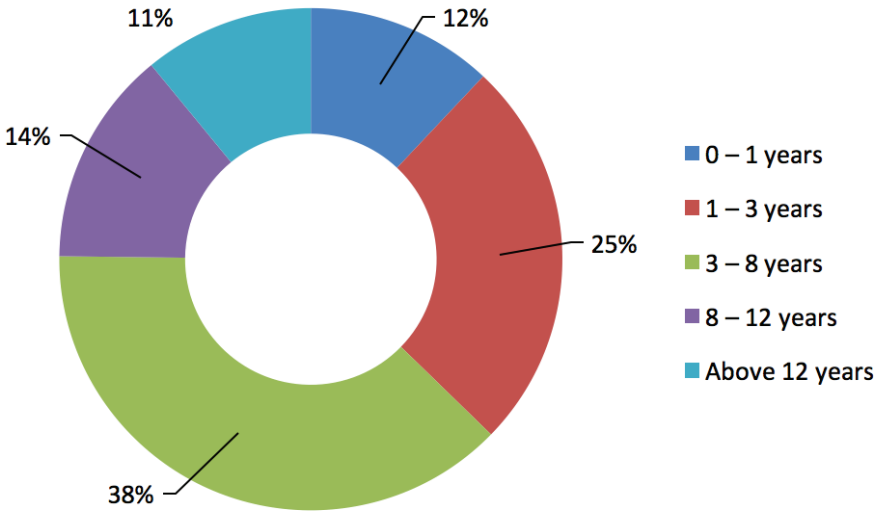

Figure 34: Experience of training staff

As in the case of academic qualifications, this situation implies a healthy improvement when compared with the situation reported in 2013. In 2013, the highest share (38%) of training staff comprised of instructors who were having experience of less than I year. Comparatively, the strength of middle-level experience categories has increased, indicating an overall improvement of quality of the staff. However, it should be noted here that samples of training organizations covered in two surveys have some incompatibilities as mentioned earlier.

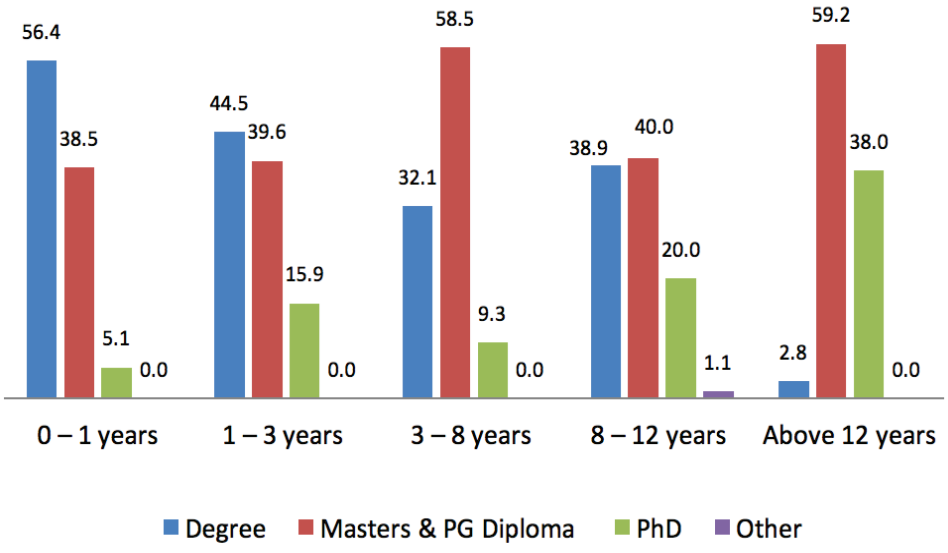

Figure 35: Qualifications of training staff in different levels of experience

As shown in **Figure 35**, an increased share of more experienced categories has naturally led to an improvement in the profile of qualifications too. Staff belonging to higher experience categories has progressively higher shares of postgraduate qualifications. Among all experience categories with more than 1 year of experience, the share with postgraduate qualifications dominate, gradually increasing up to 97% in the highest experience category having 38% of PhD qualified staff.

07. Demand-Supply Gap in the ICT Workforce

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The final target of the workforce survey is the assessment of the demand-supply gap. It is based on the demand and supply estimates as discussed in previous sections. This section also presents an assessment of gaps in supply and demand of skills.

7.1. Gap between demand and supply for graduates

Figure 36 shows the total demand for and supply of ICT graduates in the country in 2019. It shows that the demand exceeds the supply in a significant margin of 12,140. Compared with the situation reported in the 2013 survey, where the gap was estimated at 458, the current situation implies that the demand-supply gap for ICT workforce in the country is widening rather than closing. Considering the fact that the total supply also includes postgraduate trainees, many of whom may already be counted as a part of the existing workforce, this margin tends to increase further.

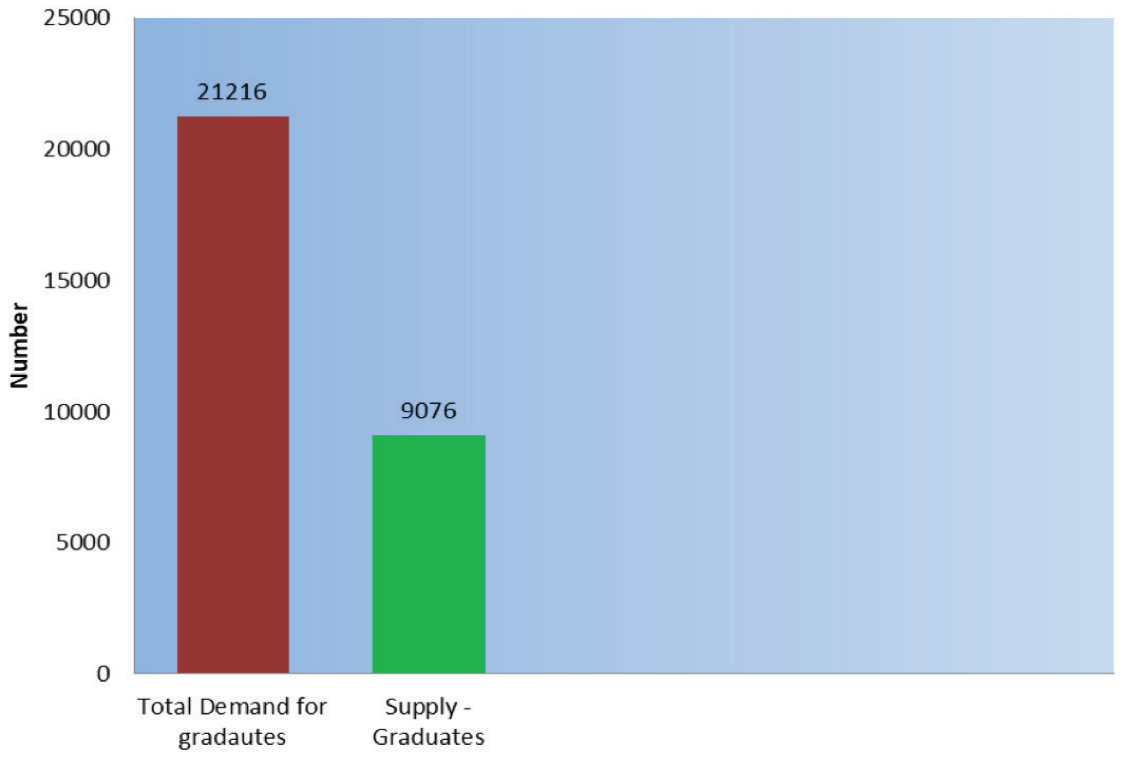

Figure 36: Demand and supply gap of graduates

The major reason for this widening gap is asymmetric growth in demand for and supply of ICT graduates in the country. As discussed earlier, despite the economic slowdown in other sectors, the ICT sector has shown a healthy growth as indicated by the high export performances and the growth of workforce. In this scenario, high demand for ICT workforce can be considered as a healthy sign of growth in the industry and should be welcome. The challenge lies with the training system of ICT graduates in the country, which is not geared sufficiently to cater to the demand from the industry. Even though estimates indicate that the supply of graduates also has increased substantially over time, the widening gap between demand and supply indicates that the growth of supply could not match the growth of demand for ICT graduates.

Nevertheless, industry stakeholders are of the view that this demand-supply gap should be interpreted in the context of 'quality' of graduates produced by the system. Their main concern was that the gap should not be understood in terms of demand for numbers alone but in terms of demand for quality as well. According to them, the demand figures are based on expectations of employers which are significantly shaped by their perceptions about the quality of trainees too. Despite a large output of trainees from variety of courses offered by training organizations, the quality of a significant share of them remains below the level of expectations of employers. As a result, many employers look for graduates which could have augmented the figures indicating demand for graduates. This is confirmed by the fact that the entry level qualifications for nearly all job categories have now been raised to the level of Bachelor's degree by many employers. As a result, demand expectations for graduates could be somewhat bloated up by employers perceptions about the poor quality, especially of non-graduate trainees.

Secondly, other than Bachelor's graduates from government universities and private degree-awarding institutes, a significant number of trainees that possess professional qualifications earned from British Computer Society (BCS), Australian Computer Society (ACS) and other professional bodies also enter the job market annually. According to industry stakeholders, they can fill the gap between demand for and supply of graduates to a certain extent since their skills can match the skills of Bachelor's qualified graduates closely. Thirdly, there are certain job categories that can be handled by non-ICT graduates as well, provided they are trained in essential core, soft and technical skills. Finally, the industry stakeholders stressed the necessity of raising the standard of the large output of Diploma and Higher Diploma qualified trainees from TVET Institutes run by the Government as well as non-state training providers. Lack of required soft skills is a main reason which is responsible for the poor employability of this group. Increasing the quality of these trainees by giving special attention to enhance their soft skills could be expected to reduce the demand-supply gap further.

7.2. Gap between demand and supply of skills

Table 9 presents a gap analysis of demand and supply of skills undertaken by comparing top skills in demand from employers and top skills in supply by training organizations.

Table 9: Gaps in demand for and supply of skills

Types of skill	Skills in demand	Skills in supply – Degree courses	Mismatch of skills	
			Less supplied skills in demand	Less-demanded skills in supply
Core skills	Business analysis & process Engineering Database design & administration Hardware engineering & maintenance Customer service System analysis Programming Systems / Application support Project management Network implementation System design System application testing	Systems Design Programming Systems Analysis Network design Database design and admin Network implementation Internet and Systems Security Hardware engineering and maintenance Systems Design Programming Project Management	Business analysis & process Engineering Customer service Systems / Application support System application testing Internet & Systems Security	Network design Internet & Systems Security
Soft skills	Communication skills	Communication Skills	Other languages	Nil
	Team work	Team working		
	Interpersonal skills	Creative thinking Skills		
	Creative thinking skills	Interpersonal Skills		
	Professional ethics	professional ethics		
	Proficiency in English language	Proficiency in English language		
	other languages			
Technical skills				

This Table shows that top skills demanded by employers and top skills offered by training organizations are not aligned in a consistent order of priority. Moreover, there are also mismatches in supply and demand of skills and this happens in both directions. In one hand, there are some skills in demand from employers that are not supplied by training organizations. For instance, business analysis and process engineering, the highest demanded skill from employers is not in the top list of skills offered by training organizations. On the other hand, there are skills in top order of the supply list of training organizations which are not in demand by employers as top priorities, e.g. Network Design.

08. Conclusions and Recommendations

08. Conclusions and Recommendations

The main conclusion of the survey is that the ICT workforce in Sri Lanka is undergoing deep structural changes at a time when the global ICT sector experiences a period of transition. These structural changes are driven by emerging trends in the overall domestic and international economic environment as well as specific technology driven transformations taking place in the ICT sector, globally. Sri Lanka's ICT sector is strongly connected to international ICT markets, especially to the market for ICT services, through globally oriented ICT and BPM industries. Global reach has introduced both opportunities as well as challenges for growth of the ICT sector in Sri Lanka with far reaching consequences for those who are engaged in the ICT workforce.

The influence of the global and domestic transformations is visibly manifested in drastic changes taking place in composition of the ICT workforce in the country. The relative shares of major employer categories in the ICT workforce has changed significantly in favour of ICT companies that came to occupy nearly a two thirds of the total workforce. On the other hand, non-ICT companies have lost the position they held as the main employer of the ICT workforce in the country as reported in past surveys. Not only have they lost their position as the main player but also experienced a negative growth with a significant decline in the total number of ICT cadre in non-ICT companies. The government organizations and BPM companies show a slow growth compared with non-ICT companies.

The transition currently being undergone by the ICT workforce has few major implications. Emergence of ICT companies as the dominant employer of the ICT workforce has positive as well as negative implications. From the positive side, it will open up more opportunities for prospective employees who enter the ICT job market with advanced qualifications, especially for those who are trained in emerging technologies. Simultaneously, it would create negative repercussions for those who possess qualifications below the degree level that still constitute a major share of ICT trained workforce in the country. This is implied by the survey finding that all major employer categories have raised the bar of entry level qualifications. Moreover, the decline of ICT cadre in non-ICT companies, which has been the major enclave of employment for Diploma and Higher Diploma holders as reported in past surveys, would further shrink their chances for finding employment.

The more disturbing fact is while a sizable section of lower qualified job seekers finds their prospects diminishing; the training system of ICT in the country is not geared to cater to the market demand by producing a sufficient numbers of graduates. This highlights a major mismatch of demand and supply forces in ICT workforce, leading to an ever widening gap between them. This is a key challenge that calls for urgent attention of policy makers, ICT industry stakeholders as well as educationists in the country.

The future growth of the ICT sector is highly dependent on availability of skilled workers. Hence, the widening demand-supply gap can be considered as a major bottleneck that can act against realizing the potential for growth in the ICT sector. The study findings and the feedback from industry stakeholders provide the basis to make the following recommendations to improve the situation.

- The widening gap between demand for and supply of ICT workforce reported in the survey is the major policy challenge indicated by the findings of the survey. The survey further indicates that besides the gap between the number of graduates demanded and supply of them, there is a gap between skills in demand and supply too.

- Hence, the widening demand-supply gap should be understood not only as an outcome of growing demand for the number of workers but also because of the demand for the quality of workers.

- The policy-makers or training providers should not take this as a direct signal for increasing the turnover of graduates from training organization on urgent basis

- Instead, the attention should be focussed more on increasing the quality of ICT trainees produced at all levels of qualification. It is also useful to consider alternative avenues for fulfilling the gap such as raising the skills of non-graduate TVET trainees and providing training on essential skills for non-ICT graduates who can be recruited for certain job categories

- The quality of ICT workers is determined by the skills they possess. Therefore, one of the urgent requirements is filling the gap in skills by making necessary adjustments in profile of skills offered at graduate as well as other levels of training such as Diploma and Higher Diplomas.

- The quality standards demanded by different employers vary from each other. In the case of ICT companies, skills in emerging technologies is a major parameter of quality in demand whereas in non-ICT companies, government organizations and BPM companies; profiles of skills in demand are different. Hence, the supply of graduates should be streamlined to cater to varied types of demands by major employers

- Poor soft skills represent a key determinant responsible for the gap in skills in demand at all levels of training. Therefore, special attention should be focussed on developing soft skills of trainees at all levels of qualification to enhance their employability

- While making necessary adjustments to degree level courses in terms of the quantity of graduates produced and the profile of skills offered, attention should be focussed on necessary changes that should be undertaken to enhance the quality of trainees produced by TVET institutes.

- In this connection, raising the skills of trainees at NVQ qualification levels of L5 and L6 (i.e. Diplomas and Higher Diplomas) and upgrading them into the level of L7 which is equivalent to graduate level should be given priority.

- These changes should be undertaken in close consultation with prospective employers to make necessary improvements in core, soft and technical skills offered by TVET institute so that the employability of Diploma and Higher Diploma level trainees could be increased

- Industry stakeholders suggest that certain job categories such as business analysis can be handled by non-ICT graduates trained on necessary skills. Therefore attention should be focused on training non-ICT graduates from selected streams for such job categories in partnership with industry stakeholders too

- As shown by examples from other countries that attempt to find solutions for skill gaps induced by new generation technologies, forming a broad alliance between training organizations and industry players, facilitated by the government, is a necessity

APPENDIX – Survey Methodology

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The methodology followed by National IT-BPM Workforce Survey 2019 is consistent with previous ICT workforce surveys conducted in 2004, 2007, 2010 and 2013.

Sample frame development and sample Selection

The *National IT-BPM Workforce Survey 2019* is a sample survey that used sample data to make estimates and projections on the entire workforce. A sampling frame was developed covering 5 categories of organizations that offer employment to ICT workforce in the country, namely, ICT companies, BPM companies, non-ICT companies, government organizations and ICT training organizations. To ensure the representativeness and statistical validity, the sample was selected using the stratified random sampling method. A careful review of existing information from a variety of sources was undertaken to identify major sub-categories within the selected organizations that constitute strata for sampling.

The finalized distribution of the sample for the survey agreed upon with the ICTA is presented in **Table A1**.

Table A1: Sampling Distribution

Basic Stratum	Sampling Strata (Categories & Sub- Categories)		Final sample size
Employer Organizations	**IT Companies**		**100**
	Non- IT Private Sector		**190**
	Agriculture including Fisheries	30	
	Apparel	30	
	Other Manufacturing & Engineering	40	
	Trade & Freight Forwarding Services	30	
	Financial Services, Insurance &Banking	30	
	Tourism and Hotels	30	
	Non-IT Government Sector		**70**
	Ministries & Departments	30	
	Statutory Bodies	30	
	Provincial & District Organizations	10	
	IT BPO / ITES Companies		**30**
Training Organizations	**IT Training Institutes**		**30**
		Total	**420**

Design of the questionnaires

Three comprehensive questionnaires were developed targeting three categories of respondents as given in **Table A2**. The questionnaires used for the previous survey in 2013 were reviewed and some modifications were introduced to capture new changes in the industry. In the review process, special attention was given to update the details on 'Job categories' since the ICT job categories have undergone significant changes during the recent period. Questionnaires were field tested to ensure the relevance and manageability**.** Each questionnaire was designed to conduct interviews with IT/human resource managers or other senior level executives who are responsible for supervising IT staff in respective organizations.

Table A2: Types of questionnaires and target respondents

Questionnaire type	Target organizations	Number in the sample
Questionnaire No 1: For Organizations that employ IT professionals	IT companies	100
	Non-IT private sector companies	190
	Non-IT government sector organizations	70
Questionnaire No 2: For BPO companies	BPM companies	30
Questionnaire No. 3: For training organizations	ICT training institutes	30
	Total	**420**

Data Collection, Field Monitoring and Quality Assurance

In order to ensure consistency and reliability of the data collected by all Field Research Officers (FROs), a training workshop was conducted at the auditorium of ICTA. This training was jointly conducted by the Consultants and members of ICTA staff. To ensure optimal response from respondents, the following procedure was adopted in field implementation of the survey.

- Selected organizations were made aware of the IT-BPM Workforce Survey via telephone calls and emails with introduction letters from ICTA and TEAMS about the objectives of the survey before making appointments
- Questionnaires were sent to respondents prior to the field data collection Names of the respondents and dates and times for interviews were obtained by calling CEOs or other senior officials of respective organizations
- A schedule of appointments were prepared and FROs were allocated to undertake interviews FROs conducted interviews according to the schedule of appointments and submitted completed questionnaires for quality checking and processing

The data collection process was closely monitored by a Project Manager to ensure completeness and accuracy of the survey. Data collected in the survey was subjected to a strict quality control procedure. All completed questionnaires were checked for completeness, clearness and accuracy. Missing data and incompatible data were corrected by referring back to the respondents whenever errors were detected. Data was cleaned and responses to open-ended questions were coded to ensure accuracy and efficiency of data entry. Data entry process was closely monitored throughout and checked for errors by comparing entered data with questionnaires.

Data Processing and Analysis

Three data entry templates were developed for entering data collected through three questionnaires. These data entry templates had built-in facilities to check entry mistakes such as unrealistic values etc. Questionnaires were given serial numbers to safeguard the confidentiality of information before entry. A group of experienced data entry operators were assigned to enter data under the close supervision of consultants. Upon completion of data entry, data analysis was carried out using SPSS software package. Descriptive statistical methods and cross tabulation were mainly used in the analysis of survey data together with graphical methods for presentation of results.

Results include estimates, projections and sample statistics.

- *Estimates:* Values computed for the total workforce based on sample data: E.g. Total ICT workforce; workforces of different employer categories; total demand for graduates; total supply of graduates.

- *Projections:* Values that indicate future changes in the workforce computed on the basis of responses on future expectations/plans: E.g. demand for and supply of ICT graduates in 2019.

- *Sample statistics:* Descriptive statistics generated from sample data to describe selected aspects of the workforce: E.g. composition of workforce by job categories, gender distribution, and experience of the workforce

Estimates and projections involved extrapolation of sample data into higher levels of aggregates such as the total workforce and workforce in sub sectors. Extrapolation is a procedure of estimation that systematically adjusts the sample data to determine values of those higher level aggregates.

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