

# 2016 JCSE ICT Skills Survey

**Joburg Centre for Software Engineering**

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## Executive Summary

The Joburg Centre for Software Engineering (JCSE) is a University of Witwatersrand partnership with government and industry. This is the JCSE's seventh edition of its survey of skills trends in the South African information & communications technology (ICT) sector.

The state of the South African economy is depressing the demand for ICT skills as the sector's clients cut back expenditures. Although we have seen a global recession in the last few years, demand in Europe and the United States for ICT skills appears to be increasing or holding steady. South Africa is falling behind its peers in Africa (notably Kenya, Nigeria and Egypt – our economy is now placed third in Africa behind the latter two countries) who are putting greater emphasis on the contribution that technology plays in economic growth and social development.

We continue to express our concern at the lack of improvement in South Africa's basic education for the majority of pupils. Exposure to and familiarity with ICTs for all learners is essential, in order to equip them to adapt the modern tools to their daily lives. Some laudable initiatives have appeared (such as the use of tablets in Gauteng schools) but they have yet to reach a sustained, critical mass for all grades of learner.

Trends in technology adoption place increasing emphasis on cloud, big data/ analytics, mobile devices, data security and "Internet of Things". In 2016, our survey once again identifies six leading priorities for managers of ICTs. Information Security has become the clear leader, followed by Network Infrastructure, Software as a Service/Cloud Computing, Database Development and Application Development. Because of its growing profile, we have separated Big Data/Internet of Things from the Business Intelligence/ Knowledge Management (BI/KM) category, and it now appears in seventh place. Had we left it combined with sixth place BI/KM, this category would have been a close second to the highest priority.

The MICT SETA used a new model in 2014 to estimate the number of employees in the Media, Advertising, Information and Communication Technologies sector. Previously, they have reported up to 200 000 such workers but the new model estimates that this is much greater at 495 000 and could be as many as 665 000. Similarly, the model increased the number of employers in the sector from approximately 4 500 to almost 20 000. We are not yet in a position to validate these numbers, since the source is a report that has not been revised in the intervening period, although the 2016 SSP update is due in Q3.

Until we can interrogate the model's predictions, we have not been able to improve our estimates of job opportunities.

## ICT Skills Environment

Many of the characteristics of the global ICT sector that were mentioned in our 2014 report (JCSE, 2014) remain true in 2016. What were then emerging technologies, such as cloud computing and the Internet of Things (IoT), have become mainstream and the issue of cybersecurity has risen to top-of-mind for many senior executives.

The structural pattern of the international ICT sector continues to shift away from the models of the 20<sup>th</sup> Century, as we see enormous value being created and lost in large and small ICT enterprises. Devices are being manufactured in Chinese factories for most brand names. The rapid obsolescence of successive models is showing signs of waning, as consumers see less reason for “upgrade” at such frequent intervals. Microsoft bought and disposed of the Nokia handsets business – and Nokia is supplying network hardware to China. Finland shed 15 000 jobs from the mobile phone business but cannot find the 7 000 software developers it needs (Fortune, 2016).

Technology developments have reached the stage of being referred to as “The Fourth Industrial Revolution” (World Economic Forum, 2016), signalling disruption of the business models and labour dynamics that heralded the 21<sup>st</sup> Century. The introduction and increased use of robotics, machine-to-machine communication, nanotechnology and 3D printing (just as examples) will inevitably reduce the demand for labour used for white-collar roles and repetitive tasks. There will be a converse increase in demand for the specialised skills that create, implement and maintain the new technologies, although predictions indicate the numbers of people required will be lower than the numbers of workers displaced.

A working paper from Empirica ([www.empirica.com](http://www.empirica.com)) at the end of 2015 suggested that the European market could absorb 756 000 ICT practitioners by 2020 if only sufficient supply was available. Of these, about one-third would be at management level, which implies the candidates will have to have experience and business skills as well as technical ability. Forbes reported in January 2016 that more than 209 000 cybersecurity jobs in the United States were unfilled and quoted Cisco as reporting the global figure at 1 million such job openings (rising as high as 1,5 million by 2020).

Cisco announced in June 2016 that it will invest \$10 million over two years in a scholarship programme to increase the pool of talent with critical cybersecurity proficiency. The scheme is aimed at diversifying the IT security industry by attracting veterans, women and young IT workers to enter the cybersecurity profession.

The message to decision- and policy-makers seems clear. There is an immediate unsatisfied need for skills in the ICT sector that is only going to get worse in the

medium and long term. Significant and sustained investment in education (at all levels) and training is required to have any hope of alleviating the skills gap. Workers who will be displaced by technology must be re-skilled and communities must instil a growing culture that “work” is not provided by “employers” but created by entrepreneurs and individuals who provide services and who derive value in a knowledge-based economy.

### The (South) African context

In previous editions of the Survey, we have referred to the optimism of potential growth in the African economy, the opportunity for investment in ICTs to fuel that growth and the challenges presented by the shortage of skills to design, implement and maintain the infrastructure and services required across the continent.

There continue to appear hopeful signs that the potential can and will be fulfilled. Significantly more international bandwidth is being installed, fibre networks are spreading in the main urban areas and the number of users of mobile devices continues to grow. More services are being delivered via those devices, including mobile money and transport sharing. IBM has opened its second Research Laboratory on the continent, at the Tshimologong Precinct in Braamfontein (Johannesburg). SAP has achieved remarkable success with its Africa Code Week events. Rwanda showed off its technology capacities during its hosting of the World Economic Forum Africa conference. Amazon, which has run a development centre in Cape Town since 2004, has opened an office in Johannesburg.

However, all is not well. Political turmoil continues to bedevil the lives of many Africans, often exacerbated by the effects of droughts and floods. South Africa is no longer the leading economy in Africa. The South African economy is showing worrying signs of sliding into recession, following a shrinkage of GDP by 1,2% in Q1 2016. Political uncertainty and poor leadership are negatively impacting many sectors – as an example, they have resulted in failure to implement vital projects in the ICT sector, such as the switch to digital terrestrial television services and the implementation of the national broadband network.

These two issues alone have delayed by years the opportunity to see tangible benefits from improved access to broadband services for learners, entrepreneurs, businesses and government departments.

A Canadian blogger (<http://www.itbusiness.ca/blog/the-it-skills-shortage-fact-or-myth/66407> accessed 2016/03/22) suggests that the skills gap is more of a perception than a reality, asserting that employers seek combinations of skills in an individual that do not exist and that individuals with the required skill sets will not work for the salaries offered. This resonates with our findings about the average number of task sets performed by South African practitioners (see “Multitasking” on page 34).

Our view is that the ICT skills gap in South Africa is a reality that continues to haunt the country's ability to lift its performance across all sectors to the level that will sustainably address the unacceptable burdens of poverty and unemployment.

### Closing the gap

The JCSE is one of many players on the field that is the South African ICT sector. Other players include government departments and agencies, commercial enterprises (local and international) and non-profit organisations and associations. A new player, supporting what is now an "old" objective, is the B-BBEE ICT Sector Council, monitoring and promoting the targets of the revised ICT Sector Codes of Good Practice.

The challenge is for the players to form a cohesive and coordinated team that clearly identifies the goals that need to be scored and the rules that frame the strategy and tactics used to overcome the opposition.

As our sporting codes understand only too well, having one or two excellent players in the side does not make for a winning team. There continue to be many excellent initiatives in the provision of better education and training for roles in the ICT world but, all too often, these appear as isolated "games" on a portion of the field, rather than a coordinated team effort under inspired leadership.

We believe that the Department of Telecommunications & Postal Services (DTPS) will launch the National ICT Policy in the coming months. We urge all stakeholders to take the opportunity to translate the policy into capacity-building by ensuring that coordinated skills development provides the building blocks for creating the dynamic, sustainable ICT sector that will support the growth of South Africa's economy and the improvement in the lives of all who live here.

## Survey Process

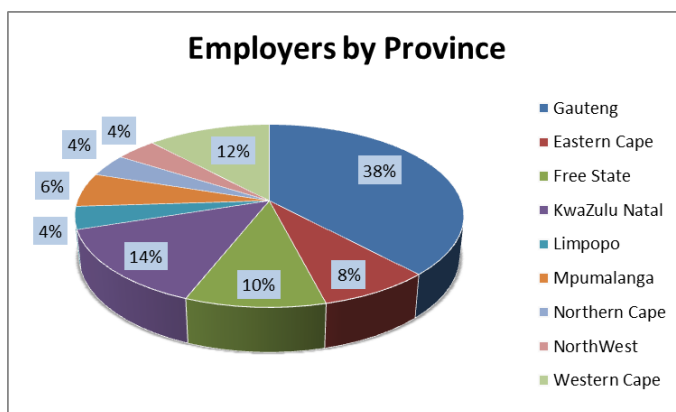
The Skills Survey continues to follow the process established in 2008. Its objective is to identify the most pressing skills needs from the corporate perspective, balanced with the view of current skills capacity of the practitioners and their intentions for future skills development. The questionnaire, devised by the JCSE, is in a consistent format to track trends and is published as an on-line survey, with additional responses gleaned from telephonic interviews. In 2016, as for the previous two surveys, we were assisted in this regard by Eduflex (a Cape Town company), who offered us the use of their Virtual Assessor™ survey engine and hosted the on-line access. Our thanks go to their team for great support.

As previously, we acknowledge the assistance of the IITPSA (Institute of Information Technology Professionals South Africa) and the Information Technology Association in bringing the survey to the attention of their members.

Any use of this Report (in whole or in part) must acknowledge “2016 JCSE ICT Skills Survey” as the source. Please direct any queries and requests to [research@jcse.org.za](mailto:research@jcse.org.za).

## Corporate Responses

In this section of the report, we analyse and comment on the responses received from employers, usually from the executives and managers responsible for ICT creation, implementation and support functions. Corporate response levels in 2016 are very similar to those experienced in the previous surveys.

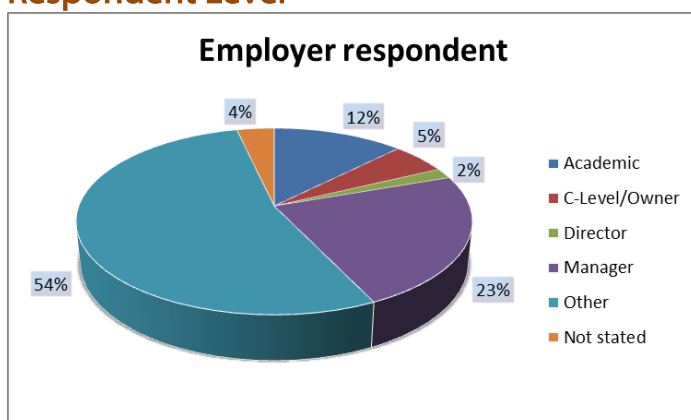


### Provinces

All nine Provinces were represented (2009 to 2014 – 9; 2008 – 5) and 38% (2014: 45%, 2012: 42%, 2011 – 34%, 2010: 40%) of the respondents were located in Gauteng, 12% (2014: 23%, 2012: 24%, 2011: 27%, 2010: 44%) in Western Cape and 14% (2014: 10%) in KwaZulu

Natal. In spite of a reduced level of response from the Western Cape, this pattern is a reasonable reflection of the geographical distribution of ICT enterprises in South Africa.

### Respondent Level



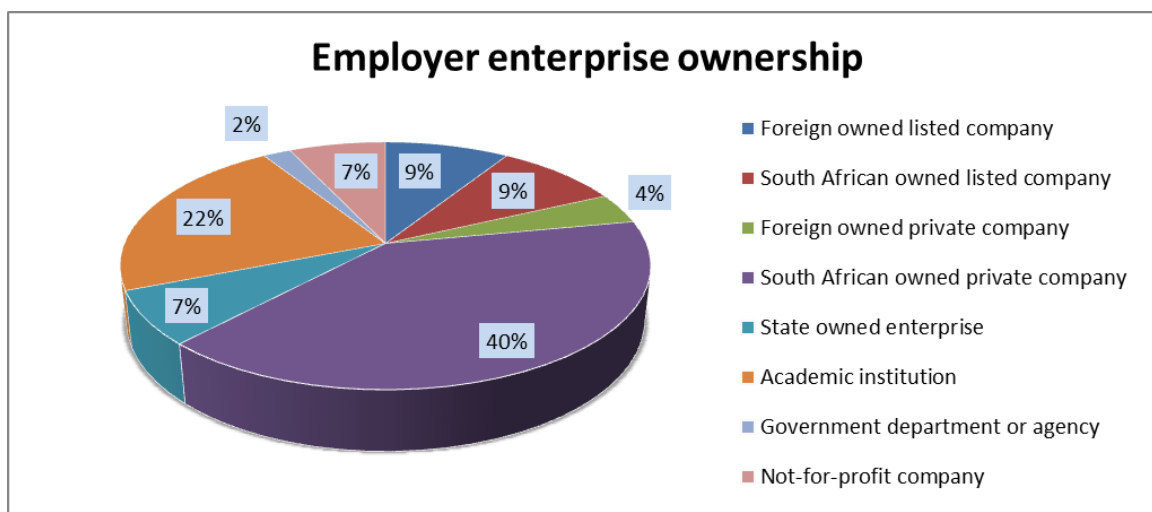
We may be suffering respondent fatigue at senior level, as only 7% of the respondents were C-level executives or Directors (2014 - 26%; 2012 – 27%; 2011 – 48%; 2010 – 34%; 2009 – 45%) and 23% were Managers (2014 - 38%; 2012 -40%; 2011 - 42%; 2010 – 30%; 2009 – 25%). 54% of respondents' job titles were not

clearly executive or management level. The overall number of respondents was greater than in 2014.

### Type of Enterprise

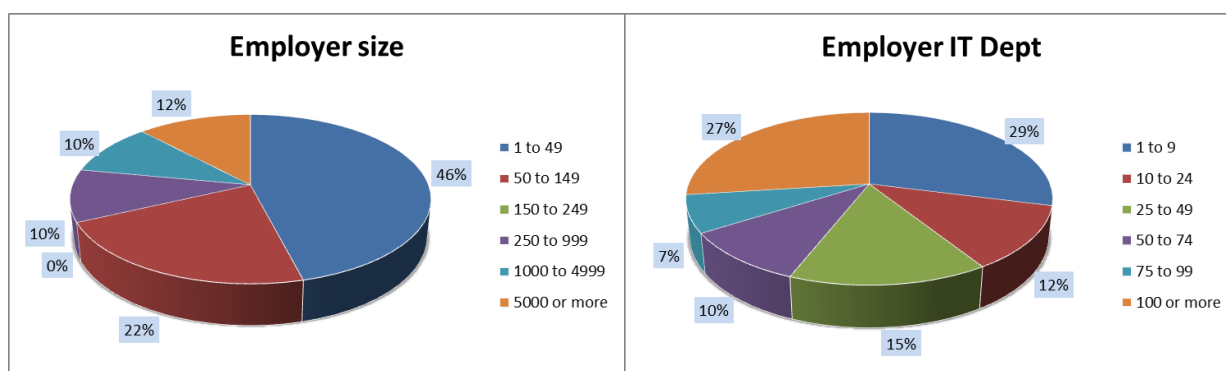
There was a lower proportion of South African privately-owned (non-listed) companies in this survey at 40% (2014 - 44%; 2012 - 56%; 2011 - 63%) and, also lower at 9% (2014 – 18%; 2012 -18%; 2011 - 19%; 2010 -13%), were South African listed companies. These lower percentages are largely due to an increase in responses from academic institutions in 2016.





### Size of Enterprise

46% of the enterprises have less than 50 employees (2014 – 41%; 2012 – 45%; 2011 - 44%; 2010 – 62%; 2009 – 50%; 2008 – 40%) and 22% have between 50 and 250 staff members (2014 – 32%; 2012 – 28%; 2011 - 16%; 2010 – 25%; 2008/9 - 20%).



29% of all respondents employ less than 10 people internally to supply ICT functions (2014 – 27%; 2012 – 31%; 2011 - 39%; 2010 – 45%; 2009 – 40%). This emphasises the need to pay attention to the effect of policies and incentives on small and medium enterprises, which continue to be in danger of “falling off the radar”.

This preponderance of small businesses in the sector weighs heavily on the need for more effective transformation as the latest B-BBEE Codes come into force following the establishment of the B-BBEE ICT Sector Council late in 2015. One of the priority focus areas is Enterprise and Supplier Development and the skills needs of these SMMEs must be met, if they are to become sustainable links in the procurement chain.

By way of comparison with the sector’s formal data source, we look to the MICT SETA’s published reports. It is disappointing that their web site has not published any new sectoral data since our last report in 2014. We hope the 2016 update to

the SSP will be published timeously. Therefore, we repeat the tables used previously.

#### The MICT Sector Size of Employers per Sub Sector

Sub-Sector	0-49	50-149	150+	Total
Advertising	2293	40	11	2344
Film and Electronic Media	2355	98	68	2521
Electronics	2107	40	48	2195
Information Technology	9144	299	143	9586
Telecommunications	1194	75	44	1313
Unknown	1951	17	10	1978
<b>Total</b>	<b>19044</b>	<b>569</b>	<b>324</b>	<b>19937</b>

Source: The MICT SETA OGS, 2014

#### Number of Levy-Contributing Companies<sup>1</sup>

Sub-sector	Levy Payers 2010/11	Levy Payers 2011/12	Levy Payers 2012/13	Levy Payers 2013/14	Growth in No Of Companies 2013/14
Advertising	356	436	453	526	16%
Film and Electronic Media	211	277	306	654	114%
Electronics	458	529	554	378	-32%
Information Technology	1 750	1 989	2128	2442	15%
Telecommunications	417	514	425	491	16%
<b>Grand Total</b>	<b>3 192</b>	<b>3 745</b>	<b>3 866</b>	<b>4491</b>	<b>16%</b>

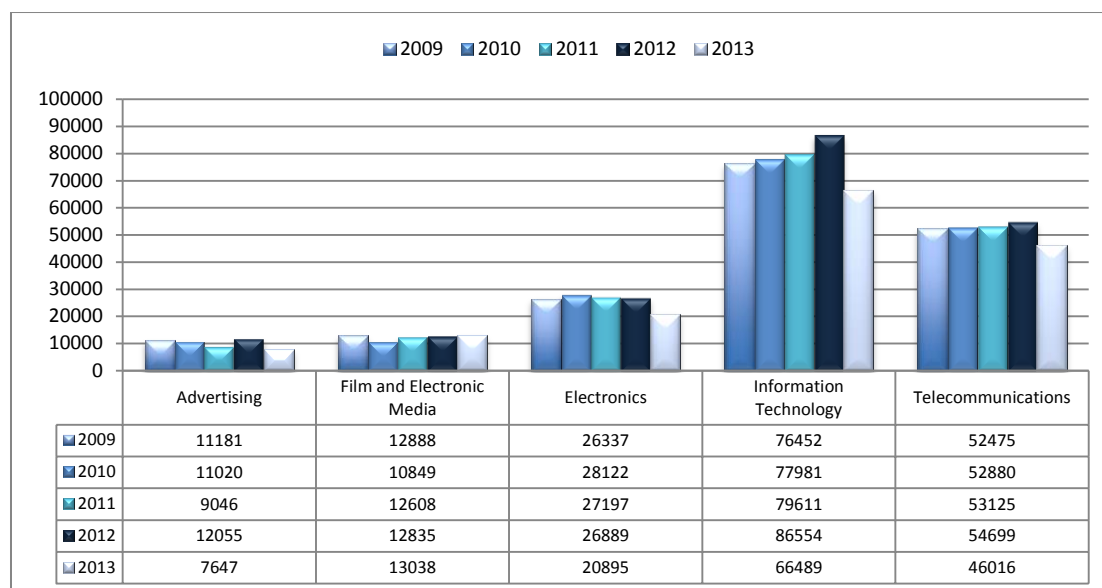
Source: The MICT SETA OGS, 2014

These tables (above), from the SSP (see “Sector Skills Plan correlation”, below), presented us with a challenge. The first shows an estimate of the total number of companies in the MICT sector, while the second reflects the number of levy paying employers. This was the first time we have seen the relationship between the total and the levy-paying companies in the MICT SETA Sector Skills Plan (SSP).

The 2014 SSP reports an estimated total of 153 880 employees in the levy-paying portion of the MICT sector, down from 162 579 in 2013 and 193 032 in 2012 (181 157 in 2011).

<sup>1</sup> Some organisations were unallocated to a sub-sector during analysis and were excluded

## Number of Employees by Sub-sector, 2009 to 2013



Source: The MICT SETA OGS

We do note that only 6% of the increased base of employers is submitting a Workplace Skills Plan, which seems to us to be a very small proportion, even allowing for the preponderance of small enterprises in the total.

The MICT SETA SSP (MICT SETA, 2014) included the following comments:

*“For smaller employers, it is assumed that those employers not submitting WSPs are likely to be employing significantly fewer employees than those submitting WSPs. For medium sized employers, it is assumed that they employ almost a third less than those submitting WSPs. For larger employers it is assumed that they employ almost the same. These assumptions were further modelled per sub-sector and the results there reflected a total of about 439,756 employees in the sector.*

*“The following table provides an estimation of the potential total number of employees in the sector based on the modelling assumptions mentioned above.*

**Table 1: Modelling output of the number of employees in the sector**

Sub-sector	0-49	150+	50-149	Total
Advertising	3074	3404	2754	9232
Electronic Media and Film	1905	2989	17728	22621
Electronics	4891	14306	34629	53827
Information Technology	19099	39480	115995	174575
Telecommunications	4567	10661	141519	156747
Unknown	1691	892	20172	22755
<b>Grand Total</b>	<b>35226</b>	<b>71732</b>	<b>332797</b>	<b>439756</b>

Source: The MICT SETA OGS, 2013

*“A similar model was built with the underlying assumption that given the variety of employers submitting WSPs, those not submitting are of equivalence in terms of size. The model based on that assumption reflected a total employment of over 665,000 for the MICT sector.”*

As commented in 2014, this was the first time we have seen the use of this model by the MICT SETA, which significantly increases the base number of employees assumed to be in the sector. This would negate the conventional wisdom that there are as many “ICT” practitioners employed in non-MICT sector companies as there are indicated above. The proportion would probably reduce to one-third of the total. We will comment on this further, when we are able to interrogate the MICT SETA model to establish what proportion of the employees are engaged in what we would recognise as ICT-related occupations.

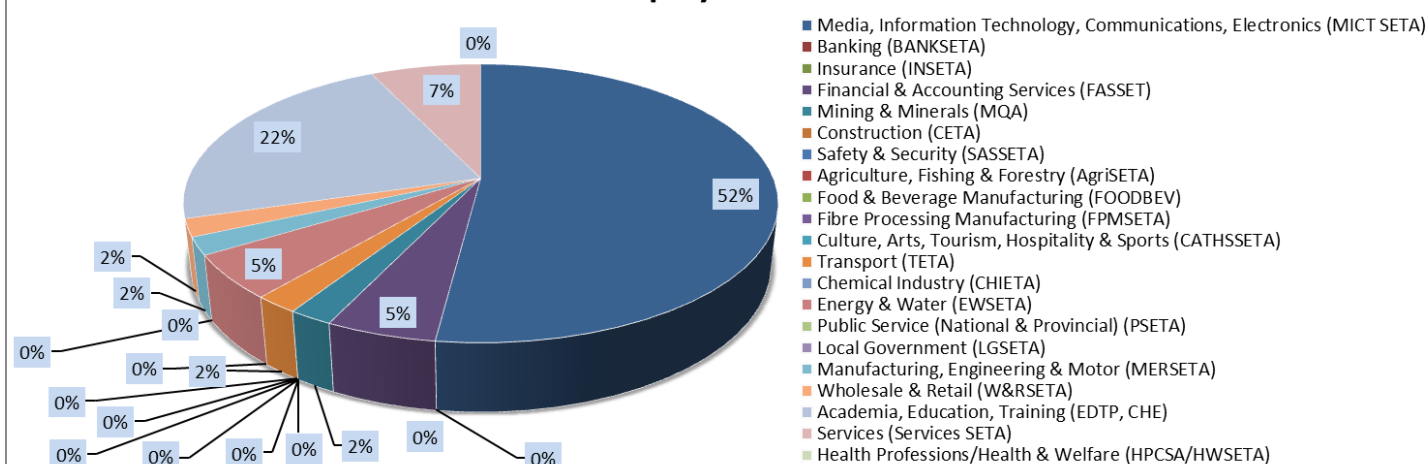
## Sectors

Our 2016 survey elicited responses from employers in half of the sectors represented by SETAs. This is a little lower than in some previous surveys but not significantly so. This was due to several factors, including:

- Most small and many medium enterprises use COTS (commercial off the shelf) technology products and services, requiring no internal dedicated support resources
- Many small and some medium companies who do need technical support will engage third party service providers as and when required
- Some managers are not willing to respond to a voluntary survey from another sector in addition to their statutory reporting for their own sector

Of the responding enterprises, 52% were operating in the MICT (including electronics) sector (2014 - 56%; 2012 - 54%; 2011 - 53%; 2010 - 67%; 2009 - 57%); none (2014 - 10%) in Insurance; 22% (2014 - 6%) in the Education/Training cluster; 5% in Energy & Water (2014 - none); none (2014 - 5%) in Banking and 5% (2014 - 3%) in Financial Services. The remaining enterprises were drawn from the Manufacturing/ Engineering, Mining, Retail/Wholesale, Safety & Security, Transport and other Services sectors.

**Employer sectors**



85% (2014 - 82%) of the responding enterprises have been in business for more than 5 years and only 5% (2014 - 2%) existing for less than 2 years. This reinforces the suggestion that a high proportion of the small businesses added to the MICT SETA base since 2012 remain “below the radar” in terms of participation in this Survey.

## Sector Skills Plan Correlation

### MICT SETA

The JCSE ICT Skills Survey samples the views of employers and practitioners in the ICT field with the intention of informing decisions about skills development, particularly but not exclusively in respect of tasks related to software creation, implementation and support. This work is seen as complementary to the statutory data presented in the Sector Skills Plan (SSP) (MICT SETA, 2014) produced annually by the Media, Information & Communications Technologies Sector Education & Training Authority (MICT SETA).

In examining the relationship between the two, it is important to understand the difference between them. The corporate data gathered by the JCSE is supplied voluntarily by executives and managers in response to invitations to participate published in the media, direct approaches and through various institutions and associations. The “ICT operations” that they manage will exist within enterprises from all economic sectors, as well as from those that are seen as ICT companies. However, it is only the latter group that falls within the ambit of the MICT SETA – its levy payers. The JCSE Survey focuses on ICT practitioners in all sectors, while the MICT SETA data includes all employees in MICT levy-paying companies.

The different rationales for the two documents (this Survey and the SSP) lead to different views of what should be the same phenomenon. The levy payers’ reports of hiring reflect the reality of filling vacancies, while the respondents to the Survey tend to indicate what they want, rather than what they get. So, while the 2014 SSP reflects a recent decline in employment numbers after a period of slow growth, the Survey traditionally reports a much higher demand – demand that would be satisfied if supply at the right price was available and not constrained by external factors. This demand scenario is also reflected in the regular Career Junction Index (CJI) reports, available online from <https://www.careerjunction.co.za/downloadindustrytrends>. The May 2016 edition of the CJI indicates that Information Technology is the industry highest in the demand table (Career Junction, 2016), where vacancy levels have been increasing for 6 months. The same report also shows increasing vacancies in the Telecommunications industry over the period March-May 2016.

Readers may refer to the detail in the MICT SETA SSP (op. cit.) but we previously noted the following scarce skills numbers for the period 2014-2016, summarised from Pages 92-104 (the pragmatic scenarios) from that report:

Sub-sector	Prev*	2014	2015	2016
• Advertising sub-sector	140	686	658	424
• Electronic Media & Film sub-sector	50	9 928	10 006	6 831**
• Electronics sub-sector	530	1 693	1 125	2 272
• Information Technology sub-sector	3 200	7 972	7 136	8 671
• Telecommunications sub-sector	540	1 073	970	1 460

\*The “Previous” column contains the figures taken from the 2012 table in the MICT SETA SSP. We believe this represented only the data from levy-payers, whereas the latest numbers in the other columns include the additional numbers estimated according to the new model adopted by MICT SETA.

\*\*We note that more than half of these very high numbers are “Multimedia designers” and “Multimedia specialists”. These numbers were generated by the modelling algorithm and have since proved to be incorrect. Given that the MICT SETA model suggests total employees in the EM&F sub-sector are less than 23 000, it suggests a phenomenal growth in multimedia activities, requiring more than 13 000 new specialised skilled employees over three years.

We are not able to comment on the significant disparity between the “previous” and the “new” numbers from MICT SETA, which arises from the use of the model data instead of the WSP data.

We await the publication of the 2016 SSP update by MICT SETA, in order to re-examine their estimates of the number of employees in the various sub-sectors. The increased numbers for scarce skills (ignoring the EM&F sub-sector) need to be seen in the context of the considerably larger “sector” numbers reported by MICT SETA (see the section on Size of Enterprise, above). In 2012, the JCSE ICT Skills Survey reported a vacancy rate of between 10% and 15%, equating to 20 000 to 30 000 opportunities. In 2014, given the new, larger base from the MICT SETA model, we scaled that up to around 40 000 vacancies, but at a lower vacancy rate of 7%. However, we have not yet been able to test this against updated data from the MICT SETA. We also believe that the stagnant South African economy and the lengthy delays in implementing government projects (e.g. SA Connect, digital migration) are severely constraining opportunities in the ICT sector, so we are hesitant to repeat the 2014 extrapolation.

The JCSE supports the comment on P.62 of the SSP:

*The ICT industry cannot afford to wait for local, regional, or national government to provide solutions to the skills crisis. Tertiary education institutions do not possess the required responsiveness. The ICT profession will have to own, and solve, the crisis through an ecosystem of scalable initiatives. A culture of “learn from at least one other, and train twice as many” is required.*

## Other SETAs

Once again, we have reviewed each SETA's SSP to establish any references to skills relevant to the ICT job roles. Not all SETAs publish updates to their SSPs with any regularity and several fail to make the latest edition available through their web sites. This exacerbates the paucity of comprehensive and current data needed by skills development policy makers and talent managers across the board.

### *AgriSETA*

The 2011-2016 SSP update (AgriSETA, 2015) has no specific mention of ICT roles, beyond a note that Information Technology is increasing in importance for commercial farmers (P.60).

### *BankSETA*

Banks are one of the larger employers of ICT skills, outside of the MICT sector. The Banking Sector Skills Plan 2013-2014 (BankSETA, 2013) has the following comment under the heading, "Technological issues":

*The banking industry has recently witnessed a number of radical technological innovations that continuously challenge the skills landscape. Technology is one of the enablers of innovation and the big four banks are investing R3,5bn in technology in the medium term. Mobile banking, in particular, is revolutionising the practice of banking, bringing in delivery cost efficiencies, ushering in branchless banking (predicted to drop by 21% from 2 877 currently to 2 285 in 2016) and attracting massive customer uptake by those with a low income. Electronic channels of banking have yielded handsome returns for South African banks who want to exploit this strategy as they expand into Africa. Technology has facilitated the rationalisation of physical banks and has provided vast opportunities for the sector, especially in the area of service delivery, it has also created new competitors and threats.*

*At the retail level, the major shifts have been the move to mobile banking and the activities focused on improving financial services directed at the low-income groups. Africa has one of the highest mobile phone penetration rates, which presents a big and lucrative opportunity to offer mobile banking services. These activities include improvements in access to financial services or payment mechanisms by the unbanked and the use of social media for marketing and product development.*

*Mobile banking presents a unique opportunity to extend banking to people in remote regions and rural areas however the cost of the technology could undermine this imperative. According to stakeholders it is important to engage with mobile operators to reduce the cost of access to mobile technology. However, the challenge for mobile banking is the legislative hurdle that still needs to be balanced to allow for a foolproof system of money transfer before this transformed way of banking can*

grow. Although technological advances facilitated more efficient services and products, banks now have complicated risks through the convergence of crime and system applications.

Many activities in investment banks are highly automated and computerised. This level of automation of operations continues to increase across trading and transaction systems. In addition, many clients demand tools to enable them to trade and transact electronically. Higher transaction volumes, the global movement of funds and the advent of seamless integration make automation a necessity to reduce operational risks and assist in the reconciliation of large volumes and values of transactions.

Retail banks have become heavily reliant on social media to determine trends and customer needs, run advertising campaigns, gather complaints and receive feedback from consumers. However, social media has a reputational impact, and banks have centralised the function to specific divisions that manage social media comments.

Retail banks have also become very innovative and have focused on streamlining systems to provide clients with seamless and speedy service. This includes teller cash recycle units, which enables, among others, the reconciliation of deposits and recordkeeping systems. ATM technology has saved 'face time with tellers and consultants' and have improved access to many poor South Africans living in remote and rural areas.

The consumer is highly dynamic and young and is looking for speed, feedback and decision-making in real time and the ability to provide service in a convenient manner. This necessitates a digital process. In this regard, stakeholders stress that digital migration (enables competition) should be undertaken in a customer centric manner.

### **Implications for skills**

- On the issue of skills supply and demand, stakeholders concluded that due to the convergence of technologies, there is an increased need for 21st-century ICT skills as a generic driver of change.
- Because of integration across business units, staff needs to have an understanding of technology across disciplines and different business units. Investing in upskilling initiatives on ICT skills and product knowledge is therefore critical.
- Technology is driving innovation in product development and system usage, resulting in vigorous competitiveness, which drives an approach termed 'cross-selling', focusing on providing a comprehensive solution to a client. The solution entails client profiling and offering a range of products commensurate with the profile.



- *Entrants into the banking market have to understand technology and the shift in the way of doing business in the sector. As a result of technology, most scarce skills are not directly related to banking. These include computer programmers, process engineers and generally people in the ICT industry.*

- *This paradigm shift to a digital dispensation requires the following set of skills: sales staff that understands technology and relationship management and process engineers that understand controls should possess banking experience and customer relations skills.*

We make no apology for quoting the entire section because the banking sector is a major employer of ICT skills and this represents significant recognition of the contribution of those skills to the enterprises within the sector. This recognition is further emphasised under the heading of “Drivers for change” in the same report (P.45):

*Technology is still a major driver of change in this industry. Mobile and internet banking, in particular, has significantly reduced the cost of service delivery by IB service providers, ushering in the era of branchless banking, contributing to seamless and efficient service, and simultaneously exposing the industry to the risks of electronic crime and fraud. Not only did technology change the landscape of service and financial access, but it has also changed the skills set of a ‘banking employee’, who requires generic complex ICT skills as entry requirements to the sector.*

Although no numbers are projected in the report, the following are identified as scarce skills in the retail and investment banking sub-sectors:

- Digital Designers
- Systems Engineers (process engineers, systems architects, IT System Developers)
- Forensic/Fraud/Security Specialists
- Business Analyst
- Digital Forensic Analyst/Investigator
- Mobile and Digital Specialist
- Systems Integrator/Systems Architecture

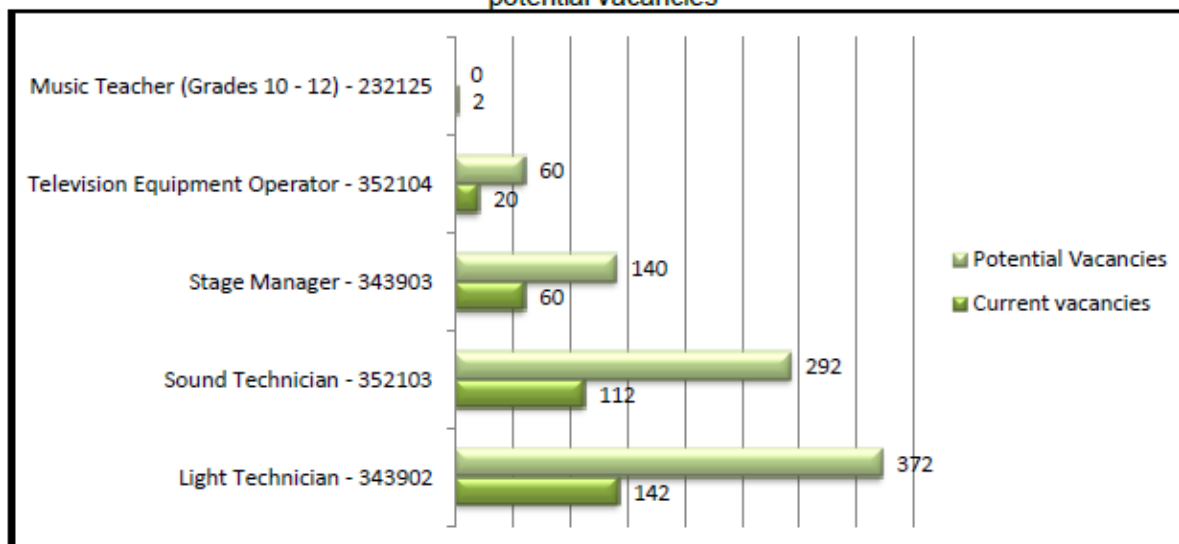
In addition, the following are included in the table of critical skills:

- Network skills
- IT governance
- ERP technical knowledge
- Database planning development
- IT risk
- Network support
- Specific systems training
- IT operations

### **CATHSSETA**

The 2014-2017 update to the SSP (CATHSSETA, 2015) does not mention ICT skills, although there is a possible overlap into the roles of TV equipment operators, sound and light technicians with the Electronic Media & Film sub-sector of the MICT SETA (see graph below).

Figure 27: Top 5 vacancies in the Arts, Culture and Heritage sub-sector in terms of current and potential vacancies



Source: CATHSSETA SMS 2014

### **CHIETA**

The Chemical Industries SETA SSP has no specific mention of ICT skills.

### **EWSETA**

The Energy & Water SETA SSP for 2011-2016 (EWSETA, 2014) includes a number of ICT roles in its Scarce Skills list for the Electricity sub-sector for 2013 (P.76):

- Computer network & systems engineer (252301)
- Software developer (251201)
- Programmer analyst (251202)
- Technical ICT support services manager (252902)
- ICT Project manager (133102)
- IT manager (133105)

The Water sub-sector Scarce Skills list includes:

- Electronics engineer (215201)
- Electronics engineering technologist (215202)

There is no indication of the numbers involved.

### **EDTP SETA**

From the 2011-2016 SSP (EDTP SETA, 2013, pp. 156-162), we extracted the following information. Workplace Skills Plans from schools have indicated that (among others) Maths, Physical Science and ICT teachers are in the Immediate

Scarce Skills category and that Information Computer Technology and IT Training are in the Immediate Critical Skills category. The FET colleges show IT Lecturers and Electronic Technicians in the Scarce Skills group.

Universities indicate a need for 300 Computer/Software Specialists and 200 Systems/Business Intelligence Analysts. At the Universities of Technology, the focus is on Information Security and Network Security, with 40 Critical Skills opportunities for each of database administrators and enterprise systems engineers.

### **FASSET**

In the 2014 update (FASSET, 2014), under the heading “Developments in Technology”, FASSET states: *“Accountants need to stay abreast of changing technology and the associated business risks. They need to advise their clients on how to manage the risks and apply new skills to use technology effectively.*

*Data security is becoming a crucial issue and all businesses have to introduce additional measures and controls to safeguard data security and to ensure statutory compliance with the manner in which information is collected, stored, used and destroyed. This drives the need for information technology professionals and technicians.” ...*

*“Many of the professional vacancies that organisations had difficulties in filling require a combination of tertiary (often postgraduate) qualifications, professional registration and work-related skills.*

*Some of these vacancies necessitate specialised knowledge in fields other than finance e.g. law, information technology and engineering.”*

FASSET lists the number of people needed for occupations where skills shortages are experienced (for the years 2013/14 and 2014/15). Relevant to ICTs, the details are:

	<b>13/14</b>	<b>14/15</b>
• 251101 ICT Systems Analyst	26	16
• 251201 Software Developer	42	40
• 251202 Programmer Analyst	11	11
• 251203 Developer Programmer	70	44
• 251401 Applications Programmer	30	26
• 252101 Database Designer and Administrator	58	50

### **FoodBev SETA**

There is no change to the information shown in the 2012 report, indicating the need for ICT Project Managers (25), ICT Support Engineers (85) and Systems Analysts (315) over the five year period to 2016.

### ***FP&M SETA***

In the 2015 update to the SSP (FP&M SETA, 2015), there is mention of Information technology expertise in the top ten critical skills for the sector.

There was no quantification of the relevant skills needs in the update.

### ***HWSETA***

There is no mention of ICT skills in the 2014-2015 update to the SSP for the period 2015-2020, beyond occasional reference to the unspecified skills needed for the national health information systems.

### ***INSETA***

The INSETA SSP update in 2015 (INSETA, 2015) indicates that the role of ICT Systems Analyst occurs both in their 2014-2015 and 2016-2017 Inseta (sic) sector scarce skills lists.

More detail comes in the scarce skills lists:

- 251203 Developer Programmer Level 01 to Level 07 Need in 2014/15= 34
- 251203 Developer Programmer Level 01 to Level 07 Need in 2015/16= 25
- 251101 ICT Systems Analyst Level 03 to Level 08 Need in 2014/15= 25
- 251203 Developer Programmer Level 01 to Level 07 Need in 2016/17= 28
- 251101 ICT Systems Analyst Level 03 to Level 08 Need in 2015/16= 24

The following references to ICT skills are made under the “critical skills” section:

- 3+ years experience in Java software plus experience in a corporate of more than 5000 employees
- 10+ years experience in multiple IT programs

### ***LGSETA***

The LG SETA published a 2014 update to its SSP for 2011-2016 (LG SETA, 2014).

Included in the absolute scarce skills list for 2013/14 (P.179) is 54 Information Technology Managers. Included in Relative scarce skills (P.180) are 136 ICT Specialists and 65 Systems Administrators.

### ***MERSETA***

The current merSETA SSP update (merSETA, 2015) has little reference to ICT skills, beyond passing mention in generic terms.

### ***PSETA***

We are unable to find a more recent SSP for this sector. The PSETA SSP (PSETA, 2011) which we accessed in 2014 does list a number of occupational categories under the list of scarce skills, with an indication of the total needed. They include the following, relevant to ICT skills:

- Information & Communication Technology Managers 303
- ICT Trainers 6 006

### **SASSETA**

The SASSETA was placed under administration in 2015 and has not published an update to the SSP since the 2013 edition.

The SASSETA 2013-14 update (SASSETA, 2013) to the SSP lists the following as scarce and critical skills:

#### **Scarce skills:**

*Defence fraternity: Cyber Crime Investigators*

*Justice fraternity: IT Security Specialist*

*Policing fraternity: Cyber Crime Investigators*

*State Security fraternity: Network Specialist, Information Security*

*Organised labour: Information Communication Technology Specialists*

*NGOs: IT Specialist*

#### **Critical skills:**

*Corrections fraternity: IT (system developer, business analyst and Information Security)*

*Legal fraternity: IT Skills/ Cyber Law*

*Policing fraternity: Computer skills, IT Skills*

*State Security fraternity: ICT Training Skills, Cyber Crime Investigation Skills, Business Analyst Skills*

*Organised labour: IT Specialist*

There is no quantification of the needs.

### **Services SETA**

The 2014-15 update for the Services SETA SSP (Services SETA, 2014) refers to the European Commission estimate of 900 000 vacancies for ICT professionals in that region by 2015 but there is very limited reference to ICT skills in the sector needs.

Specifically, there is a need for 558 ICT Systems Coordinators in 2014/15 (P.57) (scarce skills) and 6 231 assorted line/operation managers for technology/ computers/gadgets (P.66) (critical skills).

### **TETA**

The Transport sector's 2014/15 SSP update (TETA, 2014) mentions the following scarce skills (with OFO codes), without quantification:

- Electronics Engineers 215201
- Aviation Software Engineer 251201
- Technical (ICT) Support Services Manager 252902
- Quality Systems Manager IT/Manager 121908

- **Electronics engineer (railway signalling; testing & commissioning) 215201**

TETA also mentions IT / information technology in the critical skills tables, without further qualification.

### **W&R SETA**

The W&R SETA's SSP for 2015/2016 (W&R SETA, 2015) includes the following paragraphs (P.28/9):

*In order for the Wholesale and Retail Sector to become efficient, effective and economical enough to maximise profit margins and customer experience, technological change is critical. The retail industry is in the midst of a consumer revolution. The key drivers of this revolution are the rapid adoption of mobile devices, digital media and tablets equipped with shopping applications. Wholesalers and retailers risk potential growth and development if they do not stay abreast of technology.*

*The type, level and mix of skills required by multi-channel retailing presents a challenge to the sector. The W&R SETA needs to focus skills development on initiatives such as learnerships that include new technologies and training in digital media, social networking and marketing. The skills development emphasis should include developing of talent pipelines to harness customer strategies.*

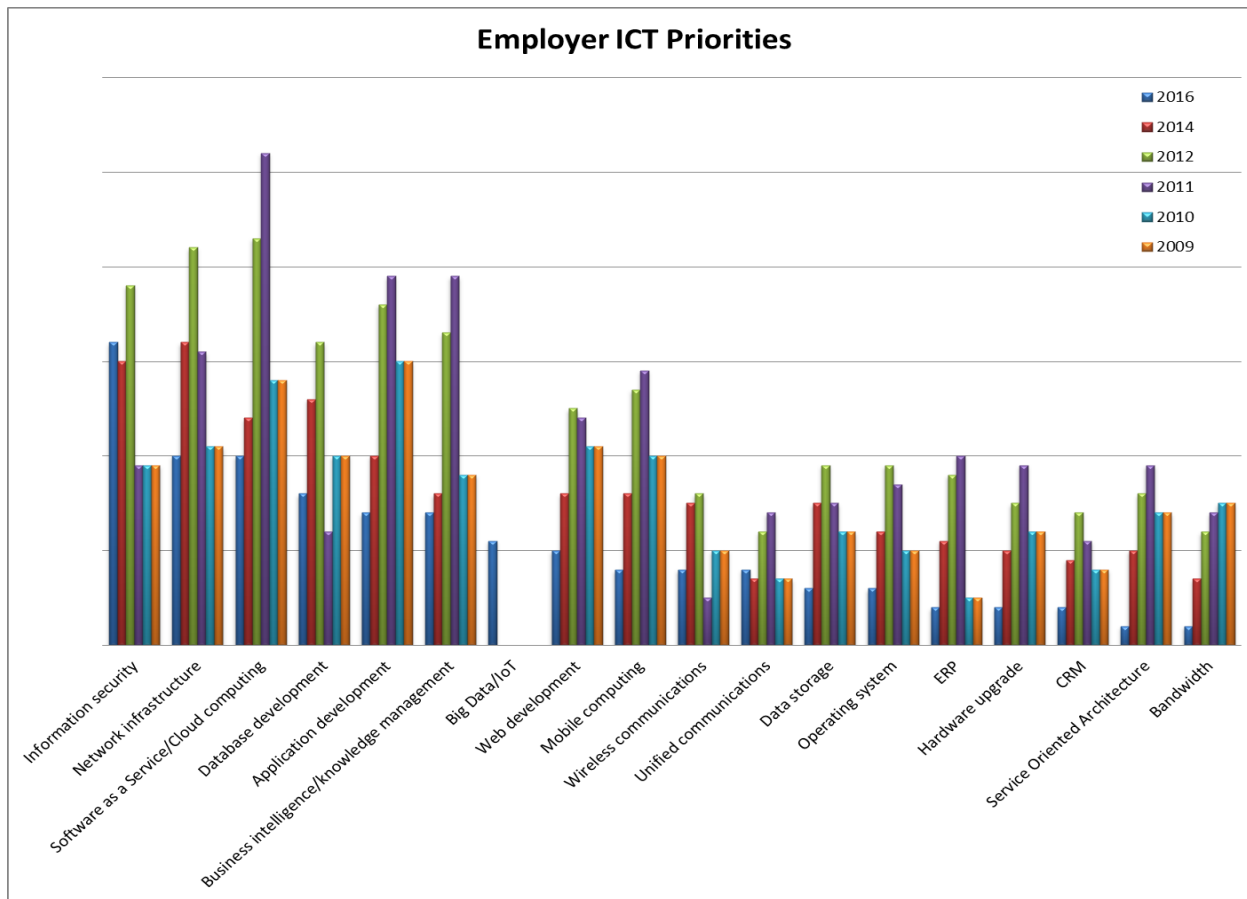
The SSP (P.47) also states that there are no OFO codes for what it identifies as scarce occupations for the e-Retail sector – specifically: e-Commerce Planner, e-Commerce Manager, Web Integrator, e-Retail Manager, e-Retail Assistant and Call Centre Agent. (NB. We believe that OFO Codes exist for the Web and Call Centre occupations.)

W&R SETA stakeholders also commented that “Software developers are no longer just technical people – they now need to be both technical- and business-minded. This combination is difficult to find, and when they are found they are very expensive.” (P.50)

### **The ICT Sector**

Although it is commonly recognised that ICTs are the tools that enable improved performance in most fields of human endeavour and that growth in the use of ICTs is critical to building sustainable economies and social cohesion, we continue to suffer from a lack of current, coordinated data about the so-called sector in South Africa.

This lack leads to fragmented policy initiatives based on flimsy and obsolete information, the effectiveness of which cannot be properly measured. The JCSE urges all the stakeholders to recognise their dependence on ICTs and to integrate their activities, horizontally and vertically, to create a sound, holistic foundational view of the attributes and dynamics of the country's ICT enterprises and practitioners.



## ICT Priorities

Our respondents have once again shown a more muted view of their top ICT priorities, as indicated by the generally lower values of the 2016 (blue) and 2014 (red) “bars” in the graph. **Information Security** has moved to the head of the pack, which is unsurprising, given the number of “hacks” and “leaks” that have been reported in recent times.

The 2008 Survey identified the top 6 priorities overall, based on the selection of their own top 3 by each respondent. That analysis showed **Business Intelligence/ Knowledge Management** to be the top-ranked priority, followed by **Application Development** and **Software as a Service**. These were supported by Service Oriented Architecture, Web Development and Mobile Computing.

In 2009, the data was revised to include all identified priorities, and the chart showed that **Application Development** was that year’s top priority, with **Business Intelligence/Knowledge Management** being pushed into third place by the entry of **Network Infrastructure** in second place. CRM, Information Security and the Operating System were the supporting cast, although there was little difference between many of these “other” priorities.

We thought that the emphasis on Network Infrastructure in 2009 reflected the realisation that effective broadband access is essential if enterprises are to benefit from the technology innovations becoming available.

The **2010** survey was revised to indicate what each respondent thought was their 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> priority for the coming year. **Application Development** retained its top spot for the second year, with **Web Development**, **Software as a Service** and **Business Intelligence/ Knowledge Management** just surfacing above several other contenders for the next most significant issues. We observed that the spread of interest among the second and third tiers of “priorities” indicated the wide range of challenges facing enterprise decision-makers who need to keep their information systems capable of delivering services that support the changing business needs.

We also commented that if we compare the changes over the three year period, we could see a significant drop in the importance of **Business Intelligence/ Knowledge Management** and a significant increase in the interest in **Web Development**. We felt the lowered interest in **Software as a Service** (SaaS) in 2009 seemed to have been an anomaly and this opinion was confirmed by the 2011/12 and 2014 results.

In **2011**, we showed the Priority Progression picture over the four years of the Survey. We could see that **Software as a Service** was definitely high on the agenda, albeit as a second priority, while **Application Development** was still the firm favourite as first priority. Managers continued to face a wide range of challenges in applying technology to support business needs and it is notable that **Mobile Computing** emerged from the “also ran” ranks in 2011. The popularity of tablet computers and “smart” phones was cementing the demand for the adaptation and implementation of systems that offer safe, secure and reliable facilities for mobile workers.

The **2012 results** follow a similar pattern to that established in 2011, with **Software as a Service/Cloud Computing** now leading the field. **Network Infrastructure** and **Information Security** move into second and third place respectively, pushing **Application Development** into fourth slot. However, the differences between these rankings are not great and we can add **Business Intelligence/Knowledge Management** and **Database Development** to complete the Big Six of priority issues in the year ahead.

In **2014**, the Big Six becomes the Big Five. The ranking of the top five priority areas remains unchanged from the previous survey – in descending order, they are **Software as a Service/Cloud Computing**, **Network Infrastructure**, **Information Security**, **Application Development** and **Business Intelligence/ Knowledge Management** (which now includes Big Data/Analytics). It is almost impossible to separate the next five areas of priority attention – they are:

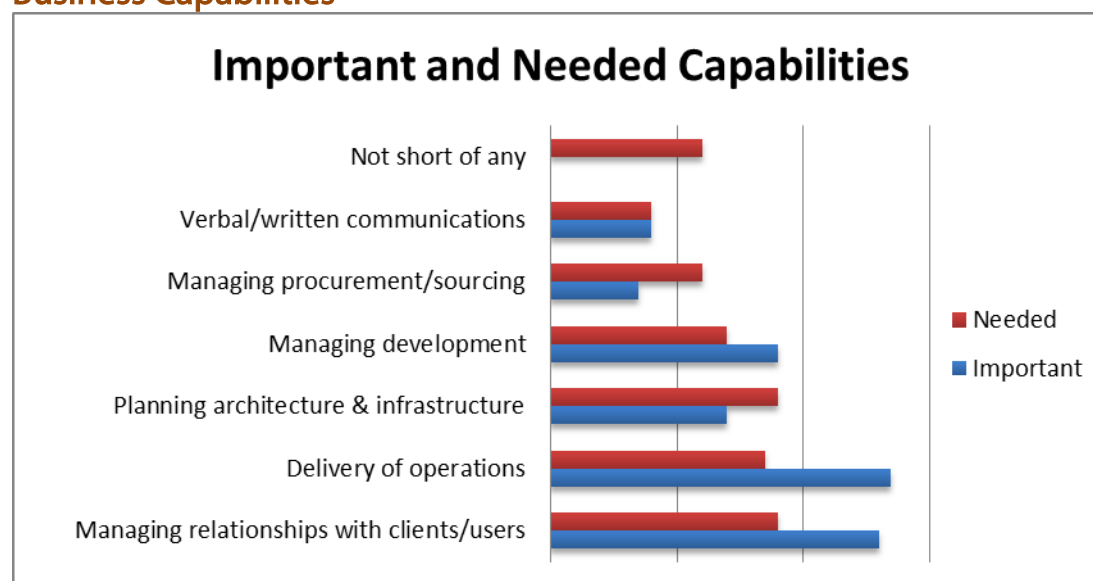


Database Development, Mobile Computing, Web Development, Data Storage and Operating System.

In **2016**, we can once again identify six leading priorities. **Information Security** has become the clear leader, followed by **Network Infrastructure**, **Software as a Service/Cloud Computing**, **Database Development** and **Application Development**. Because of its growing profile, we have separated **Big Data/Internet of Things** from the **BI/KM** category, and it now appears in seventh place. Had we left it combined with sixth place **Business Intelligence/Knowledge Management**, this category would have been a close second to the highest priority.

Overall, the Survey results continue to support the view that enterprises have to utilise a growing range of technologies to meet their business needs. They must take advantage of the opportunities arising from the innovation in business and personal technologies, whilst recognising the increasing threats presented on the cybersecurity front, otherwise they will lose competitiveness.

## Business Capabilities



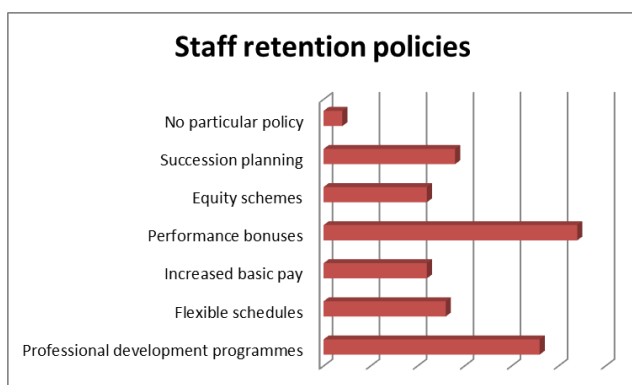
This chart shows that our respondents continue to indicate that the top capabilities that will contribute to success for their businesses are Managing Relationships (with clients/users) and Delivery of Operations to those same stakeholders. In response to “Which do you need most?” the sought-after capability is planning architecture and infrastructure, now tied with managing relationships and closely followed by delivery of operations.

## Staff Dynamics

Trends in skills demand are not easily identified, due to the fragmented and incomplete data received from employers in and outside of the MICT sectors. There is no doubt that the stagnant state of the South African economy (the latest growth rate forecast is down to less than 1%) does not encourage hiring of new

employees, particularly those with little or no experience. The successful innovations in technology solutions to drive efficiency ensure continued demand for many of the skills relevant to the design, creation and implementation of those solutions.

JCSE would like to corroborate this poor growth with the information in the MICT SETA SSP, which reports the actual staff numbers from its levy payers who submit annual returns. Under the heading “Size of Enterprise” (above) we indicated that the MICT SETA reported a significant decrease in employees of around 40 000 (25%) between 2012 and 2014. The only comment in the SSP indicates this may be due to differing numbers of WSPs submitted, rather than linking it to the state of the economy.



The pattern of staff retention policies in 2016 is similar to previous years. Performance bonuses and professional development programmes continue to lead the preferences, but succession planning has taken over from increased basic pay as the third policy. Comments from respondents

reinforce the importance of information security, indicating this as a particularly hard field of skill to retain. Programmers are also identified as being difficult to hold on to.

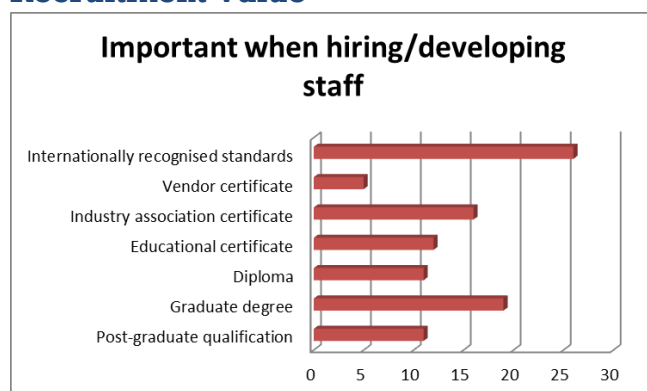
There continues to be a mix of line managers and senior executives holding the responsibility for training, although there is a small increase in the presence of HR executives in this role. JCSE suggests that line managers should be able to identify training needs among their teams but the responsibility for executing the training programmes should rest with a manager whose role is focused on this activity. Sourcing appropriate interventions and monitoring their effectiveness is a distraction for operational managers and should be “outsourced” to the HR function.

The percentage of employers recruiting overseas in 2016 has jumped to 26%, after showing a decline to 12% in 2014 (from 18% in 2012). The few who indicated their sources showed preference for African countries. In previous Surveys, the source has more often been India or Eastern Europe. There is a steady stream of applications for “critical skills visas” via the South African embassies and consulates, as the country remains a desirable destination for ICT practitioners.

The increase in respondents recruiting overseas may reflect a worsening lack of locally available candidates with experience, combined with a growing awareness of the “critical skills visa” as a key to medium term residence in South Africa.

## Corporate Preferences

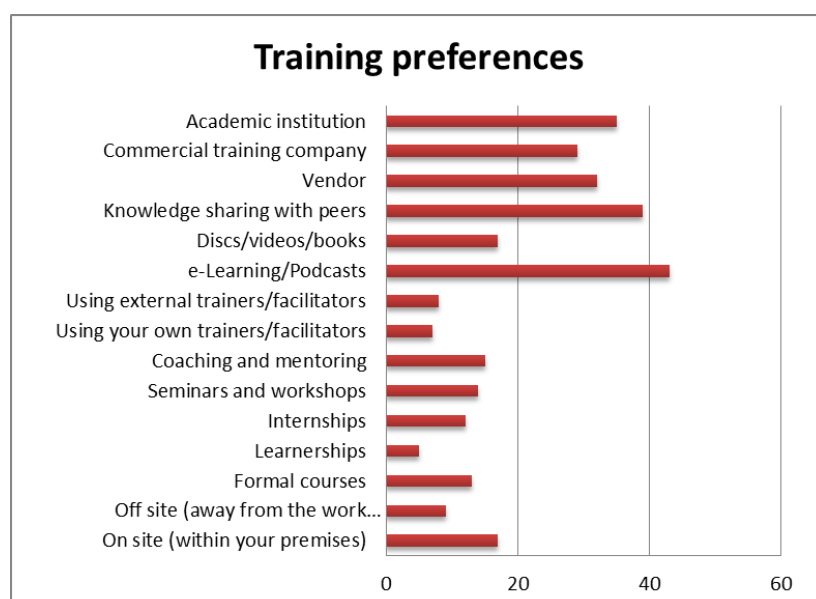
### Recruitment Value



The relative importance of pre-hiring qualifications and certifications shows a distinct change in 2016 from the previous pattern. Internationally recognised standards have taken over from graduate degrees as the most important “value”, with industry association certificates moving into third place.

Vendor certificates continue to be least-rated in the recruiting process but are more highly valued as indicators of ability to support specific products or technologies during the course of employment.

### Training Methodologies



The 2016 picture of the training methodologies preferred by employers is similar to the pattern set in the previous two Surveys. Onsite is still preferred to offsite and knowledge sharing with peers follows self-study (discs/ videos/books and e-Learning) as the top scores onsite.

We are pleased to note that more than half of the respondents to the

ITWeb Brainstorm CIO Survey 2015 (op. cit.) report an active IT internship or apprenticeship programme in their organisation.

Offsite, academic institutions are just ahead of vendors and commercial training companies as the venue/supplier of choice, but there is little to choose between these results.

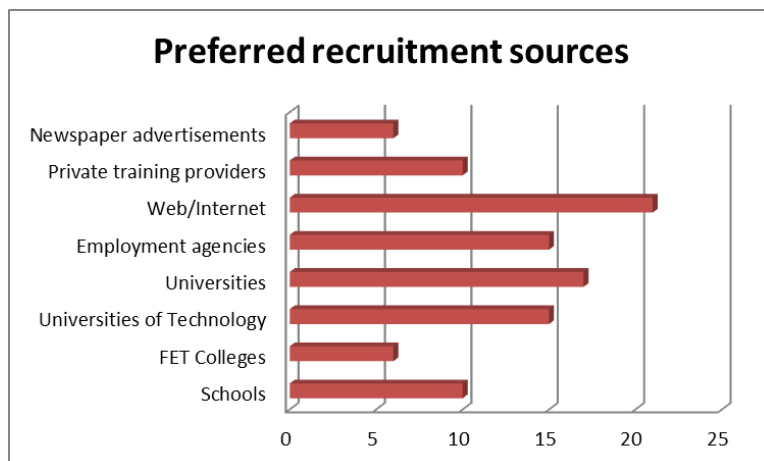
### Management Development

In 2016, mentoring has again become the preferred approach to management development, followed by continuing education and formal management courses. In the 2014 results, formal management courses took the lead from

mentoring as the preferred approach to developing management skills, continuing the trend shown in 2012, when this approach moved from fourth to second place.

There is no doubt that investment in current and future managers will come under close scrutiny, now that the B-BBEE Council for the ICT sector has started operations.

### Local Recruitment



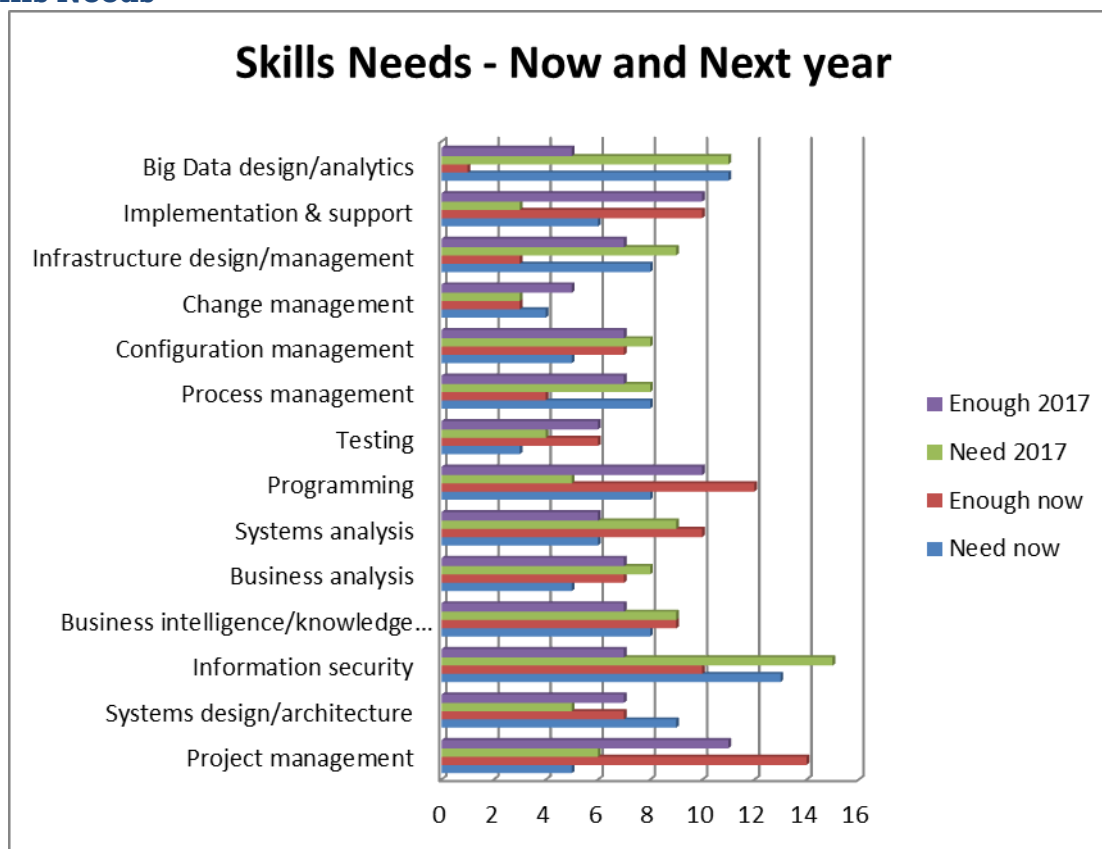
In 2010, when we first asked this question, on line was the recruitment source of choice. Since then, employment agencies have continued to lead this field, showing the value they add by pre-selecting and verifying candidates, albeit at a cost to the employer. In 2016, this trend has reversed and on line has

returned to the top spot by a clear margin.

Universities continue to head the choice of institutional sources, and it is encouraging to see an improved popularity of the Universities of Technology.

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## Skills Needs



This is an important chart, reflecting the balance between skills shortage and skills sufficiency. The blue/red bars indicate current demand and the green/purple bars the anticipated state in 2017.

**Big data design/analytics** shows high demand now and in the future with low sufficiency for both periods. To a lesser extent, this pattern is repeated for infrastructure design/management, process management and **information security**. It is not surprising that the latter shows the highest demand level, given that this field has become the highest priority among our enterprise respondents this year. Just as worrying is the gap between the demand and the supply for big data design/analytics.

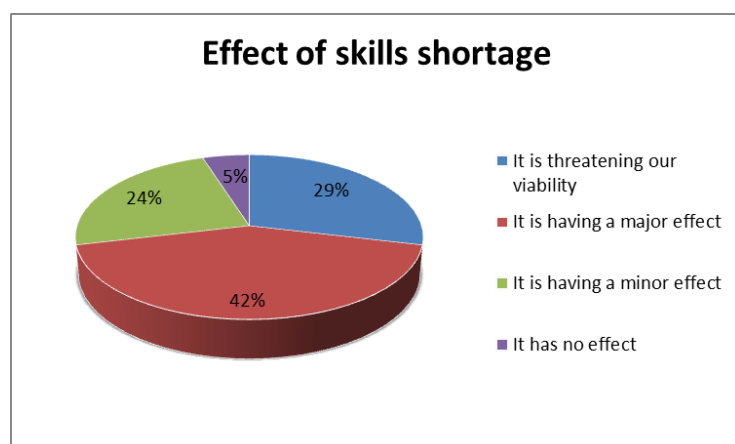
In contrast to the 2014 indications, the enterprises showing demand for testing and programming skills are lower than the enterprises reporting sufficiency for both periods.

The pattern of demand for programming languages in 2016 shows the leading languages to be **Java** and **C#**, followed by VB.NET and PHP. 2014 was very similar to 2012, with Java, C#, .NET, C++ and VB the most popular.

## Impact on Business

In continuing to track this opinion from our respondents, it is concerning that the proportion reporting a serious impact of the skills shortage on their business

remains high. In 2008, all respondents indicated that the skills shortage was having at least a major effect on their business.



In 2009, 75% still said that the skills shortage was having a major effect on their business.

In 2010, the 75% shrank to 45%, suggesting that the demand for critical skills lessened significantly, perhaps because more suitable candidates were

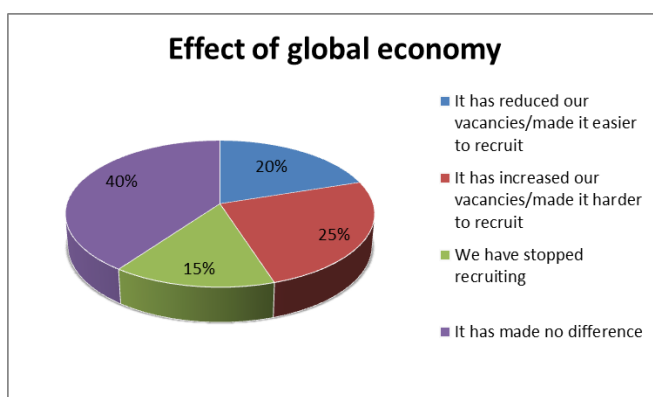
available. However, in 2011, more enterprises were again concerned about the skills shortage, with two-thirds reporting at least a major effect.

In 2012, there was another small improvement, with 60% of enterprises indicating that the skills shortage was having a major (or more serious) effect on their capacity and 40% (34% in 2011) showing that the effect was minor or non-existent.

In 2014, this pattern continued, with a minor shift of 1% less in the major concern zone.

In 2016, the gap has widened again with 71% reporting at least a major effect (including a high 29% indicating a threat to their viability). We repeat last year's comment that it is interesting that, in spite of the reduced level of economic activity, the skills shortage continues to impact management perceptions to this extent.

Our findings are supported by the ITWeb Brainstorm CIO Survey (ITWeb Brainstorm, 2015), which showed lack of skills to be the second "top concern", reported by 70% of respondents.



In the same vein, the global economy is having a greater effect than in 2014, with 25% (2014 – 12%; 2012 – 21%; 2011 – 34%) of respondents indicating that it is harder to recruit their skills needs. Only 40% indicate the economy is having no effect on recruitment (2014 – 53%).

## Corporate Summary

There are three main categories of corporate respondent for the JCSE's ICT Skills Survey: the suppliers of ICT products and services and the employers of ICT skills as part of a non-ICT business, split between commercial and government users.

Our current sample levels do allow us to identify top-level trends and highlight some issues, but we recognise that the users of this report would prefer to be able to extract information in more depth about areas of specific interest. We will continue to seek ways of increasing the respondent numbers in future editions to enable this in-depth analysis.

In 2011, we highlighted the need for greater cooperation between the SETAs in respect of ICT roles performed across the board. We thanked the MICT SETA for their efforts to facilitate this in 2012 but observe that there is still much progress to be made. It does not make sense that the collection of vital employment data continues to be disjointed and inconsistent. We are pleased to note that the MICT SETA has embarked on a project to map the OFO codes to industry job roles and qualifications pathways. We hope this will assist with improving the coordination between the SETAs, StatsSA and the Departments of Labour and Higher Education & Training.

Overall, the ICT skills shortage continues to constrain South Africa's capacity to increase economic activity and create jobs. The ongoing failure of the education system to generate a cohort of young people who are familiar with technology and its application in daily life, who are interested in developing and implementing ICTs and who are work-ready when they exit from the system is unaffordable. There are some beacons of hope in the education system and in the enterprise development arena. They must attract the investment and policy support they deserve.

Regardless of the political uncertainty ahead of municipal elections and the staving off of the ratings downgrade in mid-2016, the shrinkage of the economy by 1,2% in Q1 of 2016 serves to emphasise that South Africa must immediately grasp the opportunities arising from increased engagement with and transformation of the all-important ICT sector.

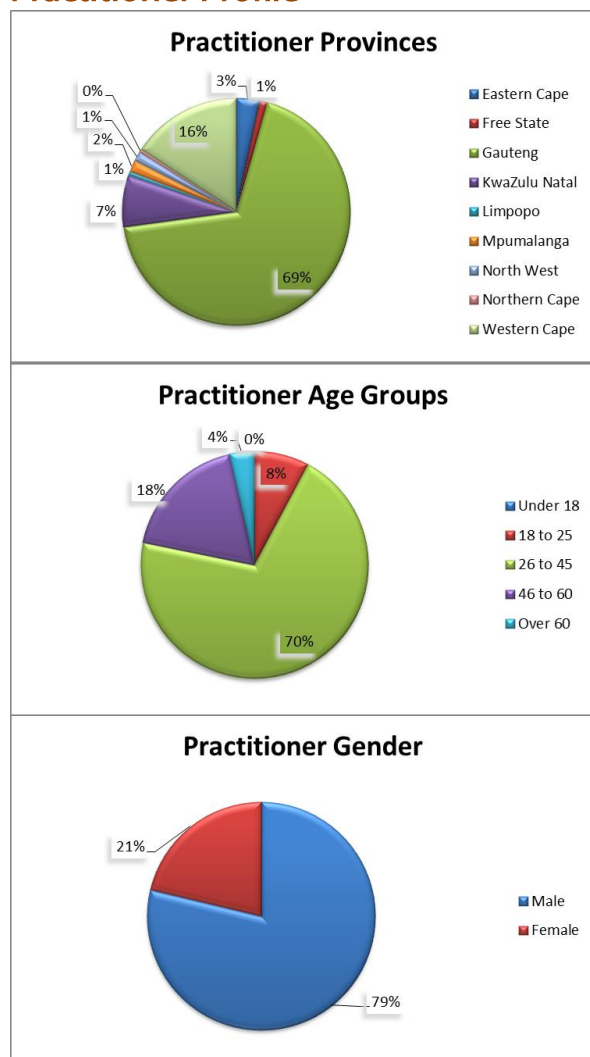
What remains to be seen is the extent of the impact of the revised ICT Sector Codes of Good Practice and the introduction of the B-BBEE ICT Sector Council's monitoring and facilitation activities into the equation in 2016.



## Practitioner Responses

Our pool of practitioner respondents remains fairly constant and we are satisfied that the sample is large enough from which to draw valid conclusions. In this section of the report, figures in (brackets) are the 2014; 2012; 2011; 2010; 2009 results, respectively.

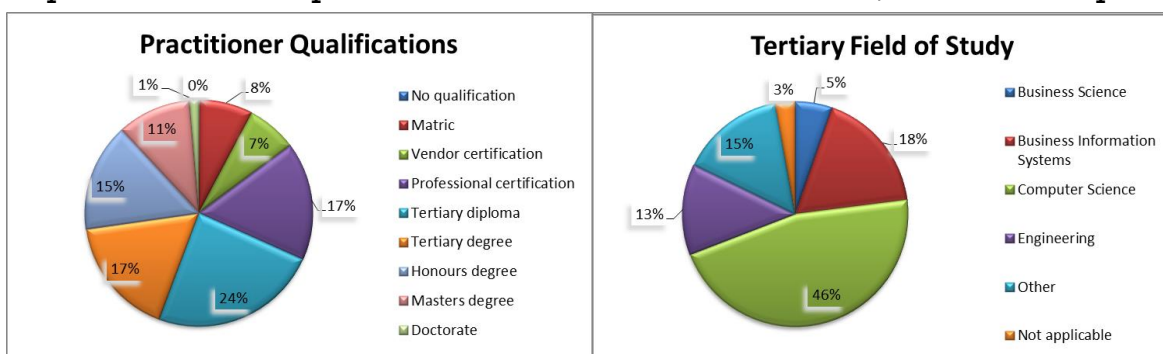
### Practitioner Profile



Our “average” practitioner respondent has not changed much in the last 8 years. He’s in his mid-30s, lives in Gauteng, has more than 10 years’ experience but has only been with this current employer for 3 years, working as a manager or a developer.

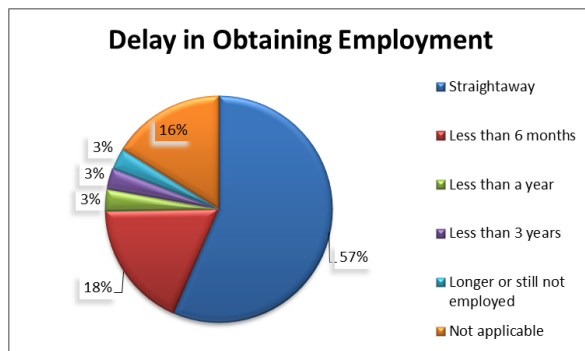
70% (68%; 68%; 64%; 47%; 66%) have a tertiary diploma or higher qualification (with almost half of them studying the field of Computer Science. 69% (69%; 68%; 69%; 43%; 70%) are living in Gauteng, 16% (16%; 16%; 16%; 47%; 16%) in the Western Cape, 7% (7%; 7%; 7%; 6%; 7%) in KZN. The 2010 anomaly between Gauteng and Western Cape resulted from a particularly enthusiastic campaign for practitioner responses by CITI in that year. All Provinces are represented in the 2016 respondents, as they were in the previous 5 surveys (although the Northern Cape number is small enough to be below 1% of the overall).

21% (21%; 21%; 21%; 20%; 21%) of the practitioners who responded are female – from the perspective of South Africa’s pursuit of gender equality, the lack of improvement in this particular area is of concern. However, this is not unique to





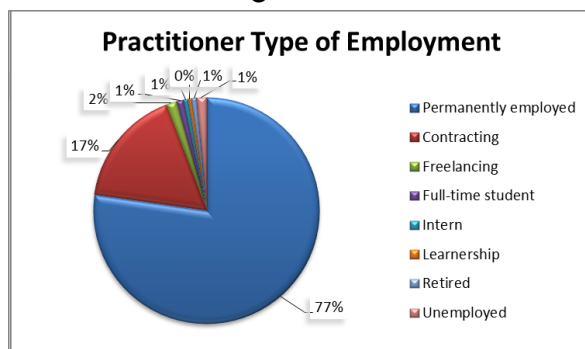
South Africa, as this ratio is commonly found across the industry globally and has shown little signs of significant change for many years. Only 8% (8%; 8%; 6%; 10%) of respondents are under the age of 25 – showing little improvement in the low number of new entrants to the ICT sector in recent years.



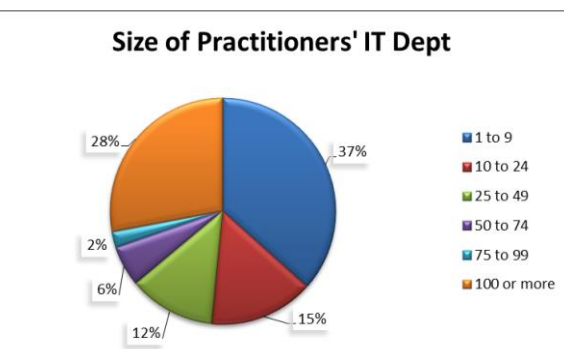
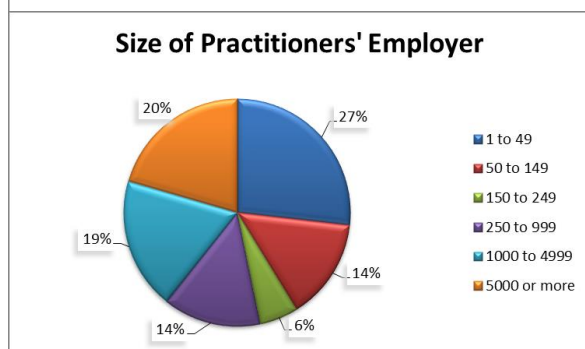
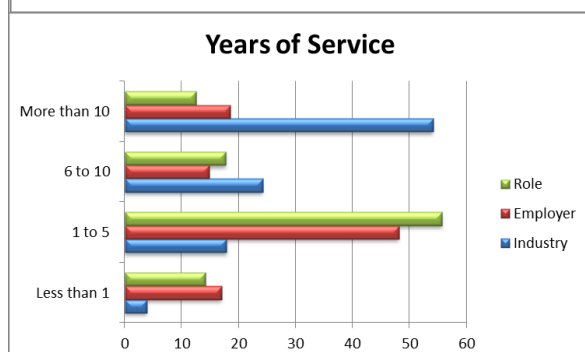
We have inserted a new question into the JCSE ICT Skills Survey in 2016, asking practitioners how long it took them to become employed, after they had completed their studies. The good news is that three-quarters were either employed immediately, or within a relatively short period. This is an indicator that demand exceeds supply.

From the statistical perspective, it is not bad news that “only” 6% waited more than a year (or much longer) before they found a job. From the respondent’s point of view, of course, this is very bad news. We intend to pursue this question in the future, to identify the trend.

There is no change to the fact that most respondents work in a small (1-9)



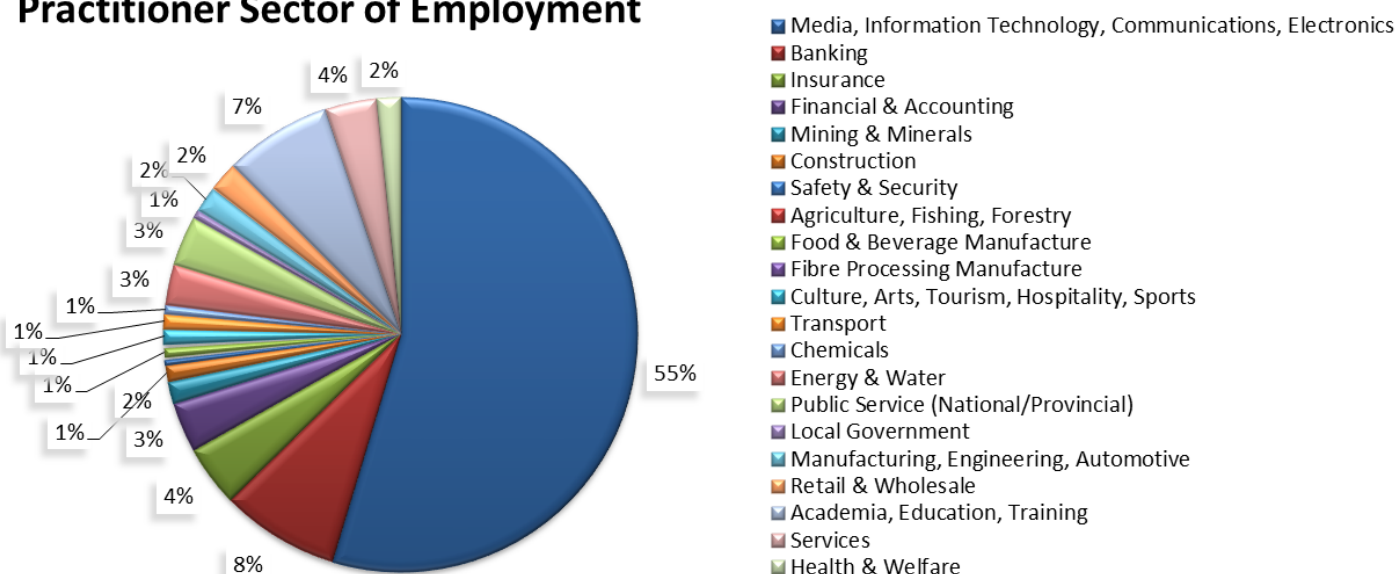
department or a large one (100+). 56% (56%; 57%) have performed their current role for between 1 and 5 years, 48% (48%; 50%) have worked for their current employer for between 1 and 5 years and only 3% (3%; 3%) have been in the industry for less than a year, continuing the trend shown during 2010-2014. In 2008, this figure was as high as 22%, supporting the trends identified from the Corporate respondents of the drastic decline in hiring in the past three to four years. 55% (55%; 57%) of responding practitioners have been in the industry



for more than 10 years.

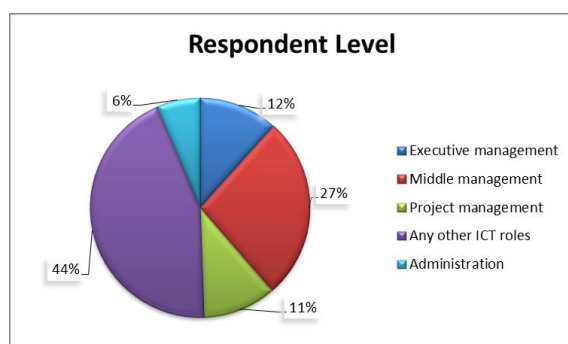
55% (54%; 55%; 53%; 72%; 60%; 57%) of respondents work in the ICT sector. We attribute the 2010 anomaly to the CITI responses mentioned above. With more than 40% of practitioners working in other sectors, this underlines the pressing need for the coordination of data from ALL stakeholders in a formal, credible methodology. We continue to suggest that the SETAs set up a trans-sector mechanism that acknowledges the pervasive nature of ICTs and the skills required to support the various technologies. We note that the MICT SETA has embarked on a project to standardise the nomenclature of job roles and responsibilities and the levels of expertise and professionalism associated therewith.

## Practitioner Sector of Employment



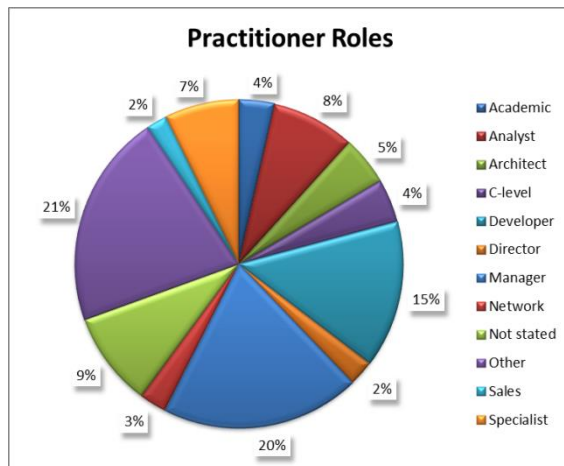
77% (78%; 79%) of practitioner respondents are in permanent employment. This proportion is almost unchanged from 2009. The flexibility of skills resourcing offered by the existence of the contractor pool (17% of respondents) is a long-standing vital component of the ICT industry's ability to apply labour where and when it is needed.

## Practitioner Roles



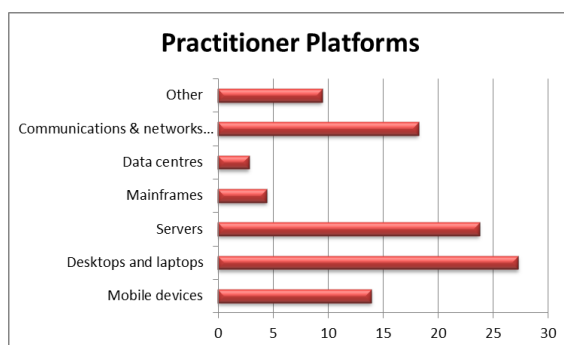
12% (11%; 10%; 10%; 9%; 5%) are working as executive managers, 27% (29%; 22%; 30 %; 18%; 10%) are managing Operations or Development, 15% (14%; 14%; 15%; 29%; 15%) are in Programming or Development roles and another 21% (20%; 22%; 21%; 17%; 15%) are in Support functions.

There are some inconsistencies between how respondents view their level in the enterprise and the job title that they report. This issue supports the need for rationalisation of the job titles and job roles used in industry and the Organising Framework for Occupations (OFO) codes used by the SETAs and DHET.

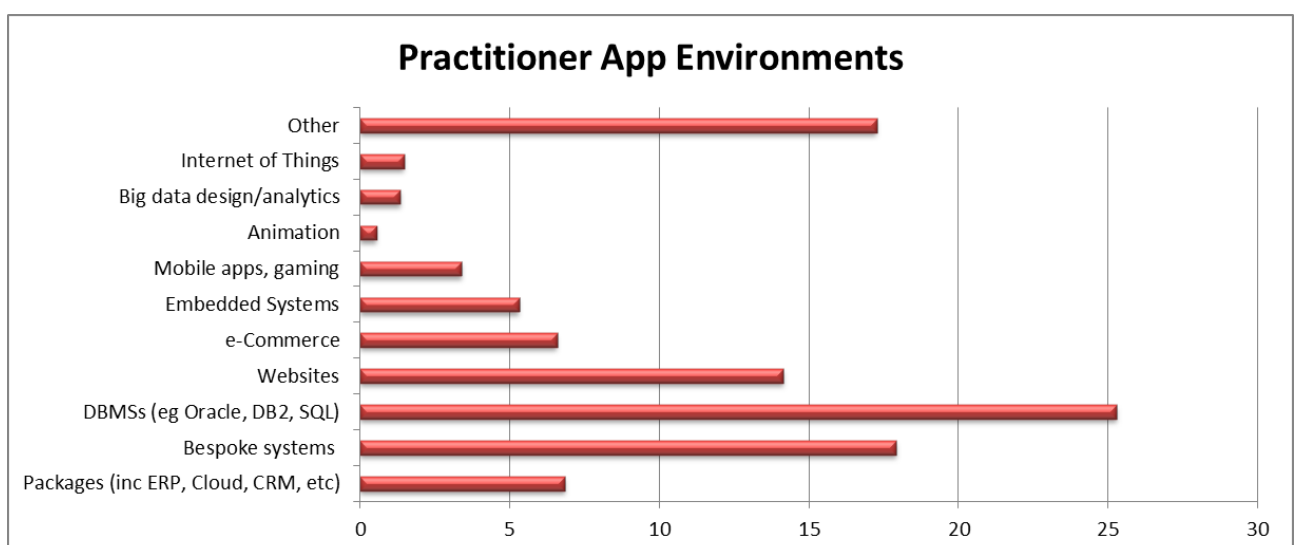


As with the previous 3 surveys, in 2016, more than half of the respondents are “platform” aligned, with Servers and PCs predominating. This reinforces the variation from the earlier years of the survey when only one-third fell into this category.

In software development and implementation, database management systems continue to occupy the largest number of practitioners for the second year, closely followed by significant numbers involved in customised/ bespoke software. We introduced the animation and mobile/gaming categories in 2012, but there has been little growth in the number of practitioners reporting in these categories. Internet of Things and Big Data/Analytics were introduced in 2016, as emerging application



environments and we expect to see significant moves towards them in the next few years. Web-based systems/e-Commerce remain important, ahead of packaged software.



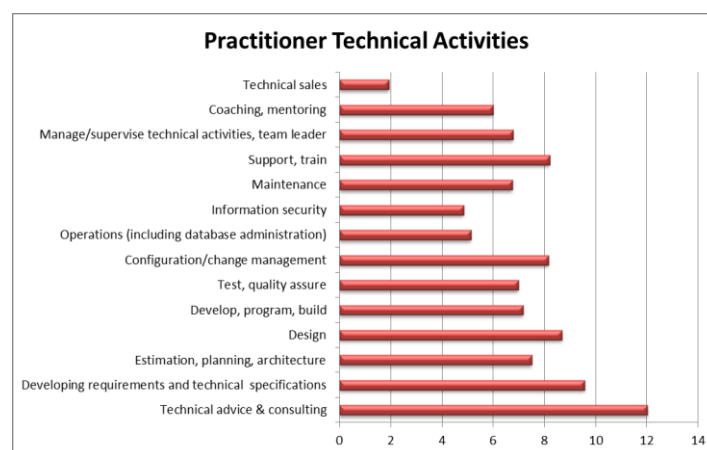
The emphasis on servers and DBMS shows the continuing importance of business intelligence and knowledge management systems to support decision-making. Engagement in mobile systems and other communications infrastructure reflects the continuing trend towards mobile users.

## Multi-tasking



We see little change in the range and mix of business activities engaging the practitioners. The average South African ICT practitioner continues to perform multiple task sets, with only a few identifying their role as “specialist” in nature. An average of 4,8 (4,7; 5,0) task

areas are engaging technical practitioners and 2,9 (2,9; 3,7) for the business-focused people. Only a minority of respondents describe what they do as involving three or less areas of activity. As we have commented before, we understand that it is appropriate for complementary roles to be performed over time, such as design, developing requirements, programming, testing and maintenance. In small enterprises, skilled practitioners will be responsible for all phases of management, administration and systems development.



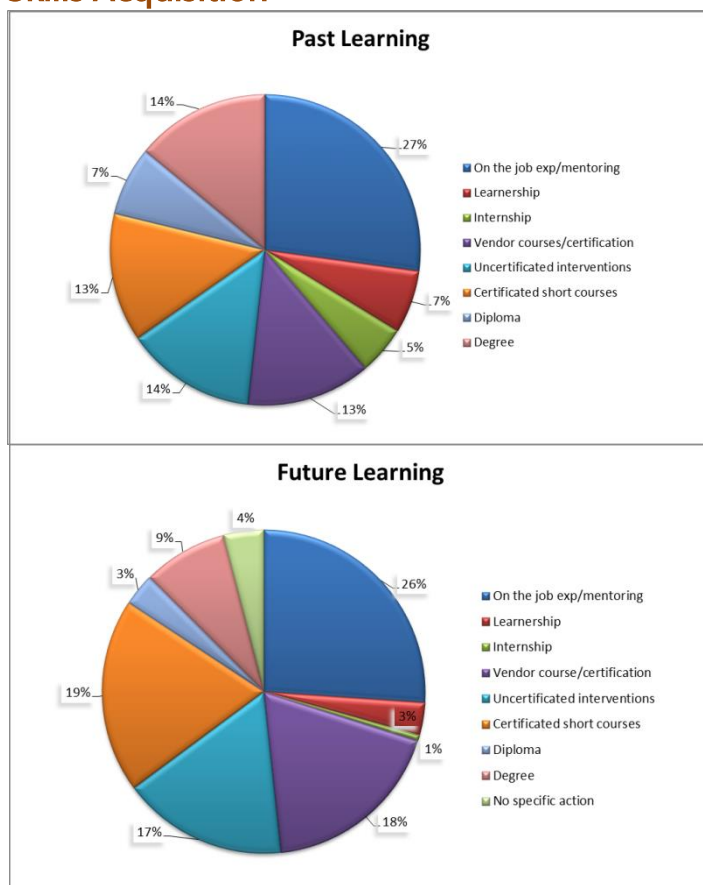
This is the seventh report in which we have raised the flag on the multi-tasking issue. If a practitioner perceives that they are performing as many as a dozen different roles, from technical consulting to administration, from programming to client management, from business analysis to outsourcing

arrangements, it is difficult to see how they can maintain focus on specific objectives while juggling these responsibilities. It is unlikely that they have the required strengths in all these activities or the time available to carry them all out, which would lead to a degree of underperformance in some areas. It also leads to over-dependence on the individual concerned, who may be perceived as “irreplaceable”.

From the economic policy standpoint, there is much to be said for greater division of labour, to enable the employment of more people at lower average salaries. However, we believe the current culture of employing personnel who

multi-task is embedded in the South African ICT sector and it will take a long time for this to change.

## Skills Acquisition

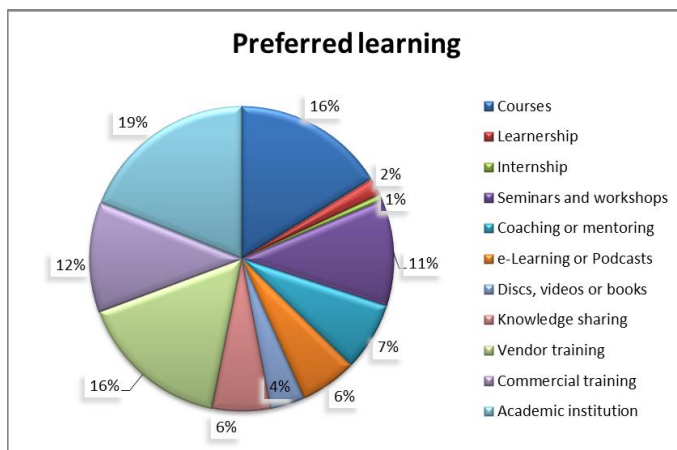


As in the previous six surveys, respondents showed how they had acquired their skills in the past, to qualify them for their current post, and how they intended to acquire skills in the future, to maintain their value in the job market.

In 2014, we changed the presentation of this response to indicate the primary contributor to skills development of the practitioner. The predominance of “on the job experience or mentoring” is fairly constant, reported by 27% (29%) of respondents in this survey. Previously, when taken as the one of many interventions, the results were (2012 – 80%; 2011

– 80%, 2010 - 89%, 2009 – 86%, 2008 - 90%) in the acquisition of skills to date. The remaining distribution was largely unchanged. Employers are less enthusiastic about certifications than the practitioners, reinforcing our suggestion that two factors are at play. Commercial training providers convince practitioners that their courses will “open doors” and practitioners are willing to acquire a certificate even though it may not directly influence their employment, perhaps as part of their continuing professional development (CPD).

Looking ahead, there is very little change from the last three years. Skills acquisition through experience, supported by short courses that lead to certification (whether vendor-specific or not) are preferred by practitioners. Pressure of work makes less time available for continuing academic studies, even on a part-time basis, even though this has become the preferred method of learning (by a small margin). In spite of the preference for on-site learning, almost as many respondents indicate that the transfer of knowledge is best suited to an environment outside of the actual workplace.



As would be expected from the preference for on the job training, the use of knowledge sharing and self-study are the preferred self-paced learning sources. As far as external providers are concerned, the balance between academic, commercial and vendor is similar to the alignment shown in the last three surveys.

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## Concluding Remarks

Since the first JCSE ICT Skills Survey Report in 2008, we have repeatedly expressed mixed emotions about the state of play in the South African ICT sector.

There are many beacons of hope in the myriad initiatives to improve the size and depth of the talent pool, the greater reach of wireless and cabled infrastructure and better support for fledgling enterprises.

There continue to be many frustrations arising from poor and delayed policies, fragmented representation and disjointed data.

The continuing threads that this research reveals are: the need for investment in teaching and training; the potential contribution to society that filling the ICT skills gap will make; the benefits that can come from better coordination and planning; the urgent need to move plans from discussion to execution.

Our peers in Africa have embraced these threads and are weaving successful interventions from them. South Africa cannot afford to be left behind.



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