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Pakistan IT HR Needs Assessment Study

National ICT R&D Fund





The National ICT R&D Fund is an entity created by the Ministry of Information Technology (MOIT), Government of Pakistan. The government of Pakistan has mandated that a certain percentage of gross revenue generated by all telecom service providers be allocated to development and research of information and communication technologies with the vision to transform Pakistan's economy into a knowledge based economy by promoting efficient, sustainable and effective ICT initiatives through synergic development of industrial and academic resources. This vision will be realized by pursuing the following goals:

- Cultivate industry-academia partnership by funding concrete development and research initiatives.
- Enhance the national ICT related human resource development capacity manifolds by facilitating industrial demand focused human resource capacity building and R&D capabilities in the country and promoting ICT related educational programs and activities.
- Make Pakistan an attractive destination for service oriented and research and development related outsourced jobs.
- Use ICT as a tool for wealth creation and upward mobility for economically challenged groups of citizens.
- Spread the ICT activities on a true national level.



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DISCLAMIER

This report is the result of a year-long effort to collect and analyse data between July 2013 to December 2014. It represents an innovative and best faith effort to draw conclusions from jobs data available on various job portals and aggregators on the web. To that effect, the report solely reflects the views and conclusions of the Consultants and may or may not reflect those of the National ICT R&D Fund, the industry players, or the Government of Pakistan. This report is a well-intentioned effort to enhance our collective knowledge about Pakistan's IT human resources pool and must be used in conjunction with other data sources and approaches and, hence, should not be used a sole means of advice for making policy or investment decisions.



Pakistan's IT HR Needs Assessment 2013-14

FINAL REPORT

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Personforce Consulting (Pvt.) Ltd.

In collaboration with:

Technomics International Ltd.

National ICT R&D Fund

Ministry of Information Technology (MOIT)

Government of Pakistan



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Glossary of Terms

ACS	Australian Computer Society
API	Application Programme Interface
ASP	Application Service Provider
BPO	Business Process Outsourcing
BYOD	Bring your own device
CAGR	Cumulative Annual Growth Rate
CCNA	Cisco Certified Network Administrator
CE	Computer Engineering
CEO	Chief Executive Officer
CGEIT	Certification in Government Enterprise Information Technology
CIO	Chief Information Officer
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
CMS	Content Management System
CS	Computer Science
CSP	Computer Society of Pakistan
СТО	Chief Technology Officer
C#	C Sharp
DB	Database
EE	Electrical Engineering
ERP	Enterprise Resource Planning
EY	Ernst and Young
HEC	Higher Education Commission
HR	Human Resources
HTML	Hyper Text Markup Language
IBM	International Business Machines Inc.
ICT	Information and Communication Technology
IDC	International Data Corporation
IEEE	Institute of Electrical and Electronics Engineers
iOS	Operating System (Apple Inc.)
ISP	Internet Service Provider
ISO	International Standards Organisation
IT	Information Technology
ITES	Information Technology Enabled Services
J2EE	Java 2 Platform Enterprise Edition
LAN	Local Area Network
LBS	Location Based Services
MCSE	Microsoft Certified Systems Engineer
MIS	Management Information Systems
MNC	Multinational Corporation
MOIT	Ministry of Information Technology
NCR	National Cash Registers Inc.
NISM	National Institute of Social Media
OSS	Open Source Software
P@SHA	Pakistan Software Houses Association of IT and ITES Companies

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PC	Personal Computer
PHP	Personal Home Page (A scripting language)
PMP	Project Management Professional
PKR	Pakistani Rupees
QA	Quality Assurance
QTP	HP Quick Test Professional
PSEB	Pakistan Software Export Board
RDBMS	Relational Database Management System
R&D	Research and Development
SAAS	Software as a Service
SCM	Supply Chain Management
SEO	Search Engine Optimisation
SQL	Structured Query Language
STEM	Science, Technology, Engineering, and Maths
TCP/IP	Transfer Communication Protocol / Internet Protocol
UI	User Interface
US	United States
VB	Visual Basic
VDI	Virtual Desktop Infrastructure
VP	Vice President
VOIP	Voice Over Internet Protocol
WAN	Wide Area Network
W3AF	Web Application Audit and Attack Framework
3D	Three Dimensional
.Net	Dot Net



Executive Summary

One of the primary challenges of policy-making for the IT Industry in Pakistan has been the absence of credible and reliable data on the industry across the entire software industry value chain including inputs (e.g. human resources, employment etc.), outputs (revenues distributions by sectoral and technology categories etc.), and outcomes etc. The absence of credible data on the industry outcomes of interest has, in the past, resulted in critical weaknesses in the policy-making processes.

One of these data gaps concerns the IT HR pipeline as well as the future industry needs. This presents at least two important challenges, namely, constructing a credible picture of IT HR – stock and growth – without having any benchmarking data, and the difficulties and challenges of projecting future growth in an area as fast changing as IT.

Last year, the National ICT R&D Fund was mandated by its Board to fund a number of studies to significantly enhance the quality and availability of credible data on Pakistan's IT Industry. In addition to the study on IT HR Needs, National ICT R&D Fund also funded efforts to generate more recent data on IT Industry and broader National ICT indicators.

This study presents an attempt to address these challenges through the innovative use of IT HR data already existing in the cyberspace. The Consultants developed a algorithm that could extract IT jobs data available on job portals and aggregators (such as indeed.com.pk) to create a database of ICT jobs. A total of 36,948 jobs from January 2010 to December 2012 were extract of which 33,496 were classified as IT jobs for the purpose of this analysis. A similar approach was used to extract 9000+ Silicon Valley jobs from Personforce.com's own job portal to allow comparison with international trends.

An IT jobs classification scheme was developed to better allow the classification and comparison of jobs. Several interesting findings emerged – including the historical trajectory of software programming jobs by platform type, as well as growth trajectories and trends of jobs in traditional IT sub-sectors as well as new and emerging areas, etc. – and these were used to identify initial statements of IT HR trends for subsequent analysis. These trends were validated through focus groups as well as a review of relevant literature and comparison with global trends.

The analysis of preliminary data provides some interesting new findings and confirms several others. That desktop as a programming platform is on a decline is quite evident from anecdotal evidence and the data merely confirms it. Web has the dominant platform, although the demand for web related programming skills (Java, PHP, HTML5, etc.) is much less in Pakistan as compared to the Silicon Valley thus pointing to considerable room for growth in the future. What is most surprising, however, is not that mobile is the fastest growing platform with regards to demand for skills but rather that the demand for mobile programming skills in Pakistan follow almost the same trajectory as in the Silicon Valley thus pointing towards a possible convergence between the client and the offshore markets.

For each of the four high level skill areas – ERP, Networks, Security, and Database – we see a growth trend between Jan 2010 and December 2012. The highest growing of these sectors is security which experienced about 100% growth over the 3 year period while ERP and database jobs experienced considerably higher growth during 2012 than in the previous years (2010 and 2011). Going further down at the platform and tools level, there are clear winners in demands for skill sets of MySQL (for Database), Oracle (ERP), and Adobe (Graphics), although there is no clear winner in Web where Java, HTML5, PHP, and dotNet are still in business. Similarly, Linux skills seems to be clearly in high demand in both Networks and Security domains and the open source platform seems to be a much clearer 'winner' in Pakistan than in the US where Cisco is still very much in contention. Finally, Cloud and Big Data emerge as new skill-sets that are in demand, though both are at a very early stage of development in Pakistan. The data on Silicon Valley suggests that the demand for Cloud and Big Data is very well-established in the client market and is likely to grow in Pakistan as well, albeit with some time lag. The data also shows that the demand for several IT skills and sub-sectors continues to grow in Pakistan while it is declining in the Silicon Valley. This is an



interesting finding that could be interpreted two ways, namely, as the demand for these skills decline in the Silicon Valley, these jobs are being outsourced to offshoring destinations like India and Pakistan or that the declining demand in the Silicon Valley will ultimately trickle down to the Pakistani market. Collection of more data could help us fully understand and establish the precise nature of the relationship between demand for skills in Silicon Valley (client market) and Pakistan (offshore market).

These data become the basis for some general trends that were then feed into a Delphi process to force experts to converge on future projection of IT HR Needs for the country.

The Delphi process was carried out between 10 experts identified from within the industry and spread over 3 rounds carried out between October 2015 and December 2014. The results are produced below:

FUTURE PROJECTIONS:

Total IT and ITES Jobs													
	Curren	Last Year		This	s Year	Next	Year	Next 3 Yrs		Following 3			
	t Stock	(2	013) (2014		014)	(20)15)	(2015	5-17)	Yrs. (2018-20)			
	100.000		5.000		500	17	500	20.0		57.500			
IT Jobs Growth	100,000	<u> </u>	5,000		0,500	17,	,500	30,0	000	57,500			
TIES Jobs Growth	97,500	20	0,500	10	10,000 20,50			30,0	000	60,000			
Current and Future Jobs in Key Plati				Areas	Novt	7.001	Iobo	Created		John Created in			
			Estim	aleu	(201		JUUS			JODS Created III			
			Curr	ent	(201	5)	Ne:	XUSYRS.	N	ext 6 Yrs. (2015-			
			Sto	ck			(2	015-17)		20)			
Programming (Deskt	op/Servers)		30.0	00	2.24	50	8.000			17 500			
Web Development			25.0	00	3.00	0		6.000		13.250			
Hardware			17,5	00	3,25	50		5,500		9,000			
ITES (BPO, Call Cer	ntres)		12,7	50	1,50	00		3,550		7,750			
Mobile Development	;		4,50	00	1,00	00		4,000		7,000			
Current and Future	Jobs in Co	ore I'l	Γ Skill A	reas									
			Estimate	d 1	Next Yea	r J	Jobs Created in		Jobs Created in Next				
			Current		(2015)		Next 3 Yrs.		6 Yr	6 Yrs. (2015-20)			
			Stock				(2015-17)						
Project Management			3,000		500		1,10	0		2,500			
Database Managemen	nt	_	3,000		200		686)		1,700			
Business Analysts		_	1,000		200		650)	1,750				
System Analysts		_	1,450		1,040		2,62	0	3,240			3,240	
Quality Assurance		_	4,000		400	_	1,500		4,000				
Content writers	Joha in F		1,000	L-:11 A -	100	100		325		700			
Current and Future	: JUUS III EI	nergi	ling I I S. Estimata	d I	Teas Novt Voo	r I	obs Cros	ted in	Iobs	Created in Nevt			
			Current		(2015)	J	Nevt 3	lieu m Vrs	6 Vr	(2015-20)			
			Stock				(2015.17)		U II.	5. (201 5- 2 0)			
			Stock				(2010						
Game Development			2,500		750		2,80	0	5,	750 (+225%)			
Animation			1,000		6,075		10,22	25 2		450 (+2500%)			
Graphic Design			3,500		300		943		2	,025 (+75%)			
Analytics			375		75		325		6	50 (+200%)			
Social Media			2,250		550		2,25	0	5,	500 (+225%)			
Payment Systems		_	500		100		200)	8	00 (+160%)			
SEO		_	1,000		350		843		1,	575 (+150%)			
Embedded Systems			3,000		3,100		1,80	0	3,	100 (+100%)			



The Median expert believes that currently there are about 100,000 people employed within the IT sector in Pakistan. There is considerable variation in the estimates of experts with 25% believing that this number is less than or equal to 32,500 and 75% believing this is less than or equal to 127,500. The median expert also believe that in 2013, 5,000 new IT jobs were added while in 2014 10,500 new jobs have been added. (S)he also believes that in 2015, 17,500 new IT jobs shall be added to the overall IT employment in the country. Similarly, over the following three years (2015-2017) 30,000 new IT jobs shall be added and subsequent three years (2018-2020) 57,500 new IT jobs shall be added to the current pool. Similarly, the median expert believes that currently there are about 97,500 people employed within the IT-enabled services sector in Pakistan.

The table (above) is self explanatory. There are clearly emerging areas that will experience far greater growth than average IT sector as a whole. These include high growth areas (consistently above average growth, doubling every six years) and areas ready for, potentially, explosive growth (far in excess of 30-50% per annum). Embedded Systems, Payment Systems and SEO fall under the first category while Analytics, Social Media, and Game Development fall under the latter category. Animation does stand out and seem way beyond expectations.

CONCLUSIONS:

Several important points stand out from the analysis.

- There is a definite linkage between the IT job data in Silicon Valley with that in Pakistan and even though most have an intuitive sense that this should have been the case, this is the first study in Pakistan that formally tries to produce and utilise data to try to understand that linkage.
- There are sectors and sub-sectors within the ICT HR that have grown faster (or slower) than others over the time period in question and may thus benefit from or be deserving of public policy interventions.
- There may be sectors that are anecdotally known as 'emerging' (or fast growing sectors) but the reality of actual job data does not support this.
- At the platform and tool-kit level, we see a greater degree of concentration (and specialisation) in Pakistan than we see in the Silicon Valley.
- There is the issue of quality of HR which is one of the most critical and hard to capture element of the HR demand situation in Pakistan and yet our study, by design, does not say much about it.

POLICY RECOMMENDATIONS

A number of policy recommendations are made:

- **Recommendation 1:** Firstly, the Ministry of Information Technology (MOIT) and the National ICT R&D Fund may consider repeating and updating this analysis on at least an annual basis and probably more frequently.
- **Recommendation 2:** We also recommend that a more detailed and longer-term and hence comprehensive analysis of IT jobs data be undertaken to better understand the correspondence (time lags, magnitude differences, etc.) between Pakistan and the Silicon Valley.
- **Recommendation 3:** There is a clear need to upgrade the curriculum being taught in our universities if our graduates and young professionals are to meet the demands of the industry.
- **Recommendation 4:** There is a dire need to introduce new and emerging areas such as Big Data, Graphical Databases, Cloud, and Virtualisation, etc. to students and young industry professionals in a systematic manner.
- Recommendation 5: While this study has addressed the demand side, there is a need for a comprehensive and definitive study on supply that may focus, in particular, on the issue of quality of HR because that is so central to the HR challenge that Pakistan faces today.
- **Recommendation 6:** In addition to supporting data collection activities elsewhere, the Ministry may also recommend that HEC and other relevant Ministries collect data on IT, CS, MIS, EE, and CE programmes at Universities to help improve data-driven policymaking in Pakistan.

We believe this study could lead to better informed decisions by various actors – Government, academics, and industry leaders – and facilitate evidence-based policy-making in Pakistan.



1. Background and Introduction

One of the primary challenges of policy-making for the IT Industry in Pakistan has been the absence of credible and reliable data on the industry across the entire software industry value chain including inputs (e.g. human resources, employment etc.), outputs (revenues distributions by sectoral and technology categories etc.), and outcomes etc. The absence of credible data on the industry outcomes of interest has, in the past, resulted in critical weaknesses in the policy-making processes. In the first instance, the lack of credible data on industry hampers our ability to use evidence-based policy in the first place. Moreover, when policy is made and programmes designed, the paucity of credible data limits our ability to improve.

The lack of credible data becomes an even more serious challenge in times of economic recessions when all public expenditures fall under increased scrutiny for effective and public (or private) returns. Under these circumstances, credible data on industry inputs, outputs, and outcomes can provide the necessary basis to develop a case for public support for the industry.

It is under precisely such circumstances that the following *questions of a rather strategic nature* may arise in the public discourse:

- What is the total level of employment within Pakistan's Software / Information Technology sector?
- How does that compare with other 'important' sectors of Pakistan's economy (such as agriculture and textiles)?
- How is the employment in the Software /Information Technology sector different (e.g. are IT jobs higher paying) from other sectors that may require similar level of public support?
- What has been the benefit of supporting the IT sector (e.g. through a10- tax holiday) in Pakistan?
- Should government continue to support the IT sector, and are the benefits greater than the costs?

In addition to these questions of a strategic nature, there may also be several very *pragmatic considerations* for seeking credible and comprehensive data, for example, about the HR within the IT industry in Pakistan:

- How might companies plan their product development cycle on the basis of national and international procurement trends?
- What technologies or products / services are likely to experience increase in sales and revenues in the next 3-5 years?
- What might an 'average' student entering into the IT job market today plan his or her career making choices about what to study and when so that he may optimise his lifelong earnings and professional aspirations?
- What might a new University offering a new major in information technology or computer science offer in concentrations or foundational and optional courses?
- How (and how often) might the curricula of the already established Universities change to keep pace with the changing trends within the industry and the demands in the marketplace?
- What might Universities, generally, teach (i.e. Concepts vs. Skills vs. Tools) and how to best prepare and optimise their product (i.e. the student) for uptake in the market of skills?
- How might the regulator (i.e. HEC) incorporate such changes through the curricular committees established for a range of subjects? etc.

These are difficult questions and will require data collection at various levels.



In recent years, Ministry of Information Technology (MOIT) and its various bodies, such as, Pakistan Software Export Board (PSEB) as well other bodies such as Pakistan Software Houses Association of IT and ITES companies (P@SHA) have made considerable strides in improving the quality of data on the industry in the country. Building upon the 2005 Best Practices Study in, PSEB commissioned an IT Market Assessment Study 2010 as well as sought policy advice on enhancing the collection and realization of Software / BPO revenues within the IT industry. These have tended to fill some gaps in evidence-based IT policy-making in Pakistan, but have fallen short of addressing several key elements including, but not limited to, the human resources for the IT Industry.

However, a well-crafted evidence-based policy is often a result of an iterative process that begins with a detailed situational assessment that collects market data; develops a broad national policy outline that draws from or builds upon the support of key stakeholders; and the development of specific detailed policy packages within key focus areas leading to implementation.

The following figure provides a graphical illustration of the three-step iterative evidence-based policy-making process that requires successive levels of detail – and hence data – for it to work as desired.





Last year, the National ICT R&D Fund was mandated by its Board to fund a number of studies to significantly enhance the quality and availability of credible data on Pakistan's IT Industry. In addition to the study on IT HR Needs, National ICT R&D Fund also funded efforts to generate more recent data on IT Industry and broader National ICT indicators.

1.1 – UNDERSTANDING OF PREVIOUS DATA COLLECTION EFFORTS

In 2004, PSEB funded a National Best Practices Study for the IT Industry that first began collecting systematic data on a small number of large and well-known software companies in Pakistan. In 2007, P@SHA built upon this seminal study and instituted a process of Annual Reviews of Pakistan's Software / BPO Industry with an aim towards carrying out systematic data collection on the industry that may not only benchmark its performance over time but also provide useful information to feed into the data needs of international data collection and analytic



outfits. With the exception of these two studies, the efforts at documenting and analyzing the industry have been largely qualitative and somewhat patchy.

While the PSEB (2005 and 2010) and P@SHA (2008) are welcome improvements over the status quo, even these studies are limited in their ability to capture the entire national IT market. More specifically, both PSEB and P@SHA Studies only looked at the software development and BPO markets and did not take into consideration the IT user community which represents a major portion of the overall IT market. While PSEB/PASHA begins to get fairly high quality data on software development and BPO sectors, several other sub-segments – possibly large and definitely important ones – are only open to guesswork. For example:

- The PASHA Annual Review 2007 stated that the 80 companies surveyed recorded local revenues (and local spend of global companies) of \$269 million (up 39% from \$193 million in 2006) showing strong growth over the last years.
- During the same timeframe, the 80 companies surveyed recorded a global revenue impact of \$716 million that grew to about \$909 million in 2007 a growth rate of over 15%. This puts the estimated overall global revenue impact of the entire industry at well over \$1 billion mark.

However, even though the accuracy of existing data has improved over time, the coverage of the IT industry within the survey sample has lagged behind. For example, additional sources of demand, not usually covered within the surveys, include:

- Domestic revenues of leading IT multinationals (e.g. IBM, Cisco, NCR, Oracle, Microsoft, SAP, SaaS, and Intel etc.) forms a major share of domestic IT spend and is estimated at around \$200-250¹ million a year.
- The domestic hardware market, over and above that captured by the IT multinationals, is the second major revenue category and is estimated at \$300-500 million¹ a year.
- A fairly large "informal" sector comprising of unregistered software and IT companies as well as freelance software developers selling and exporting their services through global online platforms such as elance.com and odesk.com.
- IT/software/BPO market not only as customers but also by hiring and in-house development activity thus
 making up a significant share of the overall IT market pie.
- In-house IT operations of major MNCs, Banks, and government entities also contribute significantly to the overall economic activity due to and within IT sector as well as the job growth.

Clearly, there is more to the Pakistani IT Market than is currently being adequately captured and that the software and BPO sector may just represent the tip of the iceberg.

¹These figures are estimates provided by industry insiders and not calculated for the purpose of PASHA Annual Review 2007.



% of Exports

CISCO SYSTEMS

58

9 4 3

2

2

Software / BPO Companies in Pakistan

Est. Total No. of Companies:	500+
No. of P@SHA Members:	250+
Companies Surveyed:	85
Foreign Subsidiaries:	32%
Firm with Front Offices Abroad:	54%
ISO Certified Companies	46%
CMM/CMMI Certified Companies	14%
CMM – Level 5 Companies	2
Domestic:Export Breakdown	52:48



Growth in Company Size & Maturity Country / Region **Revenue Category** 2004 2007 **United States** Less than \$ 50K 24 6 United Kingdom 7 \$51 – 100K 16 Thailand \$101 - 500K 26 United Arab Emirates 19 \$501K – 1 Million 8 15 Japan \$1M – 5 Million 13 17 China \$5M – 10 Million 3 6 \$ 10 Million and more 0 13

Employment and HR*

	2004	2007
Full Time Employment Average per Company % of Women Employment Average Length of Employment Foreign Qualified Employees Number of QA Professionals Employment Growth (2006-7) Employment Growth (2007-8)	4,619 81 8.95% 2.6 yrs - 333	12,232 214 13.5% 2.9 yrs 20% 771 27% 41%

* Based on Survey of 85 companies

Strategic Posture & Product-Service Profile

Strategic Posture	% of Firms
Niche Product-Service Horizontal Focus Vertical Focus	44 61 38
Product – Service Profile	% of Firms
Product-Focused	59

Others	220
* Source: State Bank of Pakistar	ı (2006)
Sectoral Breakdown of Total	Revenue
Sector	% of Revenue
Financial Services Telecommunications Government / Public Energy Fashion & Textiles Retail Healthcare & Life Sciences Others	31 17 10 5 4 4 4 30
IT Multinational Operations in	Pakistan
NCR	SAP

Google Grap

Figure: Pakistan's Software & Business Process Outsourcing Industry - A Snapshot

(intel)

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1.2 – HUMAN RESOURCES STUDIES IN THE CONTEXT OF PAKISTANI IT INDUSTRY

There is considerable dearth of rigorous and credible data and analysis on human resources available to Pakistan's nascent yet growing software / BPO / and IT industry. Over the last few decades, a small number of studies have been commissioned by a number of different entities that, with a few exceptions, have been of a more or less generic nature. Only a few studies have directly focused on the question of IT HR or manpower.

The CSP-SEARCC Study of ICT Manpower (2000) had a two-tiered structure of organizational and individual level data collection. At the organizational level, more than 340 organizations from Pakistan's industrial spectrum participated with a response rate of 71% of which 40.8% were IT suppliers, 14.5% public-sector organizations, and 44.7% private sector end-users. At an individual level, 2375 of 5000 IT professionals responded (46% response rate) of which 60.3% worked in development and 39.7% in services. The study had some interesting findings such as distribution of developers and management (51.3% IT professionals worked in software development while 6.3% in IT management), age groups (IT professionals aged between 25-29 (33%), 20-24 (23%), and 30-34 (19%)), gender (male: female ratio of 9:1), salary levels (less than \$3000 p.a.(44%), \$3-5000 p.a. (25%), \$5-8000 p.a. (14%)), shortage (85% of organizations report shortage of manpower with 34% reporting it as extreme and 51% reporting it as moderate), and skills in demand (top-5 skills in critical shortage include: Applications/systems development, network protocol/typologies, data base, mobile/wireless comm., and multimedia development).

While the CSP-SEARCC study appears methodologically rigorous and sound, it is quite outdated to be of policy relevance today. It does, however, provide a useful starting point for a National IT HR Needs Assessment study.

A second study on IT HR was funded by Pakistan Software Export Board (PSEB). Three separate survey instruments were used for IT development companies, user organizations, and universities and a plethora of different variables and future projections about HR numbers, skills, roles, etc. were collected. A total of 35 universities, 46 IT companies, and 93 non-IT public limited companies responded for a combined response rate of 41%.

The table (below) presents the study's projections of new job positions in the industry (by sector) based on a survey of 35 universities, 46 IT companies, and 93 non-IT user organizations.

Required	2006	2007	20 08	2009	2010	2011	2012	2013	2014	2015
IT	13,000	15,000	18,000	21,000	24,000	27,000	000,00	33,000	36,000	39,000
Non IT	2,000	2,000	2,000	2,000	2,000	3,000	3,000	3,000	4,000	4,000
Universities	1,000	1,000	1,000	1,000	1,000	2,000	2,000	2,000	2,000	3,000
Total	16,000	18,000	22,000	25,000	28,000	31,000	35,000	38,000	42,000	45,000

Figure 1.3: Projections of IT Human Resources in 2006 PSEB Study

It is difficult to The P@SHA Annual Review of 2007 presents a starkly different picture. Actual employment (not projections) in 80+ software and BPO companies surveyed begins to diverge considerably right from the first year of projection and continues to do so the remainder of the projection period.

There is clearly a need for a systematic, rigorous, methodologically sound study of IT HR in Pakistan that deploys a credible data collection strategy going to the level of fine detail necessary for developing policies and programs and supporting corporate decision-making in Pakistan. Such a study would be starting point of a process that could lead to formulating a strategy for government, academia, and industry to come together to solve the country's human resource problems. It would also support decision-making grounded in actual data rather than hypotheticals and enable policymaking and trade-offs on costs and benefits.



1.3 THE SCOPE OF THE ANALYSIS

Understanding the IT HR Market is a significant challenge particularly in view of the fast changing nature of IT and the emergent needs of HR in a vast array of different technologies, tools, languages, and systems. The situation is further complicated by the long feedback loops (usually 6-8 years) inherent in HR planning as market signals reach those at the start of the HR pipeline i.e. students entering colleges and universities that then trickle through the HR pipeline in 3-5 years timeframe. This is particularly true when universities are unable to keep up with the demands of the marketplace.

Although the HR cycle is self-correcting in the long run, there may be shortages and glut of particular skillsets and types of human resource in the short-to-medium term. If the time required for the feedback to trickle through the system can be shortened, significant savings and improvements can be achieved both for the job seekers and the employers.

Alternatively, improvements in our ability to predict what is coming – though of somewhat limited utility given the short horizon on which such a prediction can be accurate – does also help better streamline the HR supply chain.

Before this can be attempted, however, there is the task to generate baseline data on which future projections and policy decisions can be made. One could institute a detailed survey of universities and employers (IT companies) to arrive at fairly accurate data on HR needs and expectations. Given the pace with which IT changes – and the accompanying change in what is required from human resources – any data collected at a given instance is likely to be obsolete in a relatively short period of time. However, the data must be accurate enough to be of value to employers, professionals, university administrators, and students, alike. Carrying out a population of IT firms and professionals in Pakistan shall provide answers that could serve as gold standards but these are costly and may present their own challenges (e.g. how to estimate the population when a vast majority of professionals may be 'under the radar').

This research takes an innovative approach that mixes quantitative and qualitative data along with expert opinion to arrive at fairly accurate estimates that could serve the needs of the industry without having to go through a detailed data collection (survey) exercise.

The scope of the current report includes:

- Classification of existing Information Technology related jobs in the formal and Informal sectors.
- Determination of the number of professionals currently working in each of these job categories.
- Projections for the IT HR required over the next 2-5 year timeframe.
- Development of an HR baseline against which future growth may be measured.

Specific outputs shall include:

- Classification of the different IT jobs available in the country;
- Number of people currently working in each category;
- Side-by-side comparison of the different IT jobs based on qualifications, experience, salary, job availability and advancement potential;
- Sector and category wise projection of number of jobs expected to be offered in next 2-5 years;
- Projection of Cumulative Job Openings and Job Seekers over the Period of 2014-2018.
- Detailed analysis of the findings and detailed projections of the sector growth for the next two and five years separately.

2. Methodological Note

This section lays out a high level ("big picture") of the project methodology and approach to achieve the objectives of the analysis outlined in the report. There were a couple of challenges inherent in the proposed undertaking.

First, as illustrated above, currently there does not yet exist benchmark data for the total number of jobs being created and filled (as well as their breakdown) within the IT industry in Pakistan. A number of studies carried out in the past have used small sample sizes to arrive at estimates but these produce numbers that are far from ideal. A straightforward approach would be to fund a large census of ICT industry to arrive at better estimates. But large-scale surveys can only be conducted once a basic level capability and understanding has been developed of the problem.

Second, even if accurate estimates of current IT HR Needs existed, it would be difficult to predict jobs in the future. In recent years, repeated recessions have demonstrated that fragility of the global IT market and ultimate impact on small outsourcing destinations like Pakistan. Besides, information technology is a fast changing field of endeavour in which new technologies emerge and old ones disappear quite rapidly making it hard to predict the future too far into the future.

These necessitated the use of innovative approaches to address the problems of lack of prior data and difficulty in predicting the future under considerable uncertainty.

The following figure lays out the methodology used to arrive at the current and future (projected) HR Needs of the Industry.



Figure 2.1: The Project Methodology

The proposed methodology draws upon three core elements, namely:

- Extraction of jobs and HR data posted on established job boards and third-party services (such as Indeed.com.pk) to create *a classification and preliminary estimates of IT HR Needs in recent years*;
- Using Focus Groups of industry leaders, HR managers, and key employers along with comparative numbers from other sources to arrive a series of *HR trends and drivers*;
- **Running a Delphi-based expert opinion poll** within industry to develop a consensus on key drivers and resulting HR projections over short (2 yrs.) to medium (5 yrs.) term.



Each of these shall be described in some detail below.

One way to collecting jobs data is to use the actual jobs data – as against depending upon self-reported data – to assess the current IT HR needs. We began looking at the actual jobs posted by employers on job boards. The advent of job boards and job aggregators has changed the economic and cost dynamic, though technical challenges remain. We looked at popular job portals such as Rozee.pk and Brightspyre but decided on using Indeed.com.pk – a popular aggregator that publishes and aggregates not just jobs in Pakistan but also across a number of regional and global destinations.

The first task of the consulting team was to better understand how various aggregators posted jobs (i.e. understand, compare, and contrast data fields) as well create a taxonomy of IT jobs that could be used for comparison purposes. It involved looking at what

Create Job		
Job Title: *]
Company Name: *]
Country: *	USA ‡)
State: *	*	
City: •]
Job Category: *	Architecture and Engineering \$	
Career Level: *	Student (Undergraduate) \$	
Job Type: *	Full Time / Permanent \$	
Receive Resume through:*	Email \$	
Email: *]
Tags: *		e.g: software
	enigineer,developer,web	
	Separate tags by commas', '. Only 100 cl	haracters are allowed
No. of Positions: *		



information provided in the job description section of various job postings in our database (e.g. see figure on the right) and whether there was consistency in what was being provided. For example, the job categories defined in various online platforms may be different from each other and classified information differently. A prior specimen of a typical classification scheme for IT job postings and its various uses is described in the figure below.

#	High Level Fields	Descriptors
1	Classification	Architecture and Engineering, Business Operations, Computer and Information Technology, Financial Services Banking, Health Care and Safety, Human Resource, Internet, Legal, Management and Executive, Office Administrative, Sales and Marketing, Technical Services, Telecommunication, etc.
2	Core Function	Software Engineer, Tech Support, Project Manager, Data Warehousing, Director of Engineering, Technical Writing, Web Designer, UI Designers, Mobile Development, System Administrators, Software Test/QA Engineer, Search Engine Optimization, etc.
3	Skills	Programming Languages, Web Programming, Mobile Development, System Administration, Project Management, Business Analyst, Social Media, Writing, Platform, Development Tools, Databases, etc.
4	Location	City, State, Country
5	Hard to Get Jobs	Re-Post or Not
6	Experience	Student, Entry Level, Mid-career level, Middle Management, Management, Senior Management, Senior Executives, etc.
7	Qualification	Bachelors / Masters / etc.
8	Description	Qualitative data extractable through Semantic Search
9	Type of Position	Permanent / Full Time, Part time, Contractual, Consultant, Internship

Figure 2.3: Specimen of Classification Fields for Jobs Posted on Personforce Portal and Jobs Board



The consulting team began by extracting jobs from the aggregator services for which an algorithm was written and executed. This returned over 36,000 jobs over a period of 3 years (Jan 2010 – Dec 2012). A quick analysis of the extracted data revealed that not all of these jobs were IT jobs since there could be some non-IT jobs that were mistakenly classified as IT jobs and also because of some of the jobs were not IT jobs at all but turned up in our search as such.

In order to identify IT jobs, we decided to run a search on the overall jobs database for an exhaustive list of IT classification terms. This required the development of a bottom-up rather than a top-down classification scheme for IT jobs. A top-down scheme, for instance, would identify 'programming' as a high-level construct and then find sub-categories of jobs within this higher level category. However, we found that many (infact, most) jobs would not mention 'programming' or 'programmer' in the built-in classification requiring us to search for strings of characters (words or phrases) within the description fields. Not only that, because some jobs would not even mention the words 'programming' or 'programmer' we needed to identify with the occurrence of specialist terms such as C, C++, C# as jobs devoted to programming. Carried out exhaustively, this classification would not only result in the identification of IT jobs within the overall data extract but would also help identify the number of different types of jobs in demand. An algorithm was developed to carry out this classification. A hit-and-trial method was used to create a classification scheme given in the figure below.

High Level Skills	Softw	are Program (Platforms)	mming)	Network	Seci	urity	Databases	Graphics Designing	Project Mgmt	ERP	Others
Platform	Web	Mobile	Windows/ Server	Multiple	Network	Application	Multiple	Multiple	Multiple	Multiple	Multiple
Tools	PHP C#.Net VB.NET ASP ASP.Net CSS HTML5 J2EE Java Ruby on Raits Perl Java Script JOuery Net VB.NET Python RDF Visual Basic	Android iOS Blackberry Java Objective C	C C++ C#	Cisco RedHat Linux Broadband VOIP Cloud iptables Network, LAN,WAN,N etworking	Firewall Nessus Metaspolite Air crack Snort TCP Dump Brup suite Nikto W3AF Pros Proxy Cyber Security Information Security.	Nessus Metaspolite W3AF Pros Proxy Citrix Security	Sql Hadoop Nosql Pig MongoDB Cassandra RDBMS	Corel Adobe Omnigraffle Photoshop Logo Dreamweaver Illustrator	PMP Prince2 MS Project OTP / Selenium Primavera JIRA puppet	SAP Oracle Dynamics Seibel Peoplesoft Salesforce	Social Media SEO Facebook Twitter Analytics Big Data R-Studio R E-Business Content Management Middleware Business Intelligence BPO Call Center IT Helpdesk CMM/ITI

Figure 2.4: A Bottom-Up IT Classifications Scheme

The number of jobs extracted for January 2010 to December 2012 is 36,948 of which 33,496 were classified as IT jobs for the purpose of this analysis. The subsequent analysis was carried out on this subset of jobs. It is worth noting here that while this data may only be a subset of all IT jobs available in the country during this period, it could be used as a starting point – a baseline– for building more accurate estimates as well as for identifying and soliciting industry views on key drivers of job growth in the IT sector.

One important consideration at this point was whether, and to what extent, was this collection of IT jobs data representative of the entire industry. In order to ascertain bias, a snap survey was carried out at the time of the focus groups. The results, tabulated in Appendix A (pg. 80), suggest that while there may be room for some bias within various sub-classifications (such as mobile start-ups, small firms, or government organisations) – and this bias can be corrected for – the results may more or less be accurate for the industry as a whole. Particularly with respect to the recruitment pattern, on a mutually non-exclusive basis 39% firms advertised on job portals, 21% in newspapers,

13% use campus recruitment drives, and 43% used referrals, among many other approaches used in the industry. This provided some prima facie evidence than job portals capture a significant chunk of the total jobs in the market.

A similar analysis was carried on Personforce data from the Silicon Valley for the same time-period to provide a comparison basis for the IT job data on Pakistan. The data was then analysed, through hit-and-experimentation, for key trends in the IT job market in Pakistan.

The key trends in the IT HR data were subsequently identified and are being reproduced in Section 3.

The preliminary data as well as key trends were then briefed to a group of industry leaders through a series of focus groups in the 4 major cities of Pakistan. These focus groups were attended by CEOs, Heads of Operations, and HR Managers of some of a mix of large and small IT companies in Pakistan as well as senior officials of public sector organisations and some leading academics.

The primary purpose of the focus groups was the use of the 'collective' intelligence of the industry players as well as key stakeholders to draw deeper insights from the data and, perhaps, identify anomalies that may either entail data errors or necessitate a different way of looking at the data. The discussion during the focus groups also provided an opportunity to the participants and the study team to valid the trends and drivers, ask questions about them, or explore the underlying factors causing them. The feedback from these focus groups was used to refine the analysis.

The penultimate step was to validate key drivers identified above and estimate population rather than sample numbers for various IT HR job categories. This was carried out through a virtual Delphi process.²

The Delphi Technique is particularly useful in arriving at expert consensus around issues that carry major uncertainties and considerable diversity of opinions – such as drivers and trends in a rapidly changing field such as Information Technology. When managed well, the process usually converges to something that resembles expert consensus within 2-3 iterations. The Delphi Method has been widely adopted and is still in use today.

We identified 12 key stakeholders and knowledgeable industry leaders from a group of people identified during the focus group meetings and invited them to become part of this Delphi process. The Delphi process was set up to engage domain experts to converge on key trends and their implications for IT HR Needs of the country. Three rounds of the Delphi process was carried out as under:

Pre-Delphi Round - Focus on validating Trends and Drivers

- Delphi Round 1 Focus on identifying Parameters and future projection
- Delphi Round 2 Focus on enhancing accuracy of future projection

Delphi Round 3 – Confirmation of Estimates

The Pre-Delphi Round used the preliminary trends and feedback identified during the data collection and focus groups to validate key trends and drivers of IT HR needs in Pakistan. The survey instrument comprised a simple table produced below.

IT HR Trends	Rank	Key Drivers of Growth	Local, Global Future Milestones, Benchmarks, or Parameters
Social Media			
Web Development			
Databases			
ERP			
Mobile Gaming and Apps			

²The Delphi Technique was developed at the RAND Corporation in Santa Monica, CA in the 1950s, originally, to forecast the impact of technology on warfare. The method entails a group of experts who anonymously reply to questionnaires and subsequently receive feedback in the form of a statistical representation of the "group response," after which the process repeats itself. please see: <u>http://www.rand.org/topics/delphi-method.html</u>



Cloud Computing		
Big Data		
Open Source		
Content Development		
Payment Systems		
System Integration		
Search Engine Optimisation		

Figure 2.5: Data Collection Instrument for the Pre-Delphi Survey

The detailed email is attached as Annexure A to this report.

The Round 1 of the Delphi process kicked off with the Delphi Instrument distributed to the selected group of 10 experts. The Delphi Instrument solicited overall estimates for IT and IT-enabled services employment for current and future years and degree of confidence in those estimates. It also required experts to identify top-3 drivers of IT jobs growth in 3-6 year timeframe about which they were reasonably sure and a couple 'wild cards' about which they were not very sure but these could make a significant impact on IT jobs growth. Finally, the Instrument also required experts to provide estimates of jobs and jobs growth (current, near-future, and farther future) in specific job categories. The instrument also asked individual to provide reasons, where possible, for assigning certain values. The instrument is produced below for reference and a bigger version is available in Annexure B.

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			(D	eiphi Exerci	se instrumer	nt - iteration 1)			-		
	Name:			Organisatio	00.			Mobile Contact:			
	Nome			Organisativ							
											1
1: Please	make an educated guess about the to	tal number o	f IT and ITES	i jobs create	ed in Pakista	n in the past, last	year, this year, i	next year, and in 3 and 6 years time. You may base t	his estima	te on some	•
data p	oint or rule-of-thumb or personal expe	rience (plese	state this a	nd the confi	dence in you	r prediction). Ple	ase provide your	best guess and not hesitate in making an error. Th	e Delphi pr	ocess shall	
help yo	u sync with other colleagues and elimi	nate your err	ror and biase	es in the sub	osequent pho	ases.					
					Due di shi su s						
		Baseline	-		Predictions			Reasons	-		
		(all current	Last year	This year	Next Year	Over 3 years	Over 6 years	Please Describe the Data Point(s) Underlying Your	% Confi	idence in	
		jobs)	(2013)	(2014)	(2015)	(2015-2017)	(2015-2019)	Predictions	Pred	liction	
otal Num	nber of Jobs Created in IT and ITES								3-year	6-year	
IT	Total Technical (IT) Jobs										
ITES	Total Service (ITES) Jobs										
			ļ					l		L	
2: Please	e identify <u>TOP-3</u> DRIVERS of job growth	h in Pakistan	(e.g. social	media, big	data, mobile	e, or web) that yo	u're most certain	about + <u>2 WILDCARDS</u> that you're not certain abo	ut but that	t may make	e a bi
Impac	t if they happen. Not the difference bet	tween a DRIV	ER is somet	hing you kn	ow about wi	ith fair degree of	certainty and a V	WILD CARD is something that may happen but is un	certain.		
		Maximum	No of Jobs	Minimum	No. of Jobs						
		Created An	nually over	Created Ar	nnually over	What Indicators	s / Data Points Is	What Future Indicator / Milestone / Data Point, if	% Confi	dence this	
op3 Drive	ers of Job Growth in Pakistan	6 yrs (20	015-20)	6 yrs (20	015-2020)	your Predicti	on based on?	it happens, could derail your prediction?	event w	ill happen	
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D2	Driver 2 (Write here)										
	Driver 3 (Write here)										
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Figure 2.6: The Delphi Instrument - Round 1



The Round 2 of the Delphi process used the data generated in Round 1 and fed this back to the experts for a reevaluation and assessment. We also shared, where possible, the reasons provided by other experts while assigning their values. In addition to providing the estimates (means, medians, expected values, and 25 and 75 percentiles) for overall IT jobs, ITES jobs, and various jobs subcategories, we also provided estimates for top-3 drivers of jobs growth gleaned from the results of Round 1. These were, in order of median jobs growth: web applications (identified as key driver by 5 experts), social media (3 experts), and mobile development (5 experts).

We also provided the experts with 4 other drivers identified by singular individuals with largest possible jobs growth, namely, enterprise mobility, open source (CMS), big data, and free-lancing. Finally, we provided jobs growth estimates for 3 wildcards with highest jobs growth including, 3G-driven location based services, 3G-driven payment systems, and ERP/CRM implementations.

Experts were requested to use the summary statistics to revise their earlier estimates.

There was considerable variation in the results of Round 1, particularly, due to two outliers that we decided not to exclude from the analysis. Instead, we provided medians, 25 and 75 percentiles for each of the estimates. The use of medians rather than means has a moderating effect on the values – the purpose here being to let the experts know about the presence of outliers but allow the latter to re-assess their estimates in the true spirit of a Delphi exercise. This resulted in considerable convergence in the values at the end of the second round

The Round 3 of the Delphi process was primarily a confirmatory round with most experts indicating that they were reasonably confident with their estimates and did not want to further revise them. The Round 3 results did indicate a considerable consensus between a vast majority of the polled experts – with an exception of the two outliers – who had narrowed their differences with others but continued assessing the job growth to be considerably higher. We also triangulated the data achieved through estimating overall IT jobs and adding the sum of various sub-categories and, with the exception of outsourcing estimates, found the difference to be in a reasonable ballpark.

Finally, a set of near (1-2 years) and long-term (3-6 years) projections for IT HR Needs were subsequently developed. These are produced in Section 5.



3. Historical IT HR Data and Trends

This section describes the preliminary findings from the historical data extracted from the IT job boards and aggregators and seeks to create some trends and hypothesis that could be further validated through expert opinion. The data is described below:

3.1 SUMMARY CLASSIFICATION DATA

Majority of the jobs sought to hire people with a Bachelors degree, although this varied somewhat between the high of 70% in Sept 2010 to a low of 60% in May 2012, the variation was quite narrow. About 10-15% of the positions required intermediate or advanced levels as a pre-requisite academic preparation and about 7-10% jobs required a Masters degree. Number of jobs requiring Matriculation or Ordinary Levels, Certificate or Diploma, etc. were fairly minimal.



Figure 3.1: Academic Preparation for IT Jobs in Sample

We also tried to establish if a certain type of position was relatively easy or 'hard to fill'. Within the data, we could only find one way to operationalise such a job, namely, whether the job was posted multiple times i.e. beyond the initial 30 days for which a company initially pays when it posts a job. We do understand that this may not be a perfect proxy for a hard to find job and may, for instance, breakdown in a situation where a company puts up a job opportunity but quickly decides to take it off because it can't find the right candidates or certain companies pursue the policy of keeping a certain job posted for longer durations (sometimes almost perpetually) to continue to have access to fresh talent in a certain critical area.

Keeping these caveats in mind, 28% of all jobs in our sample qualified as hard-to-fill jobs i.e. they were advertised for more than 30 days (often up to 60 days but sometimes even up to 90 days) on the portals. The following figure illustrates the most common hard-to-find positions in our data base of jobs. Many of these, such as, graphic designer, project manager, PHP developer, and even executive secretary makes more sense than others and given richer datasets this could be improved in future iterations.





The data also provides us an opportunity to look at the industries that hire IT professionals. Here, we have access to data from both Pakistan (Indeed database) and United States (Personforce database) and the industry classification is built into the job classification scheme. The differences between the two sets of figures is quite revealing of the degree of maturity of the two economies. In Pakistan, for instance, a typical job description is often highly specified describing in considerable details the various platforms, tools, and technologies that a person needs to have facility with to be able to perform within the advertised role. In the United States, on the other hand, job descriptions are much less specified in terms of particular platforms, tools, and technologies and focus more on functional aspects of the job i.e. what would be required of the position and how does it fit the overall picture of the organisation. This is clearly an artefact not just of the degree of maturity of the economy but also the kind of tasks performed and being outsourced. However, it does have some implications for the kind of analysis we can undertake in that it makes it much harder to compare job descriptions – even of same or similar jobs – between United States and Pakistan.

In Pakistan, the top employer of IT professionals is the IT industry itself employing about 60% of the professionals. The number is much smaller (25%) in the United States for computer and information technology industry and these professionals definitely do different kinds of jobs as well. In Pakistan, bulk of the 60% would be engaged in software or programming of some kind while in the US hardware, manufacturing, design, and R&D would also feature as significant roles. Similarly Telcos and ISPs engage 5% of all IT professionals in Pakistan while the comparable number in the United States is 23% within the 'internet' sector. Again, the caveat about the nature of the roles applies here too. In Pakistan 3% of professionals are engaged in BPO while in the US 11% are engaged in Art and Design and only 2% in business operations.







TOP 10 Industries Hiring IT Professionals in Silicon Valley



Figure 3.3: Which Industries Hire IT Professionals? Differences between US and Pakistan

In order to dig deeper into the types of jobs be created and skill-sets, platforms, tools, and technologies being sought, we needed to extract data from the job descriptors and qualify each of the jobs as one belonging to one (or more) sub-classifications. In fact, on average, each job belonged to at least 3 of these sub-classifications.



3.2 TRENDS IN HIGH LEVELS SKILLS

The figures below show the total jobs within a particular sub-sector / specialisation during a given month / year as a percentage of total jobs advertised on job boards during that month or year. Using percentage, instead of absolute numbers, solves a number of important problems. First, these jobs are a subset of the total jobs created (or advertised) within the market and so looking at absolute numbers tends to bias the figures by anchoring them in numbers that only tell part of the story. Secondly, using percentages also removes the season cyclicality within the job data and also helps focus on the real changes. For instance, if people tend to hire less in July than in December, overall, looking at percentage data will hide this and lets us focus real changes.

At the highest level, software programming is the most fundamental skill-set that we looked at Software programming jobs fall across a range of different platforms, namely, desktop/server, web, and mobile. While desktop was traditionally the platform of choice, web has taken over and now dominates the percentage of total jobs within our sample. In recent years, mobile is fast emerging and could become a serious threat to the dominance of the web. The figure below illustrates the jobs advertised on leading job board(s) mentioning desktop, web, and mobile.



c) Mobile Development

d) Web vs. Mobile vs. Desktop

Figure 3.4: Software Programming Jobs Advertised in Pakistan on Job Boards

The figure above illustrates the relative number and nature of the demand for software programming jobs across the different platforms and their comparison. A few things clearly standout:



First, while the numbers are different – often on the order of magnitude – but the basic structure of the demand is quite similar. Each of the three areas experienced growth during the period in question.

Secondly, despite the similarity in the overall structure of job growth (i.e. shape of the curve) there are some differences. The jobs growth for desktop has been lower and relatively flatter over the last 3 years, mobile experienced the highest growth over the 3 year period and web remained somewhere between the two.

Third, while there is little doubt that ultimately mobile may catch up with the web, there seems to have been a tapering off of the job growth in mobile sector in 2012. This is not a good omen given the fact that mobile jobs are still very small, in the absolute sense, as compared to web jobs. Whether or not this is just a blip, and not a longer term trend, remains to be seen. It is also possible that this is merely an aberration given the fact that we only have one year's data here and, hence, cannot be construed, by any means, as a trend. More data for subsequent years shall be needed to make a prognosis.



Figure 3.5: Jobs Advertised on Job Boards in Key Skill Areas in Pakistan

In addition to software development, there are several other areas such as databases, security, networks, and ERP that define the high level skills that are demanded within the IT HR market. Over the 3 year period in question, on average, each of these sectors has shown an increasing trend with ERP jobs growing from about 0.4% to 0.7% of the total jobs after remaining flat in 2011, networks jobs growing from about 0.8% to about 1.2% of the total jobs, security jobs growing from 0.4% to 0.8%, and database jobs growing from about 2% to about 3% of the total jobs



each month. The highest growing of these sectors is security which experienced about 100% growth over the 3 year period while ERP and database jobs experienced considerably higher growth during 2012 than in the previous years.

3.3 PLATFORMS AND TOOLS

A step deeper, than high-level key skill-sets, are platforms and tools. The demand for various platforms and tools can inform choices by individuals and institutions to train on certain types of platforms, tools and technologies. The following figure illustrates the demand of the most important platforms and tools during the time period of interest.





Within the database category, the demand for MySQL outweighs the demand for Oracle skills by almost 100% while SQL Server is a distant third. Other database platforms and tools in our taxonomy are too small to even feature in this graph. The graph (a) also suggests that the demand for both MySQL and Oracle skills are equally growing in somewhat similar fashion. In ERP, on the other hand, we see a very different picture. Here Oracle has broken from the pack and is experiencing must faster growth. In fact, the demand for SAP skills – as a percentage of total jobs advertised – are on a decline, relatively speaking, than Oracle skills. Microsoft Dynamics and Siebel are still relatively small but growing steadily and may exceed SAP sometime next year to take on 2nd and 3rd spot in this market.

In graphics, skill-sets around Adobe products – Photoshop, Illustrator, and Dreamweaver – far outweigh the demand for Corel which is a very distant fourth though not yet completely in a decline yet. And within web development, Java is emerging is most sought after skill-set with about 15% of jobs mentioning it. PHP used be the most sought after skill-set in web but is now on a decline. HTML5 is another skill area on fast growth trajectory as is dotNet.



Similarly, across both networks and security, Linux has been greatest in-demand platform or tool followed by Cisco and TCP/IP in networks and Firewall and Cisco and in Security in that order.

For mobile development, iOS started in 2010 as the most sought after platform followed by Android with blackberry being a distant third. However, the demand for Android skills started virtually from zero in 2010 to overtake iOS in 2012 and since exceeded that of iOS. Infact, there is some suggestion, particularly in 2012 that the iOS skill-set may be in a bit of decline. However, one-year data is not enough to establish a trend and we need to look more data to be able to say something definitive about this.

Finally, with the exception of PMP whose demand continued to rise through 2010-2012, none other certification seem be much in demand by those posting jobs on job boards. This includes QTP, Microsoft Certified Systems Engineer (MCSE), or Cisco Certification.



Figure 3.7: Most Sought After Platforms on Job Boards in Key Skill Areas in Pakistan

While these numbers may not be totally reflective of the overall IT HR demands, they do point towards important trends and relative demand of various kinds of skills, platforms, tools, and technologies and could form an important input into the subsequent process.



3.4 NEW EMERGING AREAS

Information technology is a fast moving target where new trends – and demand for new skills – appear and decline rather rapidly and changes happen at 'internet speed.' Facebook was created in 2004 and today is a behemoth with hundreds of millions of users. In a matter of years Google started from a little known entity to a powerful search engine displacing the likes of Yahoo! and others but then ended by dominating the search and advertising segment introducing a totally new skill ('search engine optimisation') to the industry. Similarly, Big Data and Cloud have become buzzwords for the day and are here to stay. Many of these developments have an impact – some more profound that others – on demand for IT skills in outsourcing countries like Pakistan.

The following figures illustrate the demand for four of these emerging skill areas, namely, Big Data, social media, game development, and the Cloud:



Figure 3.8: Most Sought After Emerging IT Skill Areas in Pakistan

Interesting things can be said about the four graphs above. While there is, beyond doubt, an increasing trend in each of these four emerging areas, the numbers are very small and are probably yet to register in a big way on the IT job market. The demand for big data is increasing but very slowly. It has tripled from 0.05% of the total jobs in 2010 to 0.15% in 2012. Social media has seen a far bigger increase from almost 0.25% in 2010 to 2% in 2012 (an 8-times increase over 3 years). Game development has remained somewhat steady between 0.25% and 0.35%, on average, although there is a lot of variability from month to month. This may be reflective of the relatively short cycle of game development and the startup and decline of companies navigating this cycle. Cloud has also experienced a



considerable increase from almost zero (0.025%) to about 0.25% - almost 10-times increase, though on a very small base.

Most of this data turns out to be as expected, with the exception of, perhaps, the game development skill-set. There is a considerable game development sub-cluster in Pakistan based primarily in Lahore and there has been large-scale hiring by at least one large game studio. It is possible, however, that our data does not capture this because it happened not through official advertising channels (such as job boards) but through 'word of mouth' referrals within a relatively small and close-knit industry sub-cluster.

For many of these emerging new skill areas, particularly Big Data and the cloud, these are very early days of the industry and there is very little business locally. It takes some time for jobs to migrate to outsource / offshore destinations like Pakistan and that probably explains the relatively low level to begin with.

3.5 COMPARISON WITH THE SILICON VALLEY

This is probably an appropriate place to look at similar graphs from Silicon Valley which fore-tells the IT trends in the United States to see if there is some correspondence with Pakistan. These data were gleaned through Personforce's job portals in the Valley and are presented against their corresponding graphs for Pakistan.





2013



e) Mobile – Silicon Valley







Figure 3.9: Comparison of Software Programming Jobs Advertised in Silicon Valley and Pakistan

There are several differences between the Silicon Valley job data and Pakistan's. For instance, in Pakistan all three high level areas exhibited growth between 2010 and 2012, albeit at different rates. In the Valley, on the other hand, we see virtually flat curves for web and desktop (somewhat declining for the former) and a mixed trend for mobile. There are several similarities too. As with Pakistan, web remains the dominant platform for programming even though it is still increasing in Pakistan but stagnating in the Silicon Valley. The web still only amounts to about 10% jobs in Pakistan while it stands at about 20% jobs in the Valley indicating further potential for growth in Pakistan. As development activity matures in the Valley and moves to other – newer – platforms, some of these jobs may be shifted to offshore locations like Pakistan. Even within Desktop, Pakistan has fewer jobs – as a percentage of total jobs – than the Silicon Valley Not so with mobile. But what is most striking in the graphs is that undoubtedly mobile is 'the' area of growth across the various programming platforms. These differences and similarities are also evident in the emerging skills segments.

















GameDev



e) Game Development – Silicon Valley



f) Game Development - Pakistan





g) Cloud - Silicon Valley

h) Cloud - Pakistan



The data on Silicon Valley throws up a few interesting insights. Big Data shows an unambiguous upward trend from 2010 to 2012. The number of Big Data jobs increased from just over 1% in the beginning 2010 to over 4% at the end of 2012. This is an increase of over 300% and is fully aligned with the rapid growth of Big Data as a phenomenon in the IT industry in the United States. The jobs trend for Pakistan is quite similar, although the numbers are much smaller than the Silicon Valley. This suggests a strong and close linkage, albeit with a lag, between the United States and Pakistani markets.

A similarly increasing trend can be seen for demand in cloud and virtualisation skill-sets in the Silicon Valley, though it slightly declined between 2010 and 2011 before rebounding in 2012 at a rate faster than Big Data grew within the same period. In Pakistan, cloud and virtualisation has continued to grow through 2012 and did not register the slight decline in 2011. The demand for social media and game development skills both declined in 2012 after registering in increase in 2010-11 in the Silicon Valley. This could be construed as a sign of the growing maturity of these areas and that these skills are likely being outsourced or offshored to other destinations. In Pakistan, the demand for these skills has continued to grow, although at a much smaller rate than Big Data or Cloud.




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e) Security – Silicon Valley







h) Databases - Pakistan



Quite similar to Pakistan, Networks and Security seem to be the relatively more sought after skills in the Silicon Valley from amongst the high level skill platforms. The demand ERP and database skills have been relatively flat over the three year period even though it has continued to grow in Pakistan. The year 2011 seems to have seen a slight decline in the demand for all but database skills which have remained steady during this period in the Silicon

Valley. Again, the overriding pattern here seems to be that while the demand for these important skills may have remained steady or declined in the Silicon Valley, they continue to experience growth in Pakistan, exactly as you would expect in a typical outsourcing destination that is both at a lower level of development than the client market but is also, often, the direct beneficiary of recessionary forces in the client market.

Moving to the next level (tools and platforms), we can see additional differences between the Silicon Valley and Pakistan. While Oracle remains the most sought after toolkit in the Silicon Valley within ERP, Salesforce.Com closely following, and SAP in the third place among ERP tools, Pakistan also showed Microsoft Dynamics and Siebel among the leading platforms even though the three platforms in Silicon Valley are much more evenly distributed than in Pakistan where a 'winner takes all' dynamic is obvious.

Similarly within web development, while Java is the most sought after skill-set, HTML5, Python, and Ruby skills are also valued in the market even though PHP seems to be relatively flat or on a decline. Here, there are several differences with Pakistan. Unlike Silicon Valley, Python and Ruby on Rails is not in much demand. Similarly, Unlike ERP where Pakistan presents a 'Winner take all' scenario for Oracle, there is a much more diverse and even mix of web development tools being sought in Pakistan.

Amongst graphics tools, while there is a declining trend in the Silicon Valley, the demand in Pakistan continued to grow between 2010 and 2012. While Adobe's Photoshop and illustrator lead the graphics platforms of choice, there is a decline in their demand during 2010-2012, as did Corel's. In Silicon Valley, Corel seems all but extinct while it still continues to be sought in Pakistan, albeit at a fast declining rate.





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j) Networks – Silicon Valley

k) Networks - Pakistan



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Figure 3.12: The Comparison of demand for platforms and tools in Silicon Valley and Pakistan

As with Pakistan, the demand for iOS skills is in a decline – at a much faster rate in the Silicon Valley than it is in Pakistan – and Android is fast becoming the most sought after platform for mobile development. Another interesting feature of these graphs is that a clear switchover happened in early-to-mid 2011 between Android and iPhone with the former skills becoming more sought after than the latter. This transition only happened in Pakistan in early 2012 – a full 6-9 month lag between the client and outsourcing markets. However, because of the relatively fast-paced nature of the mobile market, this 'lag' cannot be generalised to other sub-segments of demand.

In both networks and security, Linux and Cisco are almost head to head and the demand for both skill-sets increased during 2012. This is very different from the skill-sets demanded in Pakistan where Linux seems to far outstrip Cisco in terms of their demand in the market.

The comparison with recent demand trends in the Silicon Valley provides some interesting perspectives on the IT jobs market in Pakistan and may provide important indicators for where things are heading in the future.

3.6 INITIAL TRENDS WITHIN PAKISTAN'S IT INDUSTRY AND ITS HR NEEDS

A number of interesting trends emerge from the preliminary analysis of data above. These may be summarised the following:

- 1. Web is the dominant programming platform right now but mobile is growing faster even though it has a lot to catch up before it can threaten Web's dominance In terms of high level programming platforms, Web is currently the most dominant one. In 2012, mobile took over desktop but is still considerably behind Web. However, mobile is fast catching up and is destined to become the leading platform particularly because of the emergence of enterprise mobility as the new 'flavour of the day.' Although, the demand for web development skills still continues grow in Pakistan, it is beginning to gradually show signs of decline in the Silicon Valley, albeit from a much higher level of demand (30% of all jobs) as compared to Pakistan (10%).
- 2. Mobile is certainly the hot new skill 'area to watch' showing an unambiguously increased demand in **Pakistan** (about 500% increase over the last 3 years). What is more important, however, is that the shape of

the trajectory and, even more surprisingly, the level of demand of mobile programming skills for Pakistan and Silicon Valley shows remarkable similarity. This could mean that while demand for some legacy areas and platforms – such as desktop and web – will continue to grow in Pakistan even after it begins to decline in the US, others could exhibit similar patterns and trends as the Silicon Valley. The prime example being the similarity between the mobile growth trajectory in Pakistan and the Silicon Valley. , though this is clearly an exception and not the rule. For a number of areas we looked at, the growth for skills in Pakistan presented a different picture than the Silicon Valley lagging behind, even in areas that shared similar trajectories, by at least two years, if not more.

- 3. Demand for skills in IT Industry, generally, shows a secular increase over the 3 years across a range of different skill-sets and platforms such as databases, ERP, networks, and security with the latter two experienced greatest growth (more than 100% over 3 years). While this is not to be confused with an increase in the total number of jobs across this three year period, it clearly indicates that the proportion of jobs dedicated to these important skill-sets and platforms continued to increase. Beyond an indication of which areas are growing within the IT sector, it may also be a sign of the growing maturity and specialisation within the industry. Database and ERP jobs are generally indicative of growing maturity within the IT user segment within the society, as do Networks and Security and this is a welcome trend.
- 4. There is often a leading platform / tool that dominates each of these areas, namely, Linux (Security and Networks), Oracle (ERP), MySQL (Databases), and Adobe (Graphics), with the exception of web development where there is fierce competition for dominant skill-set / tool-kit between Java, PHP, and HTML5, etc. To the extent that these findings may represent the direction in which industry is leaning towards one leading skill-set or the other, they may point towards the needs for capacity building programmes at Universities to ensure that graduates are proficient in these platforms / tools. Here again, Pakistan's market for IT HR is a bit different from the Silicon Valley in that it shows greater degree of dominance by one platform or tool-kit. This is particularly true with Networks and Security where Linux dominates in Pakistan even though Cisco survives alongside Linux in the Silicon Valley. Web development is clearly an exception.
- 5. The battle for the dominant mobile platform has been neck to neck with the demand for Android only barely edging past iOS in the last 12 months while the demand for the latter seems to be falling sharply. The battle for dominant mobile platform has only recently been won by Android and very much like a 'winner takes all' markets, the influence of iOS is falling by the wayside although it won't completely disappear for obvious reasons. iPhone remains an extremely profitable and successful Apple product and it will continue to hold a significant chunk of the smart phone market alongside Samsung and other devices that run Google's OS. This is another trend where Silicon Valley data not only provides a confirmation of what we see in Pakistan IT jobs data but also potentially could be used as a lead indicator of what is to come in the future.
- 6. Cloud and Big Data are fast growing areas even though we cannot yet see the kind of exponential growth in demand for these skills in Pakistan as we have seen, lately, in the Silicon Valley. In the United States, for instance, the demand for data and analytical skills for big data has been gradually climbing to significant levels. We see strong growth from 1% to about 5% of total Silicon Valley jobs advertised monthly mentioning 'Big Data' and there is considerable anecdotal confirmation of the rising demand of the 'data scientist' within IT circles. In Pakistan, though the growth has been much slower. Similarly, the demand for skills relevant to the cloud has only recently begun to take off in the last 12 months or so.

- 7. Several other 'emerging' areas, such as Social Media and Game Development, do not show the kind of job growth expected of them. In fact, in the Silicon Valley data, social media and game development seem to begin to show signs of tapering off and decline. In Pakistan too, the demand for these skill-sets has not demonstrated the kind of growth expected. This finding goes against the conventional wisdom and anecdotal experience which suggests that there is considerable growth in social media and SEO (both local spending and potentially international work) as well as game development. In addition, if these sectors are beginning to decline in the US, then some of these jobs could be shifted to offshore destinations like Pakistan. However, the demand for these skills as suggested by our data is not growing as fast as the conventional wisdom may suggest. We have hypothesized the reasons for this above but it would suffice here to suggest that this apparent trend needs a closer examination.
- 8. Demand for IT Certifications is small and declining in Pakistan's IT Industry. There is little demand for various kinds of certification within the IT job market in Pakistan. With the exception of the Project Management Professional (PMP) certification whose demand has grown from 1.5% of all jobs in 2010 to about 3% of all jobs in 2012, none of the other certification we looked at (e.g. MCSE, CCNA, etc.) seemed be sought after in the market. This could have some implications about the kind of HR the industry values, what universities and career counselling services should preach, and where government bodies should focus their energies on.
- **9.** Clear and definite differences between hiring trends in Silicon Valley and in Pakistan sometimes these differences are qualitative i.e. Silicon Valley firms are seeking different kinds of professionals that Pakistani firms. Sometimes, however, these differences are merely quantitative (as big as an order of magnitude) in the kind of skills Silicon Valley firms are seeking in the market place through the Personforce.Com job board vs. What Pakistani firms are seeking in Pakistan. This may be represent the different quanta of activity (e.g. Silicon Valley's IT Industry is much bigger, diversified, and mature than in Pakistan) but often times this could also represent a different stage in the evolution of the IT Industry, particularly the outsourcing and offshoring within this industry since many firms in Pakistan, though not all, are in offshore relationship with Silicon Valley firms.

These are merely some preliminary trends gleaned from the data and are by no means definitive. However, these trends were used a starting point of the Delphi analysis. However, the data is just one of the inputs used. We also looked at literature and expert opinion to guide our understanding of the trends and forecasts for the IT HR market. These are described in the sections below.



4. Putting Pakistan's IT HR Trends in the Global Perspective

The Information Technology (IT) sector has undergone significant changes over the years. From its birth in the United States and Western Europe, the IT revolution has embraced the entire world, including developing countries such as India, China, and Pakistan. IT companies offer a number of services and products falling under manufacturing, development and R&D services.³ Starting from 1980s, the US and European IT hardware companies have shown a tendency to outsource manufacturing to China and other countries in Asia, while focusing more on design and R&D at home. This process has been, in turn, accompanied by corresponding adjustments in IT manufacturing industry⁴. A similar trend has also played out in the IT software domain where starting from mid-1990s, outsourcing of software development services began to take place with India being the single largest beneficiary accounting for more than 50% of all outsourced IT services from the United States. This has had implications on the IT workforce, not only in the United States and Western Europe but also, around the World, including Pakistan. In this chapter, we look at high level trends in IT workforce around the World (mostly the developed world) and then dig deeper into trends due to major drivers for Pakistan identified by data in Section 3.

Numbers are a bit sketchy for the developing world but IT industry is a major and fast growing employer in the United States. According to a report published by the US Bureau of Labor Statistics in August, 2014 computer occupations make up for almost 44 percent of a total of 8.2 million people employed in STEM jobs (science, technology, engineering, and mathematics) in the US.⁶ The report further notes that seven out of ten STEM occupations are computer related. These include software developers, computer system analysts and computer user support specialists. Additionally, BLS categorizes 'computer and information system managers' as the fourth highest paid jobs in the STEM sector with an annual mean salary of more than \$125,000.

Occupation	Job openings,	Employment		Median annual	Typical entry-level
	2012–22	2012	Projected 2022	wage, May 2015	education1
Software developers, applications	218,500	613,000	752,900	\$92,660	Bachelor's degree
Computer systems analysts	209,600	520,600	648,400	81,190	Bachelor's degree
Computer user support specialists	196,900	547,700	658,500	46,620	Some college, no degree
Software developers, systems software	134,700	405,000	487,800	101,410	Bachelor's degree
Civil engineers	120,100	272,900	326,600	80,770	Bachelor's degree
Computer programmers	118,100	343,700	372,100	76,140	Bachelor's degree
Sales of technical and scientific products	111,800	382,300	419,500	74,520	Bachelor's degree

³Nikulainen, Tuomo&Pajarinen, Mika. (2013). Industry restructuring in the ICT sector – What does labor mobility tell us about skill relatedness and knowledge spillovers?.*ETLA Working Papers No 17*. Retrieved Sep 9th, 2014 from, http://pub.etla.fi/ETLA-Working-Papers-17.pdf ⁴Nikulainen, Tuomo&Pajarinen, Mika. (2013).

⁶U.S. Bureau of Labor Statistics. (August, 2014). *BLS Statistics by Occupation*. Retrieved Sep 9th, 2014 from, http://www.bls.gov/spotlight/2014/occupations/pdf/occupations.pdf



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Network and computer systems administrators	100,500	366,400	409,400	74,000	Bachelor's degree
Mechanical engineers	99,700	258,100	269,700	82,100	Bachelor's degree
Computer and info systems managers	97,100	332,700	383,600	123,950	Bachelor's degree
Industrial engineers	75,400	223,300	233,400	80,300	Bachelor's degree
Architectural and engineering managers	60,600	193,800	206,900	128,170	Bachelor's degree
Web developers	50,700	141,400	169,900	63,160	Associate's degree
Electrical engineers	44,100	166,100	174,000	89,180	Bachelor's degree
Computer network architects	43,500	143,400	164,300	95,380	Bachelor's degree

Table 4.1: Selected STEM occupations with many job openings, projected 2012–22 (Source: Occupation Outlook Quarterly⁷)

According to the statistics published by Office of National Statistics (2013), information and communications sector comprises 4% of the total employment in the UK. ⁹ Similarly, according to 2013 ICT Statistical Compendium of the Australian Computer Society (ACS), employment in Australian ICT industry increased by 10% in 2012 to 597,700.¹⁰ While is no systematic data collection on IT employment in Pakistan so far (this study being the first such attempt) anecdotal evidence suggests that IT jobs are one of the fastest growing and highest paying in the country, even though the overall level of IT employment may not be as high as the developed world.

4.1. DIFFICULT TO FILL POSITIONS

IT staff occupies the seventh place in the overall findings of 2013 Talent Shortage Survey¹³ that provides an overview of hardest to fill positions across the globe. However, in Asia Pacific IT related jobs occupy the sixth position in the most difficult to fill positions. In TEKsystems' 2014 Annual IT Forecast,¹⁴ which was conducted with 900 IT leaders in US and Canada, programmers and developers were identified as the most difficult to fill IT roles. These were followed by architects, software engineers and business analysts.

To the extent that increase in salaries could be an indicator of a skill-set being 'in demand,' there are indications IT skills are in high demand. Several IT positions also featured very high on expected salary increase with several IT leaders predicting more than 60% increase, on average, in 2014.

⁷U.S. Bureau of Labor Statistics. (2014). *Occupation Outlook Quarterly, Spring 2014*. Retrieved Sep 22nd, 2014 from http://www.bls.gov/careeroutlook/2014/spring/art01.pdf

⁹Office of National Statistics (ONS), UK. (December, 2013). *Statistical bulletin: Key Statistics and Quick Statistics for Local Authorities in the United Kingdom - Part 2*. Retrieved Sep 9th, 2014 from, http://www.ons.gov.uk/ons/dcp171778_343047.pdf

¹⁰Australian Computer Society (ACS).(2013). Australian ICT Statistical Compendium 2013. Retrieved Sep 9th, 2014 from,

http://www.acs.org.au/__data/assets/pdf_file/0004/28570/Australian-ICT-Statistical-Compendium-2013.pdf

¹³Manpower.(2013). 2013 Talent Shortage Survey Results. Retrieved Sep 11th, 2014 from,

http://www.manpowergroup.com/wps/wcm/connect/587d2b45-c47a-4647-a7c1-

 $e7a74f68fb85/2013_Talent_Shortage_Survey_Results_US_high+res.pdf?MOD=AJPERES$

¹⁴TEKsystems Inc. (2014). *TEKsystems' 2014 Annual IT Forecast*. Retrieved Sep 10th, 2014 from,

http://www.teksystems.com/~/media/Files/resources/executive-summaries/2014-teksystems-annual-it-forecast.ashx



	2014 Rank	2013 Rank	IT Leader Expecting Salary Increase in 2014
Programmers and Developers	1	1	69%
Architects	2	2	65%
Software Engineers	3	3	67%
Business Analysts	4	4	63%
Project Managers	5	5	67%

 Table 4.2: Most difficult to fill IT roles (Source: TEKsystems¹⁵)

Computer World's 2014 Forecast Study¹⁶ identifies Programming/application development as the most difficult to hire IT role followed by business intelligence/analytics, and mobile applications and device management.



Figure 4.1: Most In-Demand Skill-set Challenging to Find (Source: Computer World¹⁷)

There are some overlaps in this list when compared to the hard to fill positions identified for Pakistan in Section 3 earlier which includes Quality Assurance Engineers, Software Engineers, PHP Developers, Network Engineers, Data base Administrators, and Project Managers, among others. The differences, primarily, may be symptomatic of the kinds of IT activities kept on-shore vs. Those off-shored in the United States and recent trends in emerging areas, as well as the level of development of IT within the respective markets.

4.2. HIGHEST PAYING IT SKILLS

According to 2014 Dice Tech Salary Survey,¹⁸ professionals specializing in big data, including databases and big data oriented languages commanded the highest salaries in 2014. Tech management jobs followed by system

¹⁵TEKsystems Inc. (2014).

¹⁶Computerworld. (2014). Computerworld 2014 Forecast Study. Retrieved Sep 16th, 2014 from,

 $http://www.scribd.com/document_downloads/direct/188921972?extension=pdf\&ft=1410846811\<=1410850421\&user_id=11864039\&uahk=V1ipmJGgHiL5qaaOlc9VCCAZzbg$

¹⁷Computerworld. (2014).

¹⁸Dice. (2014). *Dice Tech Salary Survey (2013-2014)*. Retrieved Sep 9th, 2014 from, http://marketing.dice.com/pdf/Dice_TechSalarySurvey_2014.pdf



architects and data architects were identified as the highest paid jobs in the Dice salary survey. Other higher paying skills included R, NoSQL and MapReduce with the average salary exceeding \$110,000 while Visual Basic. NET, iPad and IBM Mainframe were considerably lower in the ranking with an average salary of around \$87,000.

Job Title	2013	YR/YR Change
Tech Management (CEO,CIO, CTO, VP, Dir.)	\$132, 974	8.0%
System Architect	\$125,467	3.5%
Data Architect	\$118,765	3.8%
Tech Management	\$118,060	5.4%
Project Manager	\$109,598	3.3%
MIS Manager	\$102,076	10%
Database Administrator	\$101,166	7.10%
Software Engineer	\$97,920	0.20%
Security Analyst/Architect/Engineer	\$96,513	1.90%
Developer: Database	\$95,879	7.60%
Developer: Systems	\$94,656	1.30%
Business Analyst	\$90,180	1.50%
Technical Training	\$90,005	18.00%
Developer: Applications	\$90,004	0.00%
Programmer/Analyst	\$83,211	5.80%
Network Engineer	\$81,944	4.50%
Web Developer/Programmer	\$78,306	-0.70%
Security Analyst	\$78,004	-6.50%
Quality Assurance (QA)Tester	\$75,444	1.30%
System Administrator	\$74,967	2.80%
Technical Writer	\$74,640	-3.90%
Technical Support	\$53,671	3.80%

 Table 4.3: Average Salary by Employment Type in ICT sector, US (Source: Dice¹⁹)

On the other hand, according to the findings of Global Knowledge & Windows IP Pro's 2014 IT Skills and Salary Survey²⁰, Application development, Application Implementation and Support, Collaboration Apps, and CRM, ERP,

¹⁹Dice. (January, 2014).

²⁰Global Knowledge & Windows IP Pro.2014 IT Skills and Salary Survey. Retrieved Sep 10th, 2014 from,

 $http://www.peoplecert.org/en/presscenter/Press_Releases/Documents/2014-Salary-Report-GlobalKnowledge-WindowsITpro.pdf$

Personforce Consulting (Pvt.) Ltd. and Technomics International Ltd.



SCM were the highest paying skills. Within IT infrastructure, the top three paying skills Cloud with a mean salary of \$94, 217, Enterprise Architecture (\$92,558), and Data Center (\$88, 778). Within collaboration and telecommunication sector, the highest paying skills Contact Center and Call Control and Mobility and Wireless with mean salaries between \$80,000 and \$85,000.²¹ Software development, however, took the top position in the Global Knowledge & Windows IP Pro's 2014 IT Skills and Salary Survey²² with the average salary of \$103,812 per annum.

Foote Research Group's 2014 IT Skills and Certifications Pay Index (U.S.)²⁴ found Data Architecture, Big Data Analytics, Cybersecurity, and Apache Hadoop as the highest paying non-certified IT skills while Open group Master Architect, Cisco Certified Network Architect (CCNA), Certified in the Governance of Enterprise IT (CGEIT), and Certified Information Security Manager were highest paying skill-sets (with certifications).

Elsewhere in North America, the national average salary in ICT jobs in Canada is 33% higher (at \$72,000) as compared to the national average. The highest paying occupations within the ICT sector in Canada include computer and information system managers with a national average of \$99,000, computer engineers (\$83,000), software engineers (\$82,000), information systems analysts and consultants (\$72,000), and database analysts and data administrators (\$68,000).²⁶

While salaries are not a direct concern of this report, it is useful to compare these with the situation in Pakistan. While data for IT salaries as compared to other sectors is not available, we can say a few things for IT salaries. The only credible data source for IT salary information is the Pakistan Software House Association for IT & ITES – P@SHA's *IT Salary Survey* which is now repeated with a fair degree of regularity (almost every year) and helps the industry benchmark its HR practices. *The 2014 survey* found around 300,000 people are directly employed by the IT and ITES sector in Pakistan and another 50,000-100,000 are indirectly employed by the sector. P@SHA's salary survey has been conducted every year since 2012 and entails that the rate of average salaries (including compensation and promotions) has been rapidly changing in the IT industry.²⁷ The 2014 survey, for instance, highlights that that there was an average increase of 12.37% in the salaries over the last year. Among the companies participating in this survey, the highest paid IT role after the top management roles is Senior Game Product Manager with an average salary of PKR 236,666.67 per month in Pakistan. On the other hand, the lowest paid job role in the IT industry is entry level Administration Professional with an average salary of PKR 23,005.92 per month, which was still 7.25% higher than 2013.

In P@SHA's *IT Salary Survey 2014* the highest increase was observed in the salary of middle level Ruby Programmer with a 94.24% raise in the average salary for the same role in 2013. The average salary of a Middle level Software Manager declined by 3.95% over the same period. The highest paid roles amongst programmers are Python developers (senior level) with an average salary of PKR 129,791 per month, Python (middle level) with an average salary of PKR 110,476 per month, and Java (senior level) with an average salary of PKR 110,484 per month. Apart from Ruby middle level, the highest increase in salary in 2014 as compared to 2013 in programming sector were observed in Android middle level with a 40.89% increase.

Additionally, this survey highlights that employee retention is a concern for many IT companies in Pakistan – as more than 50% of the participating companies indicated that employee retention was a strong concern in their company.

²⁴Foote Partners, LLC. (2014). Foote Partners News Release - April 20, 2014. Retrieved Sep 10th, 2014 from,

²¹ Global Knowledge & Windows IP Pro (2014)

²²Global Knowledge & Windows IP Pro (2014)

http://www.footepartners.com/fp_pdf/FooteNewsrelease_1Q14ITSkillsTrends_04162014v2sec.pdf

²⁶The Information and Communications Technology Council, Canada (ICTC).(2014). *Canada's Digital Economy Annual Review 2014*. Retrieved Sep 9th, 2014 from, http://www.ictc-ctic.ca/wp-content/uploads/2014/05/Digital-Economy-Annual-Review-2014-ICTC-English1.pdf

²⁷Pakistan Software House Association for IT & ITES (P@SHA).(2014). *IT Salary Survey 2014*. Pakistan Software House Association for IT & ITES (P@SHA)









4.3. CERTIFICATION TRENDS

73% of the respondents participating in Global Knowledge & Windows IP Pro's 2014 IT Skills and Salary Survey $(U.S.)^{29}$ reported that they hold at least one certification, whereas one third indicated that they hold two or three certifications. Almost half of the respondents participating in the survey had earned new certification in the past two years and 53% indicated that they were either pursuing a certification or plan to do so in 2014. Around 50% of the respondents reported that they had not planned to pursue any certification. Certification trends, however, varied

²⁹Global Knowledge & Windows IP Pro. (2014).

Personforce Consulting (Pvt.) Ltd. and Technomics International Ltd.



amongst those with more experience (20 years or more) as compared to those with less experience (less than 10 years). Majority of the respondents with more experience reported that they had no plans for certification whereas only one third of those with less experience indicated the same. Additionally, this study also entails that more people working in multiple functional areas plan to certify as compared to those who are working in just one area (see section 1 for main functional areas).

IT certification has also seen highest gain in terms of pay premiums in 15 years according to Foote Research Group's 2014 IT Skills and Certifications Pay Index (U.S.)³⁰ – showing up to 2.1% overall increase in the average pay premiums for 309 IT certifications. Foote Research Group's 2014 IT Skills and Certifications Pay Index (U.S.) found Open group Master Architect, Cisco Certified Network Architect (CCNA), Certified in the Governance of Enterprise IT (CGEIT), and Certified Information Security Manager were highest paying skill-sets (with certifications).

4.4. CRITICAL SKILLS AND SUB-SECTORS

Respondents contacted for the Global Knowledge & Windows IP Pro's 2014 IT Skills and Salary Survey (U.S.) reported that IT companies in the US are looking to expand competency in virtualization with a tendency towards cloud based applications and services³¹.

Findings of TEKsystems' 2014 Annual IT Forecast³² indicate that the most critical roles for IT companies in the US include programmers and developers, project managers, help desk/technical support, software engineers and architects. Top five trends that are expected to have the most organizational impact in the TEKsystems' report include business intelligence, security, mobile, cloud computing and virtualization.

	1	Programmers and Developers
s	2	Project Managers
oer	3	Help Desk/Technical Support
Ω	4	Software Engineers
	5	Architects
•	6	Executive (C-suite) leaders
ship	7	VPs and Director-level Leaders
lers	8	Business Analysts
eac	9	IT Managers
T	10	Account Managers

Figure 4.3: Critical IT roles (Source: TEKsystems³³)

Foote Research Group's 2014 IT Skills and Certifications Pay Index (U.S.)³⁴ indicates that 'Computer Systems Design/Related Services' and 'Management and Technical Consulting Services' were the two main IT segments responsible for 95% of all the new IT jobs during 2013-14. Additionally, Foote survey also highlights that

³⁰Foote Partners, LLC. (2014).

³¹Global Knowledge & Windows IP Pro.(2014).

³²TEKsystems Inc. (2014). *TEKsystems' 2014 Annual IT Forecast*. Retrieved Sep 10th, 2014 from,

http://www.teksystems.com/~/media/Files/resources/executive-summaries/2014-teksystems-annual-it-forecast.ashx

³³TEKsystems Inc. (2014).

³⁴Foote Partners, LLC. (2014).



Telecommunications, Data Processing, Hosting and Related services showed an increase in net gain of jobs in March, 2014.

	Certified IT Skills	Non Certified IT Skills
1	Architecture	Database (open source DBMS, NoSQL, advanced analytics)
2	Project and Program Management	Mobile Operating Systems
3	IT security	Management/Methodology/Process (architecture, analytics, capacity and service management, user interface/experience design, BI, project management and governance
4	Cloud	Applications Development (data analytics, open source programming, agile, mobile, scripting, web/e-commerce)
5	Applications development	Systems/Networking (security, mobile devices, architecture, configuration management, cloud frameworks
6	Database	SAP and enterprise applications

Table 4.45: IT Skills that gained market value in 2014 (Source: Foote Research Group's³⁵)

According to MBIE's 2014 Occupation Outlook Annual Report³⁶, in New Zealand highest sector wise projections are expected in Database and System Administration, ICT Network and Support Professionals, ICT managers, Business and System Analysts, and Programmers with expected growth rate around 3% till 2016.

	Annual Average		
	2011-16	2016-21	
Database and System Administrators	3.60%	3.00%	
ICT Network and Support Professionals	3.30%	2.80%	
ICT Managers Business and System Analysts, and Programmers	3.20% 3.00%	2.70% 2.40%	

Table 4.5: Highe	st projected gr	owth occupations in	New Zealand (S	bource: MBIE³⁷)
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4.5 TRENDS IN IT SUB-SECTORS

4.5.1 Cloud and Mobile Computing

KMPG LLC's 2013 Technology Outlook Survey³⁹ identifies cloud and mobile computing as the two biggest drivers of revenue growth in the US ICT industry. The survey reports that industry executives foresee a 38% revenue growth in cloud and mobile sector over the course of 3 years. Advanced Data and Analytics was rated third with an anticipated 33% growth over the same period. Software as a Service (or SaaS) was identified as the main driver in cloud technology with the revenues generally meeting or exceeding the previous year's forecast. In mobile, mobile apps and mobile platforms were the two main drivers with the revenue again exceeding that of the previous year. The survey highlights the increased competition in applications and platform ecosystems because of the increasing overlap in notebook PCs, smart phones and tablets technology. Participants of the survey also reported that they faced very little challenges in adopting cloud with 57% of the executives saying that they faced no or minor challenges and only 15% reporting major problems in cloud adoption.

³⁵Foote Partners, LLC. (2014).

³⁶Ministry of Business, Innovation and Employment, New Zealand.(2014). 2014 Occupation Outlook annual report. Retrieved Sep 10th, 2014 from, http://www.dol.govt.nz/publications/lmr/occupational-outlook/occupation-outlook-report-2014.pdf

³⁷Ministry of Business, Innovation and Employment, New Zealand. (2014).

³⁹KMPG LLC.(2013). 2013 Technology Outlook Survey. Retrieved Sep 9th, 2014 from,

http://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/Documents/technology-outlook-survey-2013.pdf

	2013	2012	2011
Cloud Computing	38%	51%	65%
Mobile Computing	38%	48%	45%
Advanced Data & Analytics	33%	19%	43%
Healthcare IT & Applications	21%	19%	15%
Consumerization of IT	20%	23%	NA
Security Artificial Intelligence	16% 10%	22% NA	20% NA

Table 4.6: Biggest drivers of company's revenue growth in US (Source: KMPG⁴⁰)

The three biggest challenges identified in KMPG's 2013 Technology Outlook Survey⁴¹ for both cloud and mobile were security/privacy governance, corporate culture and technology complexity. Issues of security were attributed to the greatly publicized outages of cloud services, larger number of people accessing corporate data on mobile devices, and reluctance of some organizations to trust cloud service providers. Data loss and intellectual property theft were the main concerns of cloud customers. In case of mobile, the security/privacy challenges declined comparatively owing to a growing understanding of risks associated with mobile technology. Similarly, Opsview's Network and IT Survey 2014⁴² shows that use of cloud services increased in the last twelve months (52%) or remained the same (44%). This survey also highlights that cost saving (34%) was a major driver of shifting services to cloud after 'in-house specialization' (23%) and 'privacy concerns' (22%).

Respondents participating in the TEKsystems' 2014 Annual IT Forecast⁴³ believed that positive changes in terms of spending are expected in two main areas: mobile (62%) and cloud (59%). TEKsystems' report highlights that this trend has been in-line with the forecasted expectations of 2013.

	2014 Rank	2013 Rank	Y-o-Y Rank Change
Business Intelligence/Big Data	1	1	Same
Security	2	2	♠
Mobile	3	3	♠
Cloud Computing	4	4	¥
Virtualization	5	5	♠
Data Center Consolidation	6	6	Same
Enterprise Resource planning	7	7	\checkmark
Consumerization of IT/BYOD	8	8	Same
VoIP/Unified Communications	9	9	-
Social Networking	10	10	¥
Open Source	11	11	-
Gamification	12	12	-

Table 4.7: Areas expected to have biggest Impact on IT companies in US ⁴⁴

⁴³TEKsystems Inc. (2014).

⁴⁰KMPG LLC (2013).

⁴¹KMPG LLC. (2013).

⁴²Opsview. (August, 2014). *Opsview Network and IT Survey 2014*. Accessed online Sep 22nd at http://www.opsview.com/about-us/blog/opsview-network-and-it-survey-2014

⁴⁴TEKsystems Inc. (2014).



Cloud computing was second in the list of most important IT projects that companies are working on in Computer World's 2014 Forecast Study⁴⁵.



Figure 4.4: Application Development & Cloud: Current IT Priorities (Source: Computer World⁴⁶)

Correspondingly, key trends reported in Software Industry Survey 2014⁴⁷ (that focuses on the software industry in Finland and Europe) include cloud computing, SaaS (Software-as-a-Service), Data management and analytics, and Collaboration and Content applications. Cloud was reported to be becoming as crucial in software development as traditional server platforms. Use of mobile platform for software development was also indicated to increase to 51.7% by 2015. Cloud computing trends were linked mostly to decreased operational costs with an emerging trend for new roles such as "cloud brokers". However, mobile saw equal increase in revenue for Android, iOS and Windows which in turn have led to reduced costs for Finnish app developers – associated with an increase in application store sales.

However, according to the Results of the German Software Industry Survey 2013⁴⁸ traditional platforms like servers and desktop/lap top computers are still dominating the Software Industry in Germany. In contrast to the Finnish survey, this report entails that mobile and computing occupy a lower position in the list of most important platforms as compared to desktop/laptop computers and servers. Embedded systems, social media and game consoles were even further down in the list. Furthermore, this survey also indicates that the projections regarding mobile and computing in 2012 were not fulfilled in 2013.

⁴⁵Computerworld. (2014). *Computerworld 2014 Forecast Study*. Retrieved Sep 16th, 2014 from,

 $http://www.scribd.com/document_downloads/direct/188921972?extension=pdf&ft=1410846811<=1410850421&user_id=11864039&uahk=V1ipmJGgHiL5qaaOlc9VCCAZzbg$

⁴⁶Computerworld. (2014).

⁴⁷Software Industry Survey.(2014). Software Industry Survey 2014. Retrieved Sep 11th, 2014 from,

http://www.softwareindustrysurvey.fi/SlidesFinland2014.pdf

⁴⁸Pussep, A., Schief, M., Weiblen, T., Leimbach, T., Peltonen, J., Rönkkö, M., &Buxmann, P. (2013).*Results of the German Software Industry Survey 2013*. Retrieved Sep 11th, 2014 from, http://tuprints.ulb.tu-darmstadt.de/3598/1/Report.pdf



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Figure 4.5: Platforms used for Software Development in Finland (Source: Software Industry Survey 2014⁴⁹)

Clearly, there is a strong support for cloud and mobile services to drive growth of IT across the world through the foreseeable future. We already see this, particularly for cloud, in the data captured for the Silicon Valley jobs. It is also clear that cloud's growing penetration around the world has not yet begun to show up on jobs data on Pakistan. We have hypothesized that this may be due to the lag between jobs in Silicon Valley and Pakistan. But looking at this data suggests a strong indication that cloud is a major driver of IT and jobs growth in the future and, hence, something Pakistani policy, academic, and industry leaders must keep a keen eye on.

4.5.2 Virtualization

Virtualization is becoming one of the main areas of investment in the IT industry. Opsview's Network and IT Survey 2014⁵¹ notes that corporations are increasingly adopting virtualization. 60% of the respondents participating in this survey indicated that their organizations have virtualized more than 50% of their IT environment.

Furthermore, Global IT Security Risks Survey 2014⁵² notes that server virtualization has emerged as the most common form of virtualization. 55% of the respondents participating in this survey indicated that they have implemented server virtualization whereas 6% planned to implement server virtualization within the next year.

Additionally, Global IT Security Risks Survey 2014⁵³ highlights that 25% of the global businesses have adopted Virtual Desktop Infrastructure (VDI) and 10% are planning to implement it in the next 12 months. Apart from that, another 28% of the respondents participating in the survey responded that they were interested in VDI.

The survey identifies potential areas that may be virtualised in the near to medium term future. VDI was identified as the area with highest rate of potential future growth in virtualization. Applications that were indicated to grow faster than others in virtualization included 'virtualization for collaboration platforms' (59% respondents), 'Customer Relationships Management' (55% respondents), and virtualized 'Test and Development Environments' (55%) is likely to grow in the future.

Again, virtualisation is clearly an area ripe for future growth, globally, and will likely make an impact on the local industry when it does. In Pakistan, this is still in the very early days.

⁴⁹Software Industry Survey.(2014).

⁵¹Opsview. (August, 2014). *Opsview Network and IT Survey 2014*. Accessed online Sep 22nd at http://www.opsview.com/about-us/blog/opsview-network-and-it-survey-2014

⁵² Kaspersky Lab. (2014). Global IT Security Risks Survey 2014 - Virtualization. Retrieved Sep 22nd, 2014 from,

http://media.kaspersky.com/en/IT_Security_Risks_Survey_2014_Virtualization_report.pdf

⁵³ Kaspersky Lab. (2014).



Figure 4.6: How much the current IT environment is virtualized, in US Companies (Source: Opsview's Network and IT Survey 2014⁵⁴)

4.5.3 Open Source (OSS)

Open source is increasingly used by many developers, particularly in the developing world, primarily due to its low-cost license free nature. However, increasingly its usage is also becoming associated with an increased cost of managing the open source inventory⁵⁷.

Black Duck's 2014 Future of Open Source Survey⁵⁸ notes that around 56 percent of the corporations participating in the survey expect to invest in open source projects. Cost is not the only factor responsible for the popularity of open source. Two main reasons identified for adoption of open source were cost reduction (61% rating it as the top factor) and gaining competitive advantage (45%).

Additionally, respondents of Black Duck survey attributed 'attracting and retaining top development talent' as the second most important reason for engaging with open source communities.⁵⁹ Due to its large-scale utilisation in technologies like cloud computing, it is expected to gain new industries such as education, healthcare and government.

The Black Duck Survey suggests that while cost reduction has been a decisive factor in the adoption of OSS (with 68% deeming it as the main driver of OSS) as many as 62% of the participants responded that they are using open source to improve the IT infrastructure of their company.

⁵⁴Opsview. (August, 2014).

⁵⁷WhiteSource.(2014). *Open Source Usage Practices survey*. Retrieved Sep22nd, 2014 from, http://www.whitesourcesoftware.com/wp/wp-content/uploads/2014/05/WhiteSource_Survey_Results_2014.pdf

⁵⁸Black Duck.(2014). *Results of the Eighth Annual Future of Open Source Survey 2014*. Accessed online Sep22nd, 2014 at

http://www.blackducksoftware.com/news/releases/2014-future-open-source-survey-results-revealed

⁵⁹Black Duck. (2014).



Figure 4.7: Main Areas When Open Source is Leading the Technology Industry (Source: Black Duck⁶⁰)

According to Statistica, projected revenue of open source software is expected to increase to 57,326 million Euros till 2020 from 40,822 million Euros in 2014 with an expected growth of 40.4%.⁶¹



Figure 4.8: Projected revenue of open source software from 2008 to 2020, in Mn. Euros (Source: Statistica⁶²)

Open source was found to be quite popular in Pakistan as well where demand for Linux skills far outweigh those of its rivals both in server and security domains. This is quite the opposite of Silicon Valley where proprietary solutions are at least as strong as Linux. One area where open source has not made the kind of headway that was expected of it is public sector.

⁶⁰Black Duck. (2014).

⁶¹Statistica.(2008). Projected Revenue of open source software from 2008 to 2020. Accessed online Sep22nd, 2014 at

http://www.statista.com/statistics/270805/projected-revenue-of-open-source-software-since-2008/

⁶²Statistica.(2008).

4.5.4 Big Data

With companies facing an exponential growth in the amount of data managed, most of the corporations seeking to implement big data initiatives in the foreseeable future. According to IDG Enterprise's 2014 Big Data Survey⁶³ organizations in the US are expecting 76% increase in the amount of data within the next year and 48% of the respondents participating in the survey indicated that big data will be extensively deployed across their company. On average companies are handling 164 terabytes of data – with the large companies tackling as much as 291 terabytes and smaller companies 57 terabytes on average. Additionally, 53% of the participants in the IDG survey reported that business decisions were occasionally delayed by data influx and another 42% said that business has been either occasionally or frequently lost because some particular information could not be found. 20% of the respondents participating in the survey said that they intend to spend between \$1 million and \$10 million on big data projects.

The IDG survey⁶⁴ also noted that respondents believed big data to be a cross-functional sector requiring both IT leadership and sponsorship. 22% of the respondents of this survey reported that finding skilled workers in big data was a significant challenge faced by their company. Correspondingly, NewVantage Partners' Big Data Executive Survey 2013⁶⁵ noted that organizations are looking for new IT roles to manage big data like Chief Data Officer. 48% of the participants in the NewVantage survey indicated that their company has either established or planning to introduce new organizational structure for successful business adoption. In 2013 investment in big data was found to be driven largely by sales and marketing (77%), risk management (68%), and new product development and innovation (64%).

The 2012 NewVantage Survey's findings⁶⁶ noted that most IT companies were concerned about acquiring workers with skills to manage big data. 75% of the respondents of the 2012 survey said that it was challenging to source analytical skills. In addition to creating new technical skills to leverage big data, the 2012 survey also highlighted that companies were looking to establish new roles, processes, and programs to exploit big data.



Figure 4.9: Sourcing Analytical Skills (Source: 2012 NewVantage Big Data Survey⁶⁷)

In Pakistan, like virtualisation and cloud computing, big data is still in very nascent stages but is growing with the right trajectory and is likely to be a key driver for IT job growth in the future.

⁶³IDG Enterprise.(2014). 2014 Big Data Survey. Retrieved Sep23rd, 2014 from, http://marketing.computerworld.com/IDGEnterpriseBigData.pdf ⁶⁴IDG Enterprise. (2014).

⁶⁵NewVantage Partners.(2013). *Big Data Executive Survey 2013*.Retrieved Sep23rd, 2014 from, http://newvantage.com/wp-content/uploads/2013/11/Big-Data-Survey-2013-Summary-Report-090913.pdf

⁶⁶NewVantage Partners.(2012). *Big Data Executive Survey 2012*. Retrieved Sep23rd, 2014 from, http://newvantage.com/wp-content/uploads/2012/12/NVP-Big-Data-Survey-Themes-Trends.pdf

⁶⁷NewVantage Partners.(2012).



4.5.5 Enterprise Resource Planning (ERP)

Although, ERP implementation targets considerable returns on investment, the findings of 2014 Panorama report show that only 13% of the companies surveyed achieved 80-100% of the anticipated benefits and 40% were able to realize only 0-30% of the forecasted benefits of ERP implementation in their organization. Main benefits of ERP implementation include availability of information and increased interaction across the enterprise. Most of the organizations implement specific modules instead of deploying the entire ERP system. This survey shows that two third of the respondents opted for specific modules including manufacturing (MPS), financial and sales, and distribution modules. Other modules implemented by companies include materials management and warehouse management. Additionally, Panorama's 2014 Manufacturing ERP report⁶⁹ notes that ERP implementations are likely to go over budget with an increased cost to revenue ratio which is attributed to level of customization and integration required for ERP implementation. This has put a lot of pressure on ERP deployments and has opened doors for alternate models, such as SaaS.

A study by Mint Jutras in June 2013⁷⁰ notes fewer and fewer companies are deploying traditional on-premises licensed ERP solutions and SaaS (48%) and other alternatives such as third party hosting is becoming popular (51%)



Figure 4.10: ERP Deployment Options (Source: Mint Jutras, June 2013⁷¹)

In Pakistan, the demand for ERP skills is still very much growing primarily owing to the low level of automation within the traditional sectors of the economy. There is a considerable gap in deployments that needs to be filled and smaller solutions such as Microsoft Dynamics, etc. as well local ones such as Lumensoft's Candela, etc. are important niche players alongside SAP and Oracle, etc. SaaS is still very much in the nascent stages in Pakistan.

4.5.6 Gamification

Use of gamification has increased in social networks, financial service websites and employee trainings. In 2012 TechNavio forecasted⁷² that global gamification market will grow at a rate of more than 99% CAGR till 2016. One of the main drivers of gamification growth highlighted in the 2012 TechNavio analysis included 'a need to optimize

http://www.aminian.com/wp-content/uploads/2014/09/wp-manufacturing-erp-cloud.pdf

⁶⁹Panorama Consulting Solutions.(2014). 2014 Manufacturing ERP Report.Retrieved Sep23rd, 2014 from, http://go.panoramaconsulting.com/rs/panoramaconsulting/images/2014-Manufacturing-ERP-

 $Report.pdf?mkt_tok=3RkMMJWWfF9wsRonvanMZKXonjHpfsX56uUpXa6xlMI\%2F0ER3fOvrPUfGjI4AS8ZII\%2BSLDwEYGJIv6SgFTLDGMbVqwrgMWxY\%3D$

⁷⁰ Mint Jutras. (June, 2013). Cloud ERP: Helping Manufacturers Keep Up with the Times. Retrieved Sep23rd, 2014 from,

⁷¹ Mint Jutras. (June, 2013).

⁷²TechNavio. (2012). *Global Gamification Market 2012-2016*. Retrieved Sep24th, 2014 from, http://www.technavio.com/report/global-gamification-market-2012-2016



consumer engagement' as gamification can be used to identify purchasing demands of particular products. However, this report also acknowledged that there were serious challenges selecting solutions from a multitude of available options. TechNavio identified entertainment as the largest end user in global gamification market. Other sectors utilizing gamification, mainly to gain competitive advantage, included Media, Consumer Goods, Retail, Telecom, Financial, and Education.

Horizon Watch's 2013 Trends Report⁷³ on gamification note that gamification market was forecasted to reach \$2.8 billion in 2016 from \$242 million in 2012 (M2 Research on gamification, 2012). Gartner also predicted that by 2014 there will be at least one gamified application in 70% of the 2000 global organizations.

In January 2013, WANTED Analytics⁷⁴ reported a 33% increase in hiring demands of video gaming skills in the US as compared to 2012. Most of these jobs were associated with the IT sector including Software Engineers, Web Developers, and QATs (quality assurance testers) in addition to Marketing Managers, Market Research Analysts, Merchandise Displayers, Multimedia Artists, and Animators.

A recent article published in Fortune (June, 2014)⁷⁵ that draws on various research studies including Gartner's 2014 study shows that there has been a lag in the implementation of gamification in enterprises – mainly due to ill defined business objectives and less focus on player goals (as gamification has been utilized mostly to inspire and encourage employees). Gartner also reported that market penetration of gamification technology was only 5% to 10% in the last year.

Gamification is a strong sub-sector of Pakistan's IT industry with a sub-cluster emerging in Lahore and several companies in Islamabad and Karachi. Strong anecdotal evidence of the demand for gamification skills exists, even though we were not able to find this in the jobs data we collected.

4.5.7 Mobile Apps

The Apps economy across the globe is fast growing. Developer Economics Survey (2014) forecasts that the Apps economy will grow to \$143 billion in 2016 – up from \$68 billion in 2013.⁷⁷ There are around 2.3 million mobile developers in the world, from which 32.9% (760, 000) are from Asia, 29.7% (680, 000) in Europe, 29.4% in North America and 3.5% in South America. This study highlights that Android is dominating the 'Developer Mindshare' with 71% of developers targeting it. However, despite a slight decrease in the developer mindshare of iOS, developers participating in the Vision Mobile Survey indicated that iOS is still viewed as the most rewarding mobile platform – though iOS has faced a continuous decrease in sales market share (from 15% in 2012 to 13% in 2013). In this scenario, establishing a strong footprint in the mobile sector has been particularly challenging for Microsoft with the Windows 8 mindshare around 21% in 2013.

Of the 7000 developers who participated in the Vision Mobile survey, 20% reported that they intend to adopt Windows Phone as a platform, followed by Windows 8 (18%), iOS (16%), HTML 5 (16%) and Android (15%).

http://fortune.com/2014/06/06/looks-like-that-whole-gamification-thing-is-over/

http://www.visionmobile.com/product/developer-economics-q1-2014-state-developer-nation/

⁷³HorizonWatching.(2013). *Gamification - A 2013 HorizonWatching Trend Report*.Retrieved Sep24th, 2014 from, http://www.slideshare.net/HorizonWatching/gamification-a-horizon-watching-trend-report-05feb2013

⁷⁴WANTED Analytics. (January 30th, 2013). *Got Game? Video Gaming Skills See a 30% Increase in Hiring Demand*. Retrieved Sep24th, 2014

from, https://www.wantedanalytics.com/analysis/posts/got-game-video-gaming-skills-see-a-30-increase-in-hiring-demand ⁷⁵ Clancy, Heather. (June 30th, 2014). Looks like that whole 'gamification' thing is over. *Fortune*.Retrieved Sep24th, 2014 from,

⁷⁷Vision Mobile. (2014). Developer Economics Q1 2014: State of the Developer Nation. Retrieved Sep24th, 2014 from,



Figure 4.11: Mobile Developers Mindshare: Percentage of Mobile developers using each platform. (Source: Developer Economics 2014⁷⁸)

Moreover, Google has removed many of its apps and APIs from the Open Source Android Project (AOSP) due to which certain Android apps and APIs that rely on Google apps cannot be run on forked versions of Android anymore. Vision Mobile's survey also highlights that share of Android and iOS is different in different regions across the globe, with the iOS having higher market share in only North America and Europe.





In Pakistan the demand for mobile-related skills is among the fast growing emerging areas, demonstrating a growth trend almost at par with the Silicon Valley. In the platforms war as well, Android is now leading – having recently overtaken iOS – even though the latter still remains a force.

⁷⁸Vision Mobile. (2014).

⁸⁰Vision Mobile. (2014). *Developer Economics Q1 2014: State of the Developer Nation*. Retrieved Sep24th, 2014 from, http://www.visionmobile.com/product/developer-economics-q1-2014-state-developer-nation/



4.5.8 Social Media

According to SimplyHired – a job search engine currently operational in 25 countries – social media jobs increased by 49% in the first quadrant of 2014 since November, 2013^{81} .



Figure 4.13: Social Media Job Trends 2014 (Source: SimplyHired, Inc.⁸²)

Similarly, National Institute of Social Media (NISM)⁸³ gives a conservative estimate of 37% increase in social media jobs since February 2013 going often under the title of Social Media Specialist, Social Media Manager, Community Manager, Social Media Strategist, and Social Media Coordinator. NISM also identified the core skills for most of social media jobs, namely, Social Media Strategic Planning, Compliance and Governance Issues in Social Media, Social Media Marketing, Project and Campaign Management, Community Management and, Research and Analysis⁸⁴.

Freelancer's November 2014 press release indicates a 63% increase in social media jobs posted on the site in the third quadrant of the year as compared to the second quadrant⁸⁵. This press release also highlights that jobs related to Pinterest have dramatically increased on Freelancer – with an overall 1065% increase in the third quadrant of 2014. Additionally, on Freelancer, Social Media Marketing saw a 96% increase, Twitter 56% and Facebook Marketing 20% increase in terms of the jobs posted on the site in the third quadrant of 2014. However, Elance has reported a 7% decrease in quarterly growth of Social Media Marketing Jobs with 96,010 total and 2087 open Social Media Marketing Jobs.⁸⁶

⁸¹SimplyHired, Inc. (2014). *Social Media Job Trends*. Retrieved Nov 24th, 2014 from, http://www.simplyhired.com/a/jobtrends/trend/q-social+media/t-bar

⁸²SimplyHired, Inc. (2014).

⁸³National Institute for Social Media.(2014). *Projected New Job Opportunities in Social Media for 2014*. Retrieved Nov 24th, 2014 from, http://nismonline.org/projected-new-job-opportunities-in-social-media-for-2014/

⁸⁴National Institute for Social Media. (2014).

⁸⁵Freelancer. (2014). Freelancer Press Release, November 4th, 2014. Retrieved Nov 24th, 2014 from,

http://press.freelancer.com.s3.amazonaws.com/Freelancer-Fast-50-Q3-4-11-2014-final.pdf

⁸⁶Elance, Inc. (2014). *Elance Trends – Jobs by Skill*.Retrieved Nov 24th, 2014 from, https://www.elance.com/trends/skills-in-demand/sales-marketing#TopSkills



4.5.9 Freelancing

Freelancing accounts for 34% of the total jobs in the US according to a national survey by Freelancers Union⁸⁷ conducted in collaboration with Elance and oDesk in 2014. This survey indicated that 53 million people in the US are freelancers – 40% of these are independent contractors (working on project to project basis), 27% moonlighters (people doing freelance work in addition to traditional jobs), 18% diversified workers (having multiple sources of income including traditional jobs and freelance work), 10% temporary workers (with temporary employment) and 5% freelance business owners (people who hire small teams and consider themselves as both freelancers and business owners). 77% of the freelancers participating in this survey made either the same or more money than they used to before they started freelancing. 42% of the participants of the Freelancers Union survey said that they made more money through freelancing than they used to before.

Elance's *Gobal Online Employment Report* (2014)⁸⁸ indicates that 1,214,000 new jobs were posed on Elance in 2013. The number of total jobs posted on Elance has shown a consistent increase, reaching a number of almost 3.5 million in the fourth quadrant of 2013. 37% of these jobs posted on Elance are in the category of IT and Programming. IT and Programming has seen a 40% year to year earnings growth on Elance.



Figure 4.14: Percentage of Jobs Posted by Category on Elance (Source: Elance's *Global Online Employment Report*, 2014)⁸⁹

Freelancer's November 2014 press release⁹⁰ notes that the number of total jobs posted on the site increased by 6.6% in the third quarter as compared to the second quarter of the year 2014. Highest number of jobs posted on Freelancer are related to Pinterest, Google Plus, Microsoft SQL Server, and Video Editing.

⁸⁷ Freelancers Union, Elance, Inc., & oDesk. (2014). *Freelancing in America: A National Survey of the New Workforce*. Retrieved Nov 24th, 2014 from, http://fu-web-storage-prod.s3.amazonaws.com/content/filer_public/c2/06/c2065a8a-7f00-46db-915a-

 $²¹²²⁹⁶⁵ df7 d9/fu_free lancing in a mericare port_v3-rgb.pdf$

⁸⁸Elance, Inc. (2014a). *Global Online Employment Report*. Retrieved Nov 24th, 2014 from, https://www.elance.com/q/online-employment-report ⁸⁹Elance, Inc. (2014a).



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Job Type	Q3 '14	Q2 '14	Change %
Pinterest	1,480	127	1,065
Google Plus	1,699	269	532
Microsoft SQL Server	1,076	300	259
Video Editing	1,120	380	195
ASP.NET	1,935	693	179
Social Media Marketing	3,755	1,914	96
Twitter	3,662	2,345	56
Web Security	1,010	776	30
Book Writing	1,314	1,015	29
Photo Editing	2,199	1,699	29
Photoshop	13,374	10,356	29
Photography	1,521	1,231	24
Google AdWords	1,238	1,015	22
Illustrator	4,730	3,889	22
eBooks	1,318	1,089	21
Editing	2,449	2,027	21
Facebook Marketing	8,571	7,122	20
3D Rendering	3,731	3,112	20
Objective C	2,292	1,961	17
Web Hosting	2,342	2,016	16
Graphic Design	59,394	51,293	16
Blog	4,290	3,742	15
C# Programming	4,707	4,108	15
Content Writing	5,547	4,845	14
Website Design	46,710	40,804	14

Table 4.8: Jobs posted on Freelancer by Job Category (Source: Freelancer's November 2014 press Release⁹¹)

4.5.10 Web Development

According to Indeed.com⁹² (a metasearch engine for job listings) HTML 5 is the most rapidly growing keyword in online job postings on the site, followed by MongoDB and iOS. Jobs trends for HTML on Indeed.com are depicted in the following graph:

http://press.freelancer.com.s3.amazonaws.com/Freelancer-Fast-50-Q3-4-11-2014-final.pdf

⁹⁰Freelancer. (2014a). *PressRelease, November 4th, 2014.* Retrieved Nov 24th, 2014 from,

⁹¹Freelancer. (2014a).

⁹²Indeed.com. (2014). Job Trends: HTML5 Job Trends. Retrieved Nov 25th, 2014 from, http://www.indeed.com/jobtrends



Figure 4.15: HTML 5 Job Trends (Source: Indeed.com⁹³)

However, trends posted for Java, C ++, C#, Visual Basic (VB), Perl and Objective C on Indeed.com show that job postings for VB slightly increased in the first quadrant of 2014 whereas listings for all the other languages mentioned above have decreased in the same period. The highest number of job postings amongst these languages is for Objective C but the number has been decreasing steadily since January, 2013 on Indeed.com⁹⁴.

HTML is fast emerging as the most preferred platform for developing custom enterprise apps as they are more compatible with multiple device types. ⁹⁶ An IEEE Spectrum survey for top languages in 2014 identified Java, Python, C#, PHP, JavaScript, Ruby, Perl, HTML, Scala and Go as among top ten languages for the web.⁹⁸

The IEEE spectrum's 2014 survey on top languages ranked languages according to their usage in different categories including web, enterprise, mobile and embedded.

In Pakistan, the demand for Java, HTML 5, PHP, and DotNet leads the way in web programming. However, Python and Ruby – becoming increasingly popular in the Silicon Valley – are yet to make a mark in Pakistan.

⁹³Indeed.com. (2014).

⁹⁴Indeed.com. (2014).java, C++, C#, visual basic, Perl, objective c Job Trends. Retrieved Nov 25th, 2014 from,

⁹⁶Sareen, H. (Dec 19th, 2013). Enterprise-technology trends for 2014. Retrieved Nov 25th, 2014 from, http://www.cnbc.com/id/101283824#.

⁹⁸ Buckler, C. (July 22nd, 2014). *Languages to Learn in 2014: Mid-Year Update.* Retrieved Nov 25th, 2014 from, http://www.sitepoint.com/best-programming-language-learn-2014-mid-year-update/



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4.5.11 Mobile Location Based Services (LBS)

According to TechNavio's 2014 forecast¹⁰⁰ the market of Location Based Services (LBS) is expected to grow at a CAGR of 37.38% during 2013-2018. In the US, LBS market is expected to grow at a CAGR of 26.11% during 2013-2018¹⁰¹, whereas in India the expected growth rate is 52.79% over the period 2014-2018¹⁰².

⁹⁹ Buckler, C. (July 22nd, 2014). *Languages to Learn in 2014: Mid-Year Update*. Retrieved Nov 25th, 2014 from, http://www.sitepoint.com/best-programming-language-learn-2014-mid-year-update/

¹⁰⁰TechNavio.(2014). *Global Consumer LBS Market 2014-2018*. Retrieved Nov 25th, 2014 from, http://www.technavio.com/report/global-consumer-lbs-market-2014-2018

¹⁰¹TechNavio. (2014).

¹⁰²TechNavio. (2014).



Previously, Berg Insight's 2012^{103} report on mobile LBS noted that the number of active users of location based services grew by 80% in 2012. In addition, it noted that 40% of the mobile subscribers in Europe were using at least one location based service frequently while 50% of the mobile users in North America were actively using location-based services. Furthermore, total revenue generated from LBS reached €325 million in the European Union countries and \$835 million in the US in 2012. Berg Insight forecasted that the revenue generated from mobile LBS will grow up to €825 million in Europe and \$1295 million in the US by 2017.



Figure 4.17: Mobile LBS revenue forecast in € million, 2011-2017 (Source: Berg Insight, 2012¹⁰⁴)

4.5.12 Mobile Payment Services

Since the introduction of Smart Money in Philippines in 2000, mobile payment systems have been introduced in a number of emerging markets including Kenya and Pakistan.¹⁰⁵ Whereas the traditional mobile payment systems have not been adopted as readily by developed markets, increased take up is expected due to the growth in app-based and hardware innovations from payment companies like Square and PayPal (EY, 2014). Although mobile payment users accounted for only 7% of the total number of mobile phone users around the world in 2013, mobile payment users are expected to increase up to 450 million by 2017 according to the EY report (2014¹⁰⁶).

 $http://www.ey.com/Publication/vwLUAssets/EY_-_Mobile_money_-_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile_money_the_next_wave_of_growth_in_telecoms/$

¹⁰³Berg Insight.(2012). Mobile Location-Based Services. Retrieved Nov 25th, 2014 from,

http://www.berginsight.com/ReportPDF/ProductSheet/bi-lbs7-ps.pdf

¹⁰⁴Berg Insight. (2012).

¹⁰⁵EY (Ernst and Young).(2014). Mobile Money - the next wave of growth.Retrieved Dec 1st, 2014 from,

¹⁰⁶EY (Ernst and Young). (2014).



Figure 4.18: Mobile payment demand, business models, services and regulatory environments in selected countries (Source: EY, 2014¹⁰⁷)

Additionally, according to another report published in Business Insider¹⁰⁸, mobile payment services accounted for 2% of all credit and debit card transactions in the US in 2013 and have grown at an annual rate of 118% in the US in the five years preceding 2013. Globally mobile payments accounted for 4% of the total credit and debit card transactions in 2013 and likely to have grown at a much faster rate.

This section substantiates many of the findings outlined in Section 3 and encapsulated in the statements of key trends and drivers affecting IT HR demand in Pakistan. They also become the basis for a Delphi exercise to predict future IT HR needs whose results are outlined next.

¹⁰⁷EY (Ernst and Young).(2014). *Mobile Money – the next wave of growth*. Retrieved Dec 1st, 2014 from,

 $http://www.ey.com/Publication/vwLUAssets/EY_-_Mobile_money_-_the_next_wave_of_growth_in_telecoms/\$FILE/EY-mobile-money-the-next-wave.pdf$

¹⁰⁸Danova, T. (January 28th, 2014). *Mobile Is The Future Of Payments — Here's How Much Runway There Is For Growth*. Retrieved Nov 25th, 2014 from, http://www.businessinsider.com/mobile-offline-retail-and-e-commerce-2013-12

5. Projections of Pakistan's IT HR Needs

The Delphi process carried out over the span of 2.5 months from end-October 2014 until early-to-mid December 2014 produced considerable convergence in the opinions of 10 experts chosen for the purpose. It also produce a set of consensus – and believable – numbers for employment in IT and ITES sector – including stocks and flows – but also key drivers driving this jobs growth as well as employment and growth within specific key sectors.

These estimates for current stocks as well as future projections are produced below:

5.1 TOTAL IT AND ITES JOBS – CURRENT EMPLOYMENT AND FUTURE GROWTH

The Median expert believes that currently there are about 100,000 people employed within the IT sector in Pakistan. There is considerable variation in the estimates of experts with 25% believing that this number is less than or equal to 32,500 and 75% believing this is less than or equal to 127,500. The convergence between the estimates has increased between rounds of the Delphi process, even though some still remains. However, we believe, for a number of reasons to be illustrated later than this is a fair estimate.

The median expert also believe that in 2013, 5,000 new IT jobs were added while in 2014 10,500 new jobs have been added. (S)he also believes that in 2015, 17,500 new IT jobs shall be added to the overall IT employment in the country. Similarly, over the following three years (2015-2017) 30,000 new IT jobs shall be added and subsequent three years (2018-2020) 57,500 new IT jobs shall be added to the current pool. The usual qualifiers about convergence and outliers apply. There is clearly an increasing and bullish trend in how our experts perceive the future potential of IT jobs growth to be though, rather expectedly, they are much more certain of the prospects of the first three years than the next three years.

Similarly, the median expert believes that currently there are about 97,500 people employed within the IT-enabled services sector in Pakistan. The IT-enabled services sector is different from direct producers of IT in that it uses IT to support other economic activities such as accounting, HR, medical transcription, knowledge process outsourcing and content development, etc. There is likely to be greater diversity within this employment pool than IT. Here, there is far greater variation within the estimates of experts too. For instance, 25% believing that this number is less than or equal to 55,500 and 75% believing this is less than or equal to 550,000. The latter constitutes a significant outlier. While the convergence between the estimates has increased between rounds of the Delphi process, it still is fairly large in comparison to IT employment. Hence we are much less confident of this number as compared to the IT employment.

With regards to future projections of ITES jobs, we are equally less sure. The median expert believes that in 2013, 2014 and 2015, 20,500, 10,000, and 20,000 new ITES jobs were or shall be created respectively. Here, the experts are much more certain of the current year's ITES jobs than they are of either the past or the future year. Similarly, over the following three years (2015-2017) 30,000 new ITES jobs shall be added and in the subsequent three years (2018-2020) 57,500 new ITES jobs shall be added to the current pool. Once again, while there is greater uncertainty, the trend remains optimistic and paints a hopeful picture of the ITES industry. The numbers are presented in the table below:

	Curren t Stock	Last Year (2013)	This Year (2014)	Next Year (2015)	Next 3 Yrs. (2015-17)	Following 3 Yrs. (2018-20)
IT Jobs Growth	100,000	5,000	10,500	17,500	30,000	57,500
ITES Jobs Growth	97,500	20,500	10,000	20,500	30,000	60,000

Table 5.1: Median Employment and Projections for IT and ITES Sectors



5.2 IT JOBS BY SPECIALTY – CURRENT EMPLOYMENT AND FUTURE GROWTH

We also asked our experts to provide precise estimates, by job speciality, for a number of different types of jobs within the industry. These numbers are important, not only for themselves but also, as a means of triangulation for the overall IT and ITES jobs number calculated in 5.1.

5.2.1 Key Platforms

According to our experts, the largest stock of jobs exists within key platform areas, namely, software programming (i.e. desktop/servers), web development, hardware, and ITES outsourcing (i.e. call centers and BPO, etc.) with the only other platform i.e. mobile developers coming a distant fifth. These are illustrated in the table below:

	Estimated Current Stock	Next Year (2015)	Jobs Created in Next 3 Yrs. (2015-17)	Jobs Created in Next 6 Yrs. (2015-20)
Programming (Desktop/Servers)	30,000	2,250	8,000	17,500
Web Development	25,000	3,000	6,000	13,250
Hardware	17,500	3,250	5,500	9,000
ITES (BPO, Call Centres)	12,750	1,500	3,550	7,750
Mobile Development	4,500	1,000	4,000	7,000

Table 5.2: Median Employment and Projections for Key Platforms

The above data presents a picture of relatively stable growth across the mature platforms. Our median experts believe that mobile development will add about 1,000 jobs a year for the foreseeable future, while (desktop/servers) programming will add about 2,500-3,000 with a mildly accelerating trend. Similarly, they foresee about 2000 jobs a year added in the web development domain with a mildly decelerating trend as is ITES with a growth of around 1,500 jobs per annum. Moreover, our experts are least certain of the current stock of jobs within the web development domain and fairly certain of the long-term growth prospects for hardware and mobile development sub-sectors. IT-enabled services (i.e. Call Centers and BPO, etc.) and programming fall somewhere in the middle.

This data also suggests potential discrepancy in the ITES jobs figure calculated in 5.1 (above) validating our caution towards that number. Although a current stock of 12,500 'agents' is probably on a low-side, given this data, we now have reason to believe that the figure of 97,500 significantly over estimates the current employment of ITES in Pakistan.

5.2.2 Relatively Stable 'Core'

Apart from the mature key platform areas, we also find relative stability in key IT job sub-segments that constitute the 'core' of an IT operation. These include project management, business analysts, quality assurance, database management, and content writers. These are illustrated in the Table below:



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	Estimated Current Stock	Next Year (2015)	Jobs Created in Next 3 Yrs. (2015-17)	Jobs Created in Next 6 Yrs. (2015-20)
Project Management	3,000	500	1,100	2,500
Database Management	3,000	200	686	1,700
Business Analysts	1,000	200	650	1,750
System Analysts	1,450	1,040	2,620	3,240
Quality Assurance	4,000	400	1,500	4,000
Content Writers	1,000	100	325	700

Table 5.3: Median Employment and Projections of the Core IT Operations

With the exception of quality assurance, which shows a somewhat accelerating trend, all other sub-sectors that form the 'core' of an IT operation show relatively stable growth prospects in both near (3 years) and longer-term (6-years) future, with one relatively minor exception, namely, systems analysts. Here, our median experts believe that next year will see a significant increase in the current stock (1,450) of systems analysts but this will taper-off in subsequent years with 6 year average being just over 500 new systems analysts jobs per annum. We did not find any unusual variance between the assessments of various experts on this, though neither did we also find any further confirming evidence to support this estimate.

5.2.3 Exciting New High Growth Sub-Segments

There are clearly certain emerging areas that will experience far greater growth than average IT sector as a whole. These sub-sectors can be further divided into high growth areas (consistently above growth, doubling every six years) and areas ready for, potentially, explosive growth (far in excess of 30-50% per annum). Embedded Systems, Payment Systems and SEO fall under the first category while Analytics, Social Media, and Game Development fall under the latter category. Animation does stand out and seem way beyond expectations. However, even if one were to discount such a high estimate, the 25 percentile is at least 13,000 jobs over 6 years which would still result in a 1300% increase over the current stock.

These figures are illustrated in the Table below:

	Estimated Current Stock	Next Year (2015)	Jobs Created in Next 3 Yrs. (2015-17)	Jobs Created in Next 6 Yrs. (2015-20)
Game Development	2,500	750	2,800	5,750 (+225%)
Animation	1,000	6,075	10,225	25,450 (+2500%)
Graphic Design	3,500	300	943	2,025 (+75%)
Analytics	375	75	325	650 (+200%)
Social Media	2,250	550	2,250	5,500 (+225%)
Payment Systems	500	100	200	800 (+160%)
SEO	1,000	350	843	1,575 (+150%)
Embedded Systems	3,000	3,100	1,800	3,100 (+100%)

Table 5.4: Median Employment and Projections for High Growth Emerging Areas

5.2.4 Growth Drivers and Wild Cards



Our experts defined web development, social media, and mobile development and leading drivers of growth within the industry over the next 3-6 year period. Our median experts felt that each of these three drivers could create at least 5,000 jobs each over the next 6 years but this number could also be as large as 15,000 for social media, 12,000 for web development, and 10,000 for mobile development over the next 6 years. These numbers are broadly consistent with those estimates elsewhere.

Our median experts also felt that enterprise mobility could create between 1,350 to 3,250 jobs over 6 years, open source / CMS could create between 1,250 to 3,000 jobs over 6 years, big data could create between 1,500-2,000 jobs over 6 years, and freelancing could create between 2,000 to 10,000 jobs over 6 years.

Wild card areas include ERP/CRM implementations (1,000-1,500 jobs), payment systems (125-200 jobs), and location-based services (300-600 jobs over 6 years). With the exception of payment systems, most of these figures are in line with experts' assessment elsewhere.



6. Conclusions and Policy Recommendations

This study has explored new avenues for analysis and insights. The use of readily available job data on online portals and aggregation services has the potential to provide rich insights into the trends of the industry and raise questions that could be further investigated.

6.1 CONCLUSIONS

without going into specific findings that are discussed in detail in earlier sections of this report, we have gleaned and learnt several high-level insights, such as:

- There is a definite linkage between the IT job data in Silicon Valley with that in Pakistan and even though most have an intuitive sense that this should have been the case, this is the first study in Pakistan that formally tries to produce and utilise data to try to understand that linkage. There are a number of potential uses for developing not only accurate but deeper understanding of these linkages. For instance, it would be useful to better understand, perhaps, by doing a formal analysis on a larger set of data, the precise time lag that separates the IT HR demand curves of Pakistan and the Silicon Valley. Similarly, with greater data coverage, it may be possible to understand to what extent increases (or decreases) in demand in the Silicon Valley translate to similar (or more or less) effects in Pakistan and under what circumstances does this relationship break down? Understanding these differences at a deeper level can help us address questions such as why is demand for mobile jobs in Pakistan and Silicon show no signs of a lag, when should one expect the demand for Big Data jobs in Pakistan to increase following the Silicon Valley hit Pakistan?
- There are sectors and sub-sectors within the ICT HR that have grown faster (or slower) than others over the time period in question and may thus benefit from or be deserving of public policy interventions. Some of these sectors could potentially benefit from focussed training, capacity building, or mentoring initiatives by the Ministry of IT and Telecom or its relevant bodies (such as National ICT R&D Fund, Universal Service Fund, and Pakistan Software Export Board), other entities (such as the Higher Education Commission), and the industry Association.
- There may be sectors that are anecdotally known as 'emerging' (or fast growing sectors) but the reality of actual job data does not support this. We have discussed why this might not reflect the true picture on the ground (i.e. companies resort to word of mouth hiring, etc.) but there are reasons why this may be true and the resulting implications of this fact for the policymakers. More importantly, the fact that we know this to be true allows us to predict future demand growth more accurately based on a careful reading of current Pakistan and Silicon Valley data and allows educational institutions, companies, professionals, and students to plan accordingly.
- At the platform and tool-kit level, we see a greater degree of concentration (and specialisation) in Pakistan than we see in the Silicon Valley. More generally as well, we see a greater degree of job specificity in Pakistan than in the Silicon Valley. While the latter could be explained by the nature of outsourcing opportunity (i.e. more specific operational jobs are likely to be outsourced), the former merits a closer examination and it may have implications for policymakers as well as industry player and academic leaders. If the demand for skills tends tips in the favour one set of tools versus the others there is a



compelling case for academic leaders, for instance, to identify that particular tool or platform early enough and ensure that curriculum develops certain level of capability for that platform or tool. If, on the other hand, there are a variety of tools and platforms being demanded (equally) within the market then curriculum could remain relatively platform neutral. Either way, there is a clear need to better understand why certain types of sectors and sub-sectors are dominated by one platform or tool and others don't.

• There is the issue of quality of HR which is one of the most critical and hard to capture element of the HR demand situation in Pakistan and yet our study, by design, does not say much about it. Questions such as: What constitutes quality in HR? What does it take to produce a professional in a public sector education institute vs. a private-sector institute? What are the differences – both at an intuitive level but also in concrete comparable and quantifiable level - between the graduate of a tier-1 university versus a tier-2 university? How much does a company have to invest in a new graduate to make him or her deployable? What kind of policies and initiatives can the government (and other entities) use to bridge the gap between demand and supply of IT HR? How does one understand, capture, and quantify the quality of an academic curriculum and accompanying experience (e.g. communication skills, project management skills, coding and testing etc.) that goes into the training of an IT graduate? Answering these questions is critical because a lot of what this study is seeking to answer (i.e. quantities) is relatively meaningless without a proper handle of its exact opposite (i.e. quality). However, answering this shall require a research undertaking of a different nature.

6.2 POLICY RECOMMENDATIONS

This study has amply demonstrated the value of IT jobs data that exists in the cyber sphere and can be readily harnessed for analysis and this could refined and make more useful through additional work.

- Recommendation 1: Firstly, the Ministry of Information Technology (MOIT) and the National ICT R&D Fund may consider repeating and updating this analysis on at least an annual basis and probably more frequently to provide both the industry, academia as well as professionals and students with up to date insights on what the current job trends and requirement are and how they may changing over time.
- Recommendation 2: We also recommend that a more detailed and longer-term and hence comprehensive analysis of IT jobs data be undertaken to better understand the correspondence (time lags, magnitude differences, etc.) between Pakistan and the Silicon Valley. A more comprehensive and nuanced understanding of the two interlinked markets and how their linkage may be evolving or transforming over time could provide very valuable early-indicators on which decisions can be made.
- Recommendation 3: There is a clear need to upgrade the curriculum being taught in our universities if our graduates and young professionals are to meet the demands of the industry. While HEC has established processes and committees to look at and review curriculum every three years or so and some of these changes may be incorporated through this process, albeit with considerable lag, there are also other ways to creatively incorporate the skill-sets being demanded by the market without modifying the curriculum at a fundamental level. For instance, while in the past basic courses such as data structures and algorithms are being taught using Pascal, C or dotNet languages, many of these have either gone extinct or are fast going obsolete. Faculty may instead now teach the same courses in Python, Java, and Objective C. Similarly, the course on databases may incorporate NoSQL, MongoDB and other approaches and allow students to explore Hadoop and other platforms that are growing faster than RDBMS. This would enable students to acquire new skills while at the same time keeping upto date with the changing needs of the market.
National ICT R&D Fund

- Recommendation 4: There is also a dire need to introduce new and emerging areas such as Big Data, Graphical Databases, Cloud, and Virtualisation, etc. to students and young industry professionals in a systematic manner. A survey of emerging skill-sets in the Silicon Valley may be used to identify areas that may require investment today to appropriate benefit in the future. Experienced international trainers may be invited to deliver industry-wide short courses across the three cities to introduce young professionals to these areas. Universities may be encouraged to offer elective courses focussing on new and emerging areas.
- Recommendation 5: While this study has addressed the demand side, there is a need for a comprehensive and definitive study on supply that may focus, in particular, on the issue of quality of HR because that is so central to the HR challenge that Pakistan faces today. This study must map the current HR pipeline number of students, what do they study, how do they study it, how do you measure quality in various parts of the HR pipeline and what measures / initiatives can be used to improve quality within the IT HR pipeline.
- Recommendation 6: In addition to supporting data collection activities elsewhere, the Ministry may also recommend that HEC and other relevant Ministries collect data on IT, CS, MIS, EE, and CE programmes at Universities to help improve data-driven policymaking in Pakistan.

We believe this study could lead to better informed decisions by various actors – Government, academics, and industry leaders – and facilitate evidence-based policy-making in Pakistan.



Annexure A: Pre-Delphi Survey Instrument

Dear XYZ

This is with reference to the **National ICT R&D Fund's IT HR Needs Assessment Study 2013-14**. The Study, as you may recall, is designed to identify Pakistan's IT HR Needs for the coming 3-5 years based on an assessment of past hiring and future trends. You attended a focus group for the study earlier this year and filled out a snap questionnaire identifying key HR practices and trends across four cities of Pakistan.

As the next step of this study, we are planning to launch a <u>**Delphi Exercise**</u> aimed at developing consensus parameters for estimating HR demand in the coming years. The Delphi is an iterative exercise whereby experts are polled repeatedly (2-3 times) in a manner that helps them achieve consensus without allowing one to bias others.

Prior to the formal Delphi, we wanted to informally poll a selected group of people from those who attended the Focus Groups to help us think through some of the key drivers of HR needs in Pakistan as well as reasons why these are key drivers in the first place? **Based on the clarity, comprehensiveness, and care of your answers, we have chosen you to do this short pre-survey.**

This important input shall go into designing the initial template of the Delphi process.

HERE IS WHAT YOU NEED TO DO TO FILL OUT THIS SHORT TEMPLATE (IN NO MORE THAN 10 MINUTES OF YOUR TIME):

1. Pic*k as many of the following IT Trends for Pakistan as you like (do at least those you think are in topfive or about whom you are most knowledgeable) and rank them by job growth in order or priority (1 for highest, 5 for lowest).

2. Write, in bullet form, 2-3 most important drivers affecting the IT Trends. For instance, you may write that the key drivers for Social Media are:

- 1) Increased penetration of social media in daily lives (users)
- 2) Increasing use (hrs/day), and
- 3) Increasing spend (\$/yr) on social media)

These could be based on your experience or insights or solid data, if known.

3. Finally, for each IT HR trend, write at least one local and one global future milestones or benchmarks that, if achieved, would substantiate your forecast or a parameter that could be used to appoximate job growth. For example, if your projection of the social media being a top-5 IT trend for Pakistan is to be correct, the total global jobs for social media will grow by 35% (just an example) or internet users in Pakistan (a parameter for web development jobs) will grow by 20%.

Please fill your answers in the table below and send it back to us by COB on Thursday (23rd October 2014) You may leave a part empty, if you wish.

IT HR Trends	Rank	Key Drivers of Growth	Local, Global Future Milestones, Benchmarks, or Parameters
Social Media			
Web Development			

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Databases	
ERP	
Mobile Gaming and Apps	
Cloud Computing	
Big Data	
Open Source	
Content Development	
Payment Systems	
System Integration	
Search Engine Optimisation	
Others (Specify):	

Also, please indicate if you would be willing to participate in a Delphi Exercise? (Y/N) _____

Participation in Delphi shall entail filling out a short questionnaire (like the one above) 3 times over the next 1.5 months as we try to improve the accuracy of our collective prediction.

As a benefit, we will share with you anonymous estimates of key drivers and trends by 9 other participants through the process which may be an educational process for you and others as well as the final results before publication of the study.

If you have any questions, please feel free to write to us (myself or Zohra cc:ed) or call at 051-8443223.

Look forward to your participation.

Best Regards,

Athar Osama, PhD Principal Researher National IT HR Needs Assessment Study



Annexure B: Delphi Instrument – Round 1

Dear XYZ

Thank you for participating in the pre-Delphi survey sent out last week. We have compiled the findings now and are beginning to get a bit more detailed this week through a formal e-Delphi exercise.

What is the Delphi Method?

The Delphi Method is a structured communication technique, originally developed as a systematic and interactive forecasting method which relies on a panel of experts. It was developed at the RAND Corporation in the middle part of the last century as a mechanism to achieve consensus amongst a group of experts while eliminating biases (such as opinion being influenced by one or two outspoken individuals). Delphi is thus carried out anonymously with each successive round feeding in information from the previous round and asking participants to revise their estimates based on what they know (or have come to know) thus bringing refinement and accuracy to the exercise. Usually, consensus appears in 2-3 iterations of the process. Details here: http://en.wikipedia.org/wiki/Delphi_method

What are we trying to achieve in IT HR Needs Study Delphi?

A Delphi Instrument (Data Template) is attached. The instrument is designed to arrive at some consensus key drivers and estimates for projected IT and ITES jobs - overall and by various classifications - over the next 2-6 year time horizon. These estimates would then be used alongside historical data already collected for the project to make future projections for the industry as a whole.

This process may seem a bit abstract in the first iteration because we are (purposefully) not providing you any references or anchors to base your initial estimates on thus allowing you to either draw from your own understanding, experience, or research, but its usefullness will become clear in 2nd and 3rd round of the Delphi exercise when you will be provided information drawn from the collective wisdom of the entire group and you will be able to revise your estimates on that basis.

I would, therefore, urge you to use your best estimates (and guesses) to fill out the attached spreadsheet and send it back to us by <u>end of the day Tuesday (November 4, 2014)</u> so that we could compile the results from all participants and send you round 2 spreadsheets.

Beyond being a service to the IT/ITES Industry in Pakistan, this also have additional benefit of learning - with 9 of other experts - about the size make up and future trends that are likely to impact demand of IT HR in Pakistan. We will also the findings of this exercise with you in advance of its publication by ICT RDF.

We look forward to your participation.

Best Regards,

Athar Osama, PhD

Personforce Consulting (Pvt.) Ltd. and Technomics International Ltd.



Principal Researcher IT HR Needs Assessment Study

Delphi Instrument:

	Pakistan IT HR Needs Assessment Study (Delphi Exercise Instrument - Iteration 1)										
	Name: Organisation:							Mobile Contact:			
Q1: Please data p help yo	make an educated guess about the total oint or rule-of-thumb or personal experier w sync with other colleagues and eliminat	number of IT an nce (plese state t e your error and	nd ITES jobs this and the d biases in t	created in Po e confidence the subseque	akistan in the in your predi nt phases.	e past, last year, th ction). Please prov	iis year, next year, iide your best gues	, and in 3 and 6 years time. You may base this estimat ss and not hesitate in making an error. The Delphi pro	e on some cess shall		
					Predictions			Reasons			
		Baseline (all current jobs)	Last year (2013)	This year (2014)	Next Year (2015)	Over 3 years (2015-2017)	Over 6 years (2015-2019)	Please Describe the Data Point(s) Underlying Your Predictions	% Confi Pred	dence in liction	
Total Num IT ITES	ber of Jobs Created in IT and ITES Total Technical (IT) Jobs Total Service (ITES) Jobs								3-year	6-year	
Q2: Please Impac	identify <u>TOP-3</u> DRIVERS of job growth in t if they happen. Not the difference betwe	Pakistan (e.g. s een a DRIVER is Maximum N	social medi something	a, big data, r you know ab Minimum	nobile, or we out with fair No. of Jobs	b) that you're mos degree of certaint	l it certain about + iy and a WILD CAR	<u>2 WILDCARDS</u> that you're not certain about but that D is something that may happen but is uncertain.	 may make a l	big]
		Created Annu	ually over	Created An	nually over 6	What Indicators	s / Data Points Is	What Future Indicator / Milestone / Data Point, if it	: % Confid	lence this	
Top3 Drive	ers of Job Growth in Pakistan	6 yrs (201	L5-20)	yrs (20:	L5-2020)	your Predicti	ion based on?	happens, could derail your prediction?	event wi	ill happen	
D1	Driver 1 (Write here)										e.g. 10%
D2	Driver 2 (Write here)										
D3	Driver 3 (Write here)										
W1	Wildcard 1 (Write here)										
W2	Wildcard 2 (Write here)										
Q3: Please	take ATLEAST 10 JOB CLASSIFICATIONS	that you know t	he most ab	out (based o	n domain kn	owledge, previous	hiring, etc.) and p	provide projections for 1, 2, and 6 year job growth in e	ach? Please a	lso	
provid	le data points, or refernces, where possibl	e, and your deg	ree of confi	dence in the	projection?						
											1
									% Confi	dence in	
Linked to	Estimates of Jobs Created by Job	Estimated Curre	ent Stock of	Jobs Create	d Next Year	Jobs Created in 3	Jobs Created in 6	Reference or Data Point(s) on which this estimate is	s Pred	iction	
Driver?	Category	Jobs (-20	014)	(20)15)	yrs (2015-17)	yrs (2015-20)	based (if any)?	3-year	6-year	
e.g. D1	Programmers			· ·							
	Web Developers										
	Database Manager / Administrator										
	Mobile Developers										
	Game Developers										
	Animators										
	Granhics Designers										
	Data and Analytics										
	Data and Analytics										
	Payment Systems										
	Social Media										
	Quality Assurance										
	Coll Contor Agonto										
	Other ILES / BPO Agents										
	Content Writers										
	Hardware										
	Embedded Software										
	Business Analysts										
	System Analysts										
	Project Managers										
1											



Annexure C: Delphi Instrument – Round 2

Dear XYZ

Thank you for your hardwork in filling out the questionnaire for the Round 1 of the Delphi Exercise.

Now comes the more exciting and enriching part...!

Please find enclosed the compilation of the Round 1 of the Delphi exercise with results from 10 other very knowledgeable individuals. We have provided means, 25th percentiles, and 75th percentile scores for each of piece of data. Please use these data with caution since some of these summary statistics may be more susceptible to outliers than others. For example, a very high 75th percentile and a low 25th percentile may mean than a couple of members of the Delphi group believe the number is towards the higher end and a couple of members believe it is towards the lower end (i.e. there is considerable disagreement) and these may also affect the mean.

You may wish to compare these numbers with your own estimates during the first round. You may also want to look at the reasons identified by some of the participants for assigning their own estimates.

Knowing what the 'Wisdom of the Crowd' (if it can be called that) is, how would you like to revise your estimates?

Delphi exercises seek to achieve consensus between a group of experts polled iteratively on an anonymous basis. In 2-3 iterations the group usually achieves considerable consensus.

We would appreciate if you could complete the Round 2 Template (attached) by end of the day on SUNDAY (November 16, 2014) and send it back to us.

Look forward to your replies.

Best Regards,

Athar Osama, PhD Principal Researcher IT HR Needs Assessment Study



Delphi Instrument: Round 2

DELPHI DATA COLLECTION TEMPLATE - ROUND 2



INSTRUCTIONS:

PLEASE READ THESE AND THE INSTRUCTIONS FOR EACH QUESTION CAREFULLY... YOU MAY WANT TO KEEP THE ROUND 1 DATA YOU PROVIDED HANDY TO COMPARE.

 PLEASE FILL ONLY IN BOXES SHADED LIGHT GREEN (BOLD MARGINS)
 PLEASE FILL AT LEAST FOR THOSE BOXES THAT YOU HAD ORIGINALLY PROVIDED ESTIMATES FOR. YOU MAY DO MORE.

3. THE FOLLOWING SPACE PROVIDES YOU WITH SUMMARY DATA OF THE RESPONSES (IN YELLOW BOXES) RECEIVED IN ROUND 1 OF THE DELPHI EXERCISE IN WHICH YOU PARTICIPATED.

4. YOU MAY USE THIS DATA ('WISDOM OF THE CROWD') AND THE REASONS ASSIGNED (WHERE AVAILABLE - IN RED AND PINK BOXES) TO INFORM YOUR OWN PREVIOUS ESTIMATE AND / OR REVISE IT.

5. PLEASE BE MINDFUL THAT SOME SUMMARY STATISTICS ARE MEANS, OTHERS 25 OR 75 PERCENTILES (TO REMOVE OUTLIERS) AND OTHERS ARE EXPECTED VALUES (TO INCORPORATE UNCERTAINTY)

6. A WORD OF CAUTION: YOU MAY LOOK AT MEANS AND PERCENTILES TO SEE IF ONE OR TWO MEMBERS OF THE GROUP ARE DRIVING THE AVERAGES AND THEN MAKE UP YOUR MIND IF YOUR ESTIMATE NEEDS REVISION.

Q1: Please R EVISE YOUR ORIGNAL GUESSS about the total number of IT and ITES jobs created in Pakistan in the past, last year, this year, next year, and in 3 and 6 years time. You may use some anonymous anchors (see rows 25-28) used by other Delphi participant to inform your own original guesses. Please handle means, percentiles and expected values with caution as some of these may be more susceptible to outliers.

		Baseline(a II current jobs)	Median (50th percentile)	75th percentile	25th percentile	Last year (2013)	Median (50th percentile)	75th percentile	25th percentile	This year (2014)	Median (50th percentile)	75th percentile	25th percentile
Total Nur	aber of Jobs Created in IT and ITES												
IT	Total Technical (IT) Jobs		100,000	162,500	20,000		3,250	130,000	2000		4,000	143,750	2,400
ITES	Total Service (ITES) Jobs		97,500	780,000	37,500		2,500	8,125	1525		2,500	12,000	1,625
_							-				-		
Si	me indicative data points to consider:	Estimates for Baseline	Reason										
	1	400000	increase in jobs	linked to mobility	in Smart devices (including smart wearables, phones	s etc.)						
	2	125000	Base number is	a guess but the gro	owth rate of 5-7%	Because IT is growing faster than	the economy (GE	OP growth 5%)					
	3	3 25000 Guess based on approximate number of companies in major citites (KHI, LHR, ISB) and average increase in team size per company expected.											
	4 15000 Based on total number of IT jobs of 12500 in techies.pk survey in 2013, plus addition of 2500 jobs per year												

			P	redictions													
		and Marca			2546	0	N/ Confidence in	Madian (COth	Mean of	7546	2544	0	0/ Canfidanas in		Mean of	75.45	2544
	()	(2015)	Mean	75th percentile	percentile	(2015-2017)	Prediction	percentile)	Values	percentile	percentile	(2015-2019)	Prediction	Mean	Values	percentile	percentile
1	_																
			5,250	155,250	3,125			12,000	82,736 5.439	100,000	5,250			28,500	93,901 42,560	200,000	11,500 11,750
			.,		2,500			20,000			,,,,,,,						

Q2: Below ore the TOP-3 DRIVERS OF IT JOB GROWTH (by Consensu) as well as OTHER TOP DRIVERS AND WILDCARDS that several individual other individual Delphi Participants Identified. We have also provided maximum and minimum jobs created nanoually over 6 years from each of these drivers (intens and parecurlicit) as well as most often cited reasons for these. You any USE THIS DATA TO REVEVOUS ESTINATE (inserted in light greater backs) or chosen to react on the USE providing an estimate. 1 1

	Maximum No of Jobs Created	Median (50th			Minimum No. of Johs Created	Median (50th			
Top3 Drivers of Job Growth (by Consensus)	Annually over 6 yrs (2015-2020)	percentile)	75 Percentile	25 Percentile	Annually over 6 yrs (2015-2020)	percentile)	75 Percentile	25 Percentile	Reasons Specified
Web Applications									i. Cloud Models will grow. ii.
D1 (Identified as key driver by 5 people)		17,500	25,000	7,750		5,000	6,250	3,875	Gut feeling
Mobile Development D2 (Identified as key driver by 5 people)		7,500	26,250	3,900		2,000	5,250	1,575	 Smart phones drive app growth No barrier to entry for people to write mobile applications
Social Media D3 (identified as key driver by 3 people)		10,000	42,500	5,250		5,000	17,500	2,625	L Social media apps ii. Gut feeling
Other Drivers idenfied for highest job impact	Maximum No of Jobs Created Annually over 6 yrs (2015-2020)	Projection	% Confidence	Expected Value	Minimum No. of Jobs Created Annually over 6 yrs (2015-2020)	Projection	% Confidence	Expected Value	Reasons Specified
D4 Enternrise Mobility (1 person)		25,000	30%	7,500		10,000	30%	3,000	 Mobility is the hot new thing and on upward graph. Mobile software solutions for enterprises, wearables etc will keep soaring at least for 2-3 years.
D5 Open Source/CMS (1 person)		5,000	30%	1,500		3,000	30%	900	Guesstimate
D6 Big Data (2 persons)		4,000	30%	1,200		2,000	30%	600	Guesstimate
Dy reciaircing (1)									No Reason Assigned
Highest Job Growth for Wildcards									
W1 3G Location Based Services (1 person)		3,000	50%	1,500		500	50%	250	No Reason Assigned
W2 3G Payment Services (1 person) W3 ERP/CRM Implementations (1 person)		3,000 10,000	50% 0	1,500 2,500		500 2,000	50% 0	250 500	No Reason Assigned Gut Feel
	· · /- · ·								

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What Future Indicator / Milestone / Data Point, if it happens, could derail your prediction?	% Confidence this event wil happen
i. Cloud faiils to pick up; ii. Web growth also be around mobile	29%
Security concerns derail critical business apps, and adoption of moible apps and software internationally	45%
i. Slower growth of Facebook and growth; ii.	30%
What Future Indicator / Milestone / Data Point, prediction?	if it happens, could derail you
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security con quality graduates	if it happens, could derail you ncerns iii. Lack c
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security co quality graduates flashy exits in this sp	if it happens, could derail you ncerns iii. Lack c ace
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security con quality graduates flashy exits in this sp flashy exits in this sp	if it happens, could derail you ncerns iii. Lack c ace ace
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security con quality graduates flashy exits in this sp flashy exits in this sp None Assigned	if it happens, could derail you ncerns iii. Lack c ace ace
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security con quality graduates flashy exits in this sp flashy exits in this sp None Assigned None Assigned	if it happens, could derail you ncerns iii. Lack c ace ace
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security con quality graduates flashy exits in this sp flashy exits in this sp None Assigned None Assigned	if it happens, could derail you ncerns iii. Lack c ace ace
What Future Indicator / Milestone / Data Point, prediction? i) Expiring tax holiday will fail financial model. Customer confidence declines due to security co quality graduates flashy exits in this sp flashy exits in this sp None Assigned None Assigned None Assigned	if it happens, could derail you ncerns iii. Lack c ace ace

Q3: Below were the 1,2 and 6 year estimates for job classifications provided by fellow Delphi participants. You may use these, and the reasons assigned, to REVISE YOUR OWN ESTIMATE ON TAKE A POSITION ON A JOB CATEGONY you had not previously filled.
We have also provided sample sizes (IN-17) for each estimate. Presse handle means, percentiles and expected values with caution as some of these may be more susceptible to outlier

to																
Driver	Estimates of Jobs Created by Job Category	Estimated Current Stock of Jobs (-	Maan	7Eth porcontilo	25th porcontilo	John Created Next Year (2015)	Moon	7Eth porcontilo	2Eth porcontilo	Jobs Created in 3 yrs	Maan	% Confidence in	Expected	75th	25th	Jobs Created in 6 yrs
e.g. D1		2014)	wear	75th percentule	25th percentile	Jobs Created Wext Teal (2013)	Iviedii	75th percentile	zourpercentile	(2015-17)	Weall	Prediction	Value	percentile	percentile	(2015-20)
	Programmers (N=7)		20,000	62,500	7,500		3,000	8,250	1,500)	8,125	38%	3,107	25,313	3,821	
	Web Developers (N=5)		7,500	32,500	4,250		1,000	3,000	1,000)	3,750	30%	1,136	9,000	3,429	
	Database Manager / Administrator (N=5)		3,000	7,000	875		200	350	163	8	592	36%	215	1,071	350	
	Mobile Developers (N=4)		4,000	16,250	2,625		1,750	20,250	1,200)	7,571	L 33%	2,516	70,000	4,082	
	Game Developers (N=4)		3,500	10,000	1,750		1,250	13,625	800)	5,071	40%	2,040	41,357	3,900	
	Animators (N=3)		1,000	13,000	550		500	20,250	263	8	3,000	45%	1,358	64,000	1,538	
	Graphics Designers (N=5)		1,500	5,000	1,500		200	500	150)	685	5 40%	275	2,000	450	
	Data and Analytics (N=2)		550	775	325		63	81	44	1	288	3 40%	116	394	181	
	Payment Systems (N=3)		500	5,375	400		250	10,225	156	5	1,000	27%	271	37,000	769	
	Social Media (N=2)		3,000	4,000	2,000		600	800	400)	2,800	40%	1,131	3,900	1,700	
	Search Engine Optimisation (N=3)		500	1,500	350		125	163	88	8	575	5 40%	231	788	363	
	Quality Assurance (N=5)		3,000	4,750	2,000		350	475	225	5	1,050	34%	360	1,800	739	
	Call Center Agents (N=4)		8,000	20,000	5,000		1,250	1,625	875	5	4,500	35%	1,587	7,000	2,450	
	Other ITES / BPO Agents (N=4)		3,500	6,250	2,000		500	750	500)	1,500	50%	752	3,250	1,150	
	Content Writers (N=4)		2,000	3,500	788		100	550	90)	300	57%	171	1,650	225	
	Hardware (N=4)		11,500	26,000	4,375		1,000	3,000	750)	2,000	52%	1,035	8,500	1,750	
	Embedded Software (N=3)		500	7,750	500		75	88	63	8	250	40%	100	275	225	
	Business Analysts (N=4)		750	1,500	425		150	275	88	3	492	2 30%	149	1,014	275	
	System Analysts (N=3)		500	4,250	500		100	150	75	5	200	50%	100	250	180	
	Project Managers (N=7)		3,000	5,000	1,500		200	500	100		1,092	29%	312	1,875	546	

Mean	% Confidence in Prediction	Expected Value	75th percentile	25th percentile	Reference or Data Points
20,946	28%	5,907	53,438	8,036	Universities Capacity to train employable programmers
11,250	23%	2,559	18,000	8,143	None Assigned
1,564	26%	411	1,907	825	None Assigned
21,107	23%	4,791	97,500	9,611	Abundant mobile usage
13,607	30%	4,109	73,750	9,461	Competition in game industry
9,000	35%	3,168	117,000	4,575	None Assigned
1,628	28%	450	6,000	900	None Assigned
825	35%	290	1,163	488	None Assigned
2,500	24%	590	52,250	1,538	None Assigned
8,100	35%	2,863	11,550	4,650	None Assigned
1,650	35%	579	2,325	975	None Assigned
2,400	24%	581	5,250	1,671	None Assigned
1,200	30%	362	21,000	5,000	None Assigned
3,000	47%	1,402	9,000	2,500	None Assigned
600	55%	331	4,800	500	None Assigned
4,000	50%	2,003	17,000	3,500	Hardware development and deployment trends in Pakistan
600	35%	211	600	600	None Assigned
1,114	23%	253	1,846	600	None Assigned
600	50%	301	600	400	None Assigned
2,314	25%	584	3,750	1,532	Gut feel



Annexure D: Delphi Instrument – (Confirmatory) Round 3

Dear XYZ:

Thank you for your hardwork in filling out the questionnaire for the Round 2 of the Delphi Exercise.

We are now in the homestretch of this tedious but very useful exercise.

Please find enclosed the compilation of the Round 2 of the Delphi exercise with results from 8 other very knowledgeable individuals. We have provided medians, 25th percentiles, and 75th percentile scores for each of piece of data. Please use these data with caution since some of these summary statistics may be more susceptible to outliers than others. For example, a very high 75th percentile and a low 25th percentile may mean than a couple of members of the Delphi group believe the number is towards the higher end and a couple of members believe it is towards the lower end (i.e. there is considerable disagreement) and these may also affect the mean.

You may wish to compare these numbers with your own estimates during the first and second round and take a final position on what your final prediction for each of these would be. Knowing what the 'Wisdom of the Crowd' (if it can be called that) is, how would you like to revise your estimates?

We have also provided you space to register dissent, if required, and/or add any final data/comments that you may want to bring to the notice of the research team.

Delphi exercises seek to achieve consensus between a group of experts polled iteratively on an anonymous basis. In 2-3 iterations the group usually achieves considerable consensus.

We would appreciate if you could complete the Round 3 Template (attached) by end of the day on SUNDAY (November 30, 2014) and send it back to us.

Should you prefer to have your Round 2 estimates remain unchanged, please let us know a soon as possible.#

Look forward to your replies.

Best Regards,

Athar Osama, PhD Principal Researcher IT HR Needs Assessment Study



Appendix A:

Results of Snap Survey on IT HR Practices and Trends

A Snap Survey was circulated amongst the participants of focus groups for the National ICT R&D Fund's IT HR Needs Assessment Study 2013-14. This survey included a sample of 43 IT Companies¹¹¹ from different cities of Pakistan. The company size is varied from small to large. As per the Survey, a total of 4,293 employees are currently working in these 43 IT companies. However, there is considerable variation in the total number of employees currently working in the participating companies with a low of 4 employees to the high of 1300.

Corporate Structure

Most of the IT companies from the sample have a Private limited corporate setup whereas from a total of 39 respondents only 13% are Public companies and 3% had offices abroad.

Corporate structure	Percentage of Companies in Sample (%)
Public Sector	13
Private Ltd	76
Development Office of International Entity	0
Company with office abroad	3
Other	8

The sector/specialization of the firms

90% of the Companies provided IT Services and Solutions while 63% said they also specialized in product development, 45% specialised in Mobile Content and Applications, 38% specialized in E-Commerce and Web Services, and 30% specialised in Web Business. However, only a few companies specialize in BPO services, Embedded systems and Software, and Customer Relationship Management (CRM).

The Sector / Specialisation of the Firm	Percentage of Companies Specialising in the Sector (%) ¹¹³
IT services and solutions	90
Product Development	63
Mobile Content and Applications	45
E-Commerce and Web Services	38
Web Businesses	30

¹¹¹ Total number of surveys received were 44. However, one survey was completely left blank reducing the sample size to 43.

¹¹³ These are overlapping categories that are not mutually exclusive. Hence the sum of these percentages would be greater than 100%.



Gaming and Animation	20
Information Security	20
BPO Services	18
Embedded systems and Software	13
Customer Relationship Management	13
IT Governance, Strategy	13
Other	13
Financial-Specialization and ERP	10
Document Management	5

Annual Revenue During last financial year (in PKR)

46% of the companies surveyed had revenues over PKR 30 million and 22% had revenues less than a million.

Annual Revenue During last financial year (2012)	Percentage (%)
PKR Up to 1 Million	22%
PKR 1-5 Million	13%
PKR 5-10 Million	13%
PKR 10-30 Million	6%
PKR 30 Million or Above	46%

Company's growth of sales/revenue

Companies responded a somewhat flat revenue trajectory for 2013 with average industry revenue growth slightly slowing down to 25% (2013) against 29% (2012). However, the respondent projected much higher revenue growth for 2014 at 34%.

Company's growth of sales/revenue					
	Average Growth of Revenues (in Million PKR)	Percentage Growth			
2012	116	29%			
2013	99	25%			
2014 (Estimated)	136.36	34%			



Revenue from Exports, Public Sector and Direct Customers

Of the 25 companies that reported this data, 51% revenues were generated through exports, 31% from sales to public sector, and 22% from exports.

Average Percentage of Revenues					
	Average Revenue (Millions of PKR)	Average Revenue generated through: ¹¹⁴			
Exports	217	51%			
Sales to Public Sector	79	31%			
Sales direct to Consumers	84	22%			

Number of Employees

	Total (N=43)	IT Professionals (N=41)	BPO Professionals (N=9)	Non IT Professionals (N=32)	Others ¹¹⁵ (N=20)
Total Employees	4293	2788	366	479	239
Percentage (%)		65%	9%	11%	6%

Across the 43 companies in sample, 65% of the employees were IT Professionals, 11% were Non-IT Professionals, and 9% were BPO professionals. Large companies (>200 employees) have 625 employees, on average while medium (50-200 employees) and small (<50 employees) hire an average of 116 and 19 employees respectively.

The proportion of IT professionals as percentage of overall employment is highest for smaller companies than medium and large companies. Out of the total of 43 companies represented in the sample, 5 can be categorized as large, 10 medium, and 28 companies as small sized.

The following table illustrates different trends of professionals' employment in IT Companies according to their size:

¹¹⁴ These figures illustrate the average of the percentages given by the companies for the revenue generated from each category. This table captures average percentage of responses given by the participants in answer to three separate questions. Consequently, average percentages do not account for the total revenue of the participating companies as the categories are overlapping: revenue generated from sales direct to consumers can be part of the total revenue generated from exports and so forth.

 $^{^{115}}$ N indicates the number of respondents who provided an estimate for that category.



		Overall Total	IT Professionals	BPO Professionals	Non IT Professionals	Others
		(N=43)	(N=41)	(N=9)	(N=32)	(11=20)
Employment in	TOTAL	2498	1667	212	260	93
Large IT Companies	Average	625	417	212	130	47
(200 or more employees)	Percentage (%)		67 %	8%	10%	4%
Employment in	TOTAL	1277	712	149	133	98
Medium IT Companies	Average	116	71	30	15	20
(50-200 employees)	Percentage (%)		56%	12%	10%	8%
Employment in	TOTAL	518	409	5	86	48
Small IT Companies	Average	19	15	2	4	4
(less than 50 employees)	Percentage (%)		79%	1%	17%	9%

Total Employment in IT Companies by Company Size (2012)¹¹⁶

The following graph shows the breakup of employees according to the sector specialization of the firms.



¹¹⁶ The sum of employees in each category does not comply with the total number of employees due to item non response.



Number of Employees Working in Last Three Years

Number of Full Time Professional Employees in IT Companies

	2012	2013	2014 (estimated)
Total Number of Full Time Employees	3497	3985	4683
Average Number of Full Time Employees per Company	90	102	120

In 2013, the 43 respondent companies employed 14 % more employees than in 2012. The respondents foresee a further increase of 17.5% in employment during 2014.

Educational Qualifications of Technical/Professional Employees

Mix of Educational Qualification of Technical/Professional employees					
Qualification Average Percentage					
PhDs	7%				
CAs	2%				
MBAs	15%				
BS/BSEs	67%				
Others	33%				

The Majority - 67% - employees have bachelors – BS/BSE – or equivalent degrees. 15% have MBAs and still fewer have PhDs or Chartered Accounting qualifications.

Breakdown of Workforce by type of Work

Breakdown of Workforce by Work type (Average Percentage)

Top Management	Project Manageme	Technical/Client Support	Business Analysts	Business Development	Programmers	Others
	nt					
9%	14%	20%	4%	7%	42%	8%

The breakup of the total workforce employed in the participating IT companies show 42% of them as programmers, 4% as business analysts while 14% were engaged in project management, and 7% engaged in business development.



Employee Breakdown by Job Function

The Table below illustrates the total number of employees within the respondent companies at present (2012), hired in 2013 and expected to be hired in 2014 under different IT roles.

Job Function	Total (in 2012) (N=35)	Hired in 2013 (N= 28)	Plan to hire in 2014 $(N = 25)^{117}$
Software Programmer	1170	353	469
Call centre/BPO agent	378	194	90
Hardware integration/Support	125	66	67
Web developer	115	32	39.5
Project manager	90	24	31
Quality Assurance/Testing	83	24	24
Business development	75	23	23
Mobile developer	49	21	20
Business analyst	43	20	18
Network administrator	42	17	16
Graphic designer	40	16	17
System architect	21	13	7
Database administrator	20	12	7
Content writers	16	9	6
SEO/Social media	10	6	6
Other	9	4	4

For most job classifications, there seems to be somewhat flat trend between 2013 and 2014. Software programmers are a major exception where companies are expecting to hire on at least 30% more positions in 2014. Call Center agents is another exception where companies felt they will hire on 50% less positions in 2014 than they did in 2013.

Average Salary

Position	Entry Level (in PKR/mo)	Senior Level (in PKR/mo)
Business analyst	36,000	63,000
Business development	30,000	79,000
Call centre/BPO agent	16,000	35,000
Content writers	23,000	38,000
Database administrator	30,000	56,000
Graphic designer	21,000	53,000
Hardware integration/Support	28,000	52,000
Mobile developer	31,000	56,000
Network administrator	27,000	53,000

 $^{^{\}rm 117}$ N indicates the number of respondents who gave an estimate against each category

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Other (Consultants, contract based/outsourced staff etc.)	25,000	123,000
Project manager	45,000	83,000
Quality assurance/Testing	26,000	63,000
SEO/Social media	27,000	46,000
Software programmer	28,000	76,000
System architect	50,000	130,000
Web developer	24,000	66,000

Use of Recruitment Channels

Most companies use referrals and advertising on online job portals such as Rozee.pk and Brightspyre, etc. Advertising in newspapers, trade websites, and job fairs account for less than a third of the recruitment effort.

Percentage of Employees Hired through a Recruitment Channel ¹¹⁸							
ReferralsJob fairsJob portalsAdvertise in newspaperRecruitment firmsAdvertise on trade websitesCampus Recruitment DrivesOthers							Others
43%	9%	36%	21%	5%	10%	13%	33%

Hiring practices of different companies categorized according to their sector specialization show that Job Portals are the most frequently used resources for hiring new IT professionals after referrals that is the second most common hiring practice indicated by the respondents.

The following graph show that average percentages of the extent to which each category (medium) is used by IT companies for hiring purposes



¹¹⁸ For this section, participants were asked to give an average percentage of hiring through a particular medium.



Knowledge of IT HR trends

Word of mouth	Salary surveys	Read newspaper adverts	focus on clients needs	read local trade news/press	others
54%	46%	43%	65%	30%	3%

The participants were asked to indicate the resources they use for staying up to date with the recent IT HR trends. Most companies said that they focused on clients' needs and hired accordingly. 54% relied on word of mouth, 46% on salary surveys, 43% on newspapers. These are overlapping sources so they do not need to add up to 100.

Top 5 IT HR Trend and Drivers



Web Development, Databases and Mobile Gaming and Apps are rated as the top three driver of growth for the IT industry.



Top 3 'Hard to Fill' Positions

1	2		3		
Business analyst	6%	Business analyst	6%	C++	4%
C++	6%	C/C++	6%	CCNA	4%
Content Writer	3%	Content Writer	3%	Content Writer	4%
Database	9%	database	9%	СТО	9%
Embedded systems	3%	Embedded systems	3%	Graphics designer	4%
developer	201	developer	201	LID Executive	101
	5%	Fresh graduates	5%	HR Executive	4%
Graphics designer	6%	graphic designer	6%	international sales agent	4%
Head motion graphics expert	3%	Head motion graphics expert	3%	iOS developer	9%
Information Security	3%	Information Security	3%	Java developer/Java/JEE	9%
Java	6%	Java	6%	Mobile developer	4%
Lead software Engr.	3%	Lead software engineer	3%	Program manager	4%
Linux and ms admin	3%	Linux & ms admin	3%	QA/Testing	4%
Manager finance	3%	Manager finance	3%	Software Developers	13%
(supply chain)		(supply chain)		/programmers	
Marketing head	3%	marketing head	3%	system architect	4%
Mobile App developer	6%	mobile developer	6%	Tech architect	4%
Programmer	3%	Programmer	3%	UX Designer	4%
Quality developer	3%	Quality developer	3%	Web Developer	9%
Senior software	9%	Snr. software architect/	9%		
Architect/developer		engineer/developer			
SEO	3%	SEO	3%		
SIEBEL configurator	3%	SIEBEL configurator	3%		
Senior game developer	3%	Snr. game developer	3%		
Tech head	3%	Tech head	3%		
Web designer	3%	Web designer	3%		

____> ___> ___> ___>

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About Technomics International Ltd.

Technomics International Ltd. is a boutique policy research, strategy advisory, management consulting, and knowledge outsourcing firm created to help individuals, businesses, and governments make sense of and excel in the tremendous changes taking place at the intersection of technology, economics, and society. For over a decade now, Technomics has provided its clients with quality research and policy advice, actionable strategies and plans, and technology programme design and implementation.

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