ICT Report

ICT Workforce in the Kingdom of Saudi Arabia
ACKNOWLEDGEMENTS

The Communications and Information Technology Commission (CITC) would like to acknowledge all the organizations that participated in the studies conducted for this report. These organizations include government entities, organizations in various industries, and other stakeholders. The following organizations merit special mention for their contribution:

- Ministry of Communications & Information Technology (MCIT)
- Ministry of Economy & Planning (MEP)
- Ministry of Education (MoE)
- National Guard Health Affairs (NGHA)
- Riyadh Chamber of Commerce
- Human Resources Development Fund (HRDF)
- King Abdulaziz City for Science and Technology (KACST)
- King Abdulaziz University (KAU)
- King Fahd University of Petroleum & Minerals (KFUPM)
- King Saud University (KSU)
- Saudi Basic Industries Corporation (SABIC)
- Saudi Airlines
- Saudi Telecom Company (STC)
- Mobily
- Zain
- Al Rajhi Bank
- Ebtikar Arabia
- Ejada Systems
- Jeraisy Group
- Saudi Oger Ltd.
- BT Al-Saudia
- Ericsson
- Hewlett Packard
- Huawei
- Microsoft
- Oracle
- Perfect Presentation (2P)
- SAP
- Samba Financial Group
- Tata Consulting Services
# Table of Contents

## EXECUTIVE SUMMARY

## 1 ICT SECTOR DEVELOPMENT AND ITS IMPACT ON THE AVAILABILITY OF ICT WORKFORCE

1.1 SPENDING ON ICT, ITS ADOPTION, AND ITS IMPACT ON THE DEMAND FOR ICT SKILLS

1.2 THE IMPACT OF SKILLS SHORTAGE ON ICT OPERATIONS

1.3 FACTORS AFFECTING THE DEMAND FOR LOCAL ICT EMPLOYMENT

## 2 ICT WORKFORCE COMPOSITION

2.1 DEMOGRAPHICS

2.2 NATIONALITY

2.3 EMPLOYMENT TENURE

2.4 STATE OF ICT TEAMS

## 3 ICT EMPLOYMENT OUTLOOK

3.1 ICT EMPLOYMENT DEMAND-SUPPLY GAP

3.2 DEMAND FOR AND AVAILABILITY OF ICT SPECIALTIES

3.3 DEMAND FOR AND AVAILABILITY OF ICT SKILLS

## 4 ICT EDUCATION

## 5 RECRUITMENT AND TRAINING

5.1 RECRUITMENT OF ICT PROFESSIONALS

5.2 TRAINING OF ICT PROFESSIONALS

## 6 AFTERWORD

## APPENDICES

APPENDIX A: METHODOLOGY

APPENDIX B: DEFINITIONS
EXECUTIVE SUMMARY

Saudi Arabia has experienced rapid economic growth, guided by the vision of the Custodian of the Two Holy Mosques, King Salman bin Abdulaziz. This growth, led by government-wide development effort, was reflected on the increased adoption and use of Information and Communications Technologies (ICT) in homes, businesses and government organizations, and resulted in increased spending on ICT products and services. In 2014, this spending reached an estimated SAR 111.79 billion, solidifying Saudi Arabia’s position as the largest ICT market in the Middle East. The local ICT market is expected to maintain its healthy growth to reach nearly SAR 138.48 billion by 2017.

Growing industries create a high number of new jobs that require advanced technical skills thereby putting pressure on domestic labor markets and technical education systems. Most developing countries, including the Kingdom, are experiencing a shortage of ICT skills, creating great challenges for governments and the private sector alike.

The shortage of a sufficiently large and experienced national ICT workforce creates a dependency on foreign workers and raises ICT costs for both providers and consumers of ICT services. This could hamper many private sector organizations that have weak internal ICT capability and make it difficult for them to build competitiveness and capitalize on the rapid growth in domestic and regional markets.

CITC forecasts that the Kingdom’s ICT workforce will increase to approximately 213,000 ICT professionals by 2017. Notwithstanding this increase, the Kingdom faces a cumulative shortage that will exceed 37,000 individuals between 2014 and 2017. The shortage of ICT professionals must therefore be addressed in a sustainable way through the development of the Saudi ICT talent pool, both in terms of quantity (e.g., the number of ICT graduates and professionals) and quality (e.g., the level of ICT and non-ICT skills they possess).

The Kingdom should mobilize the local ICT workforce through close collaboration between the public and private sectors. Investment in recruitment, training and retention of Saudi national ICT workers should be further emphasized. Moreover, the capacity of the higher education system needs to be bolstered through increased collaboration between policy makers, academia and the ICT industry. The overarching goal should be to increase the share of Saudi nationals in the ICT workforce and improve the quality of their skills.
ICT SECTOR DEVELOPMENT AND ITS IMPACT ON THE AVAILABILITY OF THE ICT WORKFORCE

1.1 SPENDING ON ICT, ITS ADOPTION, AND ITS IMPACT ON THE DEMAND FOR ICT SKILLS

Spurred by growing adoption of Information and Communications Technologies (ICT) by both individuals and organizations, spending on ICT has been growing at a rapid pace in Saudi Arabia. The Saudi ICT market surpassed SAR 111.79 billion in 2014, cementing the position of the Kingdom as the largest ICT spender in the Middle East. ICT spending is expected to reach SAR 138.48 billion by 2017.¹

Spending by individuals comprises more than half of the Kingdom’s ICT spending, and the growth in this segment is mainly driven by increased demand for mobile and portable devices such as smart phones and tablet computers.² As was informed by CITC’s ICT Report on Mobility in Saudi Arabia, a significantly high proportion (82%) of mobile users in the Kingdom have access to either smart phones or tablet computers.³ The Kingdom currently has nearly 8 million Facebook users, over 1 million LinkedIn users, over 5 million Twitter users, and over 90 million YouTube videos viewed daily.⁴ The explosive growth in the use of applications and social media, and the need for ubiquitous access to communication networks and applications are boosting the demand for mobile and portable devices.

Saudi organizations, in both the private and public sectors, are rapidly increasing their spending on ICT. Spending on computers, enterprise networks, servers and storage systems, and software applications has seen significant growth over the past few years. There is now a growing demand for services related to the design, installation and maintenance of these systems. This proliferation of devices, systems and applications has resulted in an unprecedented growth in enterprise data volume. These factors, coupled with a need for greater communication and collaboration, have boosted the demand for connectivity, bandwidth and enterprise telecommunication services.

This growth in ICT spending will create new ICT jobs, and the need for a large local ICT workforce to fill these positions.

1.2 THE IMPACT OF SKILLS SHORTAGE ON ICT OPERATIONS

Lack of ICT skills can lead to reduced efficiency and higher ICT costs, and in turn, undermine competitiveness. More than 40% of organizations surveyed by CITC agree that a lack of ICT skills in the Kingdom has a significant impact on ICT operations, while 44% say that a lack of ICT skills has significant bearing on wider organizational

¹ CITC ICT Indicators Report, End of Q4 2014, and IDC Blackbook, Q3 2014
² IDC Blackbook, Q3 2014
⁴ The Social Clinic. The State of Social Media in Saudi Arabia, 2014
operations and performance (Figure 1). A shortage of skills will prevent organizations and sectors with intensive ICT operations from expanding easily.

The availability of a reliable national pool of skilled ICT professionals is critical to the building of sustainable ICT industries. Lack of skilled ICT professionals discourages foreign ICT companies from establishing presence, and local telecommunications operators and IT providers from expanding operations in the Kingdom. In the absence of a sufficiently large local ICT workforce, there will be increased pressure to bring in expatriate workers to fulfill the demand.

Figure 1: Effect of ICT Skills Shortage on ICT Operations

5 2014 CITC Saudi Arabia ICT Workforce Skills Survey, n=413
1.3 FACTORS AFFECTING THE DEMAND FOR LOCAL ICT EMPLOYMENT

A Push for Saudi Nationals in the ICT Workforce

The ICT workforce in the Kingdom has a large representation of expatriate workers. The enforcement of Nitaqat regulations is expected to persuade organizations to hire more Saudi nationals. Further increasing the proportion of Saudi nationals in the ICT workforce may take some time, as it requires:

- Increasing the number of Saudi students in the ICT specialties;
- Training a number of workers currently working in other fields, and facilitating their movement into ICT jobs;
- Training cadres who are currently unemployed on the requisite skills for entry into the ICT sector.

In the interim, however, the shortage could lead to difficulty and delays in hiring, and possibly, some salary inflation in the short term as organizations compete with each other to bring on board the best and most suitable Saudi local ICT workers. However, in the long term, the three aforementioned initiatives are expected to create an even larger and more capable Saudi local ICT workforce, and eventually, mitigate the effects of salary inflation.

Availability of Cheaper ICT Delivery Options

In order to reduce ICT costs, many organizations prefer to outsource to offshore providers. In the modern, globalized ICT delivery environment, it is possible to effectively consume ICT services from remote locations at acceptable quality levels. Providers that have resources based in cheaper locations can often offer services at relatively lower costs than providers who are fully based onshore.

Cloud computing also offers cheaper options for ICT services, and typically requires a relatively smaller number of workers within the customer organization.

Alignment of University Curricula

Higher education institutions such as universities and training institutes play the critical role of supplying skills and adding individuals to the ICT workforce. These institutions in Saudi Arabia sometimes face criticism that their curricula do not match the needs of the industry, and that, as a result, their graduates are not job-ready. This criticism of higher education institutions persists in most countries. Furthermore, there is a view that while the premier institutions are renowned for their high quality ICT education, the lower tier institutions have relatively lower quality level. It’s important to understand that educational institutions cannot by themselves fully address the skills supply gaps. Both the higher educational institutions and the industry in the Kingdom will benefit much by working closely with each other to train and develop skilled workers.

Governmental Focus on ICT Skills Development

The National Communications and Information Technology Plan (NCITP), issued by the Ministry of Communications and Information Technology (MCIT), recognizes the ICT skills challenge, and states that one of its objectives is to “prepare the Kingdom’s manpower for ICT jobs through ensuring proper utilization of ICT at all levels of education and training, and through the provision of qualified, trained human capabilities in various ICT disciplines.”

---

6 Ibid.
Over the years, a number of initiatives have been launched by the government to boost the local skilled ICT workforce. One noteworthy success, among others, is the financial support provided to over 18,000 Saudi scholar students since 2005 to pursue higher education abroad in the field of ICT through the King Abdullah Scholarship Program (KASP).8 There has also been a 500% growth in the number of colleges teaching computer science established in Saudi Arabia since 2003.9 Furthermore, the focus on technical learning has been strengthened through the creation of the National Center for e-learning and Distance Education (NCeL).

---

CITC conducted a survey of 413 ICT opinion leaders and decision-makers from various public and private sector organizations in the Kingdom to assess the state of the ICT workforce. The following sections summarize some of the key findings from this survey.

2 ICT WORKFORCE COMPOSITION

2.1 DEMOGRAPHICS

As one would expect, the ICT workforce in Saudi Arabia is relatively younger than the overall workforce. Roughly 76% of the ICT professionals in the organizations surveyed by CITC are under the age of 40 - a higher proportion when compared to the overall workforce (where 59% are under the age of 40). Professionals in their 30's constitute the largest subset of ICT professionals, making up 58% of the ICT workforce (Figure 2).

Figure 2: ICT Workforce by Age

2.2 NATIONALITY

Saudi nationals constitute nearly half of the total ICT workforce. However, most of the Saudi ICT professionals are employed in large organizations (those with 250 or more employees), the government being the largest employer. The number of Saudi nationals employed by small and medium businesses (SMBs) is relatively low.

11 2014 CITC Saudi Arabia ICT Workforce Skills Survey, n=413
2.3 EMPLOYMENT TENURE

A majority (82%) of ICT professionals in the Kingdom are full time employees, while the rest are either outsourced or contract employees.\textsuperscript{12} Outsourcing of ICT skills has become a more common practice among Saudi organizations now as compared to when CITC conducted its previous skills study in 2009. Many of the organizations interviewed are now choosing to outsource operational and/or maintenance tasks while keeping core and strategic functions within the internal ICT teams.

2.4 STATE OF ICT TEAMS

A majority of Saudi organizations have relatively small ICT teams. Less than one-third (29%) of the organizations surveyed employ more than five full-time ICT employees. A majority of the government sector organizations surveyed have relatively larger ICT teams - of 20 or more ICT professionals. This is followed by ICT-savvy industries, such as financial services and oil and gas, which have a significant proportion of organizations with 6 or more ICT employees. As one would expect, ICT companies also have relatively large ICT teams; on the other hand, among the less ICT-savvy industries, such as wholesale and retail, real estate and agriculture, a significant proportion have very small ICT teams (Figure 3).

Figure 3: ICT Workforce by Size of Total Permanent Full-time ICT Staff and Industry Sector\textsuperscript{13}
3 ICT EMPLOYMENT OUTLOOK

According to the Saudi Central Department of Statistics and Information (CDSI) data, the total size of the economically active population in Saudi Arabia is approximately 11.29 million individuals.\textsuperscript{14}

Of this, the Kingdom is estimated to currently have a workforce of approximately 165,000 ICT professionals. This is nearly 1.5\% of the total economically active population.\textsuperscript{15} The ICT workforce is expected to grow at a compounded annual growth rate (CAGR) of 9\% over the next three years to reach approximately 213,000 ICT professionals in 2017 (Figure 4).

Figure 4: Number of ICT Professionals in Saudi Arabia (2014 – 2017)\textsuperscript{16}

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF ICT PROFESSIONALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>165,000</td>
</tr>
<tr>
<td>2015</td>
<td>180,000</td>
</tr>
<tr>
<td>2016</td>
<td>196,000</td>
</tr>
<tr>
<td>2017</td>
<td>213,000</td>
</tr>
</tbody>
</table>

Rapid growth in ICT spending in the Kingdom over the coming years will create a large number of new ICT jobs. The ICT workforce is expected to increase cumulatively by 29\% between 2014 and 2017 from its current size today, alongside a cumulative ICT spending growth rate of 24\% between 2014 and 2017. If a sufficiently large pool of Saudi IT professionals is not developed to fill these jobs, there would be increasing pressure to use expatriate workers and to provision services from offshore locations (Figure 5).

\textsuperscript{14} Central Department of Statistics and Information. Labour Force survey 2013 Round 1, 2013.
\textsuperscript{15} 2014 CITC Saudi Arabia ICT Workforce Skills Study
\textsuperscript{16} Ibid.
Between 2014 and 2017, Saudi universities, colleges, recruitment organizations, and domestic training institutions are expected to supply nearly 23,000 new ICT professionals; however, the gap between the demand and the supply will nonetheless continue to expand. In the year 2014 alone, demand for ICT professionals is estimated to have exceeded the supply by 8,400 individuals, and this gap is expected to increase to almost 10,400 individuals in the year 2017. Cumulatively the expected gap between ICT demand and supply will exceed 37,000 individuals between 2014 and 2017 (Figure 6).

Figure 6: ICT Employment: Demand-Supply Gap

### 3.1 ICT EMPLOYMENT DEMAND-SUPPLY GAP

17 Ibid.
18 Ibid
DEMAND FOR AND AVAILABILITY OF ICT SPECIALTIES

The ICT workforce that comprises nearly 165,000 professionals is employed in a number of specialties. ICT support and helpdesk executive, systems engineer (including computer networking engineer), and software developer are the three most common specialties.

Relative to other specialties, a greater number of ICT support and helpdesk jobs will be created over the next few years. There is a subset of jobs expected to have relatively higher demand while also being relatively more difficult to find and hire. Among these, the greatest focus is required on the development of specialties such as software application developer, software apps manager, consultant, and design engineer, alongside continuing efforts to monitor the requirement for other ICT specialties presented below (Figure 7).

Figure 7: Demand - Availability Analysis for ICT Specialties

---

19 Ibid.
Likewise, a subset of skills is also expected to have relatively higher demand and relatively greater difficulty to find and hire. Greater focus is required on the development of skills related to cloud infrastructure, software development, security, mobility, ICT strategy, IT administration and helpdesk and support, than, for example, on the development of those related to maintenance or optical systems (Figure 8).

*Figure 8: Current ICT Employment and Future Demand by Skill*20

20 Ibid.
As was shown in Figure 6, the supply of ICT professionals is expected to increase by an average of 6% annually to reach approximately 6,500 in 2017. Universities, technical and vocational colleges, are the major sources of ICT graduates.

Saudi universities and colleges have made substantial investments in new ICT courses and additional seats. Their primary role is to provide foundational education which can be leveraged for further skills development. Here, the more renowned universities have been able to produce sufficiently high quality graduates.

While there was some negative feedback on the English language capability of graduates from the ICT industry a few years ago (which was also noted in the 2009 CITC Skills Study), universities have since introduced measures such as preparatory years and orientation courses to improve skills. Several employers surveyed by CITC acknowledge this significant improvement.

Universities acknowledge that graduates are not fully ready for ICT market needs immediately after graduation, and that they need practical training on specialized technical topics. Such specialized training needs to be provided by the technical colleges and the employers themselves.

Employers point out that the quality of university graduates from the leading institutions is satisfactory; however, there is a sharp drop in quality between the graduates from the top ranked universities and the lower tier institutions.

A majority of the university ICT students prefer to work for large organizations such as Saudi Aramco, Saudi Airlines, Saudi Electricity, etc. upon graduation. While a few start their own ICT business, others prefer to use scholarship programs to study abroad.

Some students consider ICT as a stepping stone to reach a managerial position. Most of the students who decide to obtain a master’s degree choose business programs rather than pure ICT programs.

On the whole, however, the feedback from the educational institutions suggests that there is significant interest in ICT courses among students.
RECRUITMENT AND TRAINING

ICT’s evolution leads to productivity enhancement for an organization’s workforce. For the ICT worker, this constant evolution puts pressure to continuously upgrade skills in order to remain relevant. This chapter examines the current state of recruitment and training activities of the ICT workforce in the Kingdom.

5.1 RECRUITMENT OF ICT PROFESSIONALS

Saudi employers use several sources to recruit ICT professionals. Recruitment agencies are the primary source: over half the organizations surveyed by CITC rely on them to fill vacancies. Outreach to educational institutions, including universities (34%) and training institutions (31%) forms the other most often employed means of recruitment. Online job portals and social networks, such as LinkedIn, are also becoming increasingly popular.

*Figure 9: Sources of Recruitment of ICT Professionals*  

![Graph showing sources of recruitment](image)

The most common specialty for which Saudi organizations recruit entry-level professionals – those who have less than 2 years of work experience – is that of ICT support and helpdesk. Other professions that demand relatively low levels of experience include systems engineer and software application developer (Figure 10).

It must be noted that the vast majority of positions earmarked for entry-level ICT professionals are for specialties with the highest levels of current ICT employment. These specialties are clearly the ones where university graduates and relatively less experienced professionals will find employment.

---

21 2014 CITC Saudi Arabia ICT Workforce Skills Survey, n=413
Organizations have a net positive perspective of the quality of entry-level ICT professionals, with 47% of surveyed organizations saying that the entry-level graduates they hired have sufficient skills to fulfill their job responsibilities, with only 15% disagreeing. The view is more evenly split when asked whether there are sufficient entry-level Saudi ICT graduates available to staff and grow operations, with 39% of surveyed organizations agreeing and 31% disagreeing (Figure 11).

Figure 10: Most Common Entry-level ICT Specialties Recruited by Organizations

Figure 11: Quality and Availability of ICT Professionals

Entry-level graduates that you hire are skilled for positions in your company

There are enough entry-level Saudi graduates to staff ICT operations and grow operations

---

22 Ibid.
23 Ibid.
5.2 TRAINING OF ICT PROFESSIONALS

Regular training of workers is critical to their development and enables the bridging of skills gaps in the organization. However, most organizations lag behind in this regard. Over half the organizations surveyed do not have formal training programs (Figure 12).

Figure 12: Presence of Formal Training Plans for ICT Professionals within Saudi Organizations²⁴

No doubt, training can be expensive, especially for small organizations. Moreover, it would mean time away from the job. As a result, a majority of the surveyed organizations prefer to train the employees on the job. A significant proportion (37%) provide structured off-the-job training programs.

The increasing availability of web-based training from such sources as Massive Open Online Courses (MOOCs) offers cost effective means of training. Nearly a third of the organizations surveyed offer web-based training to their employees.

The demand for skills in emerging technology areas can be addressed only through regular training. A lack of training can lead to obsolescence of the skills pool in the organization. Furthermore, it can lead to greater employee turnover. Therefore, many successful organizations use training as a tool to motivate and retain staff.

²⁴ Ibid.
Over half of the organizations surveyed have developed links with higher education institutions in Saudi Arabia. The most common engagement is through internships. Interestingly 15% of the organizations have partnered with universities for research and development on initiatives that can contribute to innovation and competitiveness. Some of them—although a small number—also participate as curricula advisors (Figure 14).

Figure 13: Forms of Training Provided to ICT Professionals

- On-the-job training: 61%
- On-site or off-site training provided by ICT vendors: 37%
- On-line (web-based) training: 32%
- On-site or off-site training provided by consultants: 18%
- Training abroad: 7%

Figure 14: Linkage with Higher Education Institutions and Nature of Involvement

- None: 49%
- Offer Internships: 26%
- Partner with universities for workforce training: 16%
- Partner with universities for research and innovation: 15%
- Participate in degree advisory boards: 14%
- Sponsor students: 10%
- Organize events at universities & colleges: 9%
As the demand for ICT products and services in Saudi Arabia grows rapidly, the demand for ICT skills is expected to keep pace with it. The focus of the Kingdom should be on developing a sustainable Saudi ICT workforce and a local skills pool that can cater to this demand. In order to do this, policy makers, academia and stakeholders in the public and private sectors need to focus on a few areas.

The capacity and effectiveness of the ICT education system can be strengthened further through collaboration between academia and the industry. Working closely together they can not only constantly improve the curricula but also drive innovation through joint research and development initiatives. Technology awareness sessions, internships, and practical workshops held by ICT organizations at universities could also help students gain a better understanding of the latest developments.

In order to grow the ICT talent pool further, it is important to draw more young Saudis into the ICT profession. Awareness programs at schools and universities could help to develop an appreciation of ICT career paths, and build the right expectations.

Skills related to emerging and transformational technologies such as cloud, mobility and security will become increasingly in demand as the market’s adoption of these technologies increases. These specialized skills are also often difficult to find. Greater focus needs to be given to further develop these skills to fill such positions.

To help employers find the skills they need, both physical and virtual platforms ranging from online portals to career fairs could be considered. They offer job information and match-making opportunities for both employers and job seekers.

The Saudi government remains highly committed to monitoring all developments within the Kingdom’s ICT market, and taking the necessary actions to ensure that a competent and sufficiently large base of ICT professionals is available to support the nation in its continued push towards becoming an information society. It is important that the private sector partners with the government in this endeavor. Focused recruitment and regular and consistent training of Saudi national ICT workers is critical to the development of a sustainable, local ICT workforce. Private organizations need to make sufficient investments in training and retention with a view to developing a sustainable, and perhaps more loyal talent base in the long term.
APPENDICES

APPENDIX A: METHODOLOGY

In order to map the current state of ICT workforce in Saudi Arabia, and to assess the current developments and challenges related to the various stakeholders, CITC conducted extensive primary and secondary research.

Primary Research

The primary research included two parts:
1) in-depth interviews with senior level executives in organizations in Saudi Arabia
2) a survey among recruitment professionals in the businesses in Saudi Arabia.

CITC conducted in-depth interviews with senior level individuals at 30 selected entities in Saudi Arabia representing the following major stakeholders groups: government stakeholders and associations that play a role in the development of the ICT workforce, universities, training and research Institutions, ICT vendors and services providers, and end-user organizations and companies. These interviews provided insights into the current Saudi ICT workforce landscape and expected future demand, as well as adding value to the qualitative commentary discussed throughout the report.

CITC also conducted a survey named ‘2014 CITC Saudi Arabia ICT Workforce Skills Survey’ with a sample size of 413 private companies and government organizations to better understand the demographic characteristics of the ICT workforce, current and future profession and skillset requirements, viewpoints on recruitment and training, as well as general perspectives on the ICT workforce and skills in the Kingdom. The survey was conducted among professionals responsible for making decisions about the recruitment of ICT professionals in businesses in Saudi Arabia. The details of the survey are given in the table below.

Table 1: Survey Details

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>413</td>
</tr>
<tr>
<td>Time Period</td>
<td>April and May 2014</td>
</tr>
<tr>
<td>Sampling Method</td>
<td>Random Sampling with quota control</td>
</tr>
<tr>
<td>Margin of Error</td>
<td>4.82%</td>
</tr>
<tr>
<td>Confidence Level</td>
<td>95%</td>
</tr>
</tbody>
</table>
Secondary Research

CITC undertook in-depth and wide-ranging secondary research which focused on consolidation of existing information available from various information sources on the topics of the ICT workforce and skills. These included a number of existing studies on the ICT sector in Saudi Arabia and development plans for the Kingdom’s ICT sector and workforces by domestic institutions such as Saudi Arabia’s Ministry of Communications and Information Technology, Central Department of Statistics and Information, Ministry of Education, Ministry of Higher Education, the Yesser e-Government Authority, among others; as well as various international studies on ICT workforce related topics by entities such as International Data Corporation, International Telecommunications Union, and the European Commission, among others.
APPENDIX B: DEFINITIONS

**Contract Employee:** This corresponds to an employee who works under contract for an employer and is not considered a permanent employee. A contract employee is hired for a specific job at a specific rate of pay without becoming a regular addition to the staff.

**ICT Professional:** An ICT professional is defined as a person engaged primarily in information and communications technology related work. The work of the person may include the design, development; build out, implementation, management, support, operation, distribution, sales or marketing of telecommunication, computer hardware/software, ICT services or digital contents.

**Economically Active Population:** Comprises all persons of either sex who furnish the supply of labor for the production of economic goods and services as defined by the United Nations System of National Accounts during a specified time-reference period.

**Margin of Error:** This corresponds to an analytical technique that accounts for the number of acceptable errors in an experiment. The margin of error is put into place so that an individual can review results and then determine the level of accuracy of the experiment. A smaller margin of error indicates trustworthy results and a larger margin of error means the results are not considered as accurate.

**Massive Open Online Courses:** This is a model for delivering learning content online to any person who wants to take a course, with no limit on attendance.

**Net positive:** refers to a positive final impact, after considering all positive and all the negative factors or inputs.

**Software:** This refers to the entire set of programs, procedures, and related documentation associated with a system and especially a computer system; specifically: computer programs

**Workforce:** This refers to the number of workers potentially assignable for any purpose.