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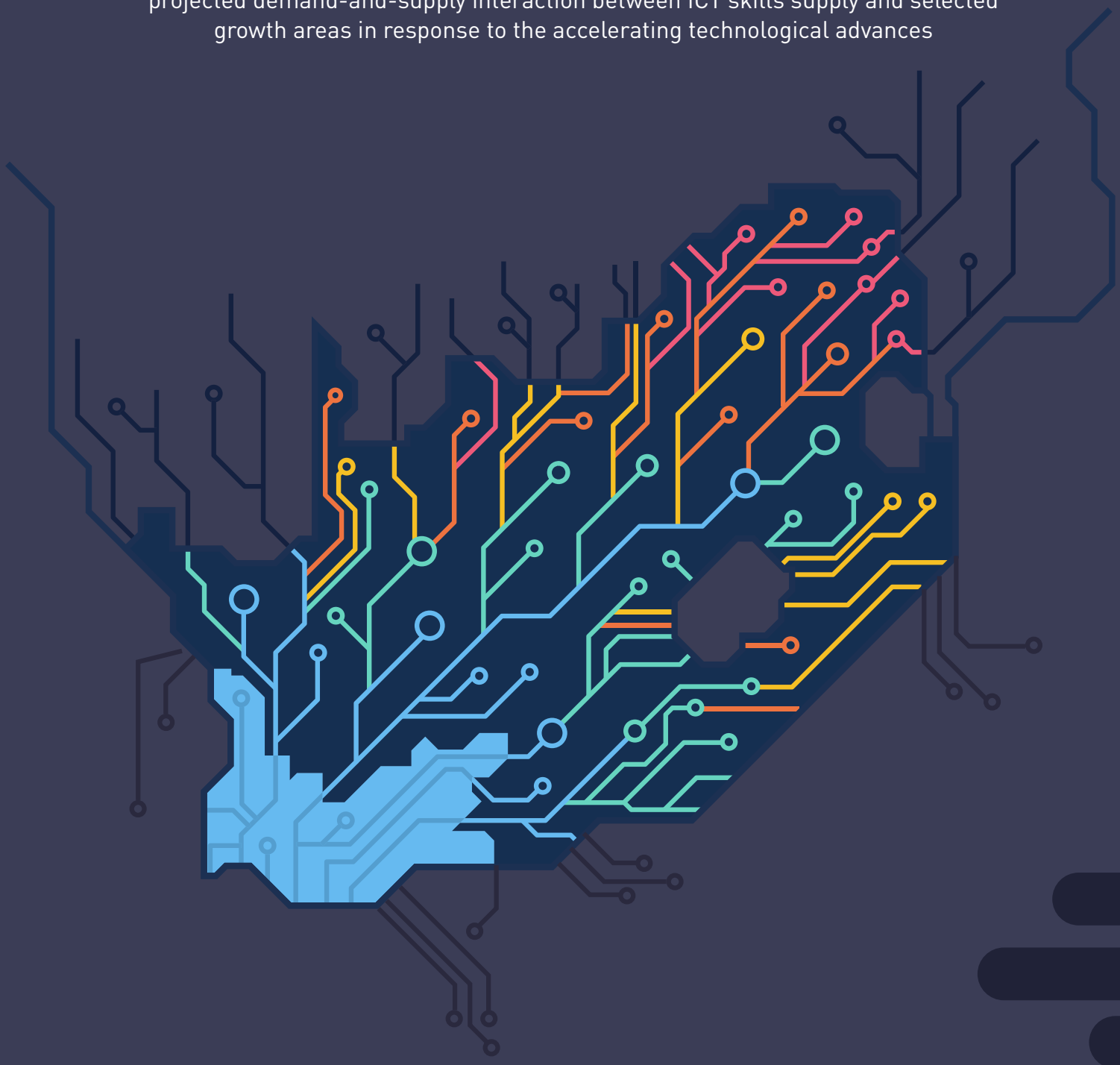
Advancing skills for the digital economy_

WESTERN CAPE DIGITAL SKILLS SHARED AGENDA FOR ACTION

AS-IS Landscape: A macro-level descriptive study of the projected demand-and-supply interaction between ICT skills supply and selected growth areas in response to the accelerating technological advances



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Capacity Building Programme for Employment Promotion

AS-IS REPORT

WESTERN CAPE DIGITAL SKILS SHARED AGENDA FOR ACTION

Project details

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Title:	WESTERN CAPE DIGITAL SKILLS SHARED AGENDA FOR ACTION
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1. Project objective

The objective of the As-Is report is to:

- Mapping the current digital skills landscape by reviewing the AS-IS environment
- Developing a view of the to-be digital skills landscape;
- Detailing a "Digital Skills Agenda", with a view to meeting the overarching goal of the project;
- Provide a communication strategy and change management process for sharing results; and,
- Implementing the recommendations.

2. As-Is report

Map the current digital skills landscape and present it as the As-Is scenario in a report format.

3. Scope of work

- Desktop research to identify and provide a descriptive overview of (South African and Western Cape specific) digital skills related research/publications as it relates to user digital skills, digital leadership skills and ICT practitioner skills within the strategic growth sectors that are ICT intensive, namely Retail and Wholesale, Business Services, Financial Services, Media, Animation and Gaming, Tourism and ICT sectors.
- A descriptive overview of digital skills initiatives (supply) within Higher Education Institutions (viz. universities, TVET colleges, selective accredited and/or industry-specific service providers), focusing on current and planned ICT-practitioner skills and skills sets (The "planned" initiatives are included in an attempt to gauge role-players' response to 4IR requirements).
- The key areas as described above) will be positioned within the context of a futuristic perspective of digital skills requirements.

- A once-off perspective on the current demand in terms of positions dependent on intermediary, advanced and specialised digital skills as obtained from a selected social media platform.

4. Project deliverables

Refer to the full report

5. Findings and observations

Refer to the full report

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SECTION 1: INTRODUCTION

The ***Western Cape Digital Skills Shared Agenda for Action*** project has been conceptualised with the main objective of supporting the Western Cap Government (WCG) in attaining its vision of positioning the Western Cape Province as a leading global digital economy hub.

This report deals in essence with the AS-IS digital skills environment of the Western Cape and has as its aim to provide a descriptive overview of the current awareness of the potentially-disruptive impact of technological advances on skills requirements and digital skills demand-and-supply patterns (e.g., shortages, duplications of efforts, gaps) as they relate to the top three stacks of the Digital Skills Framework as presented in the inception report[1]. Primary emphasis will be on the sectors identified by the WCG as strategic growth sectors that are ICT intensive.

In its discourse on innovation challenges, the WEF 2018 Report[2] places particular importance on "*the pace and disruptiveness of technological change*" which creates "*unprecedented opportunities and challenges ... set to be amplified by the convergence of digital, physical, and biological technologies that are characterizing the emerging Fourth Industrial Revolution*." The Report goes further to state that these emerging technologies present major opportunities for growth, but with the proviso of unlocking the potential in such a way that will benefit the society as a whole.

The Western Cape is well poised to play a leading role in the 4IR in Sub-Saharan Africa and South Africa: "*The Fourth Industrial Revolution will provide substantive opportunities for the Western Cape economy. The digital revolution, driven by the 4th wave, will have an impact on a number of sectors such as construction, retail and wholesale, manufacturing, tourism, agriculture, green economy, transport, financial and business services and government. However, the full potential of technologies and related capabilities has yet to be fully explored and is yet to fully penetrate all aspects of business models in the Western Cape and emerging markets generally."*[3]

With the Western Cape contributing 14% to the GDP of the national economy[4] in 2016, compared to Gauteng at 34,95% and KZN at 15,97%, the Western Cape is South Africa's third most important provincial economy. Relative to other provinces, growth in the Western Cape is job-rich contributing 23,6% of all jobs created in South Africa from 2013 and 2017, much larger than its relative share of GDP.

There are key driving forces that suggest that the Western Cape is leading South Africa from a 4IR perspective and that it may well become South Africa's second biggest economy within the next ten years.

First, is the strength of the services, trade and tourism sectors. Digitalisation has a major impact on the services sector, which also leads many other sectors. The Western Cape has a very strong services sector with a high private sector component[5] (11% higher than the national average). Business services are expected to contribute almost three-quarters of the Province's growth forecast over the next five years. This report indicates that digital skills development is a key factor in the financial and business services sector (see Section 5 of this

report below). Strong growth sectors with major digital skills issues include wholesale and retail trade and tourism (see Sections 4 and 6 of this report).

Second, is the ascendant global competitiveness of Cape Town. *With an unemployment rate 13 percentage points lower than the national figure, and 10 points lower than the average metro, Cape Town is a city of genuine opportunity for millions of people"*.[6] The City is a key driver of the economy, accounting for 72,5% of the GDP in 2016, providing globally competitive business clusters in finance, insurance, real estate and business services sector which contributed 61,8% of the total growth in 2016.

Within a globalised world, cities compete against each other for investment, export capability, skilled workers, entrepreneurship, tourism and retirees. "*International and domestic firms, mobile professionals, investors and development can make choices between counties and cities as never before, with cities overtaking countries in importance"*[7]. Investment, skills and partnerships are drawn to cities that perform well on global indexes, particularly the "footloose" new economy industries of the 4IR.

Key indexes in which Cape Town performs well include being a continental leader in start-ups, financial services and liveability and being a global icon for tourism. In the PWC ranking of 2018[8] Cape Town comes top in Africa with strongest scores are for cost (i.e. quality-of-life to cost-of-living ratio compared to other global cities cities), ease of doing business (i.e. a business friendly-regulatory environment and low costs), transportation and infrastructure, and sustainability and the natural environment, with moderate scores in intellectual capital and innovation and health, safety and security. Areas for improvement include economic clout, technology readiness, city gateway, and demographics and liveability. As this report will show (see Sections 7, 8, 9 and 10) the City also leads in the cutting edge industries of film and media, animation, gaming and ICT.

Third, is the fact that the Western Cape is exceptionally well invested from a knowledge and innovation infrastructure and performance, with Cape Town the national leader in the number of patents registered[9].

Finally, a steady effort by the Western Cape Government over the past decade has seen the maturation of digital partnership institutions such as CITI and the success of broadband roll out, so that digital literacy in the Western Cape is significantly higher than in other provinces[10].

Against this formidable platform of opportunity is the risk of job-less and job-loss growth as the 4IR affects the lowest level jobs and the least digitally literate majority of the Province. "*South Africa remains the most unequal country in the world, and though this is less pronounced in Cape Town, it remains very unequal by international standards …inequality means that even as Cape Town's universities produce Nobel Prize winners in Chemistry, Medicine and Literature, its population as a whole remains uneducated, and while tourists can relax in its safe Waterfront areas, city-wide crime statistics reflect the dangerous daily lives of its many informal township dwellers*"[11].

In recognition of the accelerating technological changes and the requirement to remain responsive to the needs, challenges and opportunities of a hyper-connected global economy, the Western Cape Government has set as one of its goals to position itself as a leading global digital hub. There is a clear understanding that such a goal statement is dependent on the targeted development of the required digital skills and competency across all sectors in the economy for future employment and sustained competitiveness.

The project is funded by the *Capacity Building Programme for Employment Promotion*[12], and will be realised by means of the following activities:

- Mapping the current digital skills landscape by reviewing the AS-IS environment
- Developing a view of the TO-BE digital skills landscape;
- Detailing a "Digital Skills Agenda", with a view to meeting the overarching goal of the project;
- Provide a communication strategy and change management process for sharing results; and,
- Implementing the recommendations.

SECTION 2: SCOPE OF THE AS-IS REPORT

In responding to the brief of the Expert 1 report, a relevant set of baseline information was developed through secondary research methodologies and limited primary research activities (e.g. interviews). The AS-IS scenario furthermore focused on the three upper stacks of the Digital Skills Framework One.

2.1 Key areas for the AS-IS research report

As defined in the inception report, the AS-IS scenario overview consists of the following key areas:

- Desktop research to identify and provide a descriptive overview of (South African and Western Cape specific) digital skills related research/publications as it relates to user digital skills, digital leadership skills and ICT practitioner skills within the strategic growth sectors that are ICT intensive, namely Retail and Wholesale, Business Services, Financial Services, Media, Animation and Gaming, Tourism and ICT sectors.
- A descriptive overview of digital skills initiatives (supply) within Higher Education Institutions (viz. universities, TVET colleges, selective accredited and/or industry-specific service providers), focusing on current and planned ICT-practitioner skills and skills sets (The "planned" initiatives are included in an attempt to gauge role-players' response to 4IR requirements).
- The key areas described above will be positioned within the context of a futuristic perspective of digital skills requirements.
- A once-off perspective on the current demand in terms of positions dependent on intermediary, advanced and specialised digital skills as obtained from selected social media platforms.

2.2 Contextualising the study within the Digital Skills Framework

In view of provided a comprehensive perspective on the required digital skills a locally relevant digital skill framework, namely the *Digital Skills Framework One* has been developed for South Africa to safely and productively benefit from, participate in and contribute towards the digital world[13].

The DSF One distinguishes between four groups of digital skills, namely:

- Digital literacy as basic life skill;
- ICT practitioner skills;
- ICT-related skills for sectoral use (such as health, education); and,
- Digital leadership skills.

These four groups of skills are described in more detail in the Table 1 below:

Table 1: Description of groups of digital skills

Digital Skills Type	Description
Digital Literacy (e-literacy)	Ability of individuals to use digital tools and facilities to: perform tasks, solve problems, communicate, manage information, collaborate, create and share content, and build knowledge

	· in all areas of everyday life and for work
Sector User skills	The digital skills for work in a specific sector, type of organisation or profession. These skills can be · of a generic nature (e.g. a generic digital skills-set for office use or · business), or · a specific skills-set applicable to that sector (e.g. the graphics industry, or health), or to a profession, or · a combination of both.
Digital Leadership skills	The capabilities needed to exploit opportunities provided by ICTs, notably the Internet, digital devices and the new media to: · ensure more efficient and effective performance of different · types of organisations, · explore possibilities for new ways of conducting business and · organisational processes, · establish new businesses, organisations, platforms, applications · or interventions, · accomplish goals that rely on ICT through the direction of human resources and uses of ICT, and · effect innovation (incl. social innovation) through digital means.
ICT Practitioner skills	The skills/capabilities required for: o the researching, developing and designing, managing, o the producing, consulting, marketing and selling, o the integrating, installing and administrating, o the maintaining, supporting and servicing of ICT systems.

The Digital Skills Framework One can be presented on a canvass, where the different blocks represent the four groups of skills, namely digital literacy sector user skills, ICT practitioner skills and digital leadership skills. The canvass is demonstrated in Figure 1 below:

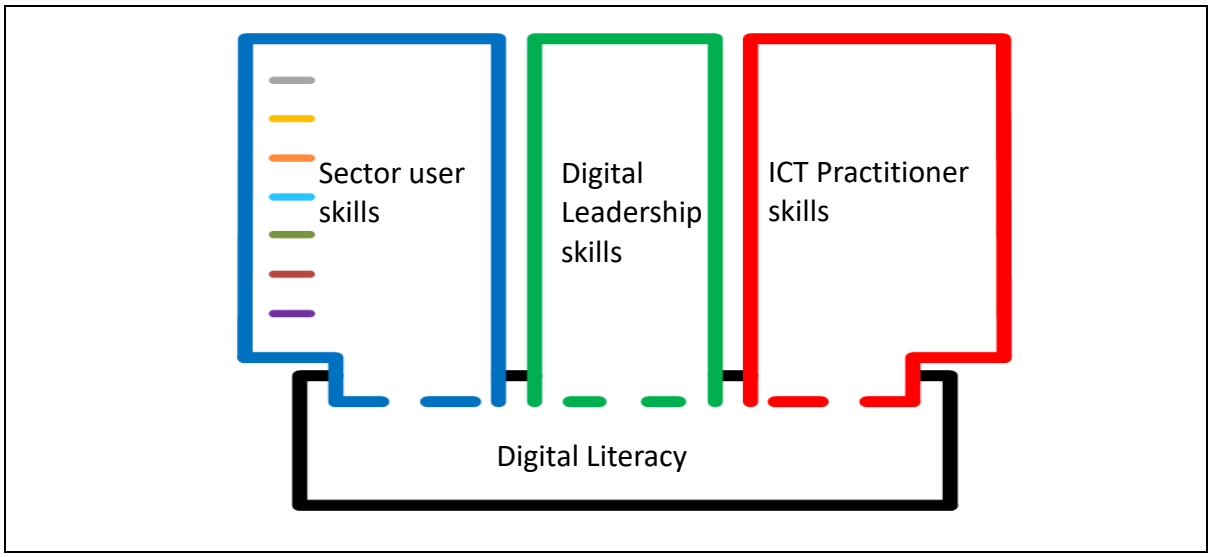


Figure 1: Digital Skills Framework One

As specified in the inception report, the project focuses on the upper three stacks of the DSF One framework, as it relates to the growth sectors identified for the purpose of this project, namely:

- Sector User digital skills
- ICT Practitioner skills

- Digital leadership skills

Within the above areas of focus, the project predominantly focuses intermediate, advanced and specialised skills. The foundational or basic digital skills, depicted in the bottom stack of the skills framework are excluded from the study.

SECTION 3: RESEARCH MODEL /METHODOLOGY

3.1 Methodology for the descriptive overview of the sectors

In its strategy to create the most appropriate and efficient research method that will allow the Expert 1 group, not only to complete its allocated tasks within the allocated time period, but also to corroborate and substantiate the findings gained from secondary research processes, the following overall methodology was agreed upon, namely:

- Secondary research by means of external desk research of the 8 major sectors constituting the Western Cape economy;
- To arrive at consistency across data sources, the team members used the method of triangulation to qualitatively check and establish the validity of their respective secondary research findings by analysing their research questions from multiple perspectives through cross verification from multiple sources; and,
- Interview and engage selected industry practitioners, industry employer representatives to add value by corroborating, or contesting, the findings.

For compliance to ethics in research, the generally-accepted protocols of conducting secondary research and its appropriate conventions of extracting secondary research data have been followed consistently.

Finally, for purposes of expediency and efficiency, the eight sectors mandated to the Expert 1 team for investigation were critically assessed and analysed. To circumvent the impact of duplication and replication between closely-related sectors of the economy, the Expert 1 AS-IS team, where possible, reconstituted the respective units of analysis into five groupings, namely:

- The wholesale and retail industry as a research cohort;
- Combining the business services sector and the financial services sector;
- The tourism sector as a single cohort;
- Combining the media, film, animation and gaming sectors into a single cohort; and,
- The ICT practitioner supply sector as a single cohort.

To ensure consistency amongst the research team, each researcher was to extract data by means of an internally agreed guideline, comprising of:

- A brief introduction of the sector in terms of what it presents, and what it can become, given a proper injection of resources, namely an adequate and relevant skills base, access to the requisite physical resources; funding to seek and promote opportunities for growth, and leadership and entrepreneurial acumen for innovation;
- Presenting a definition and description of the sector;
- An overview of its economic contribution, policies pertinent to the advancement of the sector, key stakeholders, challenges and opportunities, etc., by analysing available research to gain systemic insights into the sector by focusing on trends that (may) impact the growth and development of the sector (e.g. key driving factors and technology changes);
- The skills landscape within the sector which includes skills suppliers, special initiatives by stakeholders, perspectives on skills requirements from the respective sectoral education and training authorities, any “special” or focused training interventions, start-ups, incubators and accelerators as opportunity generators; and,
- Identifying gaps in each sector based on industry views of a futuristic perspective.

Each of the five groupings is reported on by generally following the above guidelines.

3.2 Methodology followed for the ICT supply information on Higher Education Institutions

3.2.1 Universities

The major supply of ICT skills in Higher Education is encompassed in the Classification of Educational Subject Matter Category 06 (CESM 06)[14], as provided by the Department of Higher Education and Training (DHET). CEMS 06 consists of the "broad areas of study concerned with all facets of electronic computing, including computer systems, computer networks and computer software, as well as the classification, storage, processing and dissemination of information."

To determine the trend in the supply of ICT skills generated by Higher Education Institutions in the Western Cape[15], the audited data sets for the years 2012, 2014 and 2016 of CESM 06 were utilised for relevant data extraction.

The above data were categorised for both national and the Western Cape according to the following variables:

- Academic qualification: (1) undergraduate degrees, certificates and diplomas; (2) Honours degrees and postgraduate diplomas; (3) Master's and Doctoral degrees
- Gender
- Employment equity requirements

3.2.2 Technical, Vocational and Educational Training Colleges (TVET)[16]

The data on the supply of ICT skills in TVET Colleges were obtained from the Higher Education Management Information System (HEMIS) of the Department of Higher Education.

The determine the trend in the supply generated by TVET Colleges, the data sets for the years 2015, 2016, 2017 were utilised and categorised for the five Western Cape TVET colleges according to the number of graduates, gender and EE imperatives.

The above data extraction was done per HEI for the provincial cohort.

3.3 Methodology for the once-off demand analysis of ICT and related skills

A demand analysis for ICT and related skills was conducted using data freely available from *LinkedIn's* jobs-search, and *Google's* "Google-Trends" platform, supplemented by data provided by *PNet*, a private recruitment company. *LinkedIn's* jobs-search data provides a snapshot of the current demand of ICT skills for the period of 1 (one) month. (Note that additional data for all jobs for all time is available from *LinkedIn*, but is less useful) whereas Google-Trends keyword-search engine provides data on a timeline, showing the variation in interest in ICT and related skills over a period of 3-4 years.

Data were limited to the Western Cape, although for *LinkedIn* only Cape Town data were available.

SECTION 4: RETAIL AND WHOLESALE SECTOR ANALYSIS

4.1 Introduction

The retail and wholesale sector is at the core of the Western Cape economy in terms of its contribution to the economy as a whole, its critical connection to other major sectors within the economy, as well as its contribution to growth and employment within the region.

4.2 Sector definition

The retail sector involves and sale and exchange of goods directly to consumers whereas wholesale involves sales from wholesalers to retailers. The following key sub-sectors have been identified by stakeholders within the retail and wholesale sector[17], namely Clothing, Supermarket, Motor trade and fuel, e-Retailing, Jewellery, Hardware, Merchandising.

General dealers dominate the sector, making up 42% of all retail enterprises. This is followed by textiles, clothing, footwear and leather goods retailers that comprise 20% of the retail sector. Wholesalers of solid, liquid & gaseous fuels & related products dominate the sector followed by food, beverages & tobacco and machinery & equipment and supplies wholesalers[18].

4.3 Sector dynamics

4.3.1 Growth and employment dynamics

The global retail sector has experienced an annual growth rate of 3,8% since 2008[19]. The sector is expected to continue to grow strongly due to macroeconomic and demographic forces such as:

- Increasing global GDP
- Increasing disposable income and consumer spending
- Growing population size
- Increasing digital penetration and mobile power
- Globalisation and connectedness

e-Commerce in this sector is anticipated to show a phenomenal compound annual growth rate of 23% globally, between 2012 and 2019[20]. In 2017, an estimated 1,66 billion people worldwide purchase goods online. During the same year, global e-retail sales amounted to R33,6 trillion and projections show a growth of up to R 65,4 trillion by 2021.

Amazon with 1.87 billion shoppers per annum, EBay with 817, 6 million and Walmart with 339 million are the top 3 retailing sites in the USA[21]. In Asia Pacific, e-retail sales accounted for 12.1% of retail sales in 2016, but only for 1,8% of retail sales in the Middle East and Africa.

The aggregation of personal data across platforms to facilitate re-selling of personal data to retailers and others is giving risen to what is called the ”content economy” or what Tim Cook the CEO of Apple recently called the Data Industrial Complex[22].

South Africa’s retail sector was valued at R 914 billion in 2016[23]. The sector is expected to grow by 2.4% p.a. from 2017 to 2021. There were 15.3 million people employed in South Africa in 2014 and the Wholesale and Retail Sector employed 3.247 million people, or 21% of the total labour force.

There are currently 18, 4 million e-Commerce users in South Africa[24], with an additional 6.36 million users expected to be shopping online by 2021. Four years from now, these 24.79 million e-Commerce users will spend an average of R2 785 online. Electronics & Media is currently the leading product category in South Africa, accounting for R 14,2 billion market share, followed by Furniture & Appliances, which generates R 8,1 billion in sales. By 2021, Electronics & Media will still be the most purchased online category, with an estimated value of R 20,3 billion, and second favourite, Furniture & Appliances, will have an expected worth of R 15,7 billion.

A leading e-grocery retailer is Woolworths[25]. The range includes food, apparel, home accessories and gifts. There is free delivery for first time orders, 60-day returns and food items require next day delivery. The leading online brands[26] for South Africa are illustrated in Figure 2.

Figure 2: SA leading online brands

The retail and wholesale sector within the Western Cape contributes 13% to provincial GDP-R**.** The Western Cape's wholesale and retail trade sector was the second largest contributor to the Western Cape economy valued at R 59bn in 2016[27]. The wholesale and retail trade sector contributed 15% to the Western Cape economy in 2016. The province's wholesale and retail trade sector grew by an average annual rate of 2.6% between 2007 and 2016.

4.3.2 Industry structure

The South African retail sector is growing and is highly consolidated, currently dominated by a handful of very large firms, often referred to as the "Big Five", namely Shoprite, Pick 'n Pay, SPAR, Massmart, and Woolworths. The Western Cape has the highest concentration of wholesale and retail trade of food companies head offices, followed by Gauteng. It is the headquarters for key retailers including The Foschini Group (TFG), Pick n Pay, Woolworths and Shoprite.

Supermarkets are the dominant channels that grocery retailers use to provide goods to consumers accounting for 47% of all channels used in 2016. South Africa is the largest African market for grocery retail sales in 2016 and the second largest in terms of retailing after Egypt. Although internet retailing accounted for only a small share of value sales in retailing during the review period, many of South Africa's retailers continued to improve their digital presence by investing in internet retailing facilities, especially websites that are mobile-friendly.

The fastest growth as presented in Table 2 has been achieved by Pick 'n Pay, followed by Shoprite:

Table 2: Fastest-growing retailers

Grocery Retailers GBO Company Shares: % Value 2011-2015

% retail value rsp excl sales tax	2011	2012	2013	2014	2015
Shoprite Holdings Ltd	18.3	18.7	18.9	19.2	19.4
Pick 'n' Pay Stores Ltd	14.4	14.0	13.7	13.4	13.0
Internationale Spar Centrale BV	9.2	9.3	9.3	9.3	9.5
Woolworths Holdings Ltd (South Africa)	3.6	3.6	3.6	3.7	3.7
Fruit & Veg City Holdings (Pty) Ltd	1.3	1.5	1.8	2.9	3.4
Pick 'n' Pay Retailers (Pty) Ltd	0.9	0.9	1.0	1.0	1.1
Wal-Mart Stores Inc	1.2	1.1	1.1	1.0	1.0
Others	51	50.9	50.6	49.5	48.8
Total	100.0	100.0	100.0	100.0	100.0

Source: Euromonitor international from official statistics, trade associations, trade press, company research, trade interviews, trade sources

The research company, Consulta[28], surveyed nearly 3 000 randomly selected customers of supermarkets, including Woolworths, Shoprite, Checkers, Pick n Pay, and Spar. The index blends customer expectations, perceived quality, and perceived value to achieve an overall result out of 100:

- With a substantially higher score than the industry average of 76.2, Woolworths achieved the most satisfied customers with a score of 82.1 on the index and is the only supermarket with a marked increase compared to its 2015 average of 80.7.
- Checkers, with a score of 77.2, and Pick n Pay at 76.5 both remained above average while Shoprite and Spar trailed with scores of 75.5 and 75.2 respectively.

According to Wesgro[29], the Western Cape was the largest global investor by province into Africa by retail, accounting for 7.3% of FDI projects between 2003 and 2016. Between 2003 and 2016 a total of 18 FDI projects were recorded into the Western Cape's retail. These projects represent a total capital investment of R4 billion which is an average investment of R250 million per project. During the period, a total of 1,744 jobs was created. The United States has been the largest investor into the Western Cape's retail environment, accounting for 36%[30].

The following additional elements are key to the retail and wholesale landscape of the Western Cape:

- The thousands of micro retailers who use the various platforms for sale, barter and procurement.
- The emergent "Maker" movement is a social movement with an artisan spirit. Maker culture[31] emphasizes learning-through-doing (active learning) in a social environment. Maker culture emphasizes informal, networked, peer-led, and shared learning motivated by fun and self-fulfilment.
- Traditional "Mom and Pop" stores or Corner Cafés
- The Township Economy[32] with its unique configuration of spaza shops, taverns, township industry and emergent retail malls
- An informal sector, a large proportion of which entails survivalist entrepreneurship.

4.3.3 Innovation

Online retailers have disrupted the traditional retail business model by simply acting as a platform which sells goods directly to consumers at small mark-ups. Some of these business models simply provide a safe and effective platform for the buying and selling of used goods, while making profits through commission, subscriptions or media and content.

Some of South Africa's biggest e-commerce platforms are based in the Western Cape. These include online shopping giants Spree, Gumtree and Zando. These platforms operate across the country and are increasingly gaining popularity and scale. They are big employers and are showcasing the sophistication and potential of the local retail and wholesale supply chain. The presence of these capabilities within the province is a testament to the Western Cape's reputation of being an enabler and early adopter of innovation[33].

4.3.4 Change drivers and dynamics

Digital is having an impact on every part of the retail and wholesale sector value chain, creating opportunities for new market creation, market entry and innovation. It is driving new capabilities and ways of operating, challenging traditional business models and transforming the traditional competitive landscape.

Omni-channel marketing is now the norm for most brands and includes web, social, email, mobile app and traditional brick and mortar shops. The integration and orchestration of these comprise what is known as the "customer journey". Kitewheel[34] observed the following customer journey trends in 2016:

- the web channel showed consistent growth
- email experienced significant growth within omni-channel journeys
  the tracking from a data analytics perspective of social touchpoints (i.e. when a potential customer comes into contact with a brand through social media or platform engagement) declined and were being used more as a means as to generate sales leads to feed into other channels in their customer journeys
- mobile app interactions represented less than 1% of total transactions but were experiencing ten times higher than the growth in other any channel.

"*To master a truly seamless omni-channel experience, retailers will need to overcome the main barriers of quality/accuracy, in-person experience and fulfilment to drive scale and growth. They'll also need to be shopper-centric, prioritise personalisation and invest in mobile-based solutions to support their activities, which incorporate digital into the in-store environment*"[35].

The trends disrupting the wholesale and retail sector are presented in Table 3.

Table 3: Trends disrupting the retail sector

Customer experience & value propositions	• Better understand customer behaviour through data & analytics, and so personalise services & offers • Improved in-store experiences • Increased e-commerce • Personalisation of the service experience • More payment options enabling easier transactions • Ability to service global customers through e-commerce
Optimisation of operations	• Quick response to fluctuations in demand to optimise inventory management • Ability to integrate products & service to create a valued experience • Business intelligence from analytics to improve display & distribution
Internet of Things	• Enhanced supply chain visibility leading to stock-out prevention etc. • Transparent supply chain enabling customers or wholesalers to track product flow • Connect infrastructure, stock and systems and for example create • Location based offers and service customisation alerts when a product needs to be re-ordered or has perished
Big data	• Merchandising and market analysis • Campaign management and customer loyalty programmes • Supply-chain management and analytics • Event and behaviour-based targeting • Market and consumer segmentations • Linking purchasing data, geo-location data with payment data through converged partnerships
Mobile connectivity	• Mobile point-of sales devices to improve payment process • Engagement of customers to provide detailed product information • Devices to assist with scanning and distribution of goods
Artificial intelligence	• Analytics & predictive models to help personalise experiences, enhance inventory demand visibility & forecasting • Automated packing and distribution of orders
Automation, Robotics & 3D Printing	• Various applications – drones to monitor stock levels, virtual assistants to place and receive orders, robotic product picking & packing • Partly 3D printed infrastructure and production equipment components • Automated inventory and warehouse management
Nature of work	• Improved employee productivity in digitally enabled environment • Ability to create more responsive retail working environment • Increased need for workers to become ”digital operators” using digital tools in the delivery of products or services.
Source: BizzCommunity. 2018. [36]	

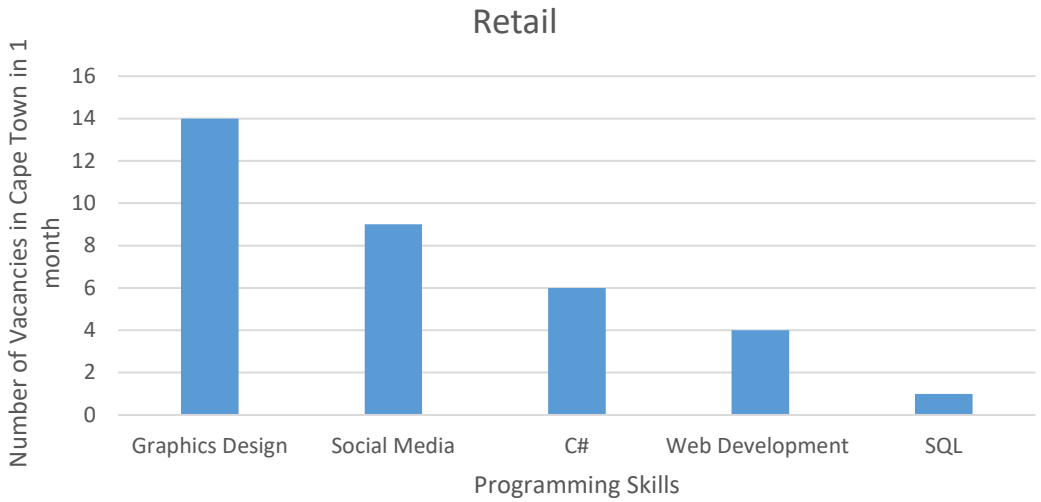
Ernst & Young[37] identify the following imperatives for the Western Cape about this sector: *Customer expectations are increasing:* The digitalisation of all facets of the value chain is enabling very high levels of tracking, personalisation, customisation and engagement.

Big firms lead digitalisation: It is the large companies within the sector that are able to invest in new digital capabilities to optimise all areas of their business operations and explore new service offerings to customers. Most large organisations within the sector have adopted digital applications that improve operations and management activities, create new distribution channels and build closer customer relationships. The wealth of lifestyle data that retailers have access to is substantial and they are starting to use this to transform customer buying experiences.

Digitalisation combined with mobile enables customer engagement: The extensive penetration of digital devices into the population has put consumers at the forefront of sector dynamics, giving them the power to influence the industry. In this evolving competitive landscape, it is those organisations which best organise and adapt to serve changing expectations and ways of working that will thrive and dominate the market. The 'intelligence' about customers that organisations are able to glean from the data captured from spending and payment records is enabling organisation to better serve customers.

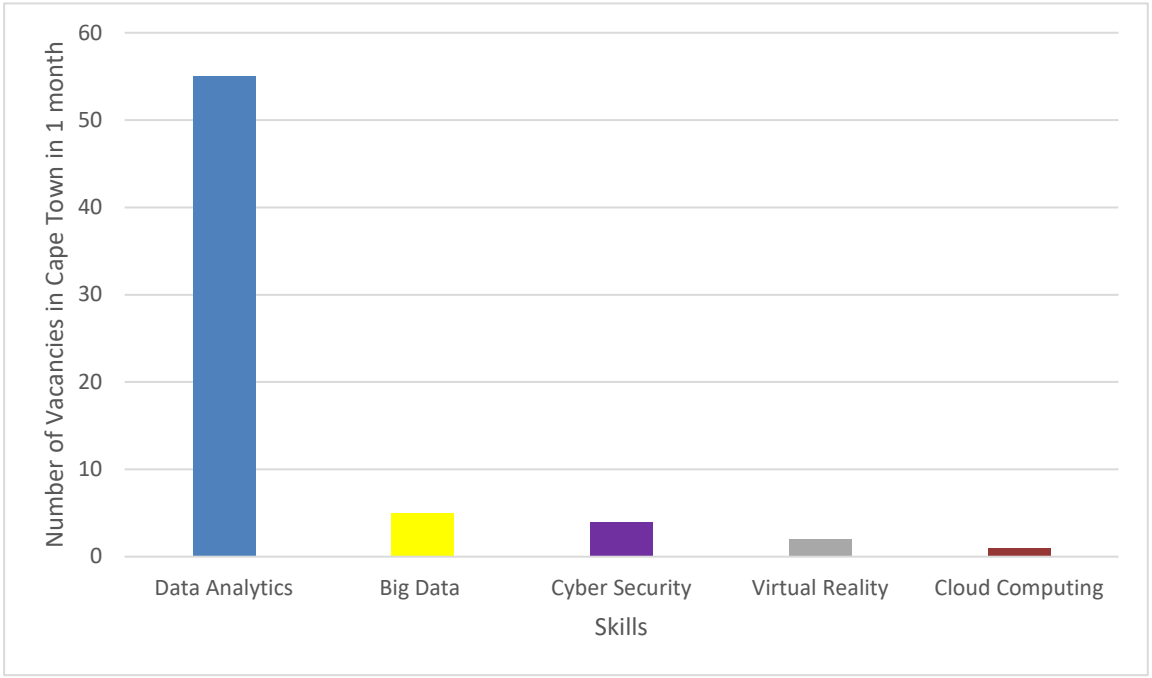
Table 4 shows the number of vacancies in Cape Town per month for programming skills for graphic designers, social media, dot.net developers, web developers and SQL programmers, while Table 5 shows the number of vacancies per month in Cape Town for the retail sector for required skills in data analytics, Big Data, cyber security, virtual reality and cloud computing. It is therefore not surprising that data analytics emerges as the top digital skills need in the retail sector.

Table 4: Retail vacancies



Source: Bizz Community (2018)[38]

Table 5: Digital skills required in the retail sector*



* This information does not portray a trend as it is for one month only

Social platforms are key in supporting better brand management. Digital solutions enable analytical tools which scan through social media to capture and categorise comments and reviews, allowing businesses to track and monitor brand reputation in real-time. Social platforms also act as a marketing medium to achieve a wider and deeper reach into a target market. This is confirmed by the pre-eminence given to social media and graphic design in our survey.

Loyalty programmes are vital, as consumers are willing to share more information if they get some benefit in return.

Opportunities are emerging for small businesses, as digital capabilities are empowering smaller organisations, because they are now better able to compete with the larger market leaders.

- The improvements in supply chain those digital solutions, means that smaller shops can better manage ordering and stock to meet demand, and benefit from significantly more efficient goods delivery.
- Smaller businesses generally have more intimate relationships with their customers and provide a level of convenience that large organisations cannot.
- Digital advancements are enabling smaller businesses to improve their services to better meet their customers' needs, improving their competitive position.
- SMMEs within the sector are also benefiting from the improving sophistication of supply chains as they are able to tap into the distribution and logistics systems built up by large and digitally maturing companies.

- This is enabling wider and faster access to products for SMMEs and assisting them to better serve their customers and save costs in storage and shelf space.
- Demand forecasting and sales analytics applications are becoming widespread and assisting decision-making.

4.4 Digital skills landscape

4.4.1 SETA-led initiatives

The W&R (Wholesale and Retail) SETA Sector Skills Plan (SSP) 2016 -2017 has this to say about digital skills:

The retail industry is enduring 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[39]

The Top 10 Critical Skills identified are: Management, Leadership, Life skills (time management, Personal budgeting, Labour relations Knowledge), Customer service, Selling, Product knowledge, Supervisory, Financial acumen, Numeracy & literacy, IT Skills Computer (Advanced).

High level computer skills are required in relatively low-level positions such as: Store Person, Checkout Operator, Shelf Filler, Office Cashier and Sales Representative.

The highest skills demand in the Western Cape are for: Retail Manager, Retail Supervisor, Retail Buyer, Sales Assistant (General), Sales and Marketing Manager, Retail Buyer, Butcher, Confectionary Baker.

From an e-retail perspective key occupations are: e-Commerce Manager, e-Commerce Planner, Web Integrator, e-Retail Managers, Call Centre Agent, Software Developers. The increase in the demand for e-retail occupations clearly indicates that "*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*."

4.4.2 Formal education-led supply chain

Some key initiatives in the Western Cape are:

TVET College / Retail Simulations Centres**:** This project is aimed at capacitating colleges to deliver W&RSETA programmes with a two-pronged purpose of fostering collaboration between institutions and the sector and to produce graduates that meet the needs of the industry. There is a centre at the College of Cape Town

Masters and Doctorates: W&R SETA has partnered with CPUT for the development of retail qualifications within HEIs as well as providing support to masters and PhD bursary beneficiaries. Partnerships have been established with Stellenbosch University (which provides access to Bureau for Market Research), CPUT (which has seen the establishment of a W&R Research Chair)

4.4.3 Industry-led supply chain

Employers / Operator In House Training: Most of the large retailers have in house training programmes

Industry Specific Academies & Colleges: An example of this is the Woolworths Food Academy[40].

Schools of Excellence: The W&RSETA's partnership with Decorland, Boxer Superstores, FG Knight, Mass Discounters, and Mass Cash was created to establish schools of excellence. This collaboration enables the provision of learnerships and Wholesale and Retail experience to graduates, the placement of 700 graduates at these retail organisations.

Vendor Package Training: All of the major platforms have online training courses, e.g. Amazon Services Training[41].

4.4.4 Less formal supply chain

Digital Literacy Programmes: None were found

Incubators and Accelerators: No retail specific incubators and accelerators were found; certain incubation complexes do, however, include Maker enterprises for example notably in the Woodstock Design District[42]. At the Woodstock Exchange, for example one Grandt Mason Originals, which uses luxurious fabrics from ends of rolls and swatch books to make one-off footwear, Chapel leather goods; and the factory shop for Honest Chocolate.

Informal & Intuitive Learning: This clearly plays a leading role in the sector.

Special Purpose Programmes: For informal trading, the W&RSETA's partnership with the Department of Trade and Industry (the dti) was created to help develop the informal trading sector.

Work Readiness Academies: None were found.

4.5 Insights

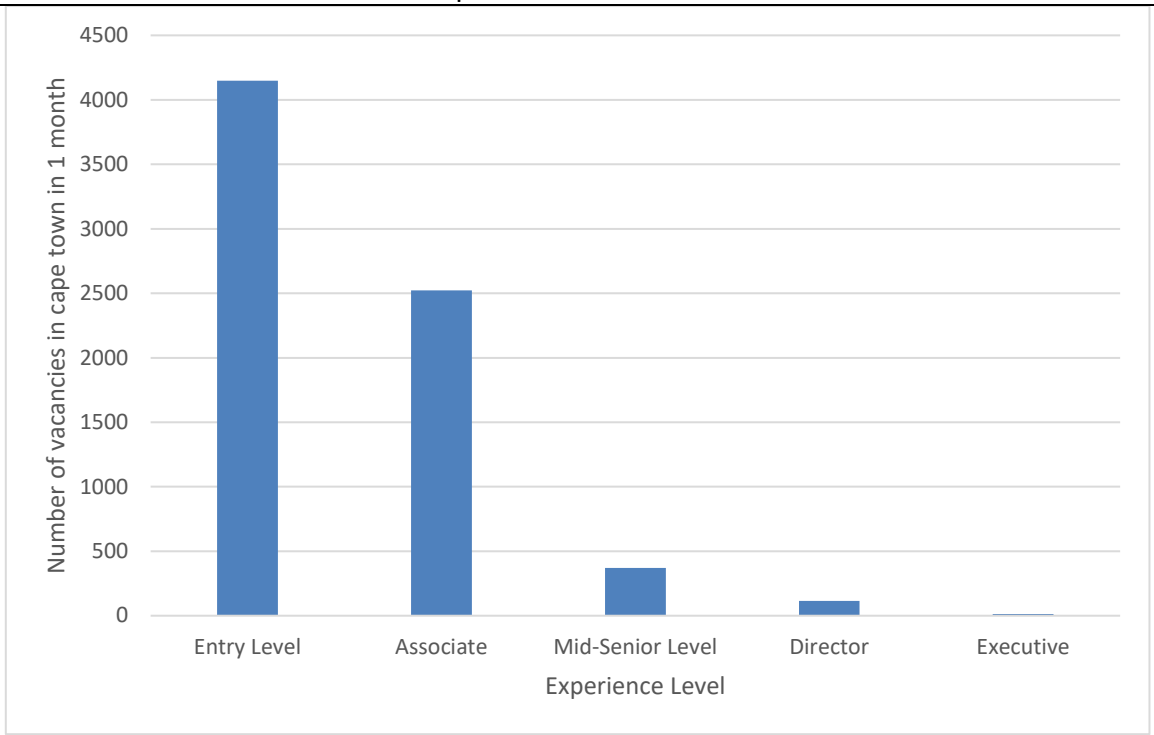
It is clear that significant up-skilling and re-skilling are required in the large Western Cape retail and wholesale workforce. This would take place on three levels:

- Firstly, at the leadership skills level, operating across sectors including banking and financial services and transport to handle distribution requires high levels of convergence management, innovation and digital savvy.
- Secondly, high levels of product information across channels, suppliers and distributors easily available on mobile will escalate the need for high level sales skills rather than basic product and price knowledge. This would, for example, mean that the sales person is familiar with the range and pricing of similar brands on the internet and is aware of what social media, blogs and celebrity tweets are saying about the product or brand.
- Thirdly, since all forms of buying and selling (C2C, B2C, informal and micro businesses) would rely on platforms (Gumtree, Facebook, Instagram) ultimately linked to mobile, mobile-based digital entrepreneurship skills are a universal need.
- A process of "downwards trickling" of needs for digital skills is evident, where the most basic occupations now require digital literacy. These jobs are also most threatened by

automation, robotics and integrated inventories and supply chains. Even the job of the famous cashier at the checkout counter is likely to be supplanted. As thousands of jobs and livelihoods are at stake, a large-scale digital upskilling programme is indicated for the Western Cape.

The needs at entry level correlate well with the IT Industry picture, as presented in Table 6.

Table 6: ICT-related vacancies and experience*



*This information does not portray a trend as it is for one month only

SECTION 5: BUSINESS AND FINANCIAL SERVICES SECTOR ANALYSIS

5.1 Introduction

The Business and Financial Services sector in the Western Cape is fully integrated into the global economy and is playing a leading role in Sub Saharan Africa both as a financial centre and as a services export hub. As a major contributor to growth and employment, digital skilling in this sector is vital to the prosperity of the province.

5. 2. Sector definition

Business services are a general term that describes work that supports a business but does not produce a tangible commodity[43].

The scope of business and financial services is vast, and includes Business Process Outsourcing services, consulting services, customer services, human resources services, cleaning, patronage, repair and maintenance services, dispute resolution and prevention services, it services, security services and financial services.

Financial services include accountancy, banks and building societies, real estate, stock brokerages, tax services, valuation, risk management and insurance.

5.3 Overview of the landscape and dynamics

5.3.1 Growth and employment dynamics

Globally, financial services are the third most profitable sector, delivering an estimated net margin of 17, 14% in 2016[44]. Employment in the services sector in the Western Cape rose by an average of 2,7% per year between 2011 and 2016.

The national Gross Value Added (GVA) contribution of Services SETA-related sectors in 2016[45] was as follows:

Professional Business Services:	R 324 billion
Business Activities:	R 93 billion
Community, social and personal services:	R 92 billion
Total:	R 509 billion

The services sector is the Province's biggest employer and added the most jobs to the provincial economy (64% of the jobs created from 2011). In 2015, the finance, insurance, real estate and business services sector made the largest positive contribution to economic growth to all districts. The sector therefore remains a key contributor to the economic well-being of the Province[46].

5.3.2 Companies / role players / industry bodies

The sector is dominated by multi-national and national vertical corporations that provide financial services (Old Mutual, Sanlam, ABSA, FNB) and consulting services (E&Y, Bigen, PWC, Deloitte, etc.) that are well represented in the Western Cape. In 2012 Cape Town hosted 6 Global HQs of multi-national firms to Johannesburg's 1447. The highly rigorous Global Financial Centres Index[48] of 2018 ranked Cape Town Cape Town highest as a financial centre in Sub Saharan African raking 38th globally, well ahead of Johannesburg at place 57th.

Around a strong globally connected and integrated core of multi-national firms are a well-established network of professional medium sized service companies in HR, legal, asset management professional and business process services as well as a plethora of small and micro enterprises that provides everything form niche and bespoke services in professional services, maintenance and security services.

5.3.3 Key drivers and technological change

Cape Town is South Africa's start-up hot spot with triple the number of start-ups compared to Johannesburg with a much larger economy. Analysis by Endeavor Insight[49] indicates that the Cape Town area tech sector includes between 450 and 550 entrepreneurial companies working in software development, e-commerce, or fintech. These firms are typically led by small teams of founders, averaging to about 1,7 cofounders per company.

Cape Town has produced multiple firms that have stood out for their innovative breakthroughs and who have a strong global presence as a result. Clickatell, for example, developed the first mobile messaging API and was hired by the US State Department to send text message excerpts to global citizens during Obama's 2009 speeches in Cairo and Accra. The data-mining firm BrandsEye is also known for its prediction of both the British exit from the European Union, and the outcome United States presidential election in 2016. Finally, what is perhaps the most obvious example of Cape Town's impact in the tech sector is the internet giant Naspers, Africa's highest-valued tech company and a massive tech investor on a global scale. Getsmarter, an Edutech firm that provides online certification courses in partnership with some of the world's top universities, is another more recent example of these firms. Last year, the company was acquired by the Edutech giant 2U for $103 million, the equivalent of over R1 billion[50].

What makes the Cape Town area an attractive location for launching a technology company? Endeavour Insight asked local tech entrepreneurs why they chose to start their businesses in this community during the interviews conducted for the study. Results show that there are some characteristics of the city in particular that are highly valued by these entrepreneurs. The most commonly cited reason for launching a firm in the Cape Town area was a practical one: the area was where entrepreneurs were living when they first decided to start their companies. This rationale is actually common and has been seen in other cities studied by Endeavour Insight. What stands out is the recurring logic - many founders living in the area wanted to continue living there and start their business there for the quality of life and ecosystem.

These factors often overlapped in the responses. As one founder noted "I was living in Stellenbosch at the time and it is an incredibly inspirational place to start a business." Another founder responded that "it is the start-up capital of South Africa and I had just finished studying at UCT so it was a perfect match." The second most commonly cited reason was the perception of Cape Town as a tech hub. One founder responded that Cape Town has an incredible tech and start up scene with creative and innovative minds because "people are willing to take a leap of faith and put themselves out there; it's a great environment to feed off of from other entrepreneurs and start-ups."

However, a major constraint observed in the Endeavour Research is lack of skills: "Access to talent was the most frequently cited challenge, with about 67% of 150 of entrepreneur respondents ranking it as a serious or very serious obstacle. The majority of respondents indicated that access to technical talent specifically was a serious or very serious challenge. One founder claimed that "our core strength is in our technology. Finding talented developers to help us build that technology, is a major hurdle."

The sector is undergoing three types of convergences:
Firstly, the advent of global multi-sided platforms (MSPs) such as LinkedIn, Salesforce, Google, MasterCard and even Facebook are converging matchmaking and financial services at low cost that connects service providers, consumers, advertisers and value add services in instant time. This convergence directly benefits ecosystems of partners which provide value add, technology and intermediation services around the platforms. It also facilitates the Gig Economy: an environment in which temporary positions are common and organizations contract with independent workers for short-term engagements. The trend toward a gig economy has begun. A study by Intuit[51] predicted that by 2020, 40% of American workers would be independent contractors. The implication from a digital skills perspective is that vast numbers of micro enterprises will require "self-help" digital skills support. This could take the form of:

- Local blended learning seminars and classes that support third party and vendor on-line training packages
- Peer learning seminars and workshops that encourage the building of fraternities in developing or implementing technologies, apps and platforms
- Developing local networking and matchmaking platforms of suppliers, producers and intermediaries to support local gig economies

Secondly, the Business Processing Industry BPO industry is converging typical back office administration services (the best example being call centres where the Western Cape has a global competitive advantage) which are concentrated to achieve economies and efficiencies of scale. Examples of this include Capitec, Sanlam and Old Mutual which have centralised their back office functions.

Thirdly, Shared Services Centres (SSCs) are converging the full spectrum of business services under one roof to provide these services to one or more large enterprises.

The Western Cape is second only to Gauteng in relation to both BPO and SSCs. In Table 7 Ernst and Young[52] identify the following trends driving sector growth.

Table 7: Trends Driving Financial and Business Services Sector Growth

Customer experience & value propositions	• Increased convenience and access to financial services • Improved knowledge of product offerings & ability to compare prices – greater choice • Integration of banking into consumer lifestyles • More payment options enabling easier transactions
Optimisation of operations	• Increased efficiency and lower operational costs. • Ability to focus operations on customer service rather than back office processes.

Nature of work	• Enable staff to work anytime, anywhere • Increased customer centricity • Less staff focused on administration & back office functions
Internet of Things	• Automated processes that trigger business rules and data analytics automatically. • Branches and ATMs that self-monitor and report status automatically • Ability to measure customer behaviour and develop product offers that respond to customised needs
Big data	• Compliance and regulatory reporting • Risk analysis and management • Fraud detection and security analytics • CRM and customer loyalty programmes • Trade surveillance • Credit risk, scoring and analysis • High speed arbitrage trading • Personalised customer pricing & experience
Mobile connectivity	• Mobile apps for consumers to carry out banking activities & manage their profiles and products
Artificial intelligence	• AI Legal assistant • Monitor online searches to anticipate trends in demand
Automation, Robotics & 3D Printing	• Robotics process automation carries out routine and repetitive activities more accurately and quickly than a human. Main usage areas – audit, insurance claims approval, legal contract creation etc.

Ernst and Young found that the Western Cape is leading within the South African context about innovation, managing disruption and mobile connectivity. The financial services sector specifically is “mature and sophisticated”.

They do, however, identify the following imperatives for the Western Cape in regard to the businesses and financial services sectors:

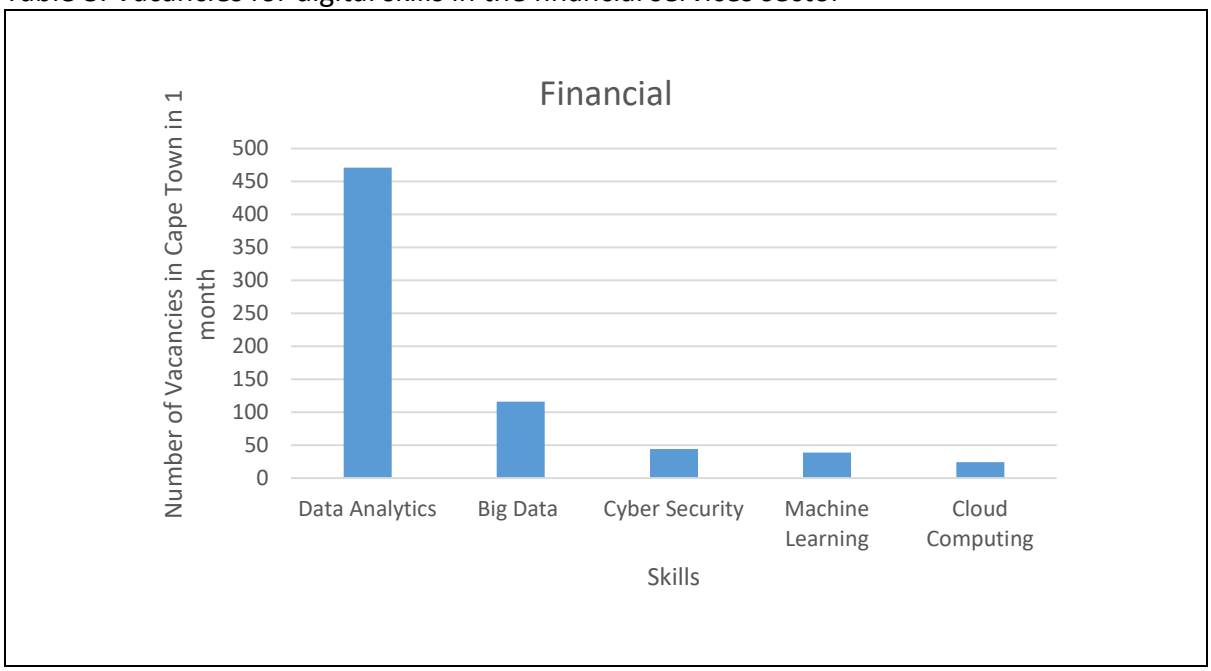
Customer engagement: Digital device ownership generally requires that customers be engaged on their own terms across multiple channels. The millennial generation and the digitally savvy expect understanding and flexibility which means that they must be able to access all services online and be informed about what competitors offer. There is a high demand for trust and transparency

New business models and operating models need to be developed. Typically, these are referred to as “agile” organisations which are able to collaborate with or buy start-ups, attract and retain millennial talent (quote) and apply the principles of exponential organisations

Predictive analytics: This cover a vast spectrum including financial security and fraud detection, recruitment, customer retention and acquisition and actuarial metrics.

The number of vacancies in the financial services sector per month for Cape Town is reflected in Table 8, which shows that the digital skills requirements are mainly data analytics, Big Data, cyber security, machine learning and cloud computing.

Table 8: Vacancies for digital skills in the financial services sector



This is illustrated well in the demand in the Western Cape for these skills:

Behavioural economics: support for customer engagement is facilitated through tracking and analytics whereas social media provides a rich platform for better understanding behaviour. This requires completely new skills sets at all levels.

Digital capability: substantial investment has been made in digital technologies, capabilities and skills

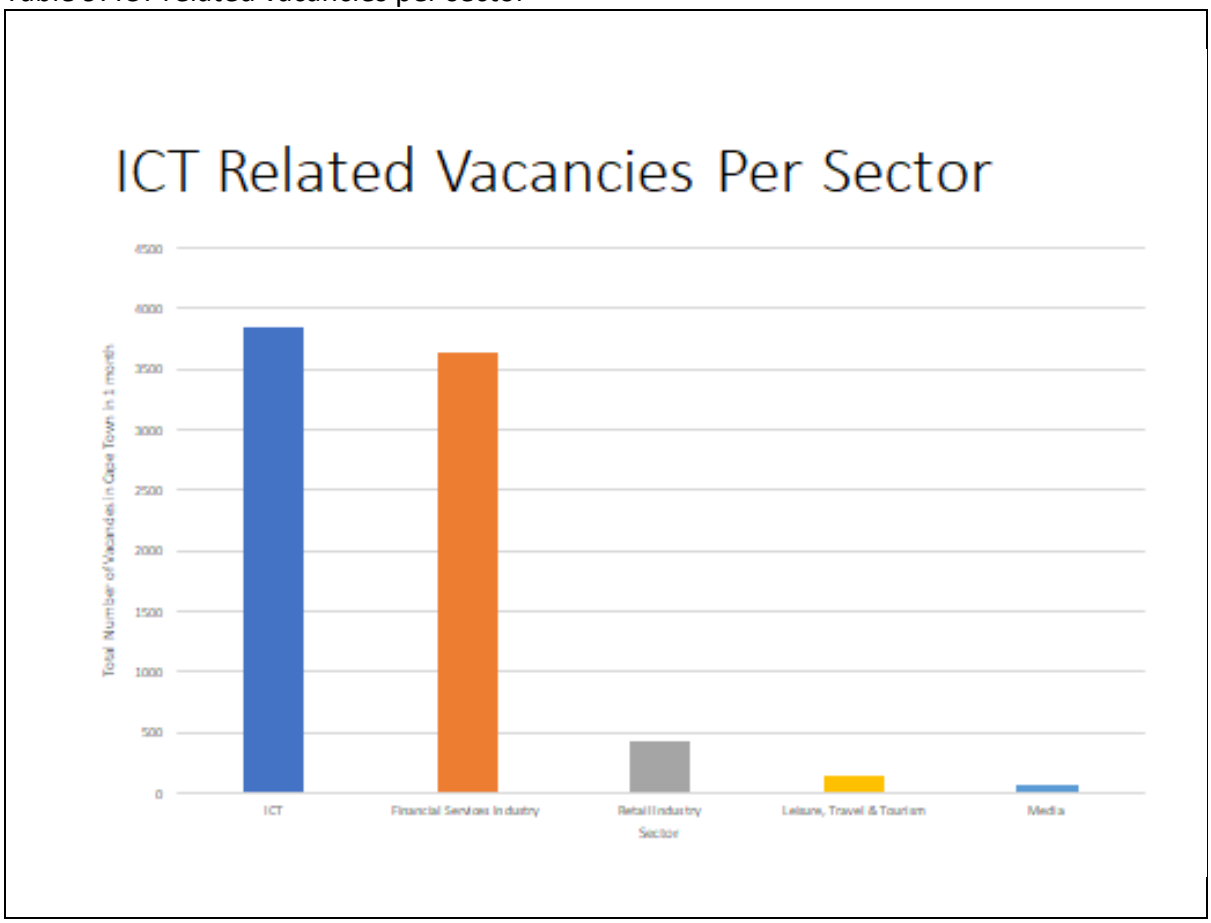
New distribution & customer channels must continue to be developed, particularly in the light of omni-channel marketing which for example is requiring up-skilling of BPO operations of call entre capabilities

Core operating systems need to be upgraded and legacy systems replaced which have implications for re-skilling and up-skilling.

5.4 Digital skills landscape

The strong demand for ICT skills is very strong in the financial services sector, second to the IT industry itself. See Table 9 for the sectoral perspective.

Table 9: ICT related vacancies per sector



5.4.1. SETA-led initiatives

The Services Sector SETA[53] (SSP) has performed an analysis of the change drives and skills demand in the sector, and identified the following skills needs in regard to ICT:

- Due to high levels of product information on the web, estate agents need to have skills in brand management, digital sales, marketing and social media
- Big data demands higher level of analytical skills
- Computer generated outputs enhance the capabilities of professional services
- Social media and online research skills are important for all companies
- The revival of postal services will involve the adoption of digital mail
- Millennials are preferring omni-channel to voice, with implications for the call centre business model. Upskilling of agents is needed

The following digital skills gaps are identified by the Services Sector SETA, namely: Management (i.e. Database analytics, Social media); Data management (Technicians & Associated Professions); Graphic design (Experiential marketing); Clerical Support Workers (Computer literacy, Internet skills, Document management).

Additional information:

- Over the last 5 years the SETA supported 60 000 learners of which 9 427 completed their learning pathways.

- The SETA has accredited 1 408 public and private Skills Development Providers with only 156 in the Western Cape.
- The SETA is working with the SAQA, the QCTO and the DHET on 11 new qualifications including Call Centre Manager.
- The SETA has entered into 186 Service Demand partnerships and 40 Skills Supply Partnerships including 4 TVETS and UCT in the Western Cape and has a Skills Development Centre in Beaufort West.

5.4.2 Government-led initiatives

The Cape Innovation and Technology Initiative (CiTi) was established in 1999. Best-known for managing the Bandwidth Barn, a space for start-ups to grow and connect in Cape Town, CiTi also successfully runs several programmes in the skills and enterprise development space.

The Genesis Community IT Initiative (G-CITI) aims to enable communities through access to broadband technology, to participate digitally for personal development and business development purposes and become a hub of activity for technological and digital development for the Elsies River and adjacent communities. In addition to wide range of services, the digital skills programmes and courses offered include: Computer basics, IC3 Digital Literacy, Microsoft Office, Pastel, IT Technician training and IT Web Specialist training
.

The Western Cape Government Broadband Initiative (WCBi) aims at co-ordinating and integrating government action to radically improve the provision of telecommunication infrastructure, skills and usage within the Province. The government connectivity project will see about 2 000 government sites, including schools, libraries and health facilities connected and ensure that by 2022, the province has a 10 Gbps fibre based backbone running through the entire province (both urban and rural). This will be rolled out via a strategic partnership between WCG, the State Information Technology Agency (SITA) and Neotel (Neotel was appointed via a competitive, public tender process). The contract has already been concluded in 2014 and the rollout has commenced.

Interactive Community Access Network (ICAN) which are a multipurpose Community ICT Access and Knowledge Centres aimed at getting mass adoption of technology to improve people's lives through facilitating ICT access, content and skills development. The aim is to expand this network by using an entrepreneurship model across the Western Cape, with the first Proof of Concept being delivered in Elsies River, a community in the Cape Flats. An ICAN centre is a physical facility containing various focused interactive zones. The focused zones are: ICAN Learn, ICAN Study, ICAN Communicate, ICAN Create, ICAN Play.

Through the ICAN project communities will be able to access digital literacy and e-educational and blended learning opportunities. A schedule of subsidised training will be available through the ICAN centres, including accreditation/ certification of certain courses. Training opportunities will range from basic e-literacy to application development and video productions.

Public Access Wi-Fi Hotspots: provide limited free internet access to citizens, Wi-Fi hotspots are being installed at specific government buildings, offering access to online government services, m-training, job portals and the Internet. This is a partnership with Neotel and was

negotiated as part of the contract that is connecting almost 2 000 Provincial Government sites. A total of 384 hotspots will be set up across the province, with each citizen receiving a free allocation of 250MB per month. The project aims to develop a model for the sustainable provision of public Wi-Fi.

Public Internet Competition: The aim of the Wi-Fi competition is to stimulate the use and adoption of technology through a quarterly competition as well as market the Internet. The competition has 2 components, namely: 1) the development of new ideas and innovations using technology and the internet and 2) uplifting stories from the 36 communities describing how the Internet has positively impacted lives.

Internet Champion Programme: To ensure that digitally marginalised citizens are able to optimally use the Internet and to drive the adoption of technology and develop basic skills, Internet Champions will be stationed at the public access Wi-Fi hotspots to introduce the general public to the Internet, and offer basic usage guidelines.

Connected Household: The aim of this project is to address the critical shortcoming of last mile access to affordable, high quality broadband in South Africa, particularly in middle- and low-income areas.

E-Skills Platform: This is a collaborative project between DEDAT's Broadband unit and Skills Development unit in order to improve skills development, support a vibrant and innovative e-content cluster, and drive broadband usage in the Western Cape. The platform incorporates a Skills Intelligence Platform to foster collaboration between relevant stakeholders; a Learning Management System to deliver e-learning content and courses; a Career Awareness Platform to match interests and skills to career paths; and a Content Publishing Platform that acts as a marketplace between creators and users of content. Key considerations include identifying gaps in the content creation 'ecosystem' and designing appropriate government interventions.

Intellectual Property Management for Digital industries: Associated to the e-skills project and its goals around content stimulation are issues related to Intellectual Property protection within digital industries.

Broadband for Business Toolkit: This project aims to develop a targeted campaign and incentive package to increase the awareness and benefits of broadband in order to improve business competitiveness through the uptake of broadband.

Business Broadband Purchasing Collective: Research suggests purchasing collectives can yield economies of scale and improve uptake, as they bring together clusters of buyers and facilitate investment in infrastructure, particularly for bandwidth intensive industries. The Department will assist the East City design precinct to set up a purchasing collective to facilitate fibre-to-the-premises in this district.

E-centres: The City of Cape Town is establishing e-centres, which ensure that residents, including those in townships, also receive broadband so that they too can be in the information superhighway of the mainstream economy.

5.4.3 Formal education-led supply chain

The formal educational infrastructure of 4 universities and 5 TVETs in the Western Cape is highly developed with two business schools (UCT GSB, SUN USB) that rank well globally. It is outside the scope of this report to further elaborate on these initiatives.

5.4.4 Industry-led supply chain

Employers / Operator In House Training

All major national and multi-nationals have well-developed internal digital skills training programmes.
Industry Specific Academies & Colleges: Various colleges and entry exams exist for most of the professions.
Partnership-led initiatives: The *Cape Digital Foundation*: Aims to initiate, co-ordinate and drive the implementation of initiatives aimed at stimulating the usage and uptake of broadband services across all aspects of society. The foundation will be independent and neutral, comprising diverse stakeholders from government, academia, business and civil society, and therefore will help to address social issues through broadband in a unified way.

5.4.5 Business-led initiatives

The *Digital Venture Build* programme (launched September 2018) is a six-month blended learning programme that provides entrepreneurs with online resources and on-site workshops to build a working prototype for a digital business. Participants of the programme will be able to apply for software development rewards valued at up to US$15,000 each. These software development rewards, which are offered as part of its Project Programme Rewards, will enable aspiring entrepreneurs to work with a full software development team to build and launch their digital ventures.

BPESA: Over the past years the BPO sector[54] has seen significant success in the continued implementation of the skills strategy, including:

- The initiation of the BPO Skills Forums across the country
- The formulation of a BPO 'Future-skills' framework
- The Training of 175 young unemployed work-seekers in the Western Cape to prepare them for access to the BPO Sector by providing work readiness training and a 12 month learnership. This initiative is being funded by the City of Cape Town, DEDAT, and EOH
- The training of 20 potential team leaders in the Western Cape to build individual knowledge and competence related to operational efficiency to positively effect change within the environment through managing team performance efficiently and effectively. This programme is also being funded by the City of Cape Town.
- The adoption of key elements of the BPO skills supply chain across all regions.
- The collaborative effort of Government and Business to lobby support for the acceleration of youth employment and the up-skilling, re-skilling and future-skilling of the work force.
- The adoption of the Programme Office model into BPESA to support strategic skills programmes across the country
- The forming of a relationship with the Y.E.S – Youth Employment Services campaign.
- The participation in a co-design process with the University of the Western Cape for the development of an interdisciplinary postgraduate diploma with specialisation in Data Analytics and Business Intelligence. This was a collaborative initiative between UWC, BPeSA, BPO agents, niche data analytics companies

Vendor Package Training
A good example of vendor package training is the Salesforce Trailblazer Certification Training Bundle. It includes eight in-depth courses and over 65 hours of video lessons. Lifetime[55] access to the training is available for only $29.99.

5.4.6 Less formal supply chain

Digital Literacy Programmes: No formal training programmes identified
Incubators and Accelerators: The Khayelitsha Barn: The Barn is an ICT incubator which was established in Woodstock and has successfully supported ICT SMME's for the past 15 years. To capitalise on its success, the Community Barn in Khayelitsha has been developed as a proof of concept to test the model in a different community environment. The Barn provides an integrated set of interventions and programmes that assist ICT entrepreneurs from idea and concept phase, through business plan development and growth towards a stable and sustainable business that is able to create employment and generate economic wealth.

Design Technology Centre: this will provide a physical space to test, model, prototype and develop broadband-enabled products and services, allowing evaluation of potential commercial and social value. This centre aims to improve the competitiveness of broadband-enabled businesses. This centre will form part of the Design Park, which is a project run in collaboration with the Design Sector/Fringe project.

Think Rise situated in Woodstock Exchange in Cape Town part of Barclays Rise network that operates FinTech hubs around the world, where cutting-edge start-ups and scale-ups can connect, create and scale their businesses, backed by Barclays' global network of industry experts, mentors, investors and partners. Entrepreneurs located at hub get unparalleled access to mentorship, insights, guidance and world class facilities to accelerate their business.

Work Readiness Academies: A good example of many academies is the following:

The *ASISA Academy*[56] for collective investment schemes, in partnership with UCT, runs this existing Academy CIS Bootcamp as an officially endorsed UCT Short Course (non-credit bearing). It is offered as a five-day course in Cape Town and Johannesburg. The course was developed in collaboration with a group of industry professionals in order to support new and existing members of investment administration, retail and compliance teams within investment management firms and CIS management companies.

5.5 Insights

In the light of the complexity and diversity of this sector and the appearance of completely new products and industries within short time cycles (e.g. cryptocurrency) it is difficult to imagine how a formalised programme or institution with accredited qualifications could keep up with digital skills needs. The solutions may rather lie in developing a culture of innovation and supporting the ecosystem through accelerators, incubators and special up skilling programmes like bootcamps and master classes.

The highly sophisticated business and financial services firms operating in the Western Cape will continue to cater for their digital skills needs in their efforts to remain relevant in a highly competitive landscape. They will do this through a mix of in-house, hands-on and on-line

training as well as through purchasing successful fin-tech start-ups in order to be agile. Unless university-linked incubators are established, it is unlikely that universities or TVETs could keep up with the pace of skilling, up-skilling and re-skilling required.

Even the smaller and medium sized firms are easily able to access cheap on-line platform training packages.

The overwhelming demand for data analytics skills, and its key role in all aspects of digitalised value chains suggests that the Western Cape needs to pay strong attention to this need, not least since it involves a strong formalised education element in the form of advanced statistical analysis (which will eventually be supplanted by AI but will still probably require high level appreciation of the mathematics). Support for Chairs of Data Analytics at universities and setting up of a university-supported data analytics incubator are indicated.

SECTION 6: TOURISM DIGITAL SKILLS SECTOR ANALYSIS

6.1 Introduction

The tourism sector is highly digitalised and a key contributor to the Western Cape economy. The sector is at the leading edge of digital innovation and disruption and is obliged to be globally competitive. The development of digital skills in this sector is therefore of paramount importance.

6.2 Definition of the sector

The UNWTO[57] defines tourism as *"…the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes."*[58]It embraces the tourism value chain which includes international tour agents and operators (inbound and outbound), accommodation establishments, air and ground transport and a myriad of local enterprises from local operators to tour guides, restaurants, curios, natural attractions, conferences and many more.

From an economic perspective we can also talk about tourism as the intersection of the visitor economy (overall demand and supply in all the sectors within which visitor activity and its direct and indirect consequences upon the economy) the leisure economy (what people do in their free time) and the experience economy[59] (the value added to all economic activities by the experience that they generate).

6.3 Overview of the landscape and dynamics

6.3.1 Economics

Tourism remains one of the world's largest and fastest growing economic sectors. The UNWTO*[60]*reports the highest growth in international tourist arrivals in seven years since 2010. International tourist travel worldwide is projected to increase nearly 70% by 2030.

The contribution to GDP growth is expected to be 4.3% in the Western Cape[61] . The tourism sector is particularly successful within the Western Cape and is one of the largest employers in the region. It has been a large recipient of foreign direct investment (FDI) over the last 10 years[62] and it is highly impacted upon by the digital economy and the Fourth Industrial Revolution.

Cape Town International Airport (CTIA) surpassed the 5 million arrivals mark for the 12-month period to June 2017 and demonstrated excellent growth, recording 25% growth year-on-year[63]. The two main source markets are foreign and domestic tourists which are of comparable size[64]but with the highest technological sophistication and product expectations obviously in regards to foreign tourists. International tourism has picked up with an increase of 10% in international arrivals in the Province between 2016 and 2017. In addition to contributing to the foreign spend in the Province of R23.1 billion in 2017, just over 11 000 jobs were created in the sector in 2017[65].

As a meetings, incentives, conferences and events (MICE) destination, Cape Town hosts 58 major conferences annually which will grow with the expansion of the Cape Town International Convention Centre (CTICC) and the completion of the Century City Conference Centre. South Africa's leading tourism attraction, the V&A Waterfront achieved 24 million visitors in 2016[66].

Cape Town is well-established as an iconic global destination and will leverage a strong share of global and domestic tourism well into the future. Some recent awards[67] include:
2018:

- One of the top 10 surf cities in the world by Surfer.
- Number one city in Africa for business tourism events by the International Congress and Convention Association (also in 2017)

2017

- Three Cape Town breweries top the South African list for the best locations to visit across the world by travel experts Lonely Planet
- Featured in Fodor's Go List 2017
- Western Cape voted Golf Destination of the Year, 2017, Africa and Gulf States (IAGTO – International Association of Golf Tour Operators
- Number one city globally for tattoo affordability and studio availability according to the YEAY App and Global Tattoo Index.

6.3.2 Policy aspects

The South African government has prioritised tourism through the creation of a stand-alone National Department of Tourism (NDT) and a National Tourism Sector Strategy (NTSS).

The Western Cape has prioritised tourism through its Project Khulisa growth strategy. The goal is to add up to 100 000 additional jobs to the tourism sector.

The City of Cape Town has a multi-year Tourism Development Strategy[68]

6.3.3 Companies / role players / industry bodies

Leading investors in the Western Cape's hotel sector include the Rezidor Group, Taj Hotels, Starwood Hotels, Hilton, Marriot who have acquired the Protea Group, Tsogo Sun and Bon Hotels. WESGRO More than 15 000 accommodation units are now listed on Airbnb for Cape Town.

In addition to major players such as Thompsons, BidVest and Hylton Ross there are literally hundreds of tour operators in Cape Town, covering a vast range of markets, tastes and experiences. Some 658 tour operators are listed in South Africa by safarribooking.com[69] and Cape Town Tourism had 1 290 members in 2017 and was experiencing strong growth.

The most important industry bodies include Cape Town Tourism, WESGRO, SATSA, Tourism Business Council of South Africa and Tourism Departments at national, provincial and City level.

6.3.4 Key drivers and technological change

The following are drivers of disruptive transition in the tourism industry:

The emergence of multi-sided platforms (MSPs) that integrate all aspects of the value chain is the key driver of change. "Large sales forces are becoming less relevant as providers advertise information & engage with stakeholders/the market remotely on digital

platforms…a different set of skills …is needed with this shifting focus from physical to digital channels" [70].

Examples of customer-facing tourism MSPs include Expedia and TripAdvisor that support the independent traveller using on-line booking. Only 22% of visitors to South Africa make use of traditional travel agencies and just 10% consult hardcopy media. Many more visitors to SA book directly through vendor sites (33%) or online travel agents[71]

Other platforms are designed for tourism businesses:

- *TrekkSoft* is used by thousands of tour and activity companies in 130+ countries and connects to distribution channels like Viator and Expedia and resellers.
- *TP Connects allows* travel agents to access rich content that includes videos, pictures, and personalised preferences both in the B2B and online channels with air, hotel, car, transfer, insurance, rail, cruise, and dynamic holiday packaging.

The digitalisation of all facets of the value chain enables very high levels of tracking, personalisation, customisation and engagement. This has supported fundamental changes to business models as product platforms such as Uber disrupt the ground transport industry and Airbnb disrupts the accommodation industry.

The rise of the 'DIY' (Do it yourself) traveller[72] is supported by mobile technology proliferation which allows instant access to self-service channel bookings supported by high levels of content aggregation. Companies are able to extend their involvement in customers' trips by regularly tracking their activity and communicating with them, expanding the opportunities to provide further services and build customer relationships[73] and can monitor customer feedback, receiving current & future financial indicators using predictive software.

As travellers can share experiences instantly their reviews and ratings are making product performance instant and transparent. This highly visible marketplace demand highly responsive engagement.

Premier Hotels & Resorts' Group Marketing Manager, Christa Badenhorst[74], shares the following forecasts for the year ahead:

"*Globally, the number of people using mobile messaging apps is expected to increase from 1.82 billion in 2017, to 2.01 billion in 2018. With more and more people using apps like Facebook Messenger, WhatsApp and Snapchat, marketers are following suit to raise brand awareness, distribute content, advertise, generate leads, drive sales and conduct customer service…Artificial intelligence (AI) enables marketers to use user web-browsing behaviour information in their marketing efforts. Now that AI tools have become more affordable and accessible, more businesses will be utilising them to enhance pay-per-click ad campaigns, suggest social media content for better engagement, provide a highly personalised experience to website visitors and enable customer support via chatbots - to name but a few capabilities*".

In sum, the following transitions are underway in the tourism industry:

- From mass markets to niche markets

- From one size fits all to personalisation: accurate understanding through customer analytics and engagement
- From vacation packages to self-service in key segments
- From brochures and websites to video and virtual experiences
- From expert and media review to social media review
- From selling of products (outbound marketing) to two-way engagement (inbound marketing)
- From traditional products to digitalised products
- From a tourism value chain to an experience value chain that is more complex, orchestrated, personalised and diverse
- From booking engines and websites to multi –sided platforms
- From desktop interfaces to mobile interfaces

6.4 Digital skills landscape

Generally speaking there is little formal education led training for digital skills in tourism. The Tourism Human Resource Development Strategy Development & Skills Audit Study[75] found very low, unacceptable levels of computer literacy at all levels, as well as high levels of unemployment for TVET graduates in tourism and a mismatch with employer needs. The CATHSSETA was found to be ineffective.

6.4.1 Formal education-led supply chain

Since much of the tourism value chain involves standard business and IT qualifications, tourism-specific qualifications are relatively limited. The following have been identified:

- BTech Tourism Management: CPUT The purpose is to equip learners in interpreting, formulating and implementing advanced event strategic and event leadership strategies for the sustainable development of the event industry
- National Certificate Tourism: False Bay College. This is a new tourism qualification at each of Levels 2, 3 and 4 of the NQF. This qualification is designed to provide both the theory and practice of tourism. The digital aspect is the vocational subject “Tourism Operations and Technology”

6.4.2 Industry-led supply chain

Few, if any, tour guide training courses offer mobile technology training (e.g. See Tour Guide Training Institute)[76].

Employers / Operator In House Training: As with all major global companies, major hotels and tour operators will have in-housetraining programmes on their booking and inventory management systems.

Industry Specific Academies & Colleges: The CATHSSETA accredits tour guide training. All tourist guides need to register as a Tourist Guide (Tourism Act 3, 2014). Registered guides are bound by the Tourism Act which requires them to be suitably qualified and to act professionally. Having completed an accredited tourist guide training course, guides must register with the Tourist Guide Registration Office of DEDAT.

Courses offered in Cape Town include Cape Academy of Guiding Services, Benguela Tour Guide Training, Tourist Guide Institute, Livingstone Tourism Academy, Cape Academy of Guiding Services and SATSA.

Few if any tour guide training courses offer mobile technology training (see Tour Guide Training Institute[77]); for example, the Southern Africa Tourism Services Association[78] (SATSA) is offering Introductory Training for Tour Operators for 5 consecutive days (week days) without a digital skills module.

Cape Town has a number of leading hotel schools, including the International Hotel School, the Private Hotel School, the IHT Hotel School, CPUT Granger Bay Hotel School and the Capital Hotel School.

Vendor Package Training: A good example is the Udemy[79] which for only R 110 offers an online TripAdvisor training course covering TripAdvisor best practices, ZMOT or Zero Moment of Truth in Travel Marketing, submitting a travel business to TripAdvisor, using TripAdvisor Forums to win more guests, best practices for implementing TripAdvisor marketing tools in a website and paid and free TripAdvisor marketing tools. Course entry requirements are to have a travel business or plans to start a travel business, to have a website and be "Internet Savvy."

6.4.3 Less formal supply chain

Work-readiness academies

The *Tourism Bootcamp*[80] by the PG Tops group aims to bridge the skills gap for unemployed youth in order to facilitate their entry into the industry. They leverage the consultant and training resources within PG Tops and Luxury Safaris with four weeks of theory work followed by two weeks of practical mentorship at industry partners.

The *Khwela Academy*[81]aims to teach previously disadvantaged female students through an internally Swiss accredited online learning platform, three-week overland trip through the country and a five-month paid internship. Students are learning in real time, and have to solve scenarios and challenges in small groups to promote peer-to-peer learning. Students are then placed with reliable companies where they will intern and experience working while gaining more experience. The Academy is supported by the Department of Economic Development and Tourism and the Jobs Fund.

Digital Literacy Programmes: We have not been able to identify any in the tourism space.
Incubators and Accelerators: We have not been able to identify any in the tourism space.

Informal & Intuitive Learning: This is clearly the core learning channel for the Internet Savvy
Special Purpose Programmes

6.5 Insights

The highly sophisticated global and national hotel chains operating in the Western Cape will continue to cater for their digital skills needs in their efforts to remain globally competitive and capture global and nationally sophisticated market segments. They will do this through a mix of in-house, hands-on and on-line training in order to retain market leadership and keep pace with innovation in omni-channel marketing, on-line booking, CRM and travel

aggregation platforms. They will have few other choices given the pace of innovation and a product cycle that will often be less than 12 months from one platform variant to another or from one less competitive to another more competitive platform (or platform convergence).

Of concern are the smaller and medium sized tour operators and tourism product owners who more will often be black-owned or community-based. For these players the following observation made in Australia[82] in 2015 would be true of the Western Cape today: "The reticence of small business operators to learn digital techniques is steeped in ignorance and fear. They do not know what they do not know about how the travel purchase cycle can be optimised by digital practices and they fear the perceived complexities and time required to make advancements in the digital space." A key requirement in all tourism companies: global, big, medium and micro is the need for social media skills. Even the largest companies are building internal social platforms and the digitally savvy tourist will expect to be able to engage at all levels through social media to ascertain the authenticity of the enterprise. The necessity for these skills is also underscored by the high value given to previous customer ratings and experiences. An agile and responsive social media capability is fundamental to responding to legitimate and illegitimate negative commentary for the biggest and the smallest tourism companies.

Whereas traditional tourism training has focused on the history, geography, landmarks and attractions of places, this knowledge is now highly challenged by the capabilities of search engines offering a deeper, more nuanced and media-rich content. Likewise, is itinerary planning now being supplanted by personalised matchmaking, content aggregation and on-line booking platforms. Tour guides and front-line staff would now be better trained in fluency of internet research, rich media presentation skills and social media. This presents a major up-skilling challenge at all customer-facing level in the industry, from the hotel concierge to the tour guide.

SECTION 7: ANIMATION

7.1 Introduction

Animation is used in the mediums of television, films, commercials, training and education, 3D visualisation, the corporate environment, marketing and other creative environments. Animation is also used in the creation and design of games for PCs, internet, mobile and gaming consoles, not excluding Virtual and Augmented Reality, which are regarded as new technologies.

Within the context of an increasing global population coupled with faster internet access, technological advances and the use of mobile phones, the animation industry is growing exponentially in developed countries. Unfortunately, from a comparative perspective the South African industry is very small as can be ascertained from the economic and performance indicators included in this report.

"New media" is a term being used to describe Animation and Gaming as globally relevant industries[83]. Gaming, film, animation and media all form part of the concept of "new media", but for the purposes of the descriptive overview, the three sectors of film and media, animation and gaming will be differentiated.

7.2 Sector definition

The definition of film and television by the National Film and Video Commission (NFVF) is closely aligned to the DTI's classification of qualifying films in line with the South African Film & Co-production Incentive, which includes Feature films; Documentaries; TV series (including broadcaster commissions); TV films (including broadcast commissions); Animation series; Shorts films; Animation[84].

Animation may be defined as the creation of moving pictures or images with the help of technology and/or animation software. Visual Effects (VFX) (which is a major segment of animation) refers to the creation of special effects and realistic environment in films by combining real-life images with animation using specialised software.

7.3 Landscape overview and sector dynamics

Although South Africa's animation industry is small, it is well developed in terms of quality service and work effort.

The South African industry typically comprises of 2D, 3D and VFX content development for the broader animation sectors including television, advertisements, films, short form and interactive media and games[85].

From a business and funding perspective, the South African animation industry is centred on a "project-by-project" basis with conditional funding from government. Besides being an impediment to the development of the industry, most large companies involved in the animation value chain are unable to employ all staff on a full-time basis. Most staff members generally are freelance contract workers. Due to difficulty in obtaining local funding, animation companies are more inclined to seek work from large organisations abroad, such as BBC, Warner Brothers, Disney and Netflix. Animation and gaming companies with an international focus predominantly function as service providers, rather than developing the

entire value chain from concept to managing the sales and distribution channels, i.e. they are content providers not owning the intellectual property (IP).

The local animation industry experienced substantial growth in recent years[86], partially achieved through the growth in the long and short films and commercials market. Essentially, by attracting major film productions from abroad to South Africa, the local film market has contributed to the exposure of foreign markets to the local animation industry and VFX abilities.

Importantly, there are South African animators that are internationally renowned for their abilities, as not only being able to successfully produce local animated long films (such as *Khumba* and *Zambezia*), but also short films such as *Belly Flop*, a BBC TV special titled *Stick Man*, and *Revolting Rhymes*, the latter of which was Oscar-nominated. Others include *Jock of the Bushveld* and *Lion of Judah* had a DVD released. Unfortunately, the list is not long, but with the support of Wesgro and international viewing of local productions, South Africa is gaining an excellent reputation for quality productions.

Distribution of pre-animation or post-animation production products varies according to the category and whether the client is local or international (i.e. co-production as collaboration between two or more countries). Animation productions are either distributed via local broadcasters (i.e. television animation), or cinemas (i.e. film animation).

7.3.1 Economics

It is estimated that the Western Cape Animation industry total turnover is R100m, as indicated in Table 10, but due to the impact of the revenue on associated industries, there is also reference to a multiplier effect that increases the turnover. Comparatively in real value, this is a very small industry[87].

Table 10: Macroeconomic Contribution - WC Provincial Film and Media Industry

2015 calendar year	Total turnover (Rm)	Direct GVA (Rm)	Total GDP (Rm)	Direct Jobs (WC)	Indirect Jobs (WC)	Total WC Jobs	Total SA Jobs	Taxes (Rm)	Net Foreign Exchange (Rm)
Film production	**2500**	**1030**	**2805**	**4890**	**3950**	**8840**	**10520**	**371**	**304**
Documentaries	300	130	320	590	470	1060	1270	46	23
Feature films	800	347	853	1560	1260	2820	3400	122	60
TV	1300	514	1516	2540	2070	4610	5430	188	206
Short films	100	40	117	200	150	350	420	15	16
Commercials	**949**	**338**	**988**	**1940**	**1400**	**3340**	**3990**	**131**	**565**
Local	292	109	298	520	420	940	1150	40	-11
Service	555	191	589	1240	840	2080	2440	76	487
International	102	38	101	180	140	320	400	14	90
Stills	**299**	**122**	**439**	**280**	**540**	**820**	**1020**	**42**	**30**
Gaming	**62**	**23**	**69**	**130**	**110**	**240**	**280**	**8**	**47**
Animation	**100**	**37**	**110**	**140**	**180**	**320**	**420**	**14**	**35**
Total	**3910**	**1551**	**4410**	**7380**	**6180**	**13560**	**16230**	**565**	**980**
Source: Grant Thornton, Cape Town & Western Cape Film and Media Sector Study, 2017, p. 107.									

7.3.2 Policy aspects

In addition to the regulations and policy creation, the City of Cape Town is responsible for all public location film permits and is continuously involved in the interaction with other government departments to ensure the permitting process is streamlined and efficient[88].

A study on the Western Cape film and media reasons that the South African government's incentive system requires improvement[89], which implies a complete and detailed explanation of the incentive schemes, the benefits and criteria for eligibility. For example, the South African public sector incentives and supporting measures have become targeted towards BBBEE entities leaving the organisations either with no, or at best limited, public funding which restricts scaling of operations to any significant measure.

The Film and Media Sector of the City of Cape Town is actively involved in supporting the City's Economic Development and Tourism Department's mandate. The City recognises the contribution of filming to the economic and cultural environment of Cape Town and therefore aims to facilitate a sustainable, film-friendly environment in all interactions with the industry. With regards to the Film and Media Sector the main focus is the regulation and policy guidelines around film and media activity within the City of Cape Town[90].

7.3.3 Companies, role players, industry bodies

Currently, more than 30 active animation companies operate in Johannesburg, Cape Town (60% of the total), Tshwane and Durban, with a small group operating from East London and Port Elizabeth.

There are 44 animation studios in South Africa and some of the key industry players[91] are included in Table 11 below:

Table 11: Key Animation developers in SA

Sea Monster – Cape Town	Sunrise (Lost Westlake) Animation Studios – Cape Town
Triggerfish Animation – Cape Town	Bugbox Animation - Johannesburg
Luma Animation - Johannesburg	Shy the Sun (Tulips / Chimneys) – Cape Town
Mike Scott Animation – Plettenberg Bay	Black Ginger – Cape Town
Pixel Thieves – Cape Town	Astral Studios - Johannesburg
Wicked Pixels – Cape Town	Blink Tower – Cape Town
Mind's Eye Creative - Johannesburg	Studio Woo – Cape Town
Lung Animation – Cape Town	
Source: Various internet sites and media reports	

Cape Town is the home of the largest animation studio on the continent, namely Triggerfish. The studio is involved with both local and international productions. The company currently employs 100 employees of whom the majority are on short-term contracts. Due to additional project work, the staff compliment will increase to 150 by December 2018.

Animation South Africa, a non-profit organisation, has as its purpose to develop, promote and represent South African animation and VFX. It is mandated by industry to fulfil the role as the representative and industry body for animation in South Africa[92]. Key associations in South Africa's film sector, which include animation and gaming industry bodies are listed in the Wesgro Film and Media study[93].

7.3.4 Change drivers and dynamics

7.3.4.1 Key drivers

Co-production project work from large international film producers is stimulating the local industry due to limited funding from government. To fill the skills gap when large projects are won, there is a tendency to outsource work to skilled people in other countries, or to import the skills for the duration of the project. Obtaining work permits for the latter arrangement is often a challenge.

7.3.4.2 Technological change

Animators are expected to create both 2D and 3D animations using a variety of animation software programs, such as Maya 3DSMax, Flash, and Morpheme. However, software is constantly evolving and its licencing is expensive, but with the benefit of being exposed to the state-of-the-art trends. Furthermore, as the local animation and gaming industries co-operate with international companies, the derivative are knowledge-sharing about techniques and programmes.

7.3.4.3 Challenges and opportunities

There is an urgent need to move away from a service industry mentality (project-to-project work and insourcing blocks of work from international companies) to creating content, owning the IP, and completing and owning the entire value chain.[94] The Gaming, Animation and Film and Media industries appear to experience similar difficulties and face quite similar opportunities.

The Grant Thornton survey[95] gives an extensive breakdown of opportunities and constraints in its stakeholder interviews, which includes a SWOT analysis[96] of the SA animation industry as presented in Table 12 from a document prepared for the Department of Arts and Culture[97].

Table 12: SWOT Analysis on the SA animation industry

Opportunities	Weaknesses
1. Collaboration 2. Implement Quotas 3. Market-led (services, content and innovation) 4. Growth in the number of developed long form productions, and potential for a self-sustaining long form industry 5. Animation is growing globally and is an attractive investment because of its longevity, its ability to travel, and the potential to create ancillary revenue streams from home video/DVD, publishing, toys and other licensing activities 6. Business development and entrepreneurship 7. ICASA regulating the allocation of local animation on SABC will expand regional broadcasting and the commercialization of local content 8. Training initiatives by industry players 9. Collaboration between provinces 10. Identification of niche competitive elements within the value chain 11. Government's mandate to digitise (make communication infrastructure more readily available) will strengthen the current platform and create	**Industry:** 1. Niche culture of current industry is fragmented with a lack of communication and collaboration between industry players 2. Limited market-led transformation activities with regard to women and youth development. 3. Scarcity of business skills of industry participants 4. Barriers to entry for start-ups 5. No legal office to assist film producers to understand legalities and processes of securing funding 6. Trend of skilled animators leaving the country 7. Poor collaboration and integration amongst relevant Institutions **Training:** 8. Communication gap between training institutes and the industry 9. Curriculum does not wholly address market needs 10. Limited opportunities for 'on-the-job' training **Distribution:** 11. Lack of support from local broadcasters 12. Limitations by broadcast content 13. Few distribution channels for marketing purposes

Opportunities	Weaknesses
opportunities for further marketing and distribution of animation 12. Development of animation clusters and support services 13. Partnerships and collaborations to leverage on brand involvement. 14. Expand on creative opportunities and Afro-centric market 15. Access to 1.5 billion viewers in Africa (co-productions)	**Funding:** 14. Financing projects/finding buyers is challenging 15. Counter-productive criteria for government funding 16. IP and patent rights are not mutually beneficial 17. A lack of innovative funding models 18. Funding not available at all stages of the value chain 19. Lack of gap-funding
Strengths	**Threats**
1. High standard of South African animation 2. Animators are multi-skilled and resourceful 3. There is high quality existing research institutions and organisations (research and development) 4. The presence of an industry association (ASA) 5. Access to world-class technology 6. A strong film industry and overall global recognition 7. Local stakeholders are renowned in international animation markets 8. Growth in connectivity and internet access	1. The continuous lack of support from national broadcaster SABC and other broadcasters (e.TV and M-Net) 2. The continuation of a 3D-biased industry threatening the existence of other forms of animation 3. Lack of an industry track record may potentially deter additional investment. 4. Funding is project orientated and not company orientated.

Source: Department of Arts and Culture. 2014.

7.4 Digital skills landscape

Currently no separate statistical economic / employment data is available on the animation industry, as it appears these statistics have been aggregated from a few key surveys in other sectors.

Despite the existence of institutions offering animation training coupled with companies' internal training programmes, there are overarching observations within the industry that students are in most cases not equipped to meet the demands of the industry. It seems as if industry role-players have a clear idea of which institutions can be approached for appropriately trained students[98]; for example, the students are provided with practical and relevant education in animation and the creative arts.

The consequence of skill shortages creates salary expectations higher than market benchmarking, resulting in the loss of valuable resources to other local industries and to international markets. Animation and the associated industries are high-risk environments due to:

- Project-to-project work, generally on a short to mid-term contract basis.
- Poaching of staff by the opposition with the incentive of receiving higher remuneration.
- The general shortage of project funding due to competitive pricing of productions.
- Outsourcing work of portions of the production value chain to individuals/organisations in other countries; depending on the contractual arrangements, final editing and completion of the project may be done in South Africa,
- Additional staff is often in-sourced for short periods from African or other countries. This simplistic approach is a quick solution to a problem, but does not help in bridging the skills gap as the arrangement is contractual, knowledge sharing is absent, internships are not a priority and SETA skills planning is absent.
- Project-to-project work has resulted in a freelance work culture.

- Recruiting suitably skilled staff becomes price competitive.

7.4.1 Skills suppliers

Table 13 indicates institutions in SA offering training in animation design.

Table 13: Organisations offering animation design

Institution	Programme	Location	Accreditation
The Animation School of South Africa.	3-year full time animation diploma. Specialises in animation and visual effects.	Cape Town Johannesburg	DHET. SAQA – NQF 6. Council of Higher Ed. MICT-SETA. Autodesk Authorised Training Centre.
Learn 3D	2D Concept Design; 3D Animation and Visual Effects & 3D Architecture / Design Visualisation 1 year Gaming Development Certificate.	Johannesburg	No details.
Prestige Academy	Bachelor of Applied Arts in 3D Animation. 2 year diploma in 3D Design and Digital Animation	Cape Town Pretoria	Dept of H Ed HEQC MICT-SETA
City Varsity – School of Media and Creative Arts	Diploma in Animation Diploma in Multimedia Design Other creative art courses	Cape Town Johannesburg	The website mentions accreditation but no details listed.
The SAE Institute of Animation.	BA in Motion Design and Animation (3 years). Higher Certificate in Animation and Visual Effects (1 year). Other creative art courses	Cape Town Johannesburg	DHET No further details.
The Wits School of Arts – Digital Arts.	BA Digital Arts Game Design BA Hons in Digital Art MA in Digital Animation	Johannesburg	University accreditation
The Centre for Fine Art Animation and Design.	3-year course. Animation, graphic design and multi-media.	Durban	No further details
False Bay College – Public Animation Academy	2D animation. 1 year full time programme. Training on software programmes: Flash, After Effects, Illustrator and Photoshop.	Cape Town	SAQA NQF 5
Source: Website search			

7.4.2 Special initiatives (government, industry)

7.4.2.1 Government-led Initiatives

Wesgro (through their Film and Media Promotion Unit) has been mandated to provide marketing and promotional activities for the Film and Media Sector in the Province, whilst Wesgro, DTI, IDC and the Department of Arts and Culture continue to invest in the development of the national Film and Media industry. [99]

7.4.2.2 Industry-led initiatives

SA Creative Services is a creative network where interested parties are able to job search, post articles, read articles by industry leader articles and readers have access to a selection of free creative tools to assist in career development. SA Creatives also provides creative

services to corporates, small business and individuals looking to find suitable talent for projects.

The Digital Canvas Academy provides classes for scholars during holidays with digital drawing skills, with the aim to inspire youth to enter the field of digital animation.

Triggerfish plans to open a training academy in the near future which will offer internships and bridging courses so that new entrants will be equipped with suitable practical and theoretical skills.

7.4.3 SETA perspective

The MICT-SETA Sector Education and Training Authority, was established in terms of the skills development act of 1998 and is responsible for skills development in the Advertising, Electronic Media and Film, Electronics, Information Technology and Telecommunications sectors and their sub sectors. Evident from the four different SETA bodies delineated to the animation industry[100], it appears that there is no skills plan for Animation and Gaming, and at present no SETA caters specifically for training in animation production; where there is a directed SETA, the roles and functionality of this body are unclear and counterproductive.

7.4.4 Challenges, opportunities, requirements

Referring to the value chain, in some instances the different stages of the process require specific job skills. The skills required range from unskilled to highly skilled, the latter referring to creative/artistic skills, editing skills, and business skills needed to convert technicians, programmers and artists into business owners[101]. Senior management skills (experienced people who have worked in different areas of the value chain) are also lacking in the animation industry according to both Triggerfish and Sea Monster CEOs.

It appears the areas of scarcity of skills for this industry primarily exists in more technical roles specific to the sector and less on generic skills such as HR and Finance. Specialist areas include but are not limited to: multimedia specialists, graphic designers, ICT programme developers, analysts, cloud computing, network infrastructure specialists, script writers and concept artists, senior managers, digital/editing technicians, Visual effects compositors, sound engineers, project managers, who have experience in the details of the value chain, agile and scrum masters, drone operators requiring the skills of a pilot but also need to have the insight of an experienced camera person and special effects artists.

Due to the quality of the SA animation productions, which are directly linked to the skills within the companies, experts confirmed regular invitations to relocate the company to places like Madagascar, Canada and New Zealand where more favourable government support and rebate/incentive programmes are on offer.

SECTION 8: FILM AND MEDIA

8.1 Introduction

The rapid evolution of the digital era continues to impact South Africa. The Internet, mobile technology, and telecommunications sectors have been experiencing rapid growth over the past few years, directly influencing the broader Media/Entertainment, Information, Communications and Technology sectors. Collectively, constantly evolving innovation presents consumers with a diverse range of choices that are, inadvertently creating preferences that drive more change. This convergence of technological innovation is influencing consumer demand. The sale and distribution of printed matter is slowly being replaced by on-line purchasing and consumption.

The media in the form of Amazon (not only as a book supplier but as a global web service), Apple, Showmax, Netflix, DSTV are forms of on-demand entertainment. The popular website Spotify offers free on-line music streaming, and Facebook and other social media platforms continue to affect the world in which we live. These examples all resort under the heading Media. New media is a term being used to describe Animation and Gaming as globally relevant industries.[102] The commonality is that technology is driving change across these media channels.

8.2 Sector definition

The concept of media is vast and includes (inter alia) TV, print, radio, blogs, email newsletters, social media, tweets, on-line sources, websites, app alerts, text messages, gaming, animation and advertising. An Oxford dictionary definition of the media is *the main means of mass communication regarded collectively*.

For the purpose of this study, the overview focuses on Film and Media for the following reasons:

- The industry is technology driven (demanding specialist technical knowledge; artistic ability and tools; the use of diverse methods such as special effects which requires different types of software depending on the application).
- The Film and Media Sector is defined not only as feature films but also as television series and documentaries, commercials, Stills photography and so-called 'new media', such as animation and interactive computer games[103]."
- The significant economic and employment contribution to the Western Cape, more so Cape Town.
- The industry can be pivotal to the positioning of the Western Cape as a knowledge-based / digital Province thereby increasing the contribution to national economic growth and development.
- Media convergence as a summation of the above: "Refers to the interlinking of computing and IT, communications networks, media content enabled by the internet and digital media technologies, and the convergent products, services and activities that has emerged as a result[104]."

8.3 Landscape overview and dynamics

8.3.1 Economics

The Film and Media industry in Cape Town and the Western Cape has been identified as a key industry, contributing significant value to the economy. The industry has grown rapidly over

the last few years with the Western Cape emerging as a popular choice for local and international film and commercial productions[105].

The (NFVF) commissioned a study to determine the economic impact of the South African film and video industry for the period of January 2013 to March 2017[106]. In accordance with statistical data published by the NFVF, the Film and Media Sector contributed approximately R4.4 billion to the total South African Gross Domestic Product in 2016/17[107].

In 2015, the Gauteng Film Commission conducted an economic impact study of the Gauteng Film and Television Industry. This study shows that the Gauteng Film and Television industry's economic contribution is estimated at R2.5 billion to the GDP of the Province, employing more than 20 000 workers per annum[108]. Table 14 provides information on the Western Cape film industry.

Table 14: Macroeconomic Contribution of the Provincial Film and Media Industry

Western Cape Film Industry									
2015 calendar year	Total turnover (Rm)	Direct GVA (Rm)	Total GDP (Rm)	Direct Jobs (WC)	Indirect Jobs (WC)	Total WC Jobs	Total SA Jobs	Taxes (Rm)	Net Foreign Exchange (Rm)
Film production	**2500**	**1030**	**2805**	**4890**	**3950**	**8840**	**10520**	**371**	**304**
Documentaries	300	130	320	590	470	1060	1270	46	23
Feature films	800	347	853	1560	1260	2820	3400	122	60
TV	1300	514	1516	2540	2070	4610	5430	188	206
Short films	100	40	117	200	150	350	420	15	16
Commercials	**949**	**338**	**988**	**1940**	**1400**	**3340**	**3990**	**131**	**565**
Local	292	109	298	520	420	940	1150	40	-11
Service	555	191	589	1240	840	2080	2440	76	487
International	102	38	101	180	140	320	400	14	90
Stills	**299**	**122**	**439**	**280**	**540**	**820**	**1020**	**42**	**30**
Gaming	**62**	**23**	**69**	**130**	**110**	**240**	**280**	**8**	**47**
Animation	**100**	**37**	**110**	**140**	**180**	**320**	**420**	**14**	**35**
Total	**3910**	**1551**	**4410**	**7380**	**6180**	**13560**	**16230**	**565**	**980**
Source: Grant Thornton, Cape Town & Western Cape Film and Media Sector Study, 2017, p. 107.									

The provincial film and media industry had a total turnover of R3.9bn in 2015. The breakdown is self-explanatory but a full explanation appears in the Grant Thornton survey. The same report offers a detailed macroeconomic overview of the Cape Town film and media industry[109].

8.3.2 Policy aspects

The Department of Trade and Industry introduced the Film and Television Production Rebate/ Incentive Programme in 2004 with the aim of attracting large budget foreign films to facilitate foreign capital inflow and skills transfer. Since 2004, amendments to the legislation include conditional rebates / incentives to international and local productions. Currently there is a complex process regarding eligibility to apply for incentives, details of which fall outside the scope of this document.

However, from March 2015, the DTI approved the following formats for the incentive: Feature films, Tele-movies, Television drama series, Documentaries, Animation, Digital content and Video gaming.

The Department of Arts and Culture, Wesgro (offering industry investment advice) and the IDC (Media and Motion Picture Strategic Business Unit), NFV, SABC, National Lottery Commission with private funding[110], continue to support the Film and Media industry, whereas the Cape Town Film Permit Office ("CTFPO") is responsible for issuing permits to shoot in public spaces.

A comprehensive section on policies and legislation that affect the film and media sector is found in the Grant Thornton survey[111].

8.3.3 Companies, role players, industry bodies

8.3.3.1 Employment

There are many companies associated with the Film and Media sector to be listed in this document. Table 15 shows the extent of employment within the film, media, animation and gaming industry of the Western Cape and the city of Cape Town, in which the city plays a most dominant role both in terms of employment (70%) and turnover (90%), respectively.

Table 15: Employment in the film, media, animation and gaming industry (2015) [112]

	Western Cape	Cape Town
Television	4 610	3 060
Commercials	3 340	2 430
Feature films	2 820	2 030
Documentaries	1 060	760
Stills	820	540
Short films	350	250
Animation	320	240
Gaming	240	180
Total employment	13 560	9 490
Turnover	R3.9 billion	R3.5 billion
Source: Grant Thornton. 2017. *Cape Town & Western Cape Film & Media Sector Study*. Cape Town: Stratecon, p. 107.		

In 2018, there were 2938 employers in the film and electronic media sub-sector (Table 16). Most of these employers are in the Gauteng and Western Cape. Gauteng, being the biggest employer, is facilitated by the Gauteng Film Commission (GFC) strategy[113].

Table 16: Number of Employers and size of Film and Electronic Media

	2014	2015	2016	2017	2018
Large (150+)	48	40	43	47	55
Medium (50-149)	40	43	54	56	56
Small (0-49)	2107	1879	2365	2615	2827
Total	2195	1962	2462	2718	2938
Source: MICT-SETA. e-mail dated 5 October 2018.					

8.3.3.2 Industry bodies

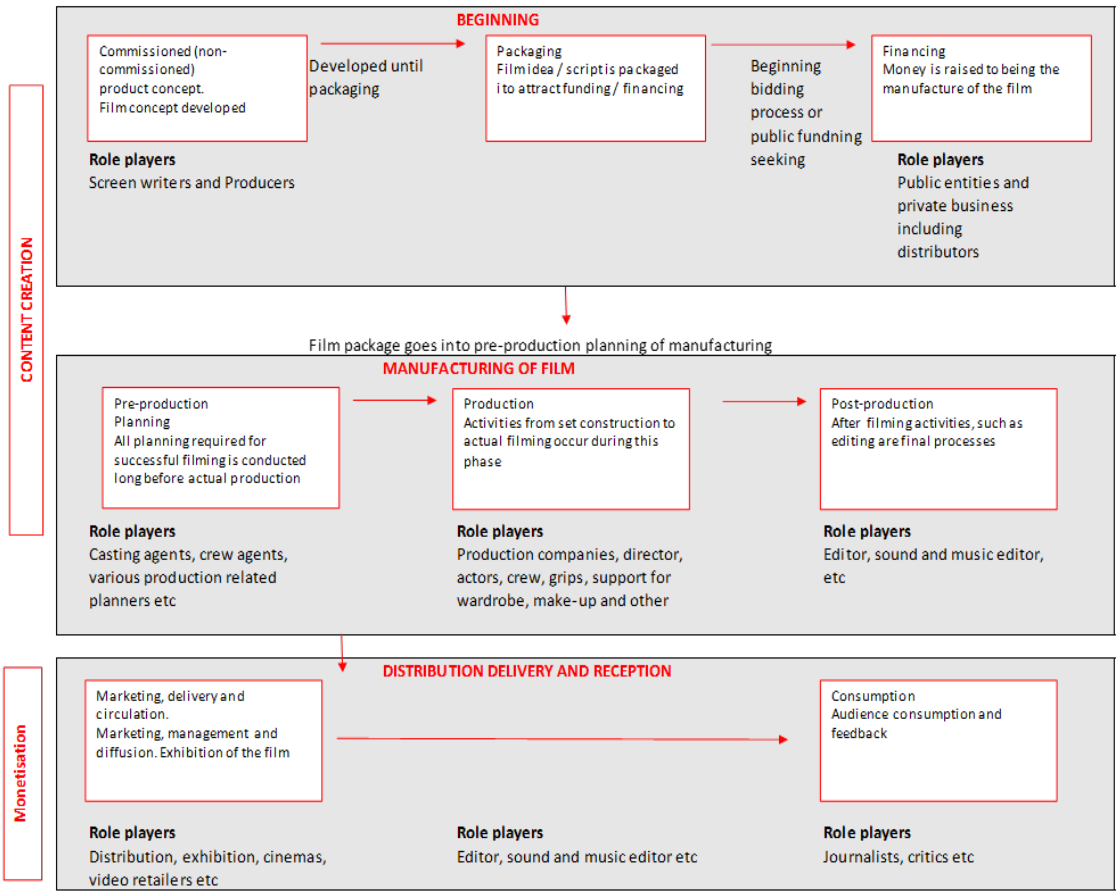
Organisations within the gaming industry are presented below:

- Gaming Industry Interactive Entertainment South Africa: A non-profit company mandated to lobby, suggest policy and aid in the growth of the local gaming, serious gaming, simulations, board-games, augmented reality and virtual reality industries in South Africa.
- Animation SA: Animation South Africa (A.S.A) is a non-profit organisation mandated by industry to develop and represent South African animation.
- Cultural and Creative Industries Federation of South Africa (CCIFSA): The Cultural and Creative Industries Federation of South Africa (CCIFSA) is the controlling body set up with the assistance of the Department of Arts and Culture for cultural and creative sectors in South Africa. It was formed to promote and develop the social and economic interests of the cultural and creative industries and to act as the controlling body for these sectors.
- Department of Communications: The Department of Communications (DoC) mission is to create an enabling environment for the provision of inclusive communication services to all South Africans in a manner that promotes socio-economic development and investment through broadcasting, new media, print media and other new technologies, and brand the country locally and internationally.
- Documentary Film Association (DFA): The Documentary Filmmakers' Association (DFA) was established to nurture and develop the interests of documentary filmmakers in South Africa. It remains the only association in the country with the sole purpose of assisting, protecting and promoting documentary filmmakers.
- Film and Publication Board (FPB): Film and Publication Board (FPB) is a statutory body established by the Films and Publications Act of 1996. The FPB's task is mainly to classify films, videos, DVDs, computer games and certain publications that are available for public consumption.
- South African Screen Federation (SASFED): The South African Screen Federation (SASFED) is an organization that represents the interest of creatives in the film and video spectra of South Africa.
- Writers Guild of South Africa (WGSA): The WGSA supports performance writers in the South African film, television, radio, stage, animation and new media industries.

8.3.3.3 The Film and Media Value Chain

There are a few images available of the film industry's value chain, but the below illustration in Table 17 is more detailed. A full description of each stage appears in the report stipulated in the endnote[114].

Table 17: Film and Media Value Chain [115]



Source: Urban-Econ Development Economists. 2017.

Although video game and animation development (in terms of the value chain) may differ slightly to film, representing the process is important as job titles often mention the stage (i.e. pre-production-production and postproduction and the category, i.e. film / commercials / stills / gaming and animation).

8.3.4 Key drivers, technological change, challenges and opportunities

8.3.4.1 Key drivers

Direct stimulants to the local film and media economy and job market are described below:

- Government's Foreign Film and Television Production and Post-Production Incentive Programme. This is a tax rebate system worth 20%–25% on South African spend. It is a system of incentives put in place by the Department of Trade and Industry (DTI) to support the South African film industry, thereby aiding both domestic and foreign productions. The incentives not only encourage filming on location in the country but also offer additional rebates for post-production work done in the country. This helps to create employment in the sector, and further develop the skills base of the local filming industry[116].

- Cape Town has a good reputation as a filming location and the quality of work offered by local service providers (film and animation) is very good.
- The favourable exchange rate attracts international companies to use the local film and new media companies, including the infrastructure.
- The province is an attractive tourist destination.

8.3.4.2 Technological change

- Virtual Reality: This new technology will come with challenges, since the filmmakers will be giving control to the viewer as to where to focus and imagine non-linear storytelling. VR is the viable direction film can take
- Digital Terrestrial TV: Digital terrestrial television (DTT) is seen as a technological opportunity for the country to unlock the economic and social benefits of broadband technology. DTT will transform the way the local film industry operates and the way in which audiences access local content by opening distribution channels for those who are operating in the TV production space.
- Visual effects technology and software for film and media will continue to evolve. Keeping abreast with the changes will require more exposure and involvement with the international film circuit.

8.3.4.3 Challenges, opportunities

The Grant Thornton, Wesgro and NFVF surveys provide extensive information on the film and media sector. Based on these studies and related online articles, the following aspects were identified:

- Due to project inconsistency, scaling of organisations is a constraint.
- Globally, media companies are responding to technical solutions that enhance their digital supply chains using cloud computing. By using cloud computing, media companies are developing new and better ways to quickly and efficiently deliver content to their target audiences. This innovation is very new to the South African media industry and the benefits should be explored further.
- There is an opportunity for Cape Town to grow and develop the post-production and animation sectors. These sub sectors are both highly technical and require large scale infrastructure investment.
- The catalyst for increased FDI is through the improvement of the DTI incentive and rebate scheme. The DTI post-production rebate should allow for projects filmed in other locations outside of SA to qualify for the rebate as this would stimulate growth and employment within the industry through an increase in project quantities.
- Government agencies do not fully comprehend the needs and challenges facing the Film and Media industry. Education of local government officials is required on the importance and value of the Film and Media industry.
- There should be a film liaison department interfacing with government agencies.
- There is insufficient production infrastructure.
- Shortening the film location permit application and processing time. The Cape Town Film Permit Office (CTFPO) is responsible for issuing permits.
- The Film and Media Sector is high profile and influential. The Sector has the ability to promote the City and Province on an international platform which in turn will attract more international business to the Province.

- Regulations and insurance around Drone filming are onerous.
- Dedicated commercial studios will increase both foreign and local products in the City, thereby increasing job opportunities and revenue.

The NFVF document contains a SWOT analysis (Table 18) which supports some of the comments made above.

Table 18: South African Film Industry SWOT

Strengths	**Weaknesses**
Existing institutional support structures	Lack of variety of skills (film, business, entrepreneurial etc.
Weaker exchange rate	No coordination between key support bodies
Digital technology driving quality content production	Slow transformation in the industry
Access to global markets	Limited distribution channels
Experienced crew	Lack of private investment
Opportunities	**Threats**
Maximise location of diverse shooting locations for local and international film industry	Changes in political and policy environment
Enhance and tailor make funding models	Inability to retain skills
Investor-attracting incentive programmes	Lack of supporting infrastructure in the province
Incorporation of Previously Disadvantaged Individuals into the industry	Protection of creative ideas (IP)
Emerging film-makers with talent	Piracy
Increase training institutions	
Emergence of alternative / innovative distribution platforms	
Source: NFVF (2017), pp. 24-25	

8.4 Digital skills landscape

8.4.1 Skills gaps

The following skills gaps have been identified by various industry surveys[117, 118, 119]:
Creative skills such as script writing, content creation, storytelling, cinematography / copy writers, artist skills for set creation/building, media producers, film and video editors, sound technicians, drone operators, editing skills, game developers, programmers, graphic designers, multimedia specialist, digital technicians, visual effects specialists, illustrators, directors (Film, tv, stage, photography and radio), broadcast transmitter operators, rigging and lighting specialists, interactive and direct marketing strategists.

In the NFVF 2016 skills survey, employers were requested to identify the most-difficult-to-find skills. The response indicated skills-shortages across the value chain and was dependent on the respondent's position in the chain. Some of the most mentioned scarce skills include: production staff (especially producers), editors, camera operators, sound engineers, writers lighting skills and engineers, animators, administrative skills (budgeting), basic technical skills (examples provided are rolling up cables, cleaning cameras, handling video equipment and general knowledge of equipment and products)[120].

8.4.2 Skills suppliers

As presented in Table 19, there are small schools such as Boston Media House, Chris Gibbins Media Centre, Apeiro Film Training Academy, Black Leopard Film Campus, Auteur School of

Independent Film Making, SA Film Academy and Media Village. The Media Academy offers entry level video courses.

Table 19: Skills suppliers

Institution	Programme	Location	Accreditation
School of Audio Engineering (SAE Institute)	BA in Arts in Film Production BA in Motion Design and Animation Higher Certificate in Animation and Visual Effects BA in sound engineering (and a certificate course) Social Media Marketing for the Creative Industry Higher Certificate in Digital Film Production Guerilla Video Production (short course) Live Streaming (short course) Feature Film Scrip writing (short course)	Johannesburg Cape Town	DHET
University of Cape Town. Centre of Film and Media Studies.	**Undergraduate courses** BA in Film and TV BA in Media and writing BA in Film and Media Production: Screen Production BA in Film and Media Production: Digital Media and Informatics Stream BA in Film and Media Production: Multimedia Journalism **Post graduate** Hons in Film and TV Studies Hons in Film Theory and Practice Honours in Media Theory and Practice Hons in Political Communication MA in African Cinema MA in Media Theory and Practice MA in Political Communication MA in Documentary Arts MA in Film Studies MA in Media Studies PhD in Film Studies PhD in Media Studies	Cape Town	University accreditation
Big Fish School of Digital Filmmaking.	A National Certificate in Film and TV Production (2 Years intensive training) FET Certificate: Film, Television and Video Production Operations NQF4 FET Certificate: Film and Television Production NQF5 Diploma: Non-Fiction Filmmaking		Accredited by MICT-SETA; Diploma course accredited by Council on Higher Education and DHET and NQF. No levels indicated.
City Varsity – School of Media and Creative Arts	Higher Certificate in New Media Development Higher Certificate in Motion Picture Makeup Diploma in Sound Engineering Diploma in Professional Photography Diploma in Professional Acting Diploma in Multimedia Design and Production Diploma in Film and TV Production Techniques Diploma in Animation Certificate in Journalism: Print and Digital Media BA Professional Acting for Camera BA in Film and TV	Cape Town Johannesburg	DHET

The SAE Institute of Animation.	BA in Motion Design and Animation (3 years). Higher Certificate in Animation and Visual Effects (1 year). Other creative art courses	Cape Town Johannesburg	DHET No further details.
The Wits School of Arts – Digital Arts.	BA in Media Studies, covers Media and Society; Reading Media Forms; Texts, Processes of Reception and Audiences; Sociology of News Production; Media and Power; Media and Culture; Media and Society. Hons and MA in Media Studies	Johannesburg	University accreditation
Cape Peninsula University of Technology	Cape Peninsula University of Technology National Diploma in Film and Video Technology National Diploma in Journalism National Diploma in Photography Baccalaureus Technologiae in Journalism Baccalaureus Technologiae in Photography	Cape Town	University accreditation
AFDA. (The SA School of Motion Picture Medium and Live Performance)	BA degree in Motion Picture Medium (NQF7) and BA in Live Performance. (3 Years) Higher Certificate in Film, TV and Entertainment Production (1 YEAR)	Johannesburg, Cape Town, Durban and PE	DHET, SAQA, CHE
Source: Wesgro Film and Media. 2017. Cape Town and Western Cape Film and Media Promotion. Cape Town. p. 46.			

Industry-led training: Generally, many companies provide in-house training and development for new and current employees. This allows organisations to tailor courses around their specific needs within the value-chain.

Although formal qualifications are preferred, due to the skills shortage, on the job training is a quick solution as long as the person has the ability and knowledge to learn about the Film and Media industry. Triggerfish and Sea Monster confirmed this during the interview.

Industry players do not find the programmes offered by certain institutions to meet the needs of the film and media industry. Furthermore, current training institutions provide training for entry-level employees only. There is no training and development for staff at middle management roles or those wishing to further their careers to potentially become industry leaders.

8.4.3 Special initiatives (government, industry)

The film festival *Behind the Blazer Film Festival*, is presented in association with the National Film and Video Foundation (NFVF). The *Behind the Blazer Film Festival* is an event that showcases films made by South African high school students from townships, developing cities and rural areas.

8.4.4 SETA perspective on skills

According to the MICT-SETA classification, gaming, and animation form part of the Film and Electronica Media sector. However, little information is available on the status and future perspective of this sector. Based on communication with MICT-SETA, the following response[121] was obtained:

"Unfortunately our study has not gone to that detail of mapping employment and unemployment rates per province. But that is a detail you will find in our impact study research that will be published next year. The animation industry is not a stand-alone sub-sector but should be understood as sector within 'Electronic Media and Film'. We have yet to document detailed research on it in our future research."[122]

Subsequent to the endeavour to gain better insight into the MICT-SETA perspective of the skills shortage in the sector, Table 20 presents an overview of these shortages in film and electronic media sector.

Table 20: MICT-SETA national skills shortage in the Film and Electronic Media sector

Occupation	Specific reason of scarcity	Short Term	Medium	Long Term
2017-352101 - Broadcast Transmitter Operator	Lack of experienced candidates, lack of new entrants into the profession and lack of qualified candidates	247	311	258
2017-265412 - Media Producer	Equity considerations, Lack of experienced candidates, Lack of new entrants into the profession	273	307	262
2017-265401 - Director (Film, Television, Radio or Stage)	Aging workforce, Equity considerations, Lack of experienced candidates, Lack of new entrants into the profession, Lack of qualified candidates	92	151	220
2017-265402 - Director of Photography	Aging workforce, Equity considerations	65	100	150
2017-265403 - Film and Video Editor	Aging workforce, Equity considerations	123	160	265
2017-264201 - Copywriter	Geographical location, Lack of experienced candidates, lack of new entrants into the profession, Lack of qualified candidates	208	198	70
2017-251301 - Multimedia Specialist	Equity considerations, Geographical location, Lack of experienced candidates, Lack of new entrants into the profession, Lack of qualified candidates	74	134	244
2017-122104 - Interactive and Direct Marketing Strategist	Poor quality of qualifications	100	80	50
2017-226302 - Safety, Health, Environment and Quality (SHE&Q) Practitioner	Lack of new entrants into the profession	100	80	

Source: MICT-SETA 2017

8.4.5 Challenges, opportunities, requirements

An analysis of the challenges, opportunities and requirements for the film and media sectors can be presented as follows:

- There are limited formal and practical training providers in the Film and Media industry which has been identified as an area that requires more support and development from government departments. A quote from Grant Thornton survey "The film industry is a service industry with limited attention to the creative input and skills needed to create internationally recognised local content[123].
- The industry is not seen as a stable and prosperous sector for students to join, therefore previously disadvantaged students may opt for careers in other industries. There is a

need to encourage more Black participation at levels such as Production Managers and HODs.

- Complying and qualifying for MICT SETA skills development initiatives are complex matters of which the benefits of these programmes are not clear.
- Lack of project consistency which creates a challenge in employing staff on a full-time basis, internal training programmes should meet MICT-SETA skills development requirements.
- Training programmes and courses relevant to the Film and Media Sector are mainly conducted at tertiary level through a select number of institutes. Refer to the section below on Skills Suppliers.
- The Film and Media Sector is currently not transformed despite the willingness of industry role players to create a more inclusive environment. Government tends to fund and support industries where they can see transformation occurring. The incentive scheme has a BBBEE requirement.
- As part of its development mandate, the industry representative bodies should facilitate a dialogue between the training providers and the film and media industry in order to bridge the current cap.
- Film and media training initiatives should be publicised and kept updated for existing employees and new entrants to the industry to be aware of upskilling opportunities.
- The Film and Media industry is unattractive to computer skilled people as the IT sector offers better job security and salaries. This results in a shortage of skills which are listed in another section of the document.
- There is an opportunity to engage international organisation to assist in training and skills transfers when foreign production companies work in the Cape Town industry.
- Obtaining international work visas is a slow and challenging process.

8.5 Insights

The MICT-SETA strategy is unclear according to the research documents, a perception which has been confirmed by SETA. The Film, Media and New Media sector is a technology driven eco-system (highly digitised) and is being influenced by international organisations. There is an awareness to keep abreast of developments but the cost factor is an inhibitor due to the project to project culture (which constrains scaling operations), the DTI funding compliance (BBBEE Level 2) and the skill shortage for certain specialised occupations.

It appears the limited training opportunities are available for the skilling of first-time job entrants and upskilling of people who are already in employment. Limited (if any) training and development opportunities are available for staff at middle management roles or those wishing to further their careers to potentially become industry leaders.

ICT Practitioner Skills are pervasive in the Film, Media and New Media (gaming and animation) industries where specialist skills are required. In general, it appears that there is a gap in sector-specific digital skills for the Film and Media sector in addition to the ICT practitioner skills. The need for development opportunities to grow the required digital leadership skills has been highlighted.

SECTION 9: GAMING

9.1 Introduction

Globally, as the video gaming industry, otherwise known as “interactive entertainment”, grows exponentially, the demand is changing gaming content, hardware and software products at a rapid rate. The ongoing challenge is that core gamers are seeking more immersive experiences which require greater artistic and technological innovations and capabilities, from a supply perspective.

The user market is extremely diverse in age, gender and competitiveness. There is the social or casual gamer on the one side to serious gamers who participate in massive on-line hackathons which can last for days. The industry caters for diverse demographics and offers the user multiple platforms.

Competitions, prize money, eSports and exhibitions are all contributing to the exponential growth of gaming globally. In February 2018, the first gaming eSports event was held at the Winter Olympics. On a professional level, serious gamers can earn substantial amounts of money just by playing eSports tournaments.

The growth in smartphone ownership is providing millions of consumers with an accessible and affordable route into the gaming market, causing an exponential growth in the casual / social gaming market. Fast and affordable broadband access coupled with easy to use mobile apps allows the enthusiast access to games, anytime and anywhere.

9.2 Sector definition

Obtaining specific sector information or economic performance of this industry has not been possible as the industry is not effectively and formally defined as an industry which “manufactures” a product. Gaming and Animation are not mutually exclusive industries. From survey reports obtained, Wesgro[124] and DTI classify animation and gaming as New Media which is accounted for within the broader term of Film and Media on a classification as a result of incentives and subsidies.

9.3 Landscape overview and dynamics

The traditional methods of playing games, i.e., pc and console, remain the most popular forms in South Africa while social gaming’s growth is on its own trajectory, not eating into the traditional market. Those using smart phones to play games generally focus on compelling but simple games while the pc and console players are more interested in on-line competitive group games.

Desktop Dungeons (GCF Design, 2013) and Toxic Bunny (Celestial Games, 1996) are two of South Africa’s video games that have hit the global arena. eSports (i.e. electronic sports) is the umbrella term for organised, competitive computer gaming, usually between professionals. eSports involves gamers gathering as an on-line collective, from all over the world to participate in gaming competitions.

eSports gaming attracts large physical audiences who watch on big screens or on-line. In 2015 alone, the global eSports gaming audience was estimated to be 226 million people. The

competitors themselves are trained professionals with high level gaming skills. Tournament prizes approach millions of dollars.

Tournaments are based around a very specific list of games, including names like League of Legends, Dota 2, CounterStrike, Call of Duty, World of Warcraft, Halo, StarCraft and FIFA. In order to be accepted into this level of competition, a gamer has to achieve a certain proficiency level.

This category of gaming has huge potential as it involves advertising, media rights and sponsorships, besides attracting new players to the gaming arena.

Game based learning is fast growing global industry according to Metaari's 2017-2022 report[125].

The following six catalysts are listed as drivers of the educational game market:

- The growing global demand for early childhood learning games.
- The organizational resistance to Game-based Learning is fading fast.
- The growing availability of easy-to-use development tools.
- Exponential innovation in Augmented Reality (AR), Virtual Reality (VR, and Mixed Reality (MR)).
- An upsurge of new next-generation brain training games coming on the market based on neuroscience, cognitive therapy, and biosensors.
- The impending rollouts of very fast 5G networks and the Internet of Things (IoT)Combined, these catalysts have created highly favourable market conditions for Game-based Learning developers across all seven regions analysed in this report.

It is quite significant that South Africa has the highest growth rate for game-based learning in the world at 51.1%.

9.3.1 Economics

There are diverse and unsubstantiated revenue figures published on the worth of the gaming industry globally. The Accenture report[126] states a revenue figure of $87bn while Newzoo, an international research organization in its 2017 Global Games Market Report[127], confirmed a spend of $109 billion on games. Furthermore, video game revenues achieved a turnover of $116bn from a 2007 base of $44.9 billion. China is leading the global market at $36.3bn followed by the USA at $25.06 billion. It is ostensibly, the fastest growing component of the international media sector.

According to PwC's Entertainment and media outlook, 2018-2022, the South African video game market, from a consumption perspective, exceeded R3 billion (2017) through its development, marketing and sales of video games. It must also be noted that this figure includes advertising spend. The report also projects that the industry will achieve R6.2 billion in revenue in 2022[128].

The Interactive Entertainment of South Africa (IESA), industry survey was conducted in 2016[129]. Due to absence of official statistics for the game development industry, the team at

"Make Games South Africa" managed the survey in 2015 so the 2016 results appear to be an update of the 2015 findings.

The following is a summary of the key findings of the IESA report (2016):

- 31 active game development companies in South Africa responded to the survey.
- 17 are located in Cape Town while 6 are located in Johannesburg.
- Overall these organisations have directly created 255 jobs.
- Permanent Jobs increased from 152 positions to 176 positions, a 16% growth.
- The value of these organisations is about R100 million (2015), an 85.6% growth from the previous year (R53,9m in 2014).
- Only 14% of the industry is female (2015 presents a slight increase from 2014).
- Only 13% of the industry is not white (up from last year).
- Little transformation has occurred in the industry. It is still predominantly white male dominated.
- Together the organisations released a total of 103 games in the 2015.

9.3.2 Policy aspects

It appears that existing government policies do not provide a clear and practical strategy or roles and responsibilities of industry role-players involved in South Africa's gaming and animation industries. Due to the absence of formal research and industry statistics, Interactive Entertainment South Africa conducted its own basic research as mentioned above.

Nick Hall, CEO of IESA and an attorney by profession, has been promoting the legal position of game developers to government, for some time. The area of contention has been around the interpretation and application of the SPB regulations.

Film and Publications Board (FPB)	The FPB is a statutory body whose role is to regulate the media sector through classification of content. The Board regulates the creation, production, possession, and distribution of certain publications and certain films by means of classification, the imposition of age restrictions and giving of consumer advice. In addition, the FPB advances the rights of children through making exploitative use of children in pornographic publications, films, or on the internet, punishable.

On 04 March 2015 South Africa's Film and Publication Board (FPB) submitted in the Government Gazette[130] which in essence was aimed at controlling all local information posted on the internet. The objective was to protect under aged children to any explicit and inappropriate video material being posted locally.[131]

In 2016 an update of policy was presented, admitting that the bulk of this content is unclassified and recognised that there is an enormous quantity of such content, most of which is produced, hosted in and distributed from foreign jurisdictions.

Nick Hall of IESA continues to engage with government on the legal aspects surrounding legislation and the gaming industries rights. This has been an ongoing complex issue and is outside the scope of this document,

9.3.3 Companies, role players, industry bodies

Some of the most important role players in the gaming industry are listed in Table 21 below, which shows that Cape Town forms the basis of the majority of these companies.

Table 21: Key Gaming developers in SA

Sea Monster – Cape Town	24Bit Games - Johannesburg
Triggerfish Animation (Ballisti) – Cape Town	Kopskop Games – Cape Town
Retro Epic – Cape Town	Marsh Town Madness- Johannesburg and Cape Town
Freelives – Cape Town	Starboy Games - Johannesburg
Quarter Circle Forward and Design (QCF) – Cape Town	Orangespice Games – Cape Town
Thoopid – Cape Town	Guinea Pixel – Cape Town
Celestial Games – Johannesburg	Fuzzy Logic Games – Cape Town
Renderheads – Cape Town	Runestorm – Cape Town
The Brotherhood – Cape Town	
Source: Various internet sites and media reports	

Gaming Industry Interactive Entertainment South Africa is a non-profit company mandated to lobby, suggest policy and aid in the growth of the local gaming, serious gaming, simulations, board-games, augmented reality and virtual reality industries in South Africa.

The African Electronic Sports Association (AESA) is a South African non-profit organisation established to promote the development and adoption of e-Sports or electronic sports in and throughout Africa. The primary objective is to encourage youth to adopt Play/Gaming, Programming/Coding and Robotics in preparation of the 4IR.

9.3.4 Key drivers, technological change, challenges and opportunities

The internet articles and industry related documents found (about the South African gaming industry) appear to be published as far back as 2008 to around 2017 with the occasional 2018 commentary. Besides some of the information being dated which has limited use, finding accurate and corroborated statistical information on the SA gaming industry is a challenge.

9.3.4.1 Key drivers

From a global perspective the key drivers of the growing gaming industry is stated below:[132]

- An evolving customer-base. A result of the growth in the number of gamers through mobile phone access.
- Evolving definition of games. The impact of innovative gaming such as immersive gaming (virtual and augmented reality).
- Digital Delivery Digital Distribution. Purchasing on-line and downloading rather than a physical purchase is disrupting the industry. On-line customer engagement with a dynamic customer experience is stimulating the purchase and distribution of games.
- Proliferating business models. The move away from a single physical purchase point to on-line purchase options is challenging traditional business models. Often termed as micro-transactions (smaller transactions), coupled with associated advertising, is allowing vendors and suppliers to get closer to individuals preferences and spending patterns.

Gaming leagues and competitions are also contributing to the growth spurt of international gaming.

From a continental perspective, South Africa's video gaming compared to the rest of Africa, is unchallenged due to the large number of wealthy South Africans living in the major cities. Nigeria and Kenya are runners-up to the local gaming industry. Much talent resides in these two countries from a gaming and animation perspective.

The PWC report indicates that social and casual gaming will be the major drivers of economic growth while pc games have passed console gaming[133]. New areas of development are virtual reality, augmented and mixed reality gaming.

Distribution channels are moving away from the conventional physical mode (store purchases) to digital which makes accessing games easy either by downloading or by using a Gaming App. On-line banking makes monetary transacting easy so the desired game is simply a click away.

The following very general factors are stimulating game awareness in South Africa:

- Easy access to affordable smart phones.
- The availability of internet access in urban areas.
- Data costs are still high but the rates are gradually being reduced due to pressure from government on the large Telco's.
- On-line publicity around public hackathons and competitions which may involve monetary or other prizes.
- The pervasive impact of social media which is being used to create awareness around gaming and the fun aspect of participating.
- The level of interest amongst young learners in the secondary education institutions is stimulating interest. Educational gaming is gaining a small, but significant presence in schools which is also stimulating the use of technology.
- The gaming industry is no longer a niche arena for the youth or a specific consumer segment. With the advent of mobile gaming and improvements to hardware used in playing these games, gaming has become a viable form of entertainment for players from all backgrounds and ages.
- Events and eSports organizations like Mind Sports South Africa, the Digital Gaming League, Orena and LANX have become very popular with the big demand for eSports tournaments and other gaming events in large cities. "Mind Sports South Africa" also hosts school events. There are other tournaments which offer sizable monetary prizes.

9.3.4.2 Technological change

Innovation in the gaming industry in Virtual Reality (VR) and Augmented Reality (AR): With the advancement of technology, software and human creativity, gaming continues to advance in innovation and product development. VR and AR are regarded as the future of gaming but currently the integrated components that enable the immersive experience, are costly for the average user.

Virtual Reality (VR): The term immersive experience is used when users of the technology are interacting in a closed real-life virtual environment, which compounds the human experience

and emotions. The computer-generated characters and surroundings offer visual effects in a 2D and 3D stereoscopic environment.

Augmented reality (AR): has the capacity to change the perception of the augmented world through the use of digital sensations, graphics and other digitally created objects in a real-world setting.

In order to enrich the perception of virtual reality, headsets shift pictures in-front of the wearer's eye according to the motion of his head. This is achieved by head tracking. Head tracking systems are typically equipped with gyroscopes, accelerometers and magnetometers to mathematically plot and visually track, the movement of user's head. It is all about enhancing the way the user interacts with the real world.

Another major difference between AR and VR lies in the way they are used. To experience VR, special headsets or 3D glasses are used, but in AR, the user experiences imagery through the app installed on their mobile or tablets, therefore it makes it easier for the user to experience AR. AR games requires a Virtual Environment to be implemented as in Mixed Reality (MR), whereas VR games are in general self-sufficient with its own virtual world.

Both these technologies have brought about significant advancements, not only in the gaming and entertainment industries but also in tourism, healthcare and business.

9.3.4.3 Challenges, opportunities

Unfortunately, the South African game developer industry is small and high risk with limited funding. Job creation and long-term economic stability are not realities in this industry due to:

- Limited government support due to compliance to BBBEE requirements (it is a white male dominated industry).
- Broad legislation which does not protect game developers from copyright infringements.
- Games face the risk of being pirated thereby reducing much needed revenue streams for the local industry.

9.4 Skills landscape

There are references to the need for different skill sets coupled with the traditional forms of training in the animation and gaming industries. These include but are not limited to: social intelligence; virtual collaboration as a requirement of the modern office (working alone and remotely); novel forms of thinking (logic with creative) and computational thinking which supports cognitive thinking.

9.4.1 Skills suppliers

9.4.1.1 Formal education-led supply

- University of Cape Town: UCT offers a major in Computer Games Development, but this must be taken in conjunction with a major in computer science. Focus areas include: 2D and 3D game technology; AI and path planning; C++/ Java programming (as part of the mainstream CS course); Microsoft XNA development; Playability and Design; Game Software Engineering; Games Engine Architecture; 2D & 3D Computer Graphics; Multi-User and Distributed Games.

- Witwatersrand University: WITS in Johannesburg offers two game design courses – a Bachelor of Engineering Science in Digital Art – BEngSc (Digital Art) and a Bachelor of Arts in Digital Arts majoring in Game Design – BA DigA (Game Design).

9.4.1.2 Industry-led supply

- Friends of Design: This institution is based in Cape Town and offers a 1-year course in game design and development, after which the student will receive a Higher Certificate in Game Graphics and Multimedia Entertainment, NQF-level 5. Since the course builds on existing skill, there is a prerequisite for a formal qualification in Graphic Design, IT & Programming, Web Design, 3D Animation, or Illustration and Fine Art.
- Learn 3D: A Cape Town and Johannesburg based training organisation, offers courses in game design and development. Basically, the focus is programming in C#, game theory and development techniques with the leading gaming engine Unity 3D, as well as work with the latest Virtual Reality technology by developing games compatible with the Oculus Rift. The website does not mention specifics about accreditation or type of qualification.
- Vega School: An educational brand of The Independent Institute of Education (The IIE) was formed in 1999. The institution offers the BCIS degree in Game Design and Development. This is 3-year full time programme at NQF Level 7. The course provides students with the knowledge and experience required to create both two-dimensional and three-dimensional games across a multitude of platforms.

9.4.2 Special initiatives

9.4.2.1 Partnership initiative

The *Serious About Games* (SAG) initiative is a collaborative effort between the Western Cape Department of Economic Development and Tourism, the Cape Innovation and Technology Initiative (CiTi), Interactive Entertainment South Africa, 67 Games, and the Cape Craft and Design Institute.

Established in 2016, the purpose of the initiative is to use game development in the spatial planning of informal settlements, thereby improving residents' living standards by enabling easy access to emergency services, basic services and recreational areas. Vukuzenzele was the first of series of events, which are to encourage game development and game-based learning to affect social change.

9.4.2.2 eSports

Local eSports tournaments (2017) include Telkom Masters and Mettlestates Counter Strike: Global Offensive, both offering prize money of R1m. 2018 events include African Cyber Gaming League to the larger attraction titled Rush which were held at the Sandton Convention Centre in June 2018. Another notable event was the FIFA eWorld Cup qualifier hosted by VS Gaming, a subsidiary of Telkom. With a prize pool of over R1.5 million, the VS Gaming Cup also offered the winners a chance to enter into the Global Series Play-offs.

9.4.3 SETA perspective

The Gaming and Animation industries are not specifically categorised as a sector or even as an industry by MICT-SETA, as confirmed during this research project. Further details can be found in the Film and Media document prepared for GTAC. From discussions with Sea

Monster and Triggerfish, the animation and gaming industries fall under the broad term of Film and Electronic Media (See 8.4.4 SETA perspective on skills).

9.4.4 Skills challenges, opportunities, requirements

To avoid repeating the drivers and enablers within the skill types, the Animation, Gaming and Film and Media industries, to a great extent, share a similar value chain. The process often requires different skills sets.

The Gaming sector-specific skills requirements are similar to the Animation industry. Refer to the Animation sub-sector for more detail (see 7.4.4 Challenges, opportunities, requirements).

9.5 Insights

A question arises in that if the local supply of games, by 31 gaming studios in South Africa is generating circa R100m in revenue (note: only the supply of games), while the consumption of hardware, games and advertising according to PWC amounts to more than R3bn[134] , there appears to be missed opportunities for the local suppliers.

An unsubstantiated and cursory comment is that the international sales / distribution channels into South Africa for gaming programmes should attract some form of levy or royalty to subsidise the development (for developers but more so for STEM training initiatives) of the local industry. Mathematics is used extensively in game programme development.

From a supply and demand perspective, social, educational and professional (serious) gaming will help equip people with valuable technical (computational), artistic or cognitive skills for 4IR. The youth should be introduced to specific early developmental programmes using educational gaming / gamification / Minecraft, etc., to stimulate their thinking around Science, Technology, Engineering and Mathematics (STEM).

SECTION 10: ICT SECTOR

10.1 Introduction

The South African ICT sector is well-established and it is the largest in Africa, contributing approximately 8,2% to the national GDP. Despite ICT spending increasing to R123 billion by 2016, there are concerns amongst sector stakeholders that South Africa is falling behind its peers in Africa.

Several international corporates, recognised as leaders in the ICT sector, operate subsidiaries from South Africa. With its current market capitalisation of R178 billion, this sector could grow to R208 billion by 2020[135].

The BMI report[136] holds "a positive growth outlook for the South African IT market in 2018 and throughout the remainder of our forecast period to 2021. We forecast the software and IT services segments will be particular outperformers as public and private sector organisations leverage a growing availability of cloud-based solutions to drive cost - cutting and efficiency gains in their operations."

10.2 Sector definition

There are many definitions for the ICT industry. The definition is directly dependent on the context in which ICT is used. For example "ICTs within the context of education encompasses not only a reference to equipment (i.e. devices) but also to a group of skills or competencies that teachers and students must possess in order to be considered having achieved a certain level of competencies as it relates to ICTs"[137].

Zia, Ilahi and Khan[138] define an information and communication technology (ICT) as "a diverse set of technological tools and resources used to communicate and to create, disseminate, store and manage information." For this study, the definition of Zia *et al*. is used. However, the application of definition is limited to the definition of the INSEAD report of 2013, as commissioned by the European Commission for Enterprise and Industry.

As this study aims at exploring the AS-IS situation in terms of ICT skills in the Western Cape the workforce includes i) management NS Business architecture level skills, ii) core practitioners skills, and iii) other ICT technical skills. The use of the term ICT practitioners does not include ICT mechanics, manual workers and non-ICT professionals working in the industry (European Commission, DG Enterprise and Industry, 2013)[139].

10.3 Landscape overview and sector dynamics

10.3.1 Companies, role-players

The ICT sector in the Western Cape is completely diffused within all industry sectors. Not only is ICT involved in the major educational and business sectors but are branching into the social-economic communities. In the Western Cape especially ICT diffusion into rural and underserved communities are seen as a major focus area of the local government (Western Cape Government, 2014)[140, 141].

ICT is a priority for the Western Cape and employs 30 000 people contributing over R3 billion to the GDP. As an example of the priority, the Western Cape Government invested over R2.89 billion to connect every resident to broadband[142].

All major industries have been affected by the growing need for more and more ICT products. For example, the programme for high-speed internet by means of fibre infrastructure has been a huge success and large parts of Cape Town and surrounding areas now has access to this product. This created an environment where business, education and the private citizen can benefit and compete on an international basis.

Furthermore, the Western Cape (WC) via Cape Town positioned itself to develop into a SMART city. The WC at large and Cape Town specifically are committed to be one of the leading ICT role players in South Africa and Africa.

The ICT industry composes of provincial government, municipalities, education sector such as the four universities, TVET's, large corporates such as Sanlam, Old Mutual, Capitec bank, PSG, Pick & Pay, Checkers, Woolworths, PEP, and the Foschini group to name a few. The ICT vendors such as SAP, Oracle, Microsoft, IBM and many others are also well presented. Unfortunately, there is a lack of industry bodies to represent the role players in the Western Cape.

From a national perspective, it is interesting to note that small enterprises are the largest employers of ICT practitioners (see Table 22). No information is available at provincial level.

Table 22: ICT employment by enterprise size 2016 – 2017

Enterprise Size	2016	2017
Large	154	170
Medium	302	351
Small	9795	12178
TOTAL	10 251	12 699
Source: MICT-SETA OGS, 2017		

10.3.2 Change drivers and dynamics

Vendors, SMME's (i.e. niche companies, new technologies), and to a certain extent large companies are driving key changes in the industry. The key focus areas by vendors are presented in Table 23.

Table 23: Vendor focus areas

Vendor	Topics
Microsoft	Azure (Cloud Services: IaaS, PaaS, SaaS), Office365, Docker, Virtualization, DevOps, Cloud Development, Infrastructure as Code, Web Development, BI, Big Data (data analytics), AR/VR / Hololens, Blockchain, IoT (and data analytics), Cognitive Services
IBM	Cognitive & AI (Artificial Intelligence / Machine Learning / Cognitive Computing), Data Science & Analytics (big data and analytics), Blockchain, IoT, Quantum Computing and Algorithms, Security (IAM, Data Security, Cyber Security), Cloud development, Systems (mainframe development)
Oracle	Container Databases, In-Memory Grids, Blockchain, Data analytics/ BI / Ml, Java (monetize), Microservices, Architecture
SAP	SAP Hana (Cloud development), Machine Learning, Block Chain IoT, Intelligent Enterprise (Process Automation), Business Process Development

Elaborating on the vendor-driven changes, Microsoft is a good case in point - the company is currently driving the Office 365 product, which is an innovative product. However, this will to a large extent dictate how companies will manage their HR function in future.

Vendors are currently promoting Artificial Intelligence (AI), Business Intelligence (BI), Machine Learning (ML), Block chain, Big Data, IoT, Quantum computing and many more new services and products. These developments create a huge demand for the development of "new" skills, leading to enormous strain on the skills supply value chain. Educational and training institutions find it difficult to cope with fast-changing skills requirements and high demand for a skilled workforce.

From a public sector perspective, legislation typically triggers significant changes in the market; for example, the new act compels Financial Service Providers (FSPs) to keep record of all advice given to clients. This requires a new function to record, store and make the information available for inspection on demand.

From an international perspective, other key drivers are also forthcoming - countries are demanding more transparency and insist on the protection of the individual's privacy. Key drivers towards the new ICT landscape are, *inter alia*, social media (Facebook, WhatsApp) and industry platforms.

10.3.3 Technological change

10.3.3.1 Global perspective

Gartner[143] identifies the following emerging technology trends for 2018:

- Trend #1: Democratized AI - AI, one of the most disruptive classes of technologies, will become more widely available due to cloud computing, open source and the "maker" community.
- Trend #2: Digitalized ecosystems - Emerging technologies in general will require support from new technical foundations and more dynamic ecosystems. These ecosystems will need new business strategies and a move to platform-based business models.
- Trend #3: Do-it-yourself biohacking - 2018 is just the beginning of a "trans-human" age where hacking biology and "extending" humans will increase in popularity and availability.
- Trend #4: Transparently immersive experiences - Technology, such as that seen in smart workspaces, is increasingly human-centric, blurring the lines between people, businesses and things, and extending and enabling a smarter living, work and life experience.
- Trend #5: Ubiquitous infrastructure - In general, infrastructure is no longer the key to strategic business goals. The appearance and growing popularity of cloud computing and the always-on, always-available, limitless infrastructure environment have changed the infrastructure landscape. These technologies will enable a new future of business.

The main changes within the ICT landscape lies within the nano-technology, blockchain, digital transformation and cloud. One of the major changes is within the self-service end-user technology where the focus will increasingly shift to the self-sufficiency of the end user. A shift from websites to platforms is evident. Artificial Intelligence (AI) and especially data analytics are fast changing and will dominate the ICT landscape.

10.3.3.2 South African perspective

Whereas the above explanation refers to the international context, the following section refers the perspective of national and provincial ICT companies.

Interviews were conducted with South African CIOs to determine their views on top technology trends and the major issues affecting ICT, as presented in Table 24.

Table 24: Industries view on top trends and biggest issues affecting ICT

Industry sector	Company	Role	Name	Top tech trends	Biggest issues affecting ICT
Consumer goods and services	British American Tobacco South Africa	Head of IT Sub-Saharan Africa	Hein du Toit	1) Automation using AI and Chatbots to transform back-office operations 2) Cloud-based platforms driving efficiency and consolidation"	1) Embracing agility and digital ways of working in multinational companies 2) Ideal time for IT to step up/in companies transformation
	Coca-Cola Southern and Eastern Africa	Chief digital officer	Priya Thakoor	AI, cloud, containerisation, robotics, marketing automation, augmented and virtual reality are top of mind for customer-led businesses.	Technology leaders need to bring both the strategy business and technology competencies together
Financial services	Insurance Group	CIO	Gavin Kandier	Consumer-driven, on-demand business products, delivered by digital channels	Organizations need to innovate and adapt by building a culture of proactive innovation and transformation
	Santam	Executive head operations and IT	Kevin Wright	1) Cloud services 2) IoT 3) Location-based data"	Becoming a facilitator of solutions rather than just a solution provider
Public sector	The Council for Medical Schemes	CIO	Jaap Kügel	1) Web services and API to automate statutory returns 2) Cloud due to its ability to support new technologies and will have to be embraced with both the regulator as well as medical schemes"	1) Compliance with stricter legislation governing privacy 2) Protection of information 3) Cyber security

It is important to note that not one of the CIO's mentioned availability of skilled resources as an issue affecting ICT, which is in contrast to the interviewed CIO's; however, it is also possible that the skills question was not posed to them.

As far as the top trends are concerned the CIO's were unanimous on Cloud Computing and digitisation of business. Also mentioned was AI, IoT, API's Consumer driven by digital channels. The trends that overlapped with the interviewed CIO's were Cloud, AI, chatbots, robotics, IoT, consumer focussed and API.

Some other emerging trends not necessarily mentioned by CIO's in Brainstorm are Big Data, machine learning, business intelligence and blockchain (refer to Section 4 & 5 for more information). Not mentioned elsewhere in the report is the aspect of the modern office:

- The modern office: In more sophisticated economies the principle of work-as-you-go and anytime, anywhere will be well embedded. The software developer and technician (as we know them today) will be replaced by a workforce that can develop their own software

and fix their own hardware problems. Some companies are currently implementing a technology knowledge transfer strategy in order for employees to be in charge of their own technology. With the modern office becoming increasingly independent, technologies will play a more important role.

With this in mind, the educational ecosystem will have to accommodate these changes and train their students to be self-sufficient in terms of technologies, and how to stay ahead of new technologies being introduced at a rapid pace.

There are many new technologies and innovations being introduced to the marketplace. The above-mentioned are but a few. Nano technology, space technology, health technologies, etc., are some examples of innovations disrupting the ICT ecosystem.

10.3.3.3 Challenges and opportunities

Although new technologies present exceptional opportunities for growth and innovation, it simultaneously poses the challenge of accelerated ICT skills requirements. The main challenges within the new ICT ecosystem are the skills needed to support the new technologies. The adoption of new technologies by new customers is often underestimated and can in some instances lead to failures.

10.4 Skills landscape

10.4.1 Skills suppliers

An overview of available research on academically-related articles available on the topic of ICT skills reveals a rich set of literature; however, although these articles are relevant and insightful, care must be taken about generalisation as it provides a location-specific perspective[144].

10.4.1.1 Formal education-led initiatives

The Department of Higher Education and Training is responsible for the higher education management information system (HEMIS) which forms the basis of the supply perspective of ICT skills at universities and TVET colleges. The supply of ICT skills is encompassed in the Classification of Educational Subject Matter Category 06 (CESM 06)[145], as provided by the DHET.

The CEMS 06 consists of the "… broad area of study concerned with all facets of electronic computing, including computer systems, computer networks and computer software, as well as the classification, storage, processing and dissemination of information."

For the purposes of this research report, the supply of ICT skills in the higher education sector is reported on from two major streams, namely universities and technical, vocational and educational training colleges (TVET colleges).

10.4.1.1.a Universities

South Africa has 26 national universities, four of which are located in the Western Cape.

To determine the trend in the supply of ICT skills generated by the four Higher Education Institutions in the Western Cape[146], the audited data sets for the years 2012, 2014 and 2016

of CESM 06 were utilised for relevant data extraction for comparison between national and provincial trends, as per Table 25.

Table 25: ICT skills supply on three levels – WC versus national

	RSA Total						WC Total					
	2012		2014		2016		2012		2014		2016	
A	4854	82%	5455	80%	5332	79%	637	67%	644	62%	805	68%
B	796	14%	986	15%	1061	16%	240	25%	326	31%	306	26%
C	237	4%	355	5%	345	5%	74	8%	69	7%	71	6%
D	5887	100%	6796	100%	6737	100%	950	100%	1038	100%	1183	100%

A = Undergraduate Diploma/Certificate/1st Bachelor Degrees
B = Post Graduate Diploma/Certificate/Degrees/Honours/National Higher Diploma
C = Masters and Doctorate
D = Total

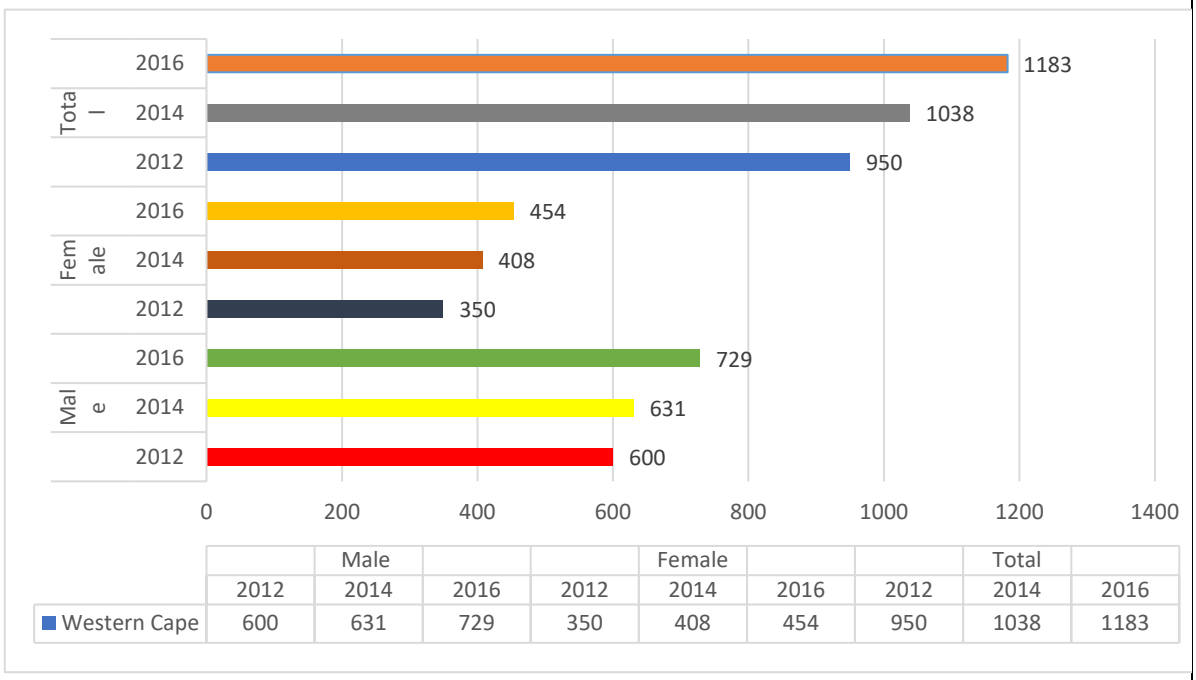
- In the ICT skills supply at all levels, an increase at both national (14%) and provincial level is observed (24%).
- For the group as a whole, the WC delivered 16% of ICT graduates in 2012 (950/5887), in 2014 it was 15% (1038/6796) and in 2016 the figure was 15% (1183/6737).
- In 2016 the Western Cape delivered: 15% (805/5332) of South Africa's first degree graduates; 28,8% (306/1061) of the postgraduate/honours level; and 20% of the masters' and doctoral graduates.
- For the Western Cape the growth in the undergraduate cohort 2012 to 2016 represents 26,4%; at honours level (B) it is 27,5%, whilst at masters and doctoral level (C) a 4% decline has been reported.

Table 26 presents a comparative figure of the CESM 06 graduates between the four Western Cape-based universities and the South African total by male/female cohort across the years 2012, 2014 and 2016:

- For the three periods under review (2012, 2014, 206) the trends indicate an increase in both the female and male graduates in CESM 06.
- The total number of CESM 06 graduates increased by almost 25% from 2012 to 2016.
- For the same period, female graduates show a 30% increase and male graduates a 22% increase, respectively. The trend depicted in the growth of female graduates is encouraging.

* The electronic database is available on request.

Table 26: Gender comparison of ICT majors Western Cape 2012, 2014, 2016



	Male			Female			Total	
	2012	2014	2016	2012	2014	2016	2012	2014	2016
Western Cape	600	631	729	350	408	454	950	1038	1183

Source: Electronic database available from the DHET*

10.4.1.1b Technical, Vocational and Educational Training Colleges (TVET)[147]

Nationally, South Africa has 50 TVET colleges, six of which are located in the Western Cape.

Public TVET Colleges offer a very wide range of courses/programmes to respond to the scarce skills needed by employers. Courses vary in duration from a short course of a few hours to formal diploma courses of three years. TVET graduates who qualify, may be admitted for advanced studies to a national diploma at universities of technology.

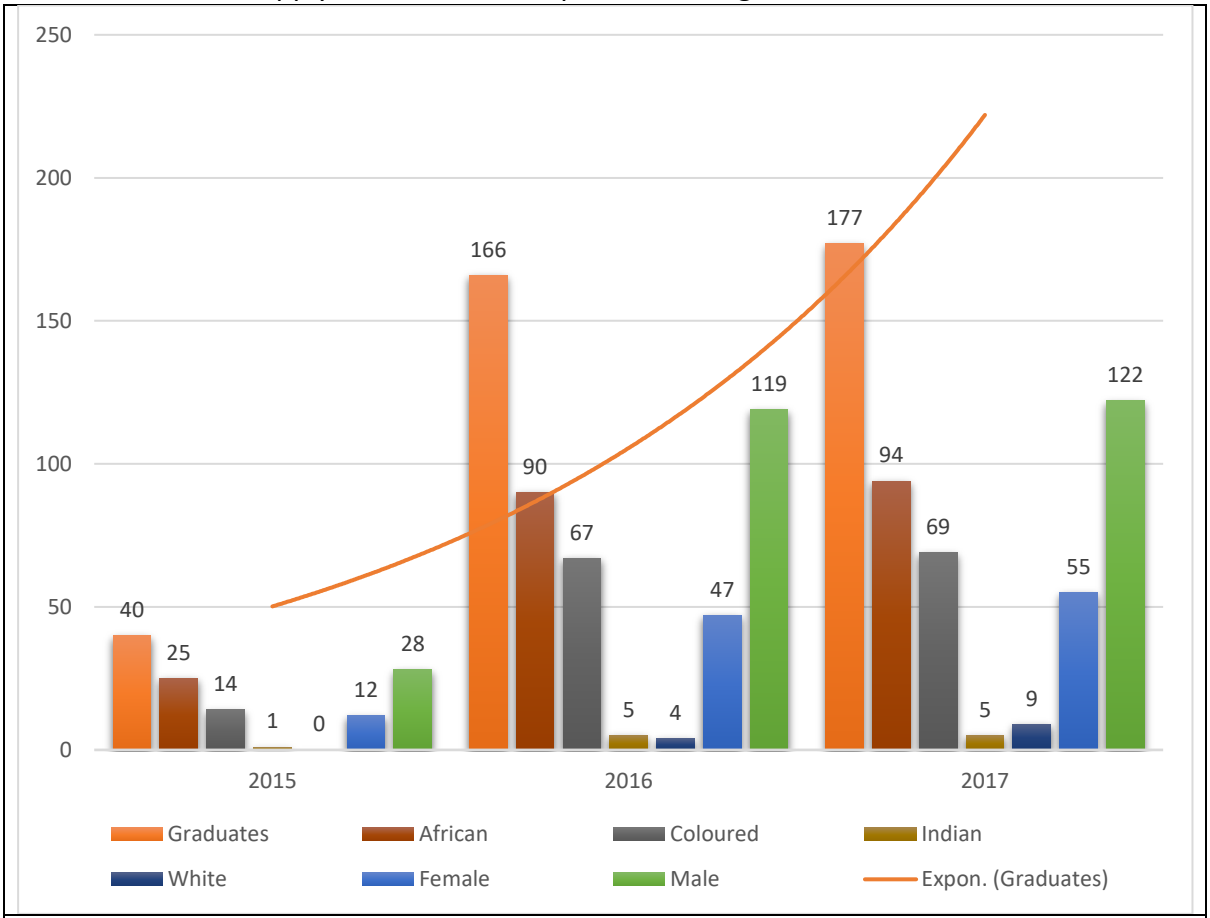
The data on the supply of ICT skills in TVET Colleges were obtained from the Higher Education Management Information System (HEMIS) of the Department of Higher Education.

To determine the trend in the supply generated by TVET Colleges, the data sets for the years 2015, 2016, 2017 were utilised and categorised for the six Western Cape TVET colleges according to the number of graduates, gender and EE imperatives (Table 27).

Table 27 presents data on four variables for the six Western Cape TVET colleges for the CESM 06 category. From a provincial perspective, the following trends can be distinguished:

- the number of graduates over the three-year period 2015-2017 shows an increase of 343% (from 40 to 177).
- Male graduates outnumber female graduates by 2:1 (122 and 55, respectively)
- African graduates constituted 53% of the student cohort who completed their studies at the six Western Cape-based TVET colleges in 2017.

Table 27: ICT skills supply from Western Cape TVET Colleges 2015 - 2017



Source: Higher Education Management Information System (HEMIS). 2018.

Although the base of completions in very small (177 in 2017), the curved trend line for the three-year time series (2015-2017) presents a general pattern of an increase in TVET college completions in ICT skills supply, across variables (gender and race).

10.4.1.1c New programmes offered by institutions

Although not extensive, from the review the following new programmes have been identified:

University of the Western Cape

- Postgraduate Diploma in Computer Studies and Media Application (with specialisation in Data Analytics and Business Intelligence. Interdisciplinary approach (business and technical skills). Implemented in 2017 with a first cohort of 25 and 33 for 2018.
- Postgraduate Diploma in AR & VR: Implementation 2019.
- Postgraduate Diploma in e-Logistics: Implementation 2019.
- Master's Programme in Data Science (in collaboration with NWU). Implemented in 2018.

University of Cape Town

- Master's degree in Data Science.

University of Stellenbosch

- Honours degree in Data Science (Computer Science Department).

Cape Peninsula University of Technology

- MTech ICT from 2019 (Artificial Intelligence, Machine learning and Business Intelligence).

In terms of the data science skills demand, the NRF, in collaboration with universities, are exploring the concept of a national postgraduate school, data science, mathematics and statistics to develop the necessary capacity. International universities will support this initiative.

* At the completion date of this research report, not all information on new courses in CESM 06 for UCT and US was available.

10.4.2 Vendor-led initiatives

To a large extent, vendors such as SAP, Oracle, Microsoft and IBM dictate what is happening in the ICT ecosystem. They are all entrenched in enterprises and are also at the forefront of new technologies. Many companies simply follow what these vendors recommend. Table 28 presents more information of vendor-specific training.

Table 28: Vendor's positioning, trends and offering

SAP[148]	Next generation applications are emerging fast. Cloud technologies are making IT department's organizational leaders. Accelerated software change is driving the world. SAP offers real-time access to information, automate manual tasks in order to thrive in the digital economy. There is also SMME management software available from SAP. The SAP university. The university caters for the Next-Gen of enterprises and enables companies around the world to connect with academic thought leaders and researchers. SAP is involved in start-ups, accelerators, tech community partners, purpose driven partners, venture firms, futurists, and SAP experts to reimagine the future of industries and the intelligent enterprise, with seeds in disruptive innovation. SAP offers ERP, digital Core, people management, customer experience, analytics and digital platforms.
IBM[149]	IBM Skills Academy is designed for academia worldwide. The program assists university faculties to provide students with additional skills, giving them an advantage in the job market. Training and certification programmes are designed to bridge the skills gap between universities and market industry. IBM offers Cognitive and AI, data science and analytics, blockchain, IoT, Quantum Computing, security, cloud and systems. This can happen through a blended learning approach is followed; Online courses, classroom training and hands-on lab.
Microsoft[150]	Microsoft South Africa embarked on a mission to train one million citizens. This will happen through the Microsoft Azure data centres that combine with other local cloud services, in order to create around 165 000 new jobs in SA through 2022. The curriculum covers five key topics including Computer Skills; The Internet, Cloud Services and the World Wide Web; Productivity Programmes (Microsoft Office); Computer Security and Privacy, and Digital Lifestyles. Free Tools and Training for SMEs & Start-ups in Africa.MS covers Virtualisation, Security, desktop management, dev ops, cloud development, mobile apps development, Database administration, DB development, BI, Adv analytics and Big data.
Oracle[151]	A new strategy emerged where by users will have to pay for services. You have to pay for a LTS or update every 6 month for your Java Version. This may be a huge problem for large companies. To add to this desktop and web applications must be updated or rewritten because of technical changes. This change is currently a big topic in Europe/USA leaving the future of Java unclear. It is foreseen that applications will be migrated to web applications. It could be that in future Java is not the right language to learn.

	The Oracle university is a well-known entity within the ICT industry. It currently offers in terms of training the following: Oracle database, Applications, Java, BI, Middleware Enterprise management, Operating systems, and virtualisation. Training is through classroom or online style training.

10.4.3 Incubators, accelerators, start-ups

The value chain in terms of incubators, accelerators and start-ups is depicted in Figure 3.

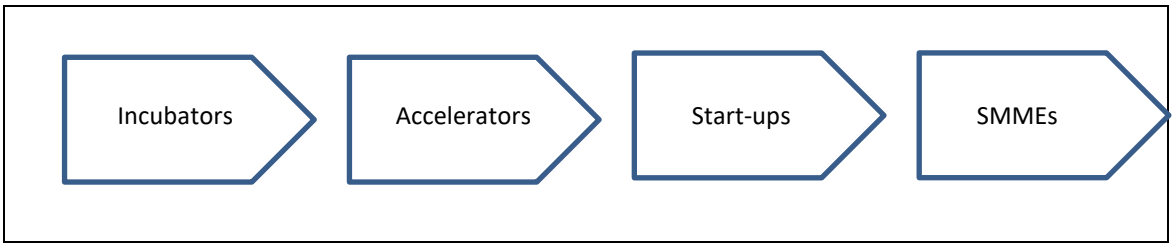


Figure 3: Initiatives value chain

There are many incubators in the ICT space. These incubators form an integral part of the ecosystem and give many people an opportunity to hone in on their skills set.

The Western Cape hosts a multitude of incubators, accelerators and start-ups. For more detail, see Annexure 5 and also refer to Section 5.4.6.

10.4.4 Special initiatives

Several special initiatives are been undertaken in the Western Cape; for example, Capaciti 1000. It is a hub that specialises in offering training in selected skills in collaboration with tertiary institutions, vendors and other companies. They are successful and have an added benefit in terms of placing interns and providing resources for permanent positions within the broader industry. E.g. Vodacom invests R600 million in digital skills and connectivity.

However, these programmes predominantly focus on the foundational levels as per the Digital Skills Framework.

10.4.5 SETA perspective on skills requirements

Eight (8) of the top 10 occupations that MICT-SETA regards as hard-to-fill vacancies, relate to ICT practitioners. Table 29 shows the occupations and number of vacancies as reported for the 2017 period[152].

Table 29: Hard-to-fill vacancies

Occupations	Number of vacancies
Software developer	1131
Computer Network and Systems Engineer	352
ICT Systems Analyst	316
Programmer Analyst	165
ICT Security Specialist	150
Business Analyst	126
Database Designer and Administrator	91
Telecommunications Network Engineer	91

10.4.6 Industry perspectives on skills requirements

From the interviews conducted with Cape Town-based CIOs their views on skills requirement and acquisition are presented below:

10.4.6.1 The fear-factor

On the question "what drivers and dynamics are at play in this sector," it was stated by the participants that disruption caused by innovations drive their strategies and decisions. To an extent it is the *fear factor* of being "caught out" or "left behind" that motivates them.

10.4.6.2 Skills profile required

Enquiring about the current skills profile required, the need for non-technical skills such as innovative, creativity, and system-thinking skills was a central theme. Design thinking skills with the ability to see the bigger picture, business development, ability to work in a team context as well as the ability for forward thinking (a futuristic perspective) were identified.

10.4.6.3 Skills acquisition strategies

At present skills are being sourced from the traditional academic institutions, such as universities, TVET colleges and private education institutions. However, this approach is supplemented by simply "poaching" resources from other companies, or recruiting resources from specialist software houses and boutique software establishments. Another strategy is to appoint graduates with the preferred aptitude profile, who are then directed to vendors for specific training for periods between 3-12 months. It appears as if the skills supply from tertiary institutions is insufficient in order to address the demand from industry which requires of them to implement alternative strategies to address the skills needs.

10.4.6.4 A demand for senior and experienced ICT practitioners

It is quite significant that CIOs' identified the need for more experienced, senior skilled individuals with specific reference to business analytics, enterprise architects and integration specialists. No reference was made to lower level skills (such as Java, Microsoft, etc.) which provide quite a different picture than the demand demonstrated by the LinkedIn statistics (see Section 11).

Table 30 provides the skills requirement as obtained via interviews and media reports. (Annexure 5 provides a summary of the responses of the interviewees).

Table 30: High level skills required by Industry

Architecture and Design	Risk management
Data centre skills	Security Management
End-user computing	Software Development
ERP & related corporate services	Systems and Solutions
ICT programs	Telecommunication Services
Network and network management	Data Analytics
Source: Various internet sites and media reports	

The interviews with ICT role players gave some insight into challenges, opportunities and requirements.

10.4.7 Specific skills requirement related to new technological initiatives

Enterprises such as EOH, Sanlam, Old Mutual, Engen and more were interviewed to gain an understanding of their current business focus. Maintenance of and new developments in legacy systems remain the focus areas. However, many of the organisations are piloting or experimenting with gamification, AI, BI, machine learning, IOT, Big Data, Bitcoin and Blockchain to name a few. Annexure 6 provides a more comprehensive list of current initiatives. Consequent to these new initiatives, are the skills required to develop and support new developments and projects.

10.4.8 Demand

Trends in digital skills confirm consistency over a period of 5 years in so far as data analytics and Big Data are concerned. Blockchain and Cybersecurity are fast moving up the chain of importance. However, Blockchain is still new and carefully monitored to determine what benefits will be harvested and how this will relate to strategies and business models of organisations. CIO's express the view that it is still too early to tell and a "wait and see" attitude is followed. Table 31 presents trends since 2014.

Table 31: Trends on ICT Skills demand - 2014-2017

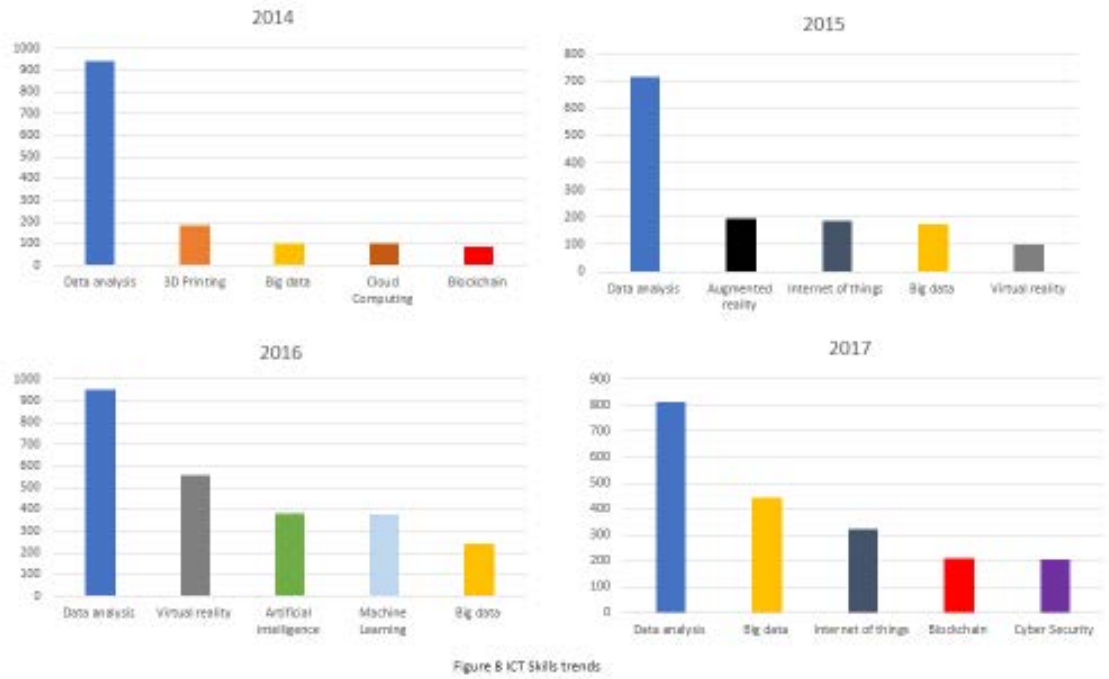


Figure 8 ICT Skills trends

Source: Google trends (Section 11, p.106)

New job entrants are expected to perform at efficient levels within the shortest period of time requiring not only their ICT skills but also a good understanding of the particular business context (e.g. financial sector, mining). Therefore, the ICT industry (ecosystem) needs to be integrated in order to understand the needs of the industry.

Currently the skills demanded by organisations, offered by the training institutions, and dictated by the main vendors, are not aligned. The tempo at which new innovative technologies are introduced into the economy at large is high and the infrastructure to support these are impeded by several factors, of which governance and regulations are the main contributors. Refer to Annexure 7 for a detailed description of ICT demand, as obtained by LinkedIn, PNet and Google.

10.5 Insights

10.5.1 Legacy vs new technology

Many of the large institutions indicated that they are managing the new technology disruption by keeping the legacy systems separate from new technologies (i.e. moth-balling the legacy technology). The legacy technology is supported and maintained until such time that new technologies are institutionalised (Figure 4). The new technology runs separately from the legacy technology, providing business the opportunity to evaluate the new technology before accepting it. In this way the new technology can replace the legacy technology and introduce a new business model without threatening business sustainability. Managing digital transformation (from old to new), is a complex process.

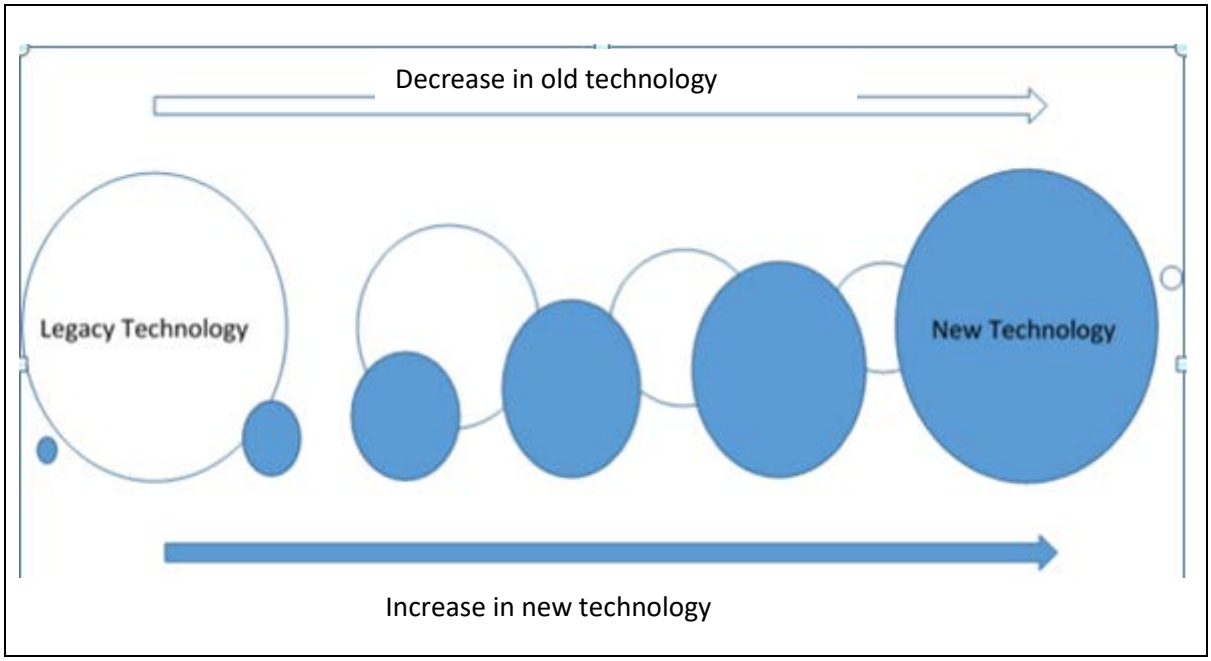


Figure 4: Decline in legacy technology

10.5.2 Legacy vs new technology skills

There is a realisation within the industry at large that new skills are needed to develop, support, maintain, implement and grow the new technology. Skills such as Java and SQl are slowly becoming obsolete and need to be replaced with new skills such as platform development, Blockchain, and design thinking. However, achieving the appropriate balance, pose challenges.

10.5.3 Tertiary institutions

New technological advances create a major demand for the development of “new” skills, leading to enormous strain on the skills supply value chain. Educational and training

institutions find it difficult to cope with fast-changing and high demand for a skilled workforce. All role players in the education sector should contribute to the development of these skills. However, universities specifically need to educate and teach higher level skills such as design thinking, systems thinking, digital leadership skills, AI, machine learning and analytics. Lower level skills can be supplied by TVET's as well as private colleges. These needs are currently being fulfilled by vendors (such as SAP and IBM). See Table 32 for a proposed ICT skills value chain.

Table 32: The proposed ICT skills value chain

Supply Chain	Entry level	Operational level	Top level
Formal higher education			
Tertiary education (Universities)			✔
TVET	✔	✔	
Private universities		✔	
Industry led supply chain (vendors)	✔	✔	
Private institutions			
Incubators/accelerators/SMMEs	✔	✔	

The tertiary institutions should be cautious as they could become irrelevant for the industry in future. This is mainly due to the fact that the accreditation process is tedious and takes exceptionally long to create a new programme. This could take as much as 3 to 4 years before implementation whereas the new technology and new products can be supplied and are indeed supplied within 3 months.

10.5.4 The management gap

Interviewing CIO's and top IT management it is interesting to note that the skills needs expressed are those at the middle and higher levels, which is in contrast to the demand as portrayed on recruitment platforms where lower level skills dominate. In some way this makes sense as the priorities of many IT departments are to maintain and support the systems needed for business to continue. New technology is being perceived as a disruptive force to be managed as it occurs. Since this is a reactive approach, it poses a major threat to businesses as the new technology may render it obsolete (e.g. the typical Kodak syndrome).

10.5.5 The vendor challenge

New innovation is mostly driven by vendors such as SAP, IBM, Microsoft and others. In some cases it is simply a matter of being first in the market and to maximise profits through the fear factor. The challenges for companies are to determine market readiness of these new products which will indeed contribute to sustainability and profits.

10.5.6 The push and pull conundrum

The large variety of industries demands new technologies from the ICT industry. However, they also lead the way in innovative products that need superior ICT enablement. In the same way ICT is offering industries innovative technologies to gain a competitive advantage.
This push and pull tension between ICT and the other industries create opportunities for growth, establishing the basis for a desirable state.

SECTION 11: DISCUSSION POINTS

11.1 Introduction

The preceding sections on the respective sectors and the ICT practitioners, present a rich set of qualitative data. An analysis of the AS-IS brief to this report, enabled the research team to gain invaluable insights. This final chapter provides a synopsis of the respective sectoral-insights and probable recommendations as well as themes that are generally applicable to the sectors for input into and consideration during the To-Be process.

11.2 Sectoral discussion points

In addition to the sectoral insights presented for each of the respective sectoral reports, a number of discussion points (recommendations) have been identified. These elements are presented per sector.

11.2.1 Wholesale & Retail

It is recommended that the Province work with the W&R SETA to establish a retail digital skills academy in the Western Cape. This should provide for the following:

- High level platform integration and development for specialists, professionals and entrepreneurs
- Large scale digital literacy programme for floor, counter and warehouse staff
- Mobile digital skills for Bottom of Pyramid and Township entrepreneurs

11.2.2 Business and Finance

The Western Cape might consider setting up a “digital skills observatory” in business and financial services that tracks disruptive trends and technologies and shares regular updates through bulletins and seminars. This would need to be well-linked with industry, research institutions and incubators and would need strong community engagement through a social media platform.

11.2.3 Tourism

Given the seminal importance of the tourism industry to the Western Cape and the dramatic re-contouring of digital skills needs a major investment by the Western Cape Government is indicated. This would need to embrace the following:

A tourism digital skills training and development platform that provides skills training in regards to the latest systems and platforms through a blended learning approach that combines vendor and proprietary skills training with on-line training providers (at cost or supported with vouchers or subsidy systems), on-line and personal mentoring, masterclasses, bootcamps and primers.

Accelerating Western Cape thought leadership through supporting a Chair in Tourism Digital Technology at one of the universities.

Establishing a tourism digital business incubator (possibly linked to the above) to support digital tourism start-ups and support the digitalisation of tourism businesses

Building world class local experience aggregation platforms with supporting training and access programmes to facilitate easy access to local niche products, alternative experiences and routes that can be linked to global platforms.

Supporting the development of rich content of tourism places, attractions and routes in a manner that foregrounds tourism business and enables easy access to that content.

11.2.4 Film, Media, Animation, Gaming

The Film, Media, Animation and Gaming sectors are interwoven, highly digitised, and typically described as "New Media" (New Media refers to the interlinking of computing and IT, communications networks, media content enabled by the internet and digital media technologies, and the convergent products, services and activities that has emerged as a result).

It is evident from the sector overview that the strategy and methodology to invest in and contribute towards a focused approach towards New Media skills development is lacking. It is recommended that a holistic approach be devised to enhance the potential of this sector to become a major contributor to the economy (follow global trend). This approach ought to include a fundamental re-assessment of the skills supply value chain and course content requiring the participation of the relevant SETAs.

Given the apparent vulnerable state of this "sector", skills development initiatives and approaches need to be supported (or encapsulated) from a more systemic perspective, including elements/dimensions such as:

- Conduct a value chain analysis for Film, Media and New Media to determine the level of transformation and how to address the shortcomings. Identify the barriers that the sector is facing which are impeding economic growth and therefore employment opportunities.
- Assess the government's incentive programme aimed at attracting foreign film and media companies as well as stimulating the local industry.
- Review legislation and regulations with industry stakeholders to determine the constraints (examples permit processing to film on locations, expedite work visa processing for international crews, the Standard Industrial Classification codes need to be aligned - DTI, MICT-SETA, IDC should be referencing to the same standard codes).
- Consider an enhanced contribution towards commercial filming infrastructure to attract more foreign film companies.

11.2.5 ICT Sector

A clear definition of the skills value chain is required and ought to be discussed in industry.

Furthermore, a central ICT research lab (research chair) should be considered to guide ICT activities in the Western Cape. Such a lab could typically focus on the potential impact and relevance of new technologies (e.g. Blockchain, Big Data) and skills strategies. Such a lab could function as a hub or unit for all interested in the ICT landscape.

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A CIO council for the Western Cape ought to be considered of which the functions could include oversight of the ICT lab, and a discussion forum to guide the public and private enterprises on relevant topics.

11.3 Generic discussion points

11.3.1 A differentiated approach for the identification of sector-specific digital skills

Addressing the digital skills requirements of realising the vision of becoming a global digital hub, necessitates a more incorporated digital skills development approach than the current supply of ICT practitioner skills through the various skills supply channels.

The sector overviews demonstrate the necessity of identifying and including sector-specific digital competencies (or capabilities not typically provided by ICT practitioner skills) in the job profiles and families of the different sectors on introductory, intermediary, advanced, specialist and leadership levels.

It is also evident that the nature of the digital skills competencies required in the various sectors is dissimilar. The tourism sector is a good point in case where the digital skills requirements for tourism operators can typically be described as *digitally fluid* which would enable them to navigate amongst various platforms, websites and different digital tools.

It therefore, seems appropriate and necessary for each of the sectors to identify and develop a digital competency profile (for its respective jobs and job families) that will be appropriate and relevant for the particular sector.

11.3.2 Pro-active skilling (upskilling) of first-time job entrants

Working towards the pro-active skilling (or upskilling) of first-time employees to be digitally competent to function effectively within the fast-changing digital economy, is a requirement as the industry cannot constantly play catch-up. It is evident from sector overviews that competency in the Microsoft Office Suite (often referred to as digital work-readiness competency) is not sufficient anymore. Competences such as media literacy and data literacy are increasingly regarded as essential components of (entry-level) digital literacy.

In addition to digital literacy, it therefore necessitates the integration of digital competencies within the training curricula of formal training institutions, as guided by sector-specific digital skills requirements (mentioned in 11.3.1). This should facilitate the supply of human resources (i.e. first-time job entrants) with the necessary functional (business) and digital skills relevant to the particular sector.

11.3.3 Upskilling and reskilling of people already in employment

Technological advances and disruption are also affecting the current work force on all job levels. To facilitate the sustained inclusion of employees in the digital economy and the sustained competitiveness of employers (companies/institutions), it will be necessary to develop and implement focused sector-specific upskilling and reskilling interventions to address current and anticipated digital skills requirements. Examples of such initiatives are already occurring and could serve as models for implementation in all sectors.

11.3.4 New and innovative models and approaches for skills acquisition

Technological development (digital disruption) has been described as a "speed-ball injected into the economy"[153], which accelerates the tempo for digital skills demand from intermediate level to specialist and leadership level. The accelerated digital skills demand outpaces the current traditional model of skills acquisition practices. The adequate skilling of new job entrants, as well as the reskilling and upskilling of those already in employment, will require a rethink of the current skills development and skills funding models and approaches.

11.3.5 Technical and digital skills are not the only requirements

It is evident from the sector overviews that (advanced) technical and/or digital skills are not the only requirements for positioning the Western Cape as a leading global digital hub. Skills such as problem solving, complexity thinking, computational thinking, design thinking skills, ability to innovate, and the ability to work across functional or disciplinary boundaries and team work seem to be important skills for this discourse.

11.3.7 Combining efforts for high impact

The efforts of the National Research Foundation (NRF) and various universities to address the data analytics skills shortage in the country serve as an excellent example of how stakeholders can collaborate and combine efforts to address skills demands in a coordinated manner for impact. Perhaps other areas of digital skills shortages (across sectors) can be addressed in similar fashion.

11.3.8 Acknowledging the human dimension, combating ignorance and fear

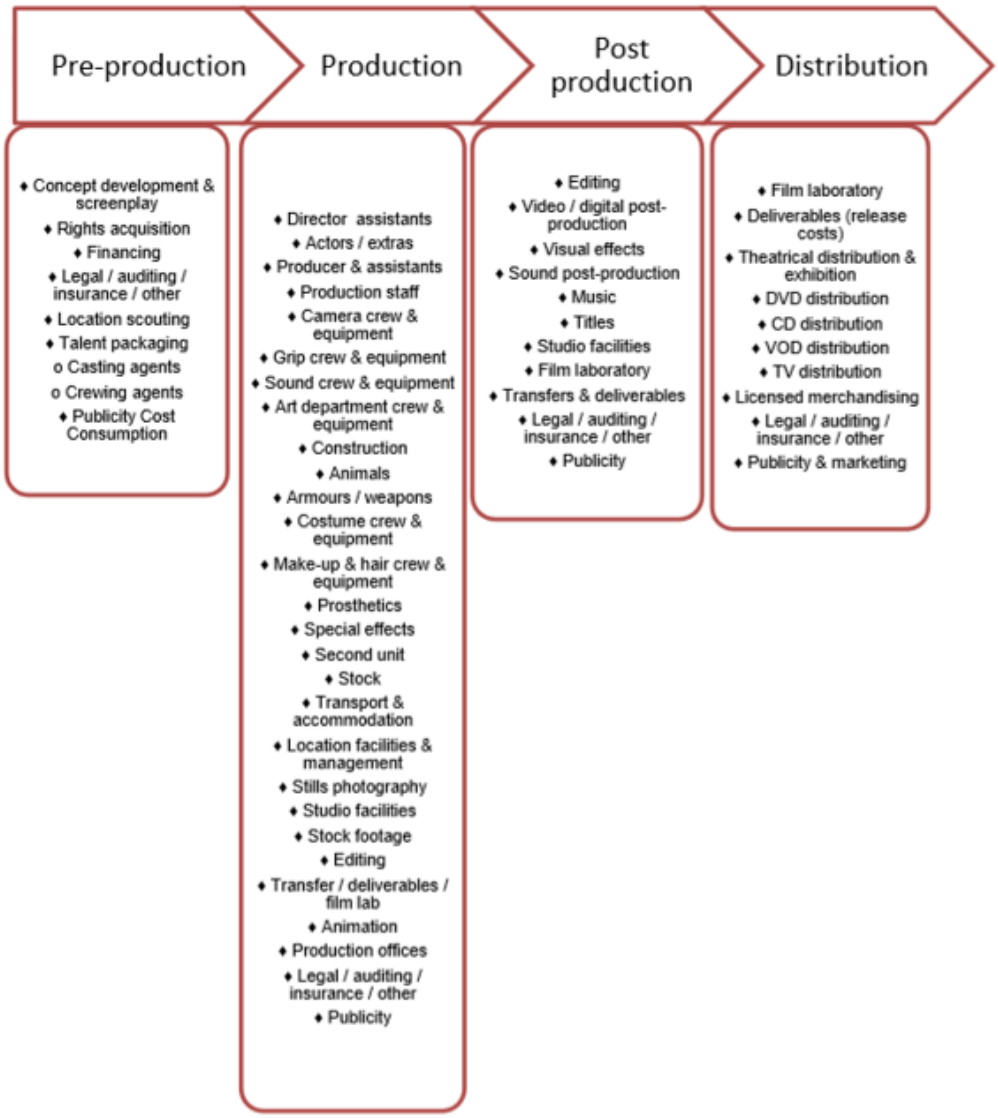
Although the main objective of this project is to work towards a shared agenda for digital skills development, it is also of importance to consider the approach adopted in motivating for and driving towards the preferred "To-Be" scenario. Cognisance needs to be taken of the potential ignorance and even fear of particular target audiences to engage with ICTs and the digital economy. It will be worthwhile considering people-friendly approaches and even the inclusion of behavioural economic principles to facilitate the larger (social) change process.

11.3.9 Digital transformation leadership skills

Skills level requirements have moved from the very technical to the higher levels of digital architecture, integration and digital transformation leadership skills. Investment in the digital leadership capabilities of medium to senior managers across sectors should be considered as a way of fast-tracking digital transformation and creating the necessary collective knowledge, insight and capability to harness the benefits of these advanced technologies to establish the Western Cape as a global digital hub.

Annexure 1: Film and media process

Film and Media Process



Source: Wesgro Film and Media (2017). Cape Town and Western Cape Film and Media Promotion. Cape Town. p. 15.

Annexure 2: Film & media

To develop the industry, government also encourages foreign production as a way not only to earn revenue but also upskill local resource. From the current structure, there is a gap in terms of initiatives offered to those that are just starting out and have no credentials as most of the current support initiatives require film makers to at least have a resume or experience, without this emerging film makers will not be able to develop any productions due to lack of start-up capital. Further leaving the industry untransformed and underserviced in some parts of the country[154].

Summary of initiative, criteria and offerings in the film and media industry

SUPPORT INITATIVE	QUALIFYING CRITERIA	OFFERING	RESPONSIBLE INSTITUTION
Programme: Foreign Film and Television Production **Aim:** Attracting international film productions to shoot in South Africa.	Foreign production companies that choose to shoot locally, or use local services.	Successful applicants receive between 20% and 25% of qualifying expenditure as a rebate.	Department of Trade and Industry
Programme: SA Film and TV Production and Co-Production Incentive **Aim:** Support the local industry and contribute towards employment, income, and economic growth. To encourage high value local productions.	Productions with a budget of more than R2.5 million. Majority South African ownership qualify.	Pays back up to 35% of qualifying expenditure as a means for the production company to begin recouping costs.	Department of Trade and Industry
Programme: SA Emerging Black Film incentive **Aim:** To nurture and capacitate emerging black filmmakers to take up big productions and contribute towards employment opportunities.	South African black-owned qualifying productions with a total production budget of R1 million and above.	A rebate of up to 50% for the first R6 million of the Qualifying South African Production Expenditure (QSAPE) and 25% thereafter. • No cap is applicable for this rebate.	Department of Trade and Industry
Programme: Export Marketing and Investment Assistance (EMIA) **Aim:** Developing export opportunities and foreign investment attraction.	South African enterprises owned by historically disadvantaged individuals, as well as groups or councils representing these enterprises.	Practical assistance in terms of exhibition material for international exhibition as well as financial assistance to pay for exhibition fees and travel allowances.	Department of Trade and Industry
Programme: Production funding **Aim:** To increase the number of South African films and previously disadvantaged individuals producing them. To encourage high value local productions.	South African-owned production companies that have produced at least three documentaries that have been broadcast on television or released theatrically in either one hour or feature length formats. New and emerging filmmakers or writers who have a production company attached to the project.	Production funding is given for feature films, short films and documentaries. A R1 million grant each year is given for the purchase of archive material for feature-length and hour-long documentaries.	National Film & Video Foundation

SUPPORT INITATIVE	QUALIFYING CRITERIA	OFFERING	RESPONSIBLE INSTITUTION
Programme: Development funding **Aim:** Support the local industry and contribute towards employment, income and economic growth. To encourage high value local productions.	Independent production companies who hold exclusive rights or options for at least 12 months Writers attached to a project.	Feature length films and TV formats-R200 000; (R40 000 reserved for script editor) Documentaries-R120 000. Short films- R100 000. Animation-R250 000 (R40 000 reserved for script editor and R50 000 for storyboarding).	National Film & Video Foundation
Programme: Marketing, Distribution and Festivals Grant **Aim:** To provide financial support to filmmakers and distributors to promote their product at film markets and festivals effectively	South African independent filmmakers and independent local distributors who have a complete film or TV product	Markets and festival attendance grant-R29 000 cap per applicant; twice per applicant per annum. Marketing and Distribution grant -R250 000 per applicant per annum. Organization and administration of local festivals -R1 600 000 per applicant per annum.	National Film & Video Foundation
Programme: The Film Tax Incentive/ Allowance **Aim:** Aimed at high net worth individuals and corporates as a way of reducing their tax liability when investing in film.	If the income is received by or accrues to an investor; and only to the extent that the income is received or accrues within a 10-year period after the film's completion date. The tax exemption is limited to investors who acquired the exploitation rights before the completion date of the film.	Successful applicants receive an upfront deduction, or in some circumstances a deduction which is spread over 10 years, for certain production or post-production costs incurred by the taxpayer.	South African Revenue Services
Programme: The Film Tax Incentive/ Allowance **Aim:** Aimed at making a difference by helping South Africa Filmmakers to turn their creative visions into a reality	New or existing companies within the Media and Motion Pictures sector that need funding of up to R1-billion. Application for funding should be in writing, including an executive summary and a comprehensive business plan.	Offers funding up to R1- billion which can be structured in the most appropriate manner utilising a wide range of instruments to meet the needs of the business including: • Debt/equity • Quasi-equity • Bridging finance • Venture capital	Industrial Development Corporation

Source: Thornton, G. (2017). *Cape Town & Western Cape Film & Media Sector Study*. Cape Town: Stratecon, page 78.

Annexure 3: Gaming industry revenue 2017

Worldwide video game industry revenues as of 2017:

Video game industry – $108.9 billion[31]

1. Digital content – $100.5 billion[32]
2. Physical sales – $14.6 billion[2]
3. Interactive media – $11.2 billion[32]

Gaming sectors:[32]

1. Mobile gaming – $46.1 billion[31]
    1. Smartphones – $35.3 billion
    2. Tablets – $10.8 billion
2. Console gaming – $33.5 billion[31]
    1. Digital content – $21.9 billion[2]
    2. Physical sales – $11.4 billion[2]
3. PC gaming – $29.3 billion[31]
    1. Digital content (free-to-play) – $20 billion[32]
    2. Digital content (premium) – $6.2 billion[32]
    3. Physical sales – $3.2 billion[2]
4. Interactive media – $11.2 billion[32]
    1. eXtended Reality (XR) – $4 billion
    2. Gaming video content (GVC) – $3.2 billion
    3. eSports – $800 million

Source: http://vgsales.wikia.com/wiki/Video_game_industry) worldwide gaming industry revenues (2017)

Annexure 4: Incubators, accelerators and start-ups

Incubators in the Western Cape (URL's added)	
Afritech startup boot camp	www.AfriTech - Startupbootcamp
Bandwith Barn Incubator (Township Incubator)	www.citi.org.za/bandwidth-barnkhayelitsha/
Entrepreneur Incubator	www.siliconvalley.tours/SiliconValley/Tours
Garden Route ICT Incubator (George)	www.grincubator.co.za/
Launchlab, Incubator, Stellenbosch	
MEST Incubator	www.launchlab.co.za/startups-entrepreneurs/
Savant Incubator (Hardware)	www.meltwater.org/training-program/
Springlab	www.savant.co.za/approach/
Windtunnel methodology	www.springlab.co/contact/
	www.em-solutions.co.za/

Accelerators currently in the Western Cape	
42 Engines	Innotech
88mph	Microsoft Bizpark
Ampion Fellowship	Net Prophet Sparkup!
Enterprise Elevator	New economy Accelerator
Founder Institute	New Ventures Studio
Global Cleantech Innovation Programme	Spark
Green Pioneer Accelerator	Start with Seven
Grindstone	Startup90
Ignitor	Tech Lab Africa
	Techstars

Some start-ups in the Western Cape	
www.2go.im	www.peachpayments.com
www.addynamo.co.za	www.nearabuilder.co.za
www.adrenaline-hunter.com	www.nomanini.com
www.apexpeak.com	www.pashash.com
www.blinktower.com	www.payfast.co.za
www.bsavi.com	www.shopdeploy.com
www.chingpayments.co.za	www.snapbill.co.za
www.clevva.net	www.snapplify.co.za
www.cognician.com	www.taxtim.com
www.ebooze.co.za	www.themassive.co.za
www.entersekt.com	www.toodu.co.za
www.findmyway.mobi	www.travelground.com
www.flickswitch.co.za	www.trustfabric.com
www.gigham.com	www.twangoo.co.za
www.gometro.co.za	www.ubuntudeal.co.za
www.homebug.co.za	www.wabona.com
www.myows.com	www.zando.co.za
www.perk.co.za	www.zapacab.com
www.runwaysale.co.za	

Annexure 5: Opinions of role players in the ICT sector

A summary of the opinions of role players in the ICT sector		
Research Questions	Participant	Conclusion
What drivers and dynamics are at play in this sector?	Prof Pete van Vuuren: CIO Council of South Africa: Board member	The main driver is to make money. To do this, smarter technology and good analytics are needed.
	Greg Groenmeyer: Sanlam: Head of IT infrastructure and strategy	Digital disruption is the driver at play in the industry. Self services by customers will increase and the big project approach will decrease
	Renier van der Merwe: CIO: Premier Foods	Businesses need to be agile with agile and need IT resources with business orientated skills. New innovations are the drivers in the industry.
	Angus de Jager	Industry is not leading. Reaction time to innovation to long. Needs a new paradigm to stay in touch with new ICT products and customers
What is the current need profile for digital skills?	Prof Pete van Vuuren: CIO Council of South Africa: Board member	A profile of innovation, creativity, energy and inquisitiveness is need.
	Greg Groenmeyer: Sanlam: Head of IT infrastructure and strategy	Higher level skills profile needed such as design thinking, systems thinking, creating and implementing API's.
	Renier van der Merwe: CIO: Premier Foods	In search of business orientated ICT resources.
	Angus de Jager	Fast changing environment with new ways of doing things. Skills need have moved from development, coding specialist to a multi skilled individual.
What are the current sources of supply/gaps in regards to digital skills?	Prof Pete van Vuuren: CIO Council of South Africa: Board member	Resources are resourced from all over the industry
	Greg Groenmeyer: Sanlam: Head of IT infrastructure and strategy	Academia is slowly becoming irrelevant, but will always play some role.
	Renier van der Merwe: CIO: Premier Foods	Skills are looked for on a very specific bases. For new innovation and creativity value added business and boutique software house are more suitable. Academia more suited for the legacy systems.
	Angus de Jager	Resources from where ever available.
What skills are needed in the sector?	Prof Pete van Vuuren: CIO Council of South Africa: Board member	Al, analytics and the high level skills needed for digital transformation
	Greg Groenmeyer: Sanlam: Head of IT infrastructure and strategy	The move is away from the detailed technical skills such as Software development towards digital transformation needing higher level skills
	Renier van der Merwe: CIO: Premier Foods	Skills are looked for on a very specific bases. For new innovation and creativity value added business and boutique software house are more suitable. Academia more suited for the legacy systems.
	Angus de Jager	The skill level requirements have moved from the very technical to the higher levels of Architecture, integration and digital transformation skills.

Annexure 6: Business Initiatives

Current Enterprise initiatives and skills required for the development of the initiatives	
Initiatives	**Skills**
AR App / Gamification	Basic IT skills
Big Data Analytics	Big Data technology
Bitcoin payment pilot	Block chain skills
Boost in ICT Skills - 44 students, 12 week training in software Programming language Scratch	Business Continuity Management
Computer technician apprenticeship	Data analytics
Cyber Security	Business development skills
Cyber Security / Disaster Recovery	Entrepreneurial skills
Entrepreneurial Dev Programme	Finance skills
Fintech start-up / Easy to setup insurance	Integration skills
In-store Wifi / E-commerce lockers (older)	Networking skills
People & Potential Programme	Programming skills
Project / Prototype	Project management
Providing basic online courses and infrastructure	Security knowledge
Scan card and collect items	System Management
Self-Checkout Cashier	Digital literacy/ fluidity
Tech Talent Programme	

Annexure 7: Western Cape digital skills agenda

Methodology

A demand analysis for ICT and related skills was conducted using data freely available from *LinkedIn's* jobs-search, and *Google's* "Google-Trends" platform. This was supplemented by data provided by *PNet*, a private recruitment company. *LinkedIn's* jobs-search data provides a snapshot of the current demand of ICT skills for the period of 1 (one) month. (Note that additional data for all jobs for all time is available from *LinkedIn*, but is less useful) whereas Google-Trends keyword-search engine provides data on a timeline, showing the variation in interest in ICT and related skills over a period of 3-4 years.

Data was limited to the Western Cape, although for *LinkedIn* only Cape Town data was available.

The definitions, scope and limitations of the data from the above sources and the methodology to analyse the data is laid out below.

1.1 ICT and Related Skills

To analyse the data from the different sources, ICT skills were considered through the narrow perspective of demand for (Software) Programming skills, and the broader perspective of Information Systems skills.

- Programming or developer skills relate to the ability to use specific programming language(s) such as Java, Python or C#
- Information System skills is a combination of various ICT skills (software, hardware, networks, etc.) that are combined under broad "technology" definitions e.g. Big Data, Artificial Intelligence, IoT, or Cloud Computing

Definitions of ICT skills are notoriously nebulous; some definitions of developer skills are a combination of sub-skills such e.g. "front-end" skills require HTML, CSS and Javascript expertise. Some defined skills types have overlap between categories.

The list of programming and Information Systems skills that formed part of the scope of the search process is given in the table below.

Skill Type	Skill
Programming Skills	Java
	C#
	.Net
	SQL
	Python
	Android
	Frontend
	Backend
	Web Development
	Linux
	Graphics Design
	iOS

	Database
	Business Intelligence
	Social Media
	SAP
Information Systems skills	Data Analytics
	Big Data
	Cyber Security
	Machine Learning
	Blockchain
	Robotic Process Automation
	Internet of Things
	Artificial Intelligence
	Virtual Reality
	Robotics
	3D Printing
	Augmented Reality
	Quantum Computing

1.2 LinkedIn data

LinkedIn's job-search engine was used to extract vacancy data for the ICT field in Cape Town over a period of one month. *LinkedIn's* filter functions were used across all searches, with the following filters.

Filter Type	**Filter Used**	**Description**
Search Location	Cape Town Area	LinkedIn recognises Cape Town as a valid location filter, but not the "Western Cape" and doesn't provide vacancy data at provincial level. Data for specific "City" locations such as Paarl and George were available, but the number of vacancies in those locations were insignificant compared to those for Cape Town, and have not been considered in the analysis.
Date Posted (Timeframe)	Past Month	This filtered out vacancies that were advertised more than four weeks before the date of extraction. The reason for limiting the scope to one month only was that, the alternative filters provided only either the vacancies in the past 24 hours or all vacancies that were ever posted on the website
Job function	Information Technology	This was a pre-defined filter tag that filtered out all the non-ICT related vacancies. This filter was used because it best matched the scope of ICT related vacancies
Industry (Sector)	Various	When extracting data on sector specific ICT related vacancies, the Industry filter was set to the sector of interest e.g. Retail or Financial Services. The "Media" sector was composed of a combination of several sub-sectors such as "Broadcast media", "Online media", "Gaming", "Animation". The grouping was done because of the small number vacancies in these individual sub-sectors.
Title (Job Title)	Various	When extracting skill specific vacancies such as Java Developer, the job-title filter was set to specific keywords of interest such as "Java" or "Java Developer"

Experience Level	Various	To determine the level of expertise required by the industry in the ICT field, this filter was pre-set by LinkedIn to e.g. internship, entry level or mid-senior level.
Number of Applicants	Various	This filter was set to "Under 10 applicants" when searching for vacancies that had less than 10 applications, this data was used to look at how many vacancies had a poor response by applicants.

In addition to job-search filters, *LinkedIn* also provides "competitive intelligence" about applicants for specific vacancies. This applicant data provides an insight into education, seniority level and location of applicants. For example, using these insights, it was possible to determine the location, education and seniority level of applicants for Software development jobs in Cape Town.

The limitations of the data must be emphasized. *LinkedIn* is the largest online jobs and recruitment platform across the world, but it is at an early stage of adoption locally – local recruitment companies that have personal and direct contact with human resource departments still play a significant role in jobs placement in South Africa. Secondly, the data presented is only over a single month – long term trends cannot be easily extrapolated. Nevertheless, we are of the opinion that the LinkedIn data provides useful insights on current skills demand.

1.3 Google Trends

The Google Trends engine allows users to extract keyword-search data. This produces the number of searches made for a specific keyword, over any given time (e.g. per week or per year). The Google Trends engine was used mainly because of a lack of historical vacancy data on LinkedIn. The keyword-search trends data indirectly hints at skills in demand over a time period. The following filters were used across all searches:

Filter Type	**Filter Used**	**Description**
Location	Western Cape	Google Trends provides provincial level data. It should be noted that the yearly trend characteristics are similar for Cape Town as for the Province, as the majority of ICT-related searches originate from the Cape Town area
Timeframe	January 2014 to Sept 2018	Even though, search data is available for the last 15 years, only five years of data was extracted. This was done because Google's keyword search data collection methods have changed vastly over the last 15 years, and because any data older than five years is likely to be outdated for the ICT sector
Keyword Category	Jobs	This filter ensures that keyword searches are specific to vacancies. This excludes general searches e.g. when extracting data for "Python" as an ICT skill, this filter would filter out search results data relating to say *Monty Python's Flying Circus*, or the reptile python.

Even though Google Trends provides insight into the trends for skills demand over time, it has certain constraints e.g. the data cannot be filtered by sector. It must also be noted that the results are that of keyword search and not vacancies, which means that the trend will represent the interest in a specific skill rather than actual demand as represented by a

vacancy. Therefore, Google Trends data must be used in conjunction with the LinkedIn data or other skills demand data in order to provide a more complete picture

1.4 Pnet

Pnet is a local careers portal that provided access to three months of vacancy data over a three-year period i.e. September 2016, September 2017 and September 2018. The data for each period was analysed and compared. Unlike Linkedin, Pnet's data did not have pre-defined key-word tags, which made the data analysis difficult. The following filters were used when analyzing the data:

Filter Type	Filter Used	Description
Job Region (Province Location)	Western Cape	Provincial level data was extracted
Timeframe	September 2016, September 2017, September 2018	A month-long snapshot of each of the three years' vacancy data was extracted, in order to obtain a consistent view of demand over time
Listing Sector (Job Function)	IT & Internet	This filter was applied to focus the scope of all ICT related vacancies
Listing Sector (Sector)	Various	In order to extract sector specific data, this filter was applied using specific sectors such as finance, or retail
Skills Required	Various	To extract skill specific vacancy data, this filter was applied using specific skill keyword such as C# or Java
Job Location (Suburb Location)	Various	This filter was applied to determine the number of vacancies per suburb in Western Cape

1.5 LinkedIn Data

1.5.1 General

In order to understand demand for ICT skills in Cape Town in comparison with other cities across the world a comparative view of ICT vacancies in a number of other major cities was obtained.

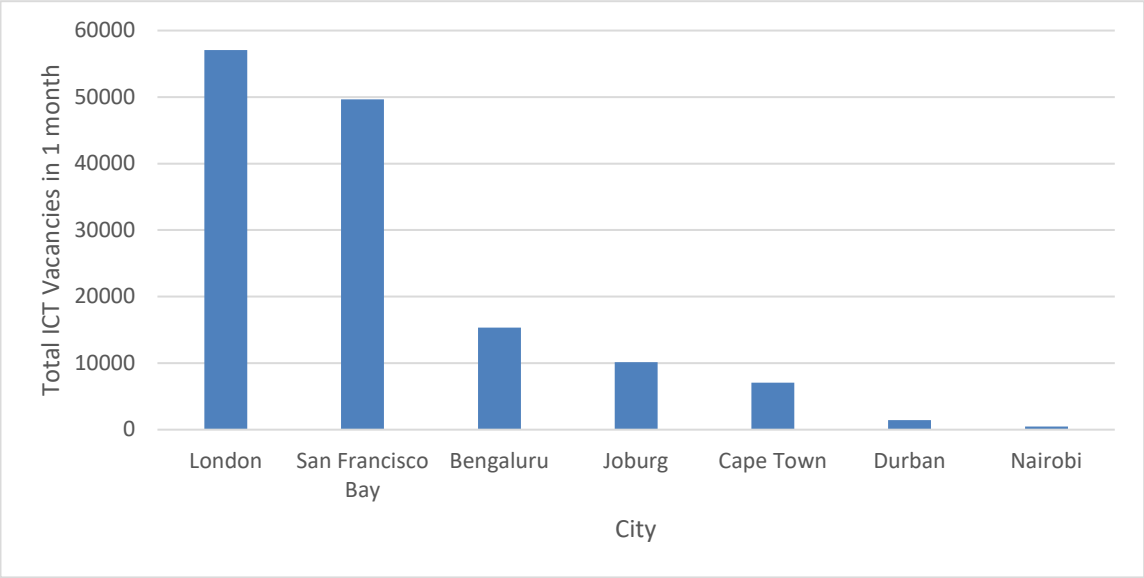


Figure 5: Total number of ICT vacancies in major tech cities

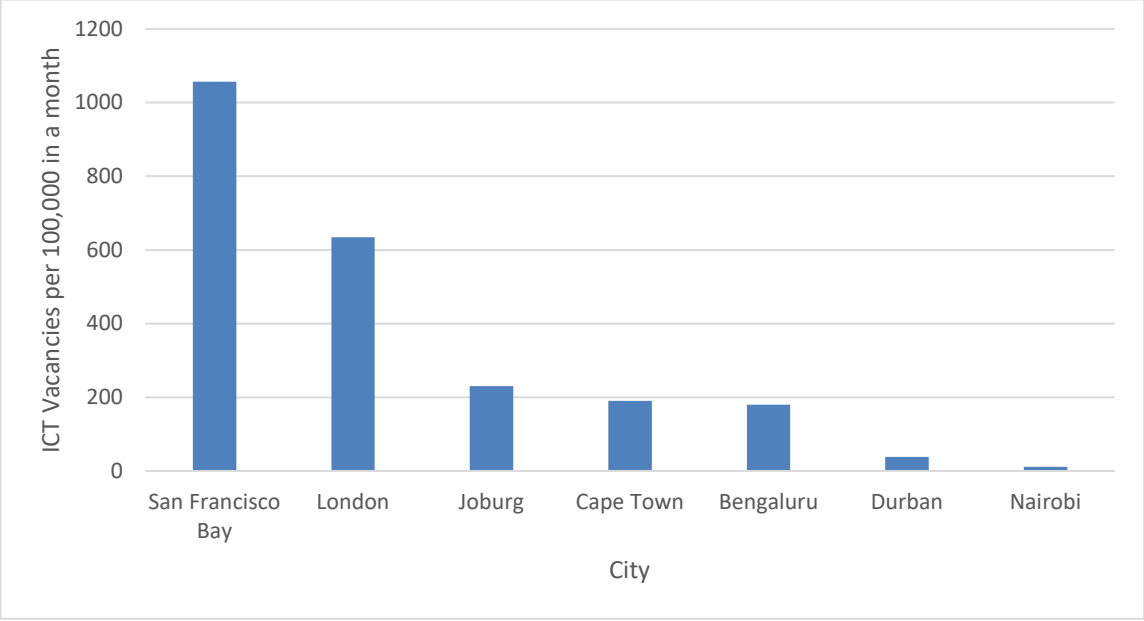


Figure 6: ICT vacancies per 100,000 in major tech cities

- LinkedIn carries jobs for a wide range of sectors. We analysed what the percentage of vacancies for ICT jobs against the total number of listed vacancies.

- We then looked at the other South African cities to see what the relative percentage of ICT jobs are across the major cities.

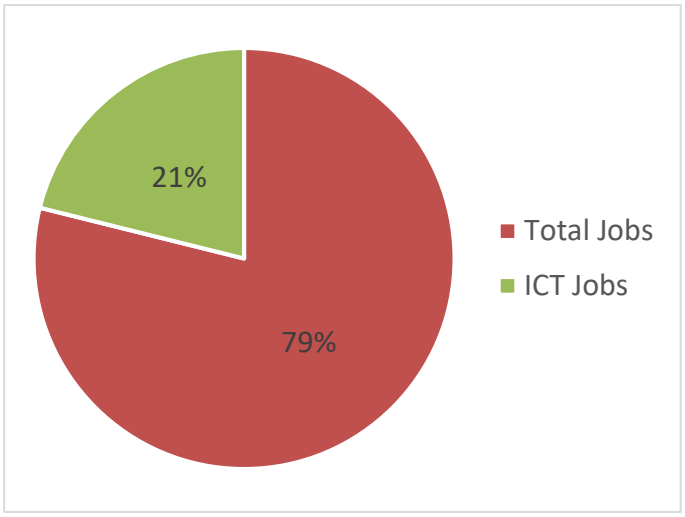


Figure 7: ICT Vacancies as a share of all vacancies in SA

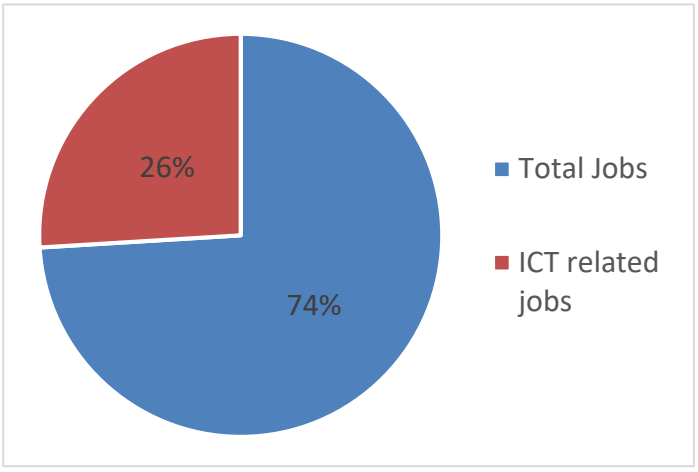


Figure 8: ICT Vacancies as a share of all vacancies in Cape Town

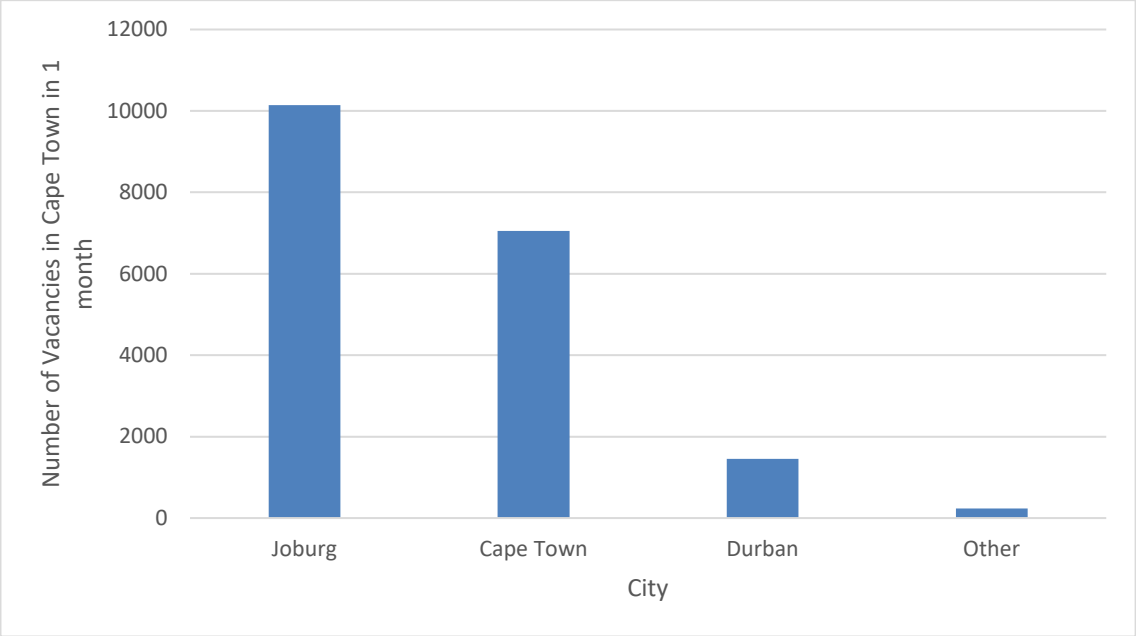


Figure 9: Share of ICT vacancies by cities in SA

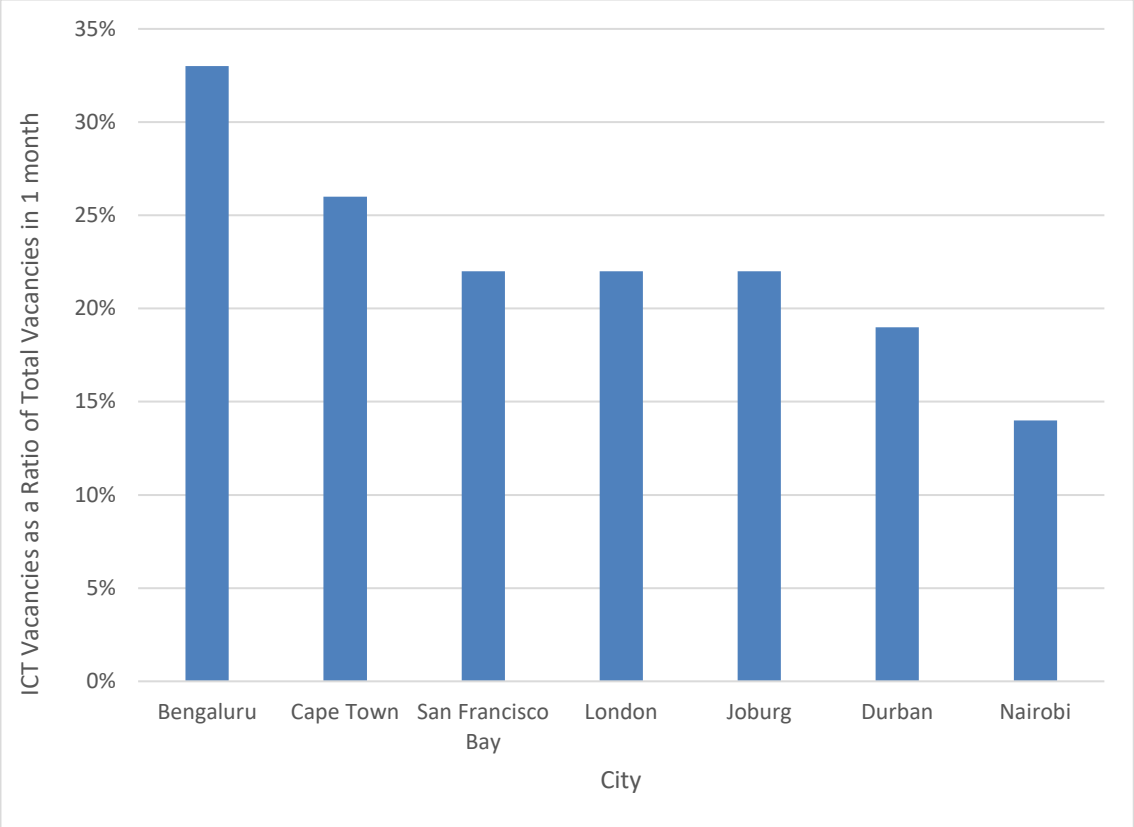


Figure 10: ICT vacancies as a share of all vacancies in major tech cities

- Nationally, Johannesburg has 40% more ICT vacancies than Cape Town
- On an international scale, large tech cities such as London and San Francisco have more than 7 times the number of ICT jobs than Cape Town
- The share of ICT jobs as a ratio of all the advertised jobs in Cape Town is on par with Johannesburg and the major tech cities around the world.

The Data that follows is based on analysis for Cape Town only

1.5.2 ICT related Vacancies by Experience

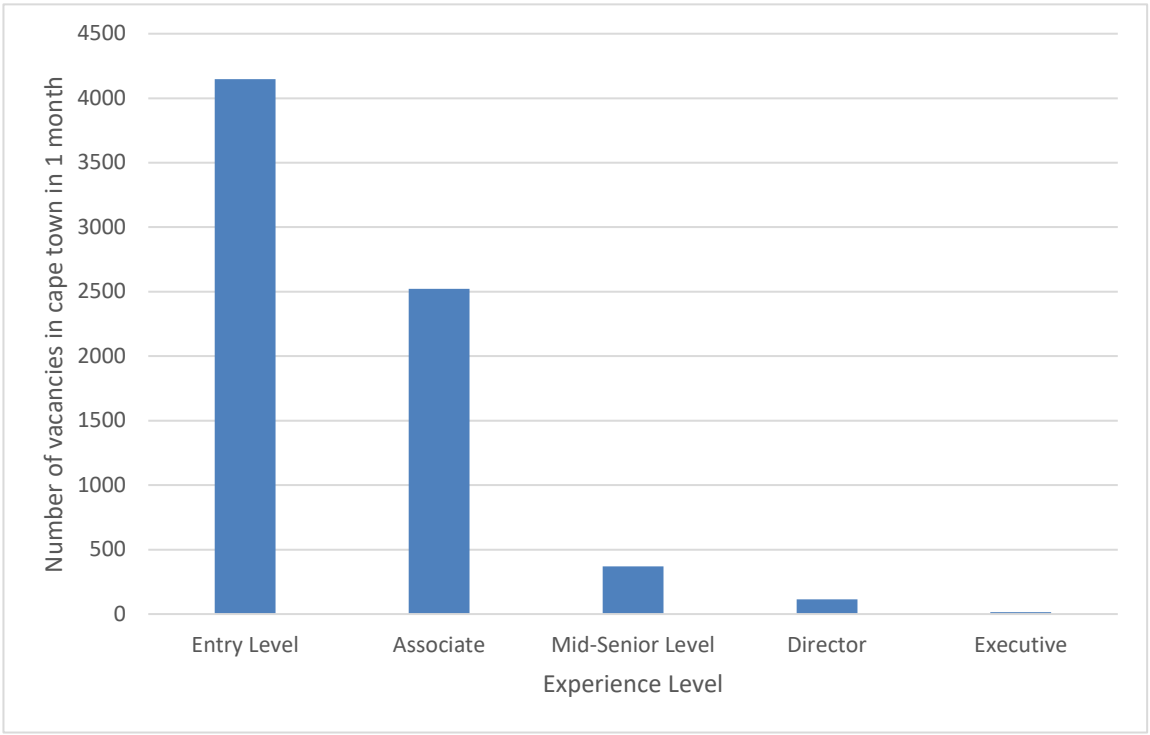


Figure 11: ICT Vacancies by Experience

- The majority (>90%) of ICT related vacancies are either Entry or Associate level (i.e. less than 5 years of work experience)
- Note that only 1% Internship opportunities are available
- According to some CIO's recruiting lower level resource is not that much of problem. It is however difficult to find senior people to fill vacancies. This is in contrast to the LinkedIn data. However, it must be taken into consideration how long it takes to find suitable people for the job. To advertise for say 4000 entry level jobs and it is filled within 30 days compared to advertise a senior level job but it takes 2 years to find a resource, shows the complexity of the issues at hand.

1.5.3 ICT related Vacancies by Sector

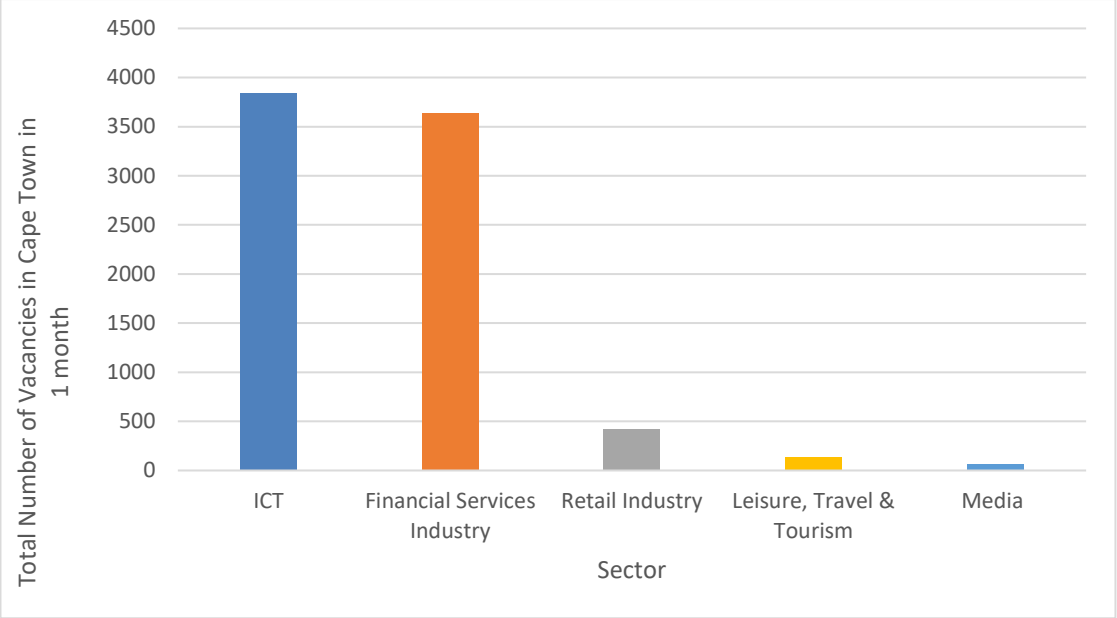


Figure 12: ICT Vacancies by Sector

- The majority (>90%) of ICT related jobs are in either the ICT sector (comprising Hardware, Software, Networks, Communications, Services, etc.) or in the Financial Services sector
- The media sector, which includes online media, broadcast media, gaming and animation, only has a small set of vacancies

1.5.4 Top Information Systems skills Requirement

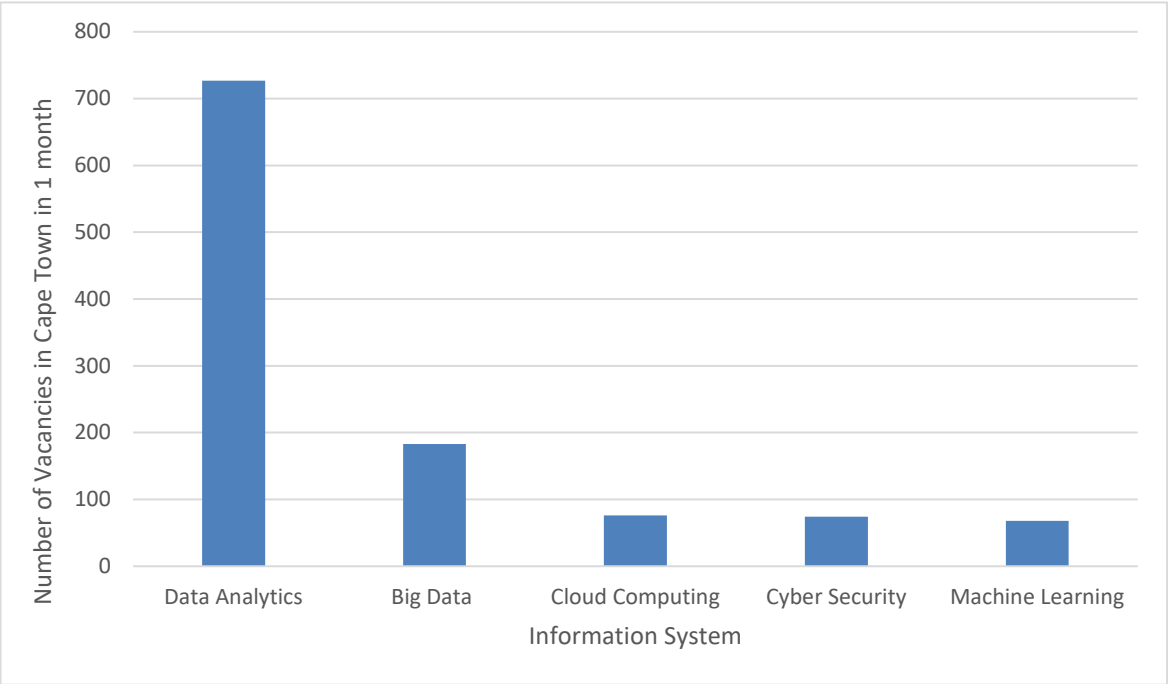


Figure 13: Information Systems skills vacancies in Cape Town

- Data analytics (which could be convoluted with Big Data) is by far (64%) the largest skill requirement for Information Systems skills vacancies
- Analysing the ICT skills required per sector shows (Figure 5) that Data analytics and Big Data to dominate the skills requirements. This again supports the industry leader's opinion of skills requirements.programming skils
-

1.5.5 Top Five Information Systems skills by Sector

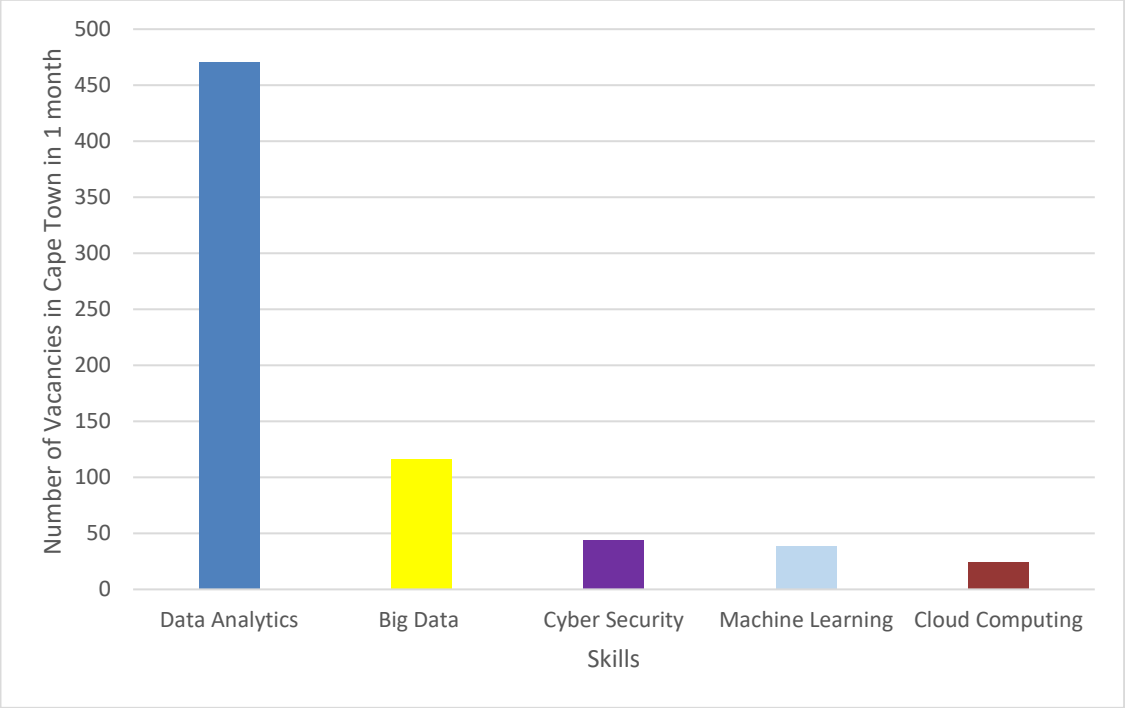


Figure 14 ICT Vacancies by Information Systems skills in the Financial Services Sector

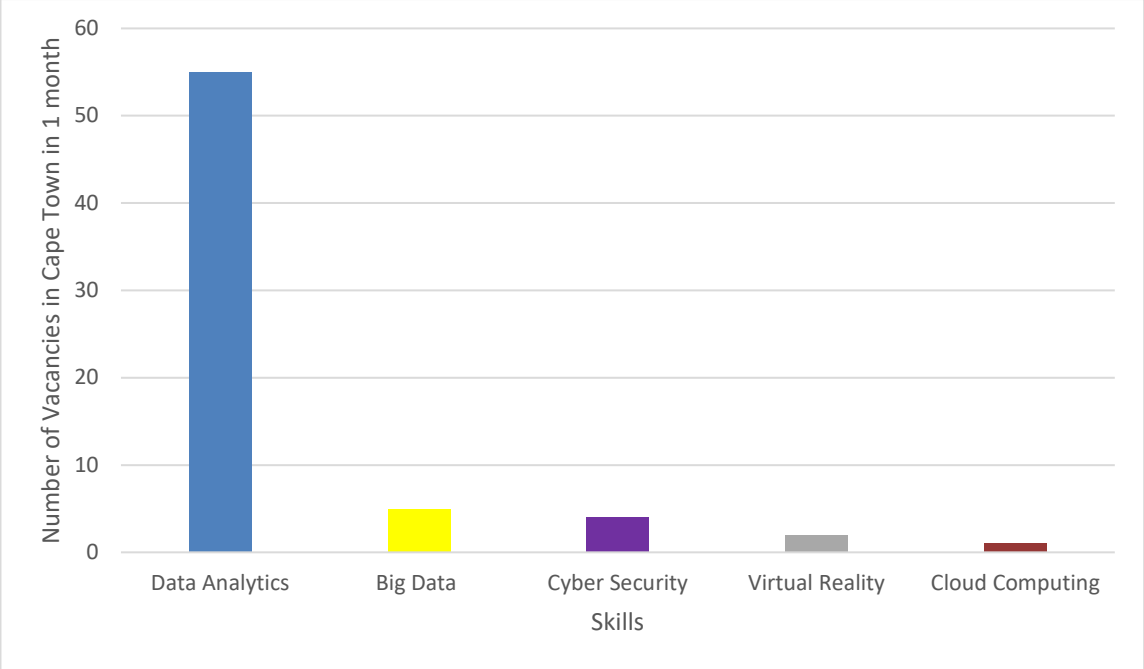


Figure 15: ICT Vacancies by Information Systems skills in the Retail Sector

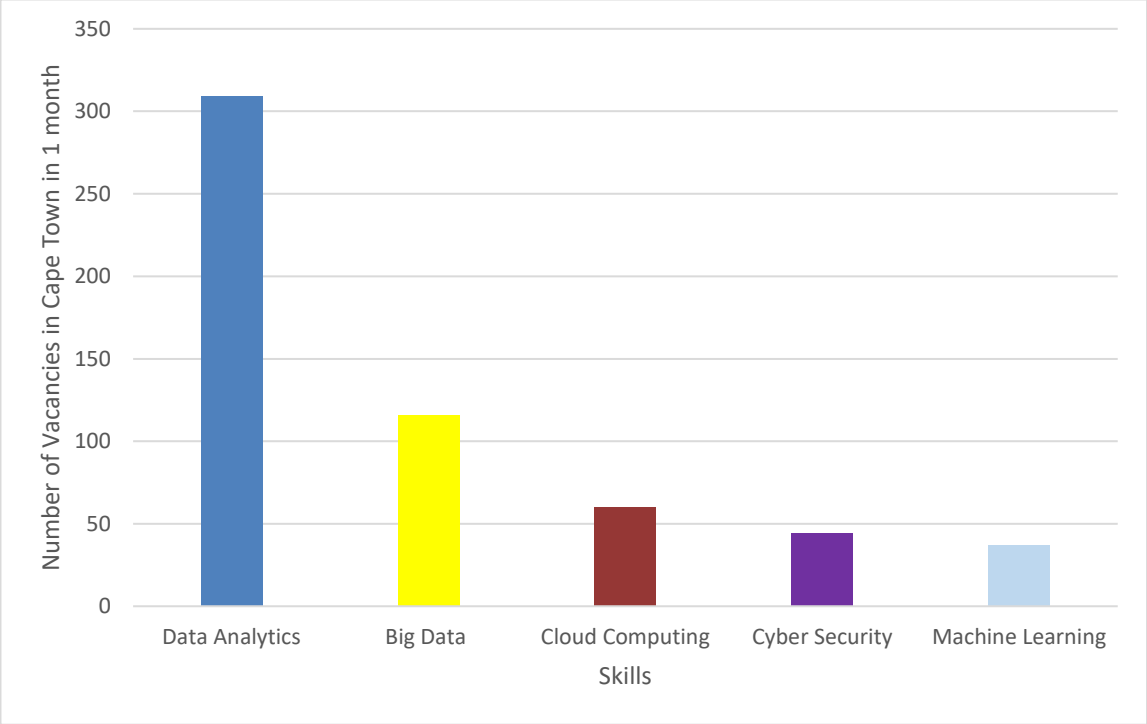


Figure 16: ICT Vacancies by Information Systems skills in the ICT Services Sector

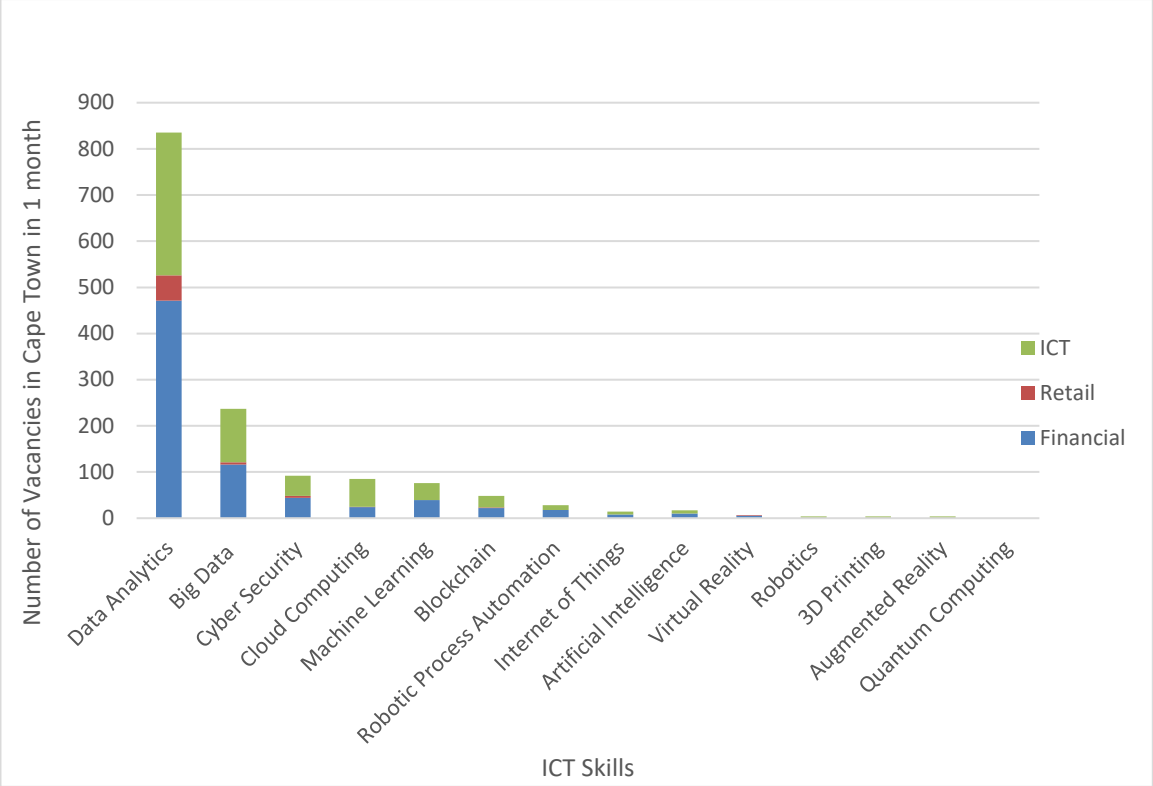


Figure 17: Consolidated Information Systems skills Requirement

- Sector based Skills data was only available for three sectors – Financial Services, ICT Services, and Retail
- Data Analytics and Big data appear as the top skills required in each of the three sectors. There is a close correlation in the skills set for Big Data and Data Analytics.
- Financial services have the greatest need for Data skills
- Virtual Reality, whilst small, appears to hold a potentially significant role in the Retail sector
- Overlap of information may have caused some double counting

1.5.6 Top Programming Skills Requirement

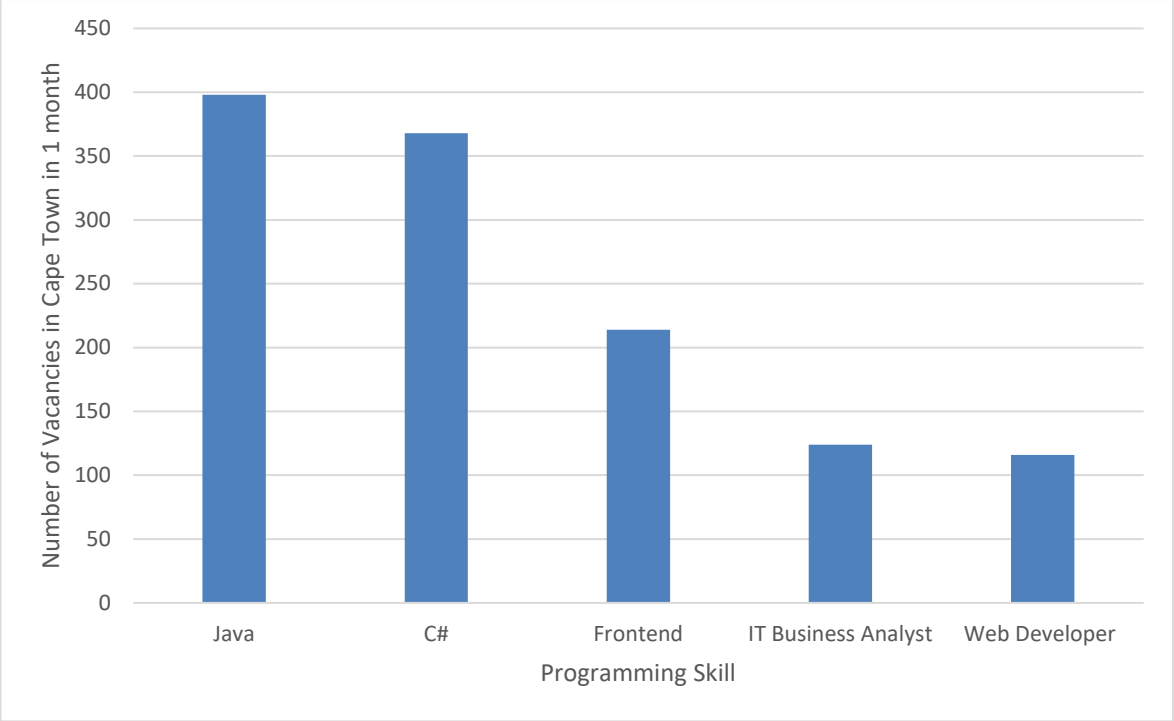


Figure 18: Top 5 Programming Skills Required in Cape Town

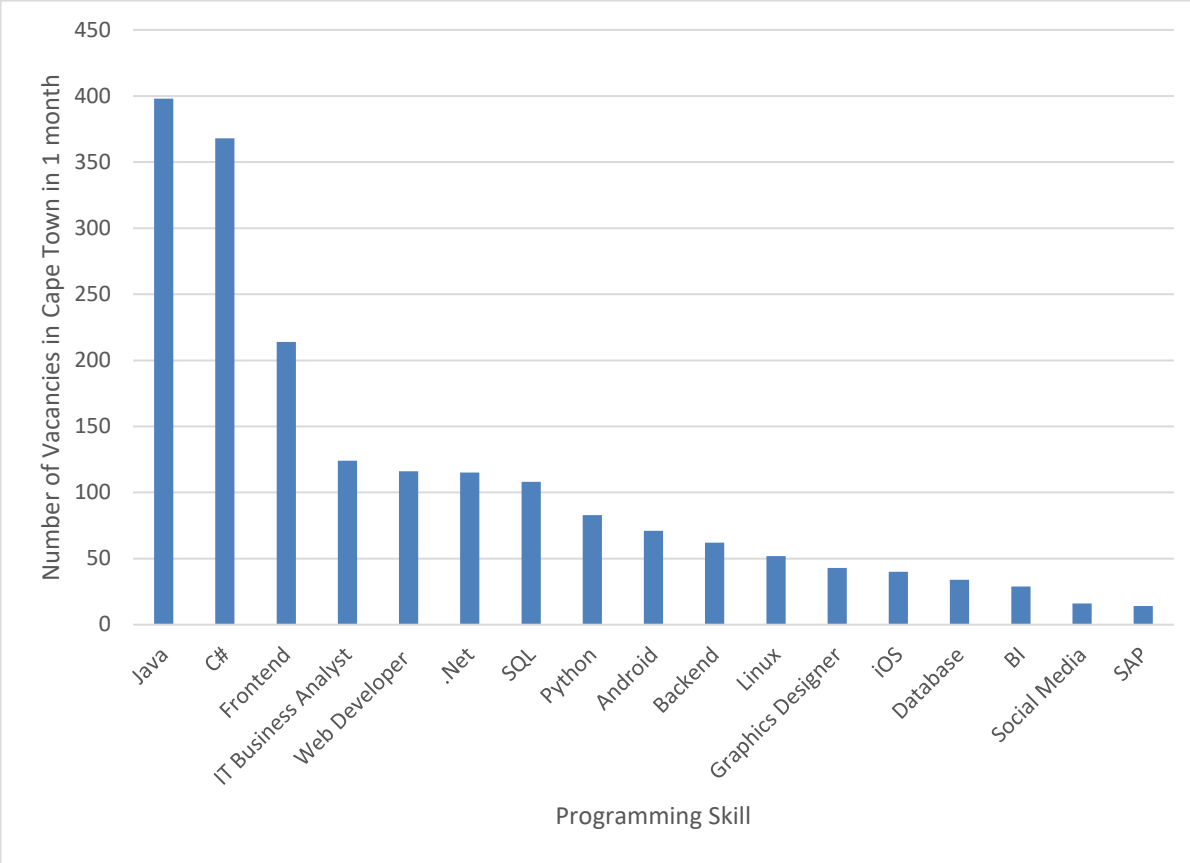


Figure 19: Top 10 Programming skills required in Cape Town

- The top programming skills requirement of Java and C# hint at mobile app-development and software development.
- Analysing the programming skills requirements Java and C# is in high demand. Web development is not that clear and many languages are being applied. It is interesting to note that the CIO's and industry leaders are of the opinion that these skills requirements will become less important and eventually disappear. As mentioned earlier it will be replaced with a different kind of resource.

1.5.7 Top 5 Programming Skills by Sector

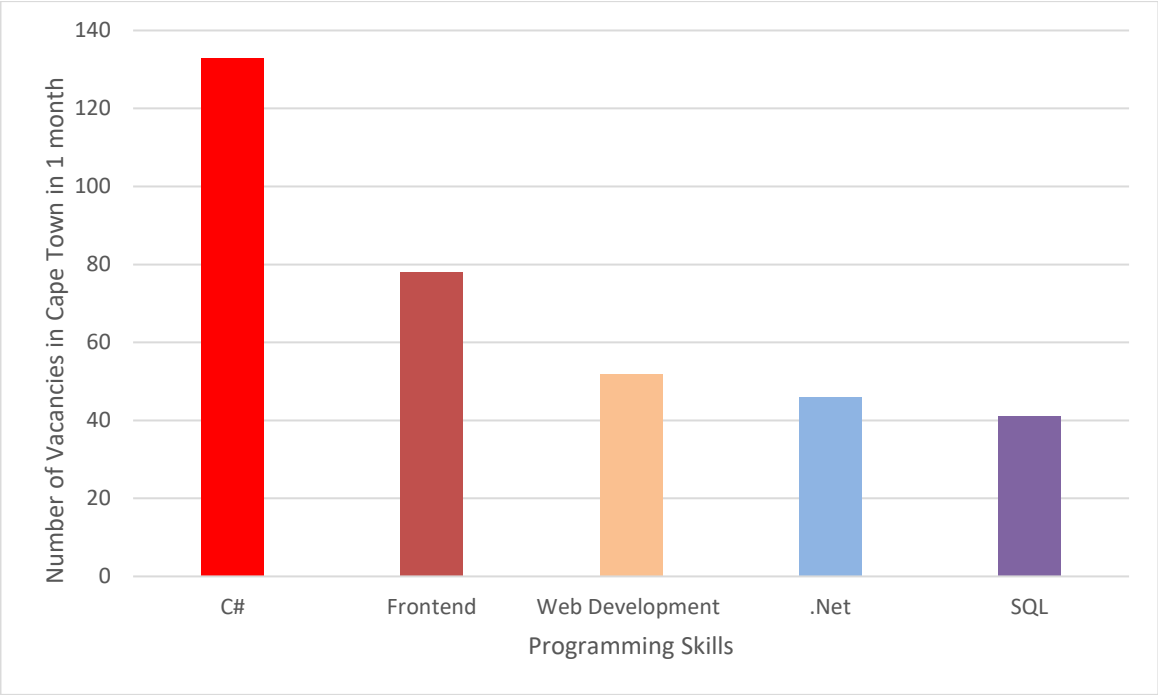


Figure 20: ICT Vacancies by Programming Skills in Financial Sector

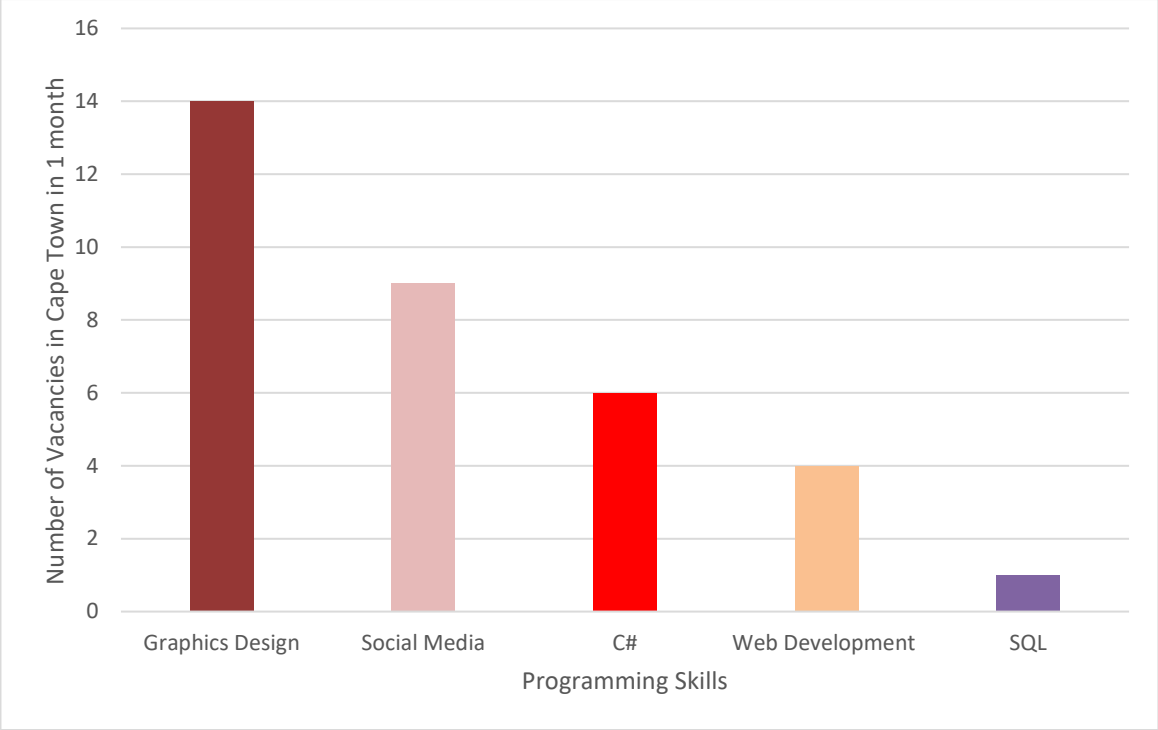


Figure 21: ICT Vacancies by Programming Skills in Retail Sector

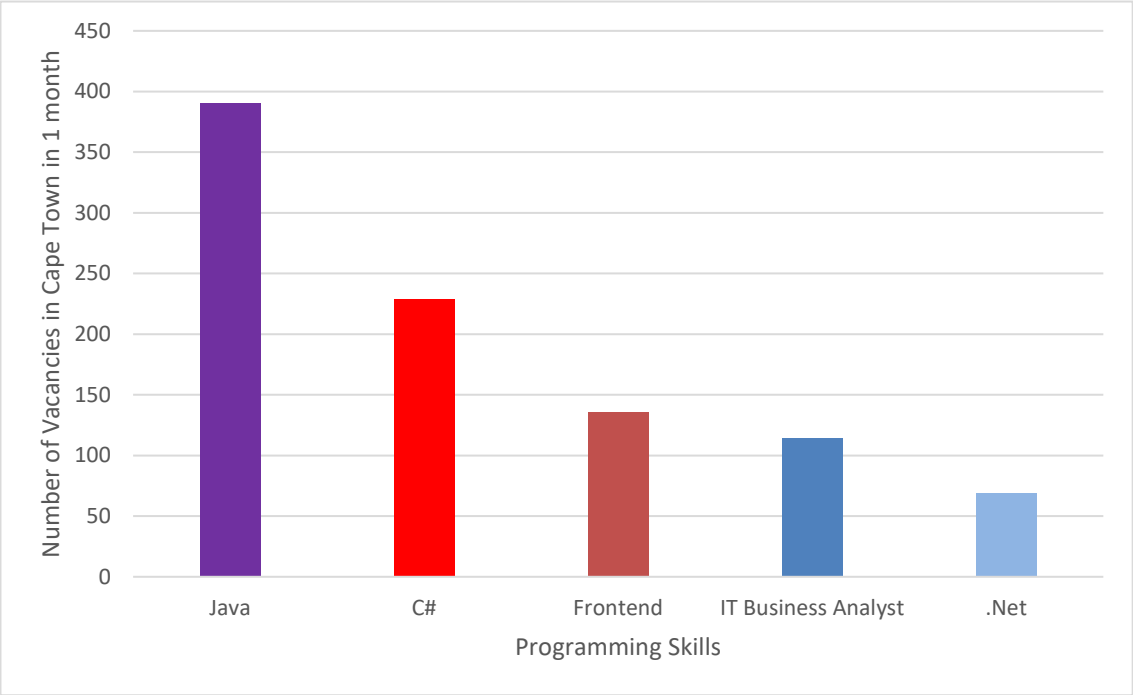


Figure 22: ICT Vacancies by Programming Skills in ICT-Services Sector

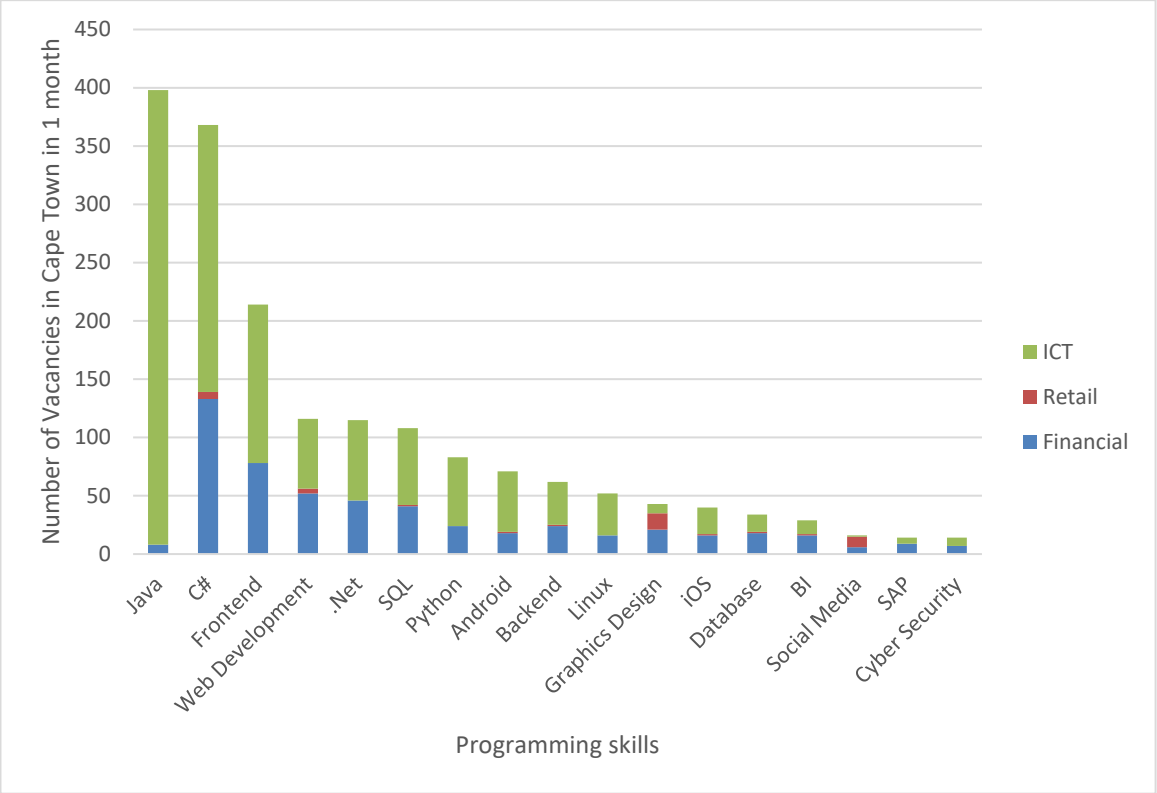


Figure 23: Programming Skills Requirement by Sector

- Although the top skill requirement in the Financial Services and Retail sector is Data Analytics, none of the usual data analysis languages like Java and Python make it to the top 5 requirements for programming skills
- This could point at outsourcing of programming of data analysis requirements to ICT services contractors
- Java and C# dominates the programming market place. It is surprising to note that data base and security skills are at the lower end of the scale.

1.6 Google Trends Data

1.6.1 Information Systems skills Search Trends

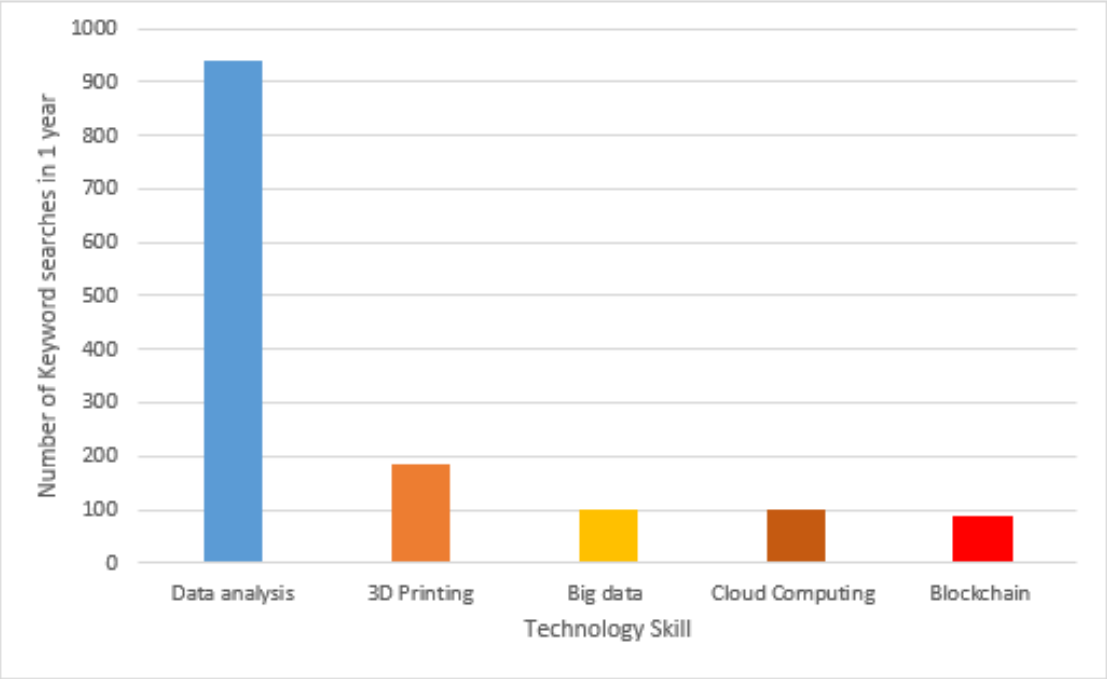


Figure 24: Number of Keyword Searches by Technology Skill in 2014

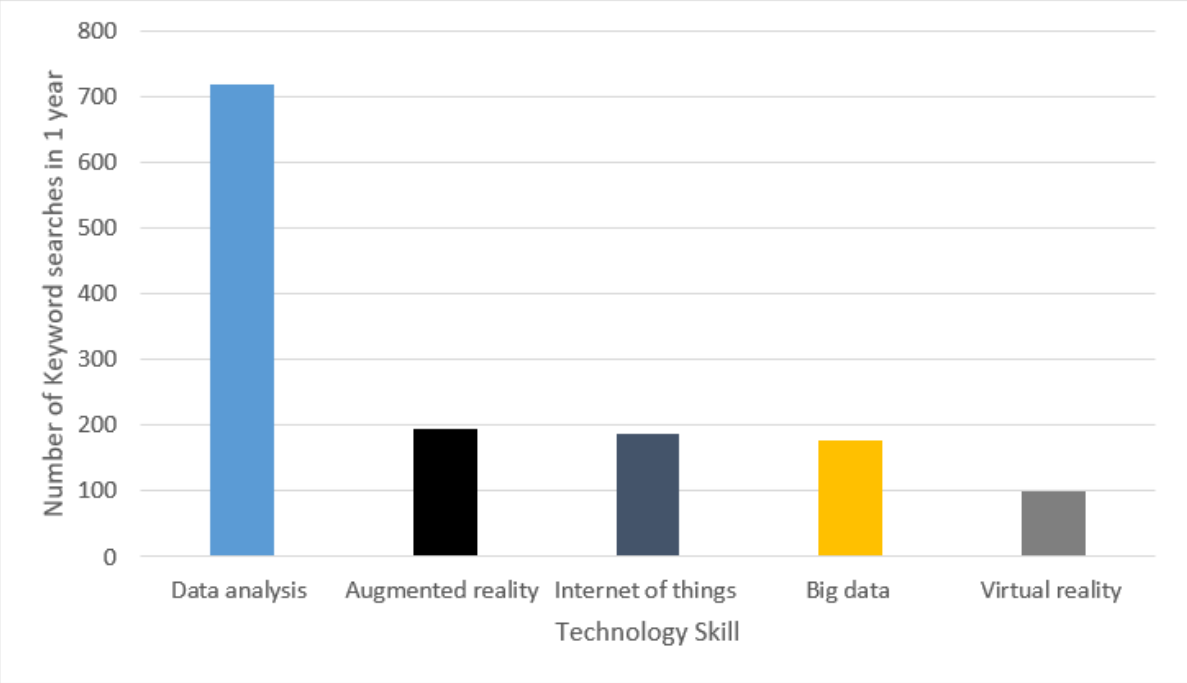


Figure 25: Number of Keyword Searches by Technology Skill in 2015

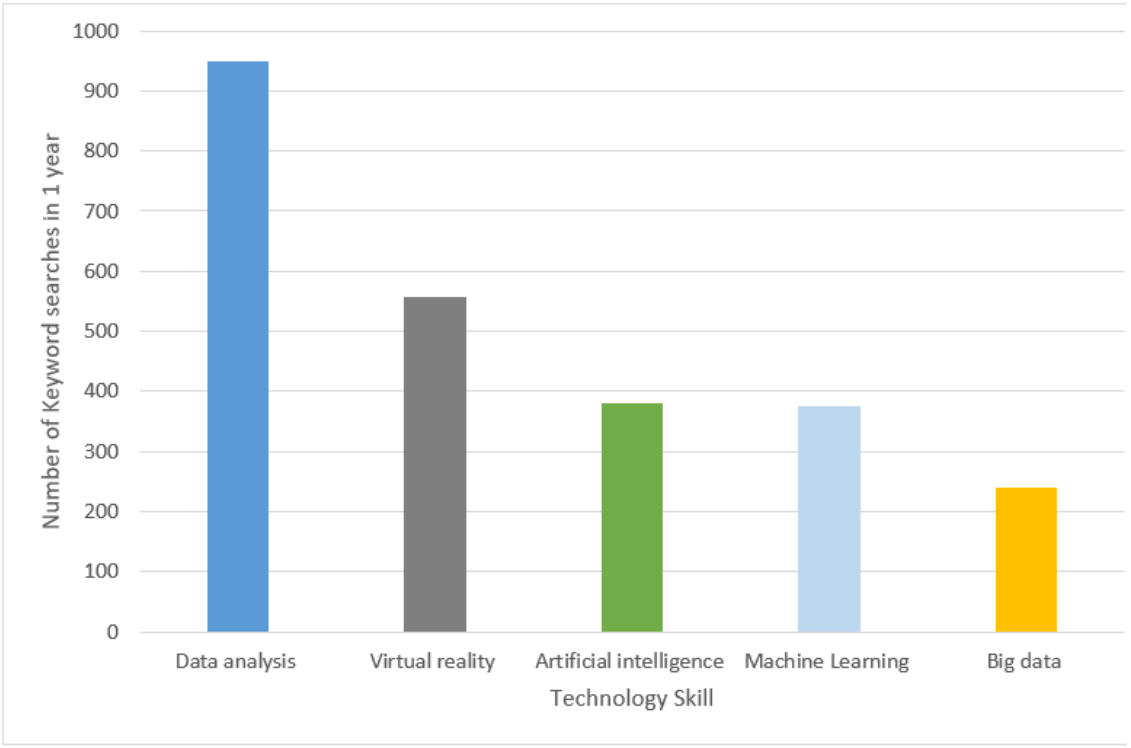


Figure 26: Number of Keyword Searches by Technology Skill in 2016

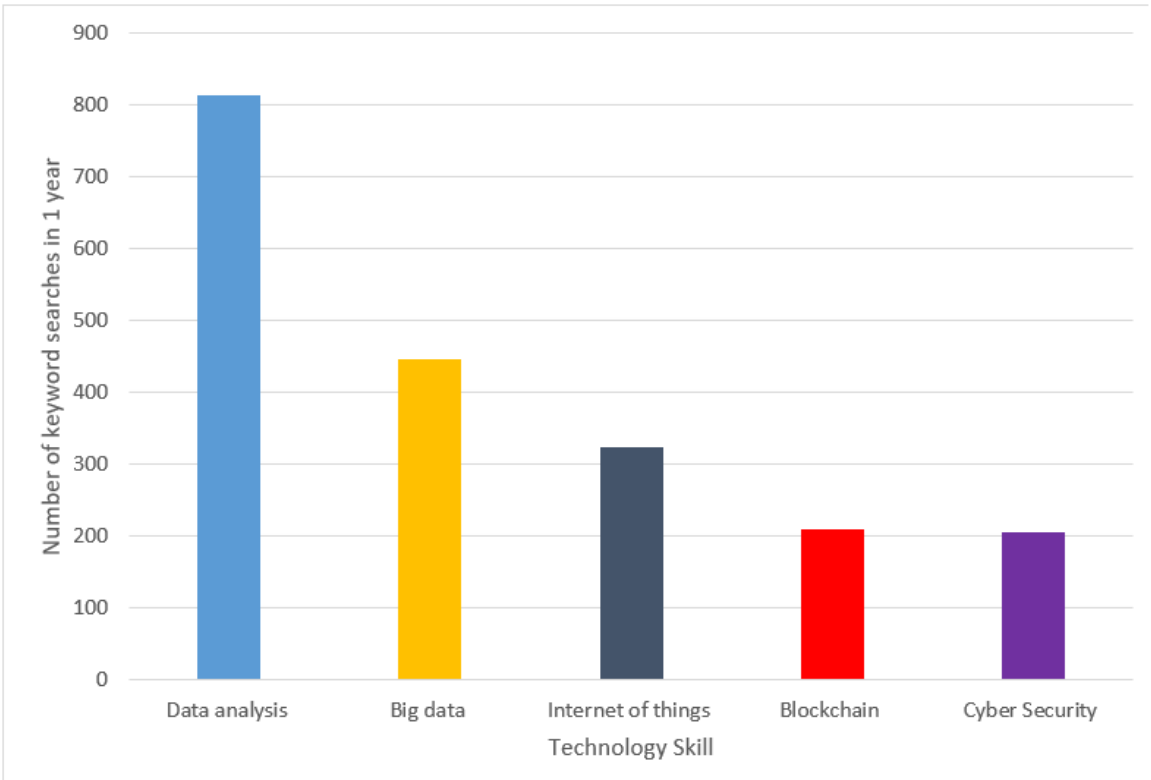


Figure 27 Number of Keyword Searches by Technology Skill in 2017

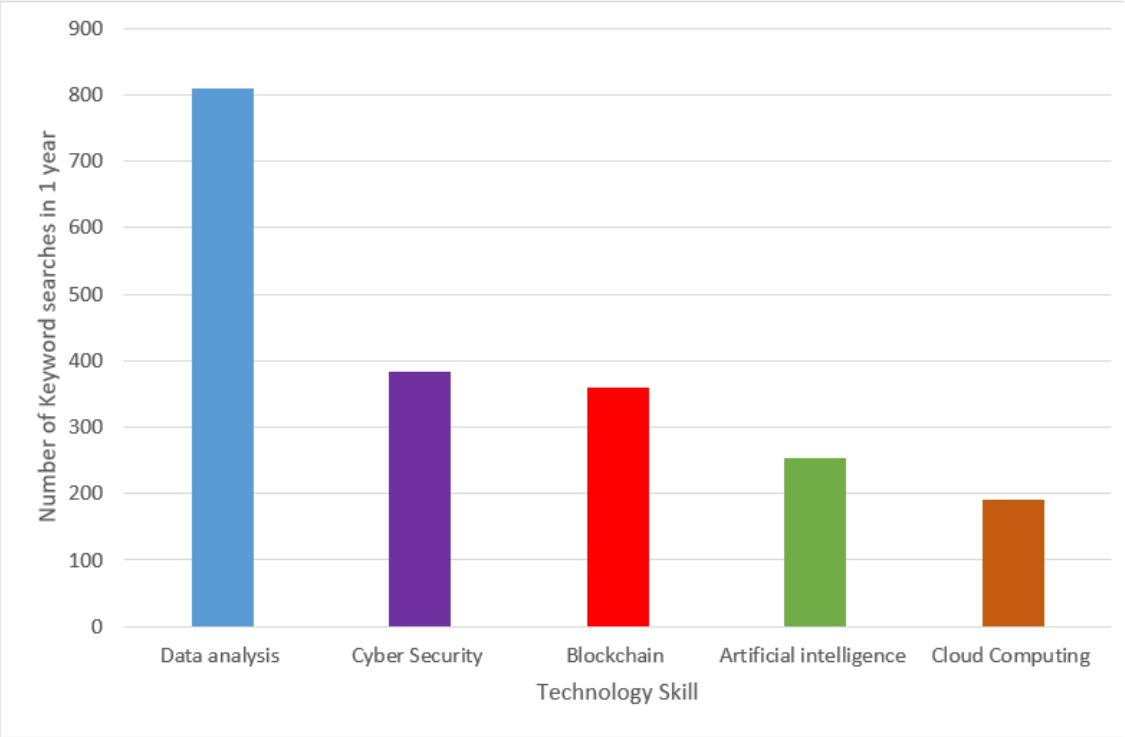


Figure 28: Number of Keyword Searches by Technology Skill in 2018

- The keyword search data shows a large, consistent appetite for data analysis, correlating with the data from Linkedin
- Skills such as blockchain and cybersecurity have more interest in 2018 than they had in 2014, which could be an indication of the growth of the Fin-Tech industry in the Western Cape
- There may be a “hype-effect” in the keyword search results, e.g. block-chain interest may co-relate to sharp increase or sharp decrease in the value of cryptocurrencies

1.6.2 Search Trends Volume for Information Systems skills Over Five Years

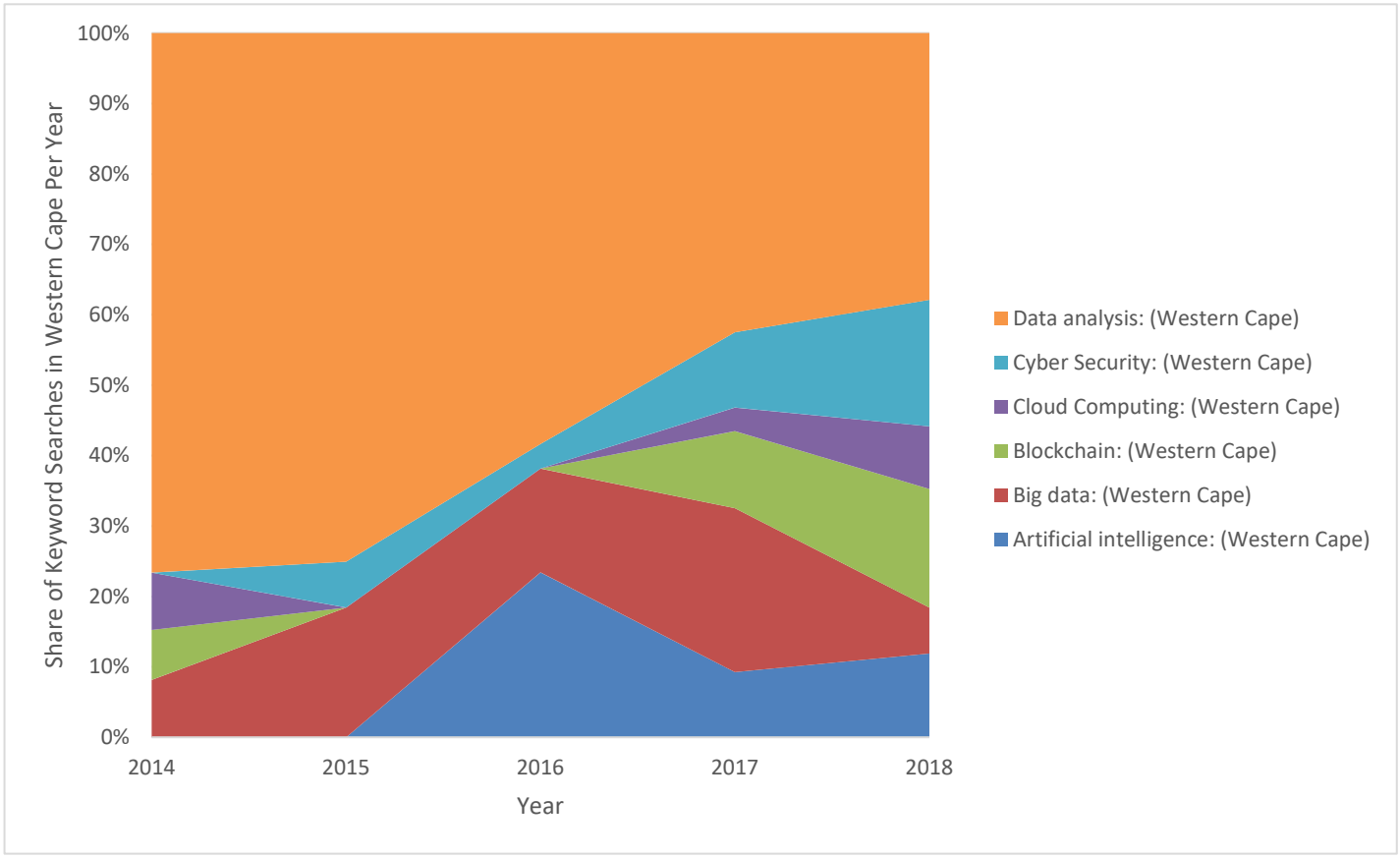


Figure 29: Search Trends Volume for Information Systems skills by Year

- Going forward, the skills that may have growing interest in 2019 may be Cyber-security, Blockchain and Artificial Intelligence
- Note that even though volume of Data Analysis searches seems to be decreasing in 2018, it is rather the volume of searches of other keywords that is increasing

1.6.3 Programming Skills Search trends

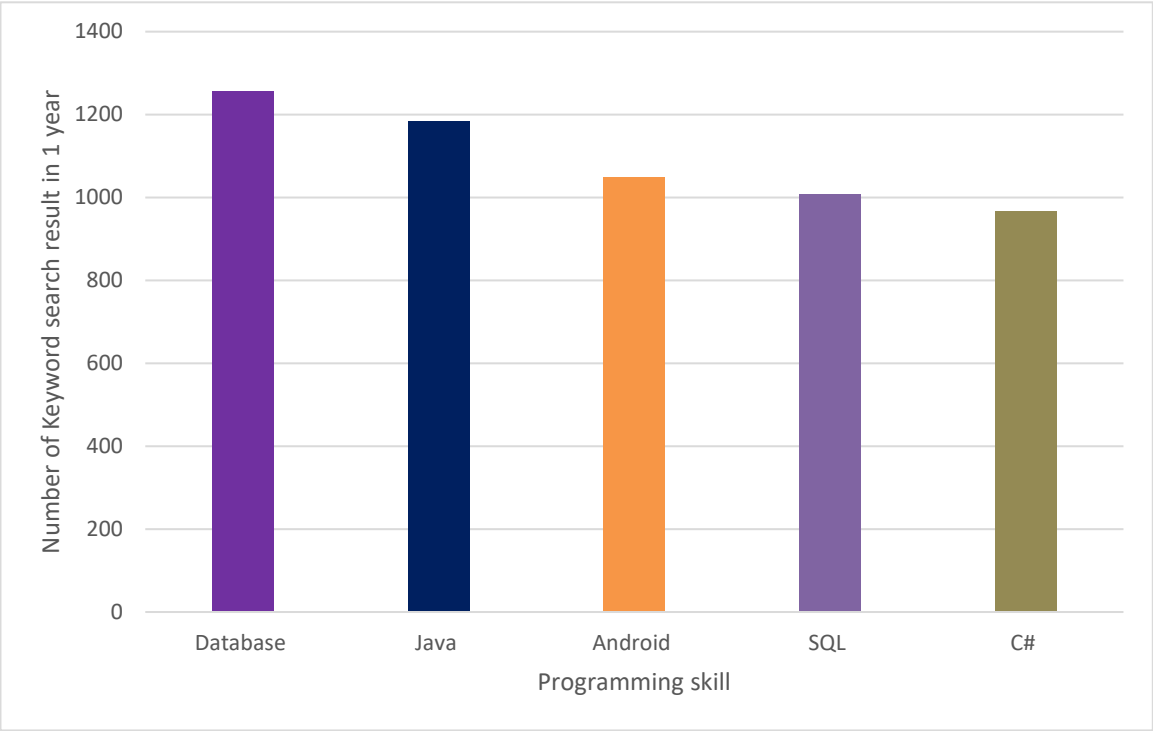


Figure 30: Number of Keyword Searches by Programming Skill in 2014

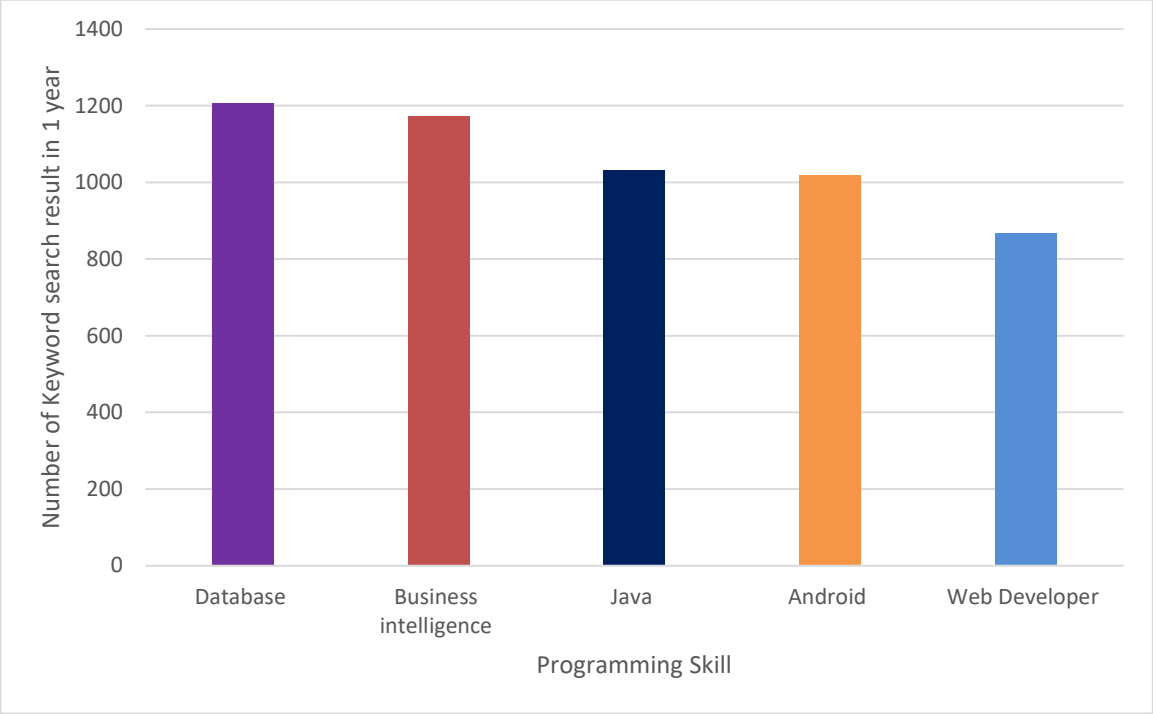


Figure 31: Number of Keyword Searches by Programming Skill in 2015

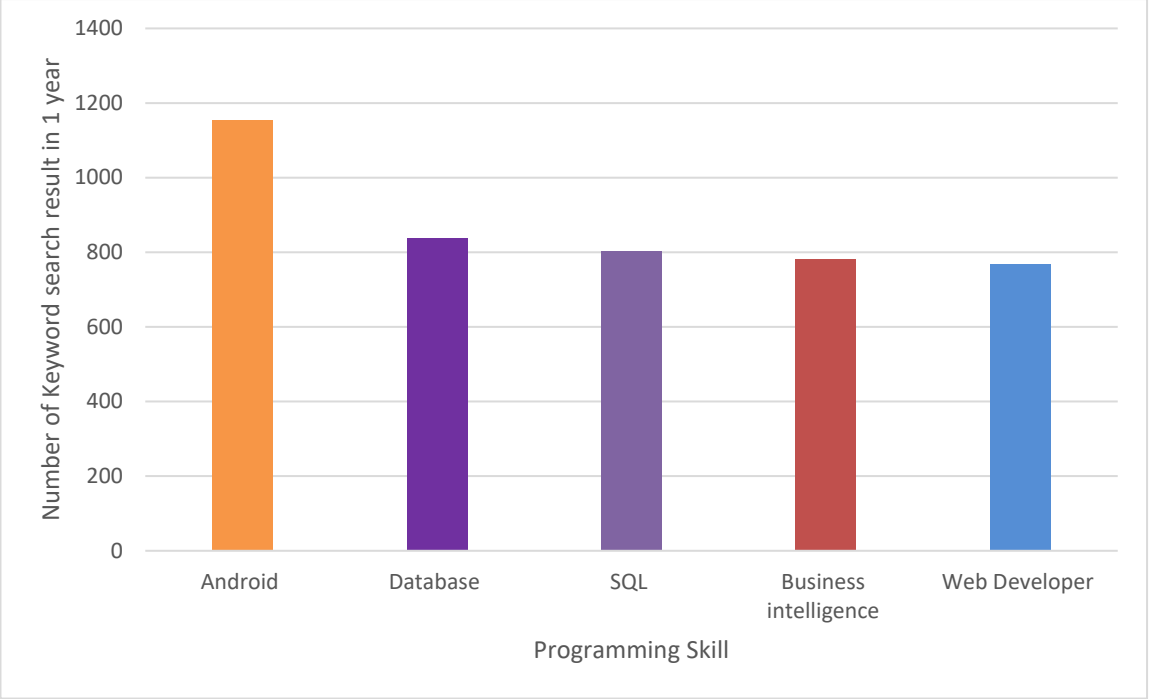


Figure 32: Number of Keyword Searches by Programming Skill in 2016

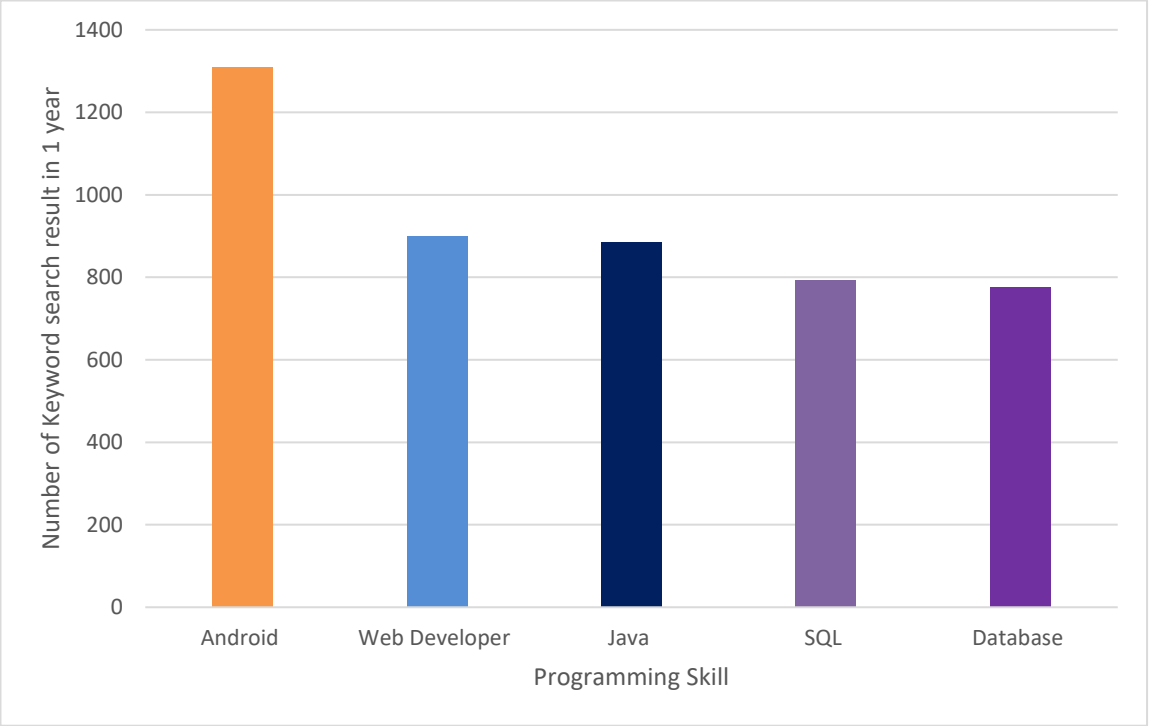


Figure 33: Number of Keyword Searches by Programming Skill in 2017

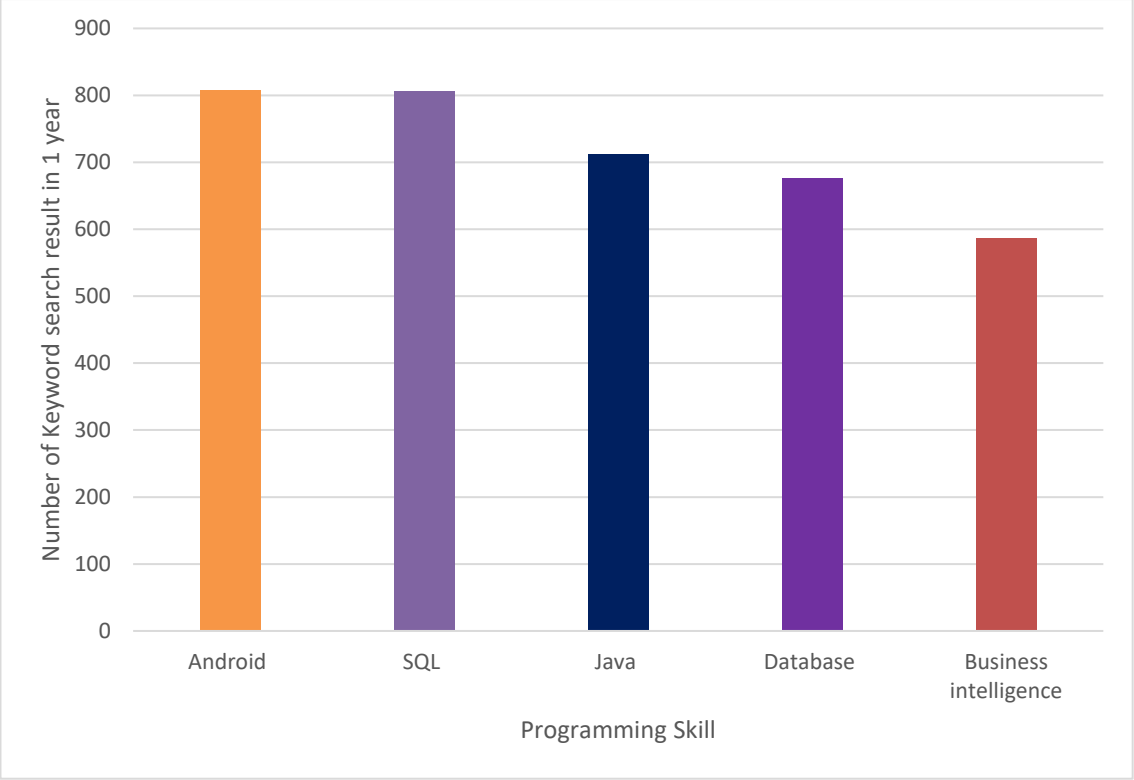


Figure 34: Number of Keyword Searches by Programming Skill in 2018

- The most significant interests in programming skills in 2018 are Android, SQL and Java, all three closely related to app development
- Results from the Google trends for programming skills are significantly different from the Linkedin data.
- The top programming skills required by companies in September 2018 according to Linkedin were Java, C# and Frontend, whereas the top programming skill interests in 2018 according to Google-Trends were Android, SQL and Java

1.6.4 Search Trends Volume for Programming Skills Over Five Years

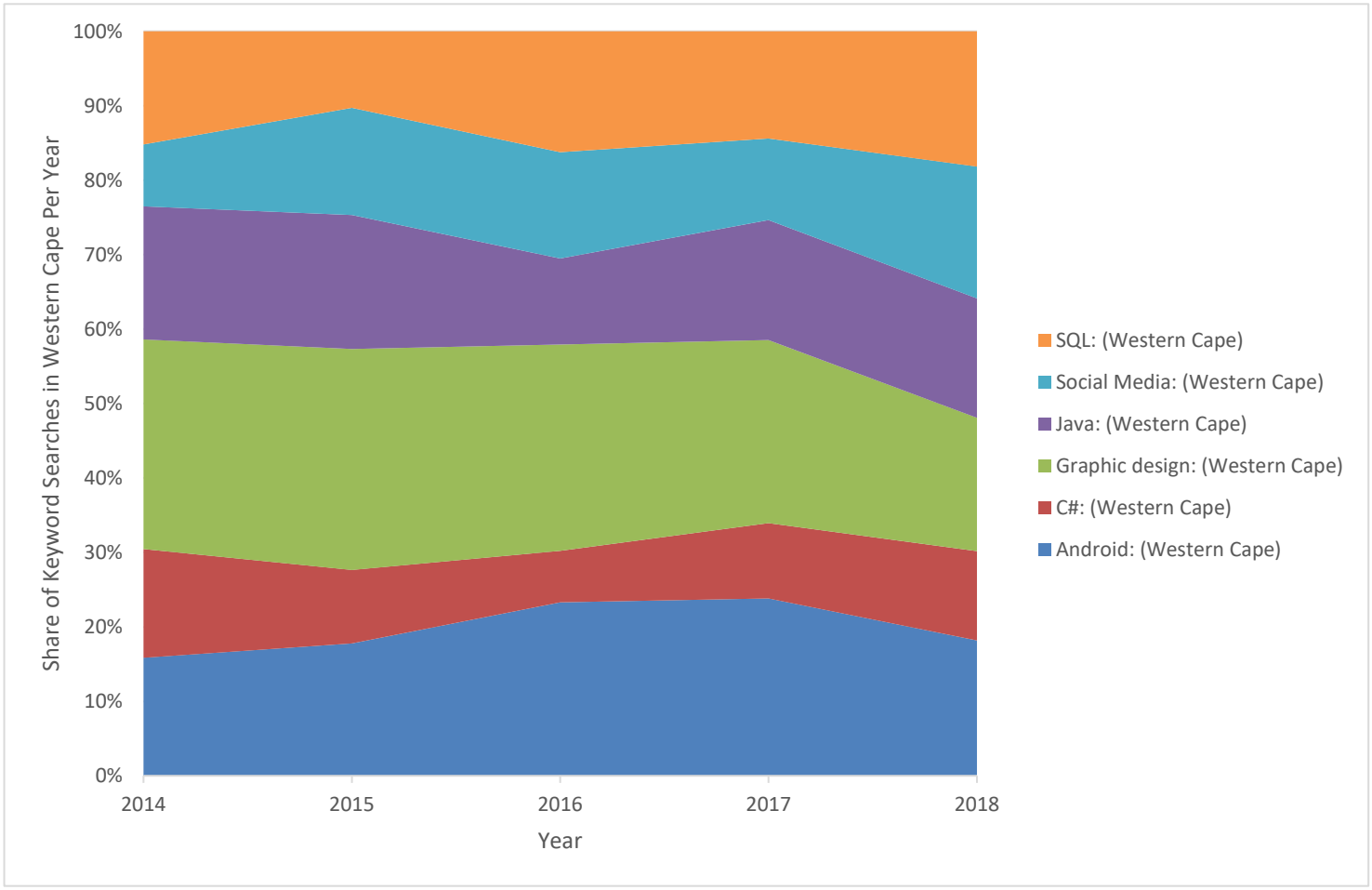


Figure 35: Search Trends Volume for Programming Skills by Year

- Interest in programming skills is fairly consistent, with skills such as Java, Android, database/SQL showing up in most of the five year's of data
- Presence of Social Media and Graphic design interest in 2018's top five data be due to the growing online media/social media industry in the Western Cape
- The most significant growth over the last five years is that of Android, which is possibly due to growing interest in mobile application development
- Searches such as SQL and database hint at interest in data-analysis

1.7 Pnet Data

1.7.1 General

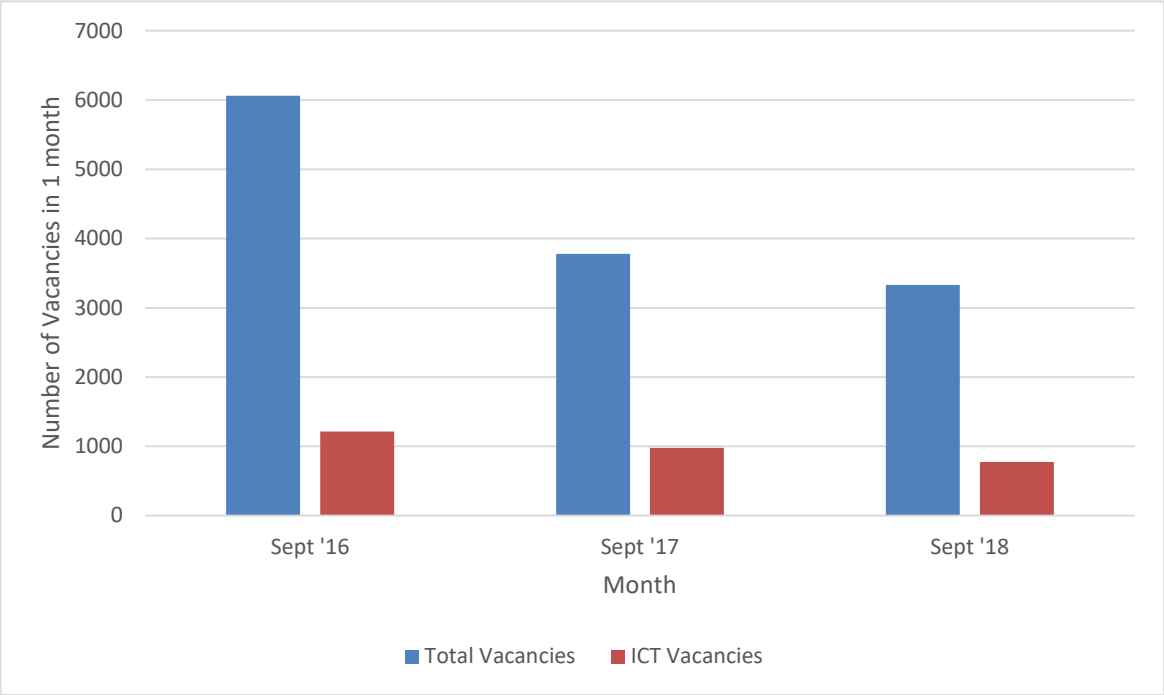


Figure 36: Total number of vacancies and ICT vacancies per month

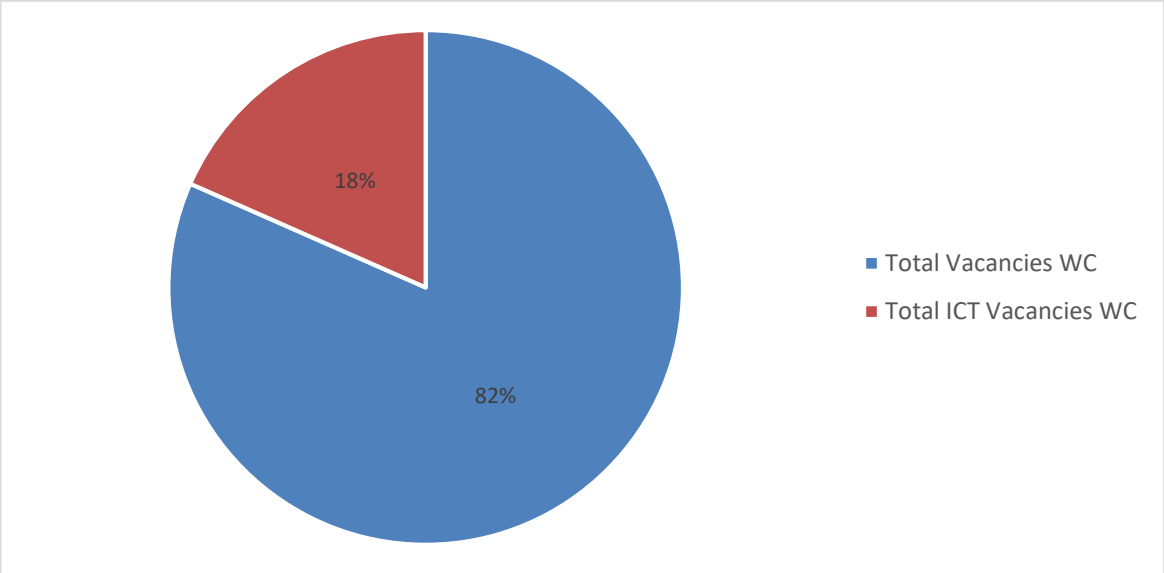


Figure 37: Share of ICT Vacancies of All Vacancies in WC 2016-2018

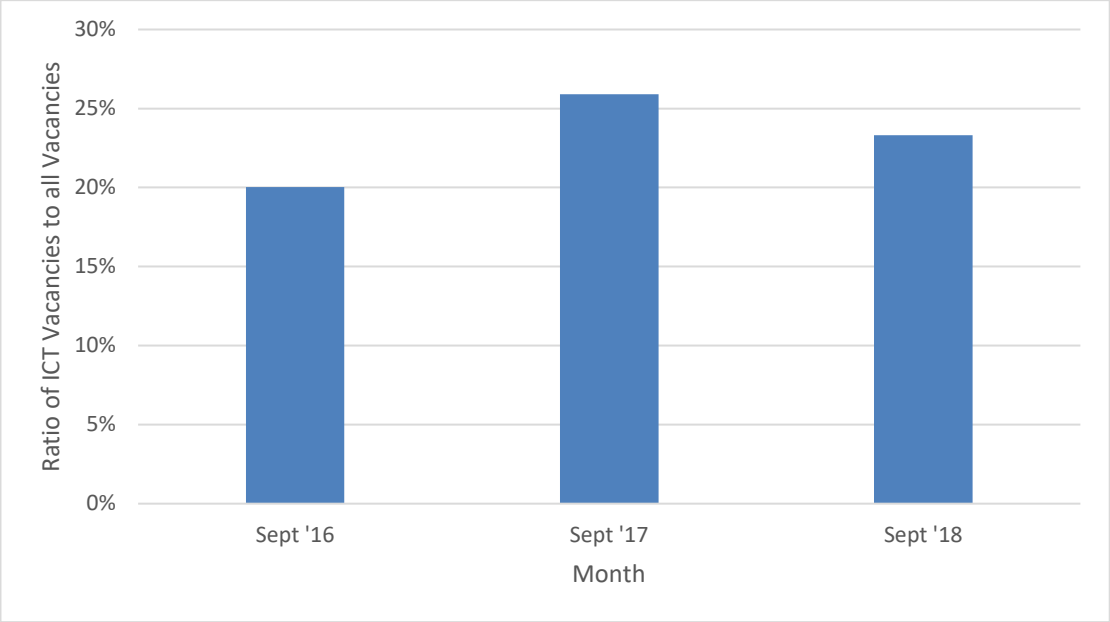


Figure 38: ICT Vacancies as a share of all Vacancies

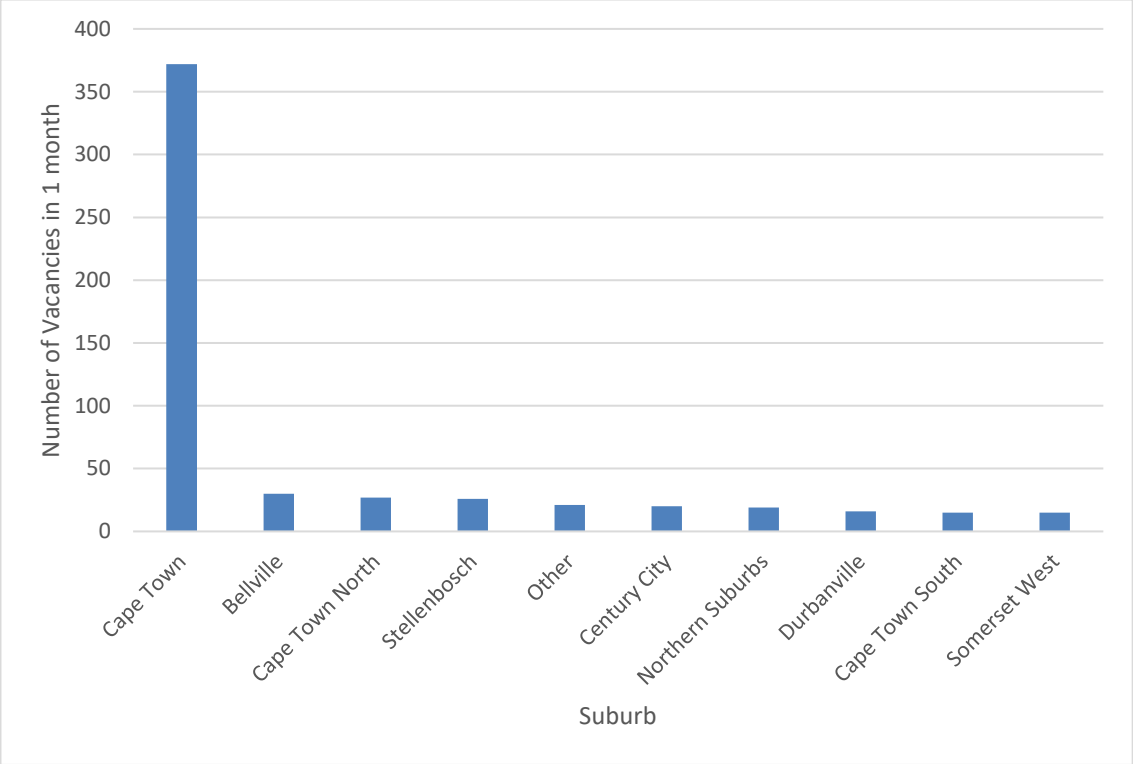


Figure 39: ICT Vacancies by Suburbs in September 2018 in WC

- Pnet vacancy data is different from the LinkedIn data in that, three months' data from three different years (Sept '16, Sept '17, Sept '18) was analysed. The ICT vacancy statistics were fairly similar to the statistics from Linkedin.
- Out of all the vacancies in Western Cape for the three months analysed, 18% were ICT related

- Each year's data showed that the ratio of ICT vacancies to all vacancies was between 20% and 25%, which is on-par with the major tech cities of the world
- A large majority of September 2018's ICT vacancies, in Western Cape were advertised from Cape Town, followed by the northern suburbs and then Stellenbosch.

1.7.2 Top 10 ICT Vacancies per Year

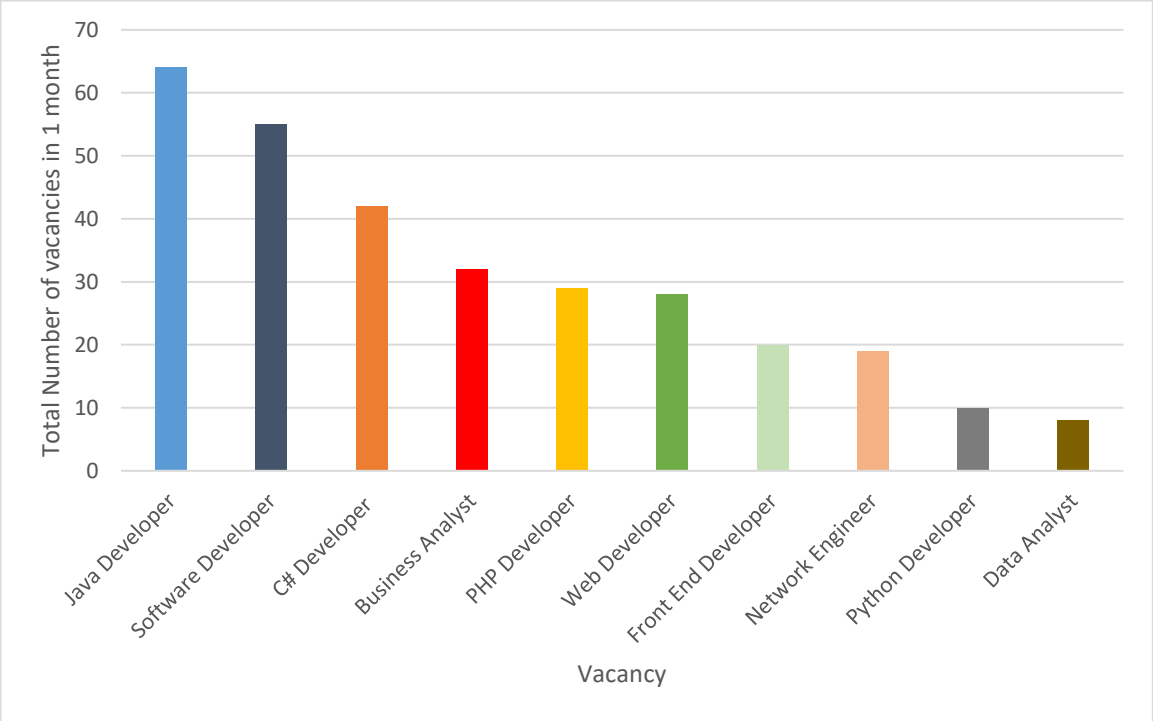


Figure 40: Top 10 Vacancies – Sept 2016

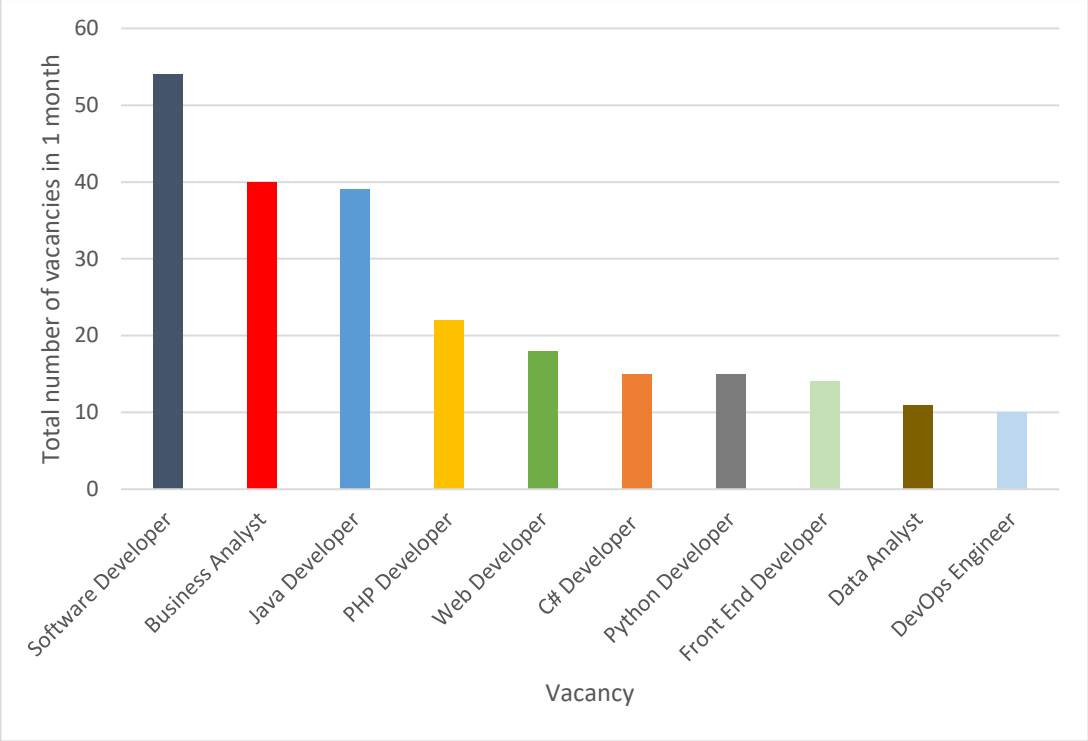


Figure 41: Top 10 vacancies - Sept 2017

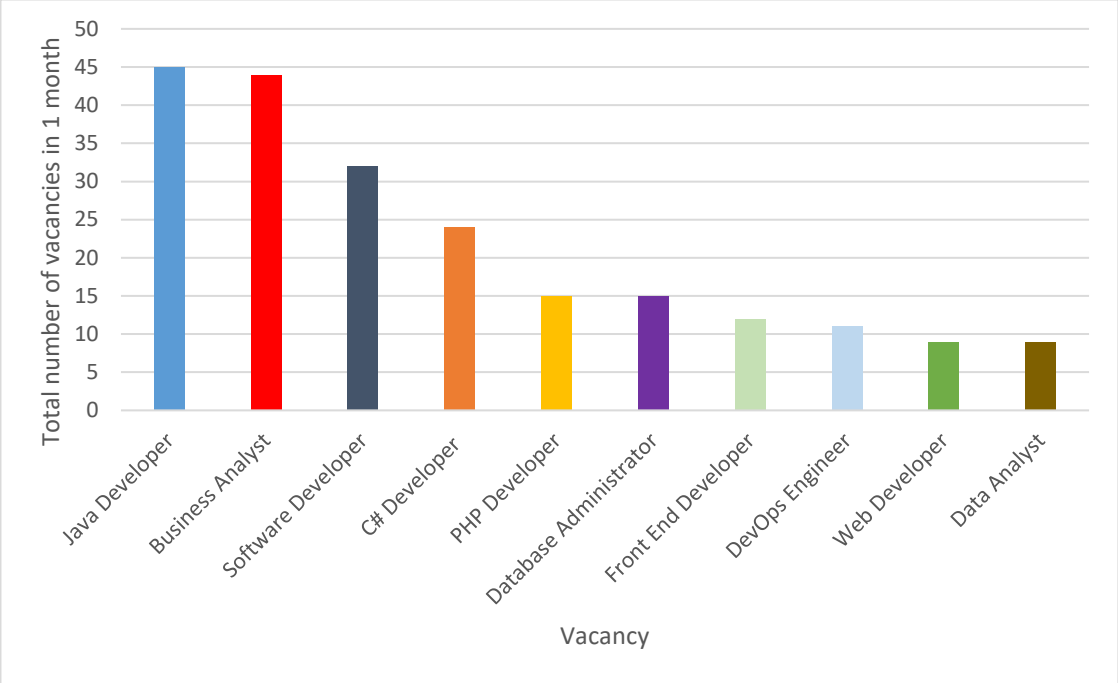


Figure 42: Top 10 vacancies - Sept 2018

- Java Developer and Software Developer positions remain one of the favourites in each of the three years
- Business Analyst position saw a constant rise between 2016 and 2018
- It should be noted that positions such as PHP developer, Front End Developer and Web Developer are positions for similar web development roles.

- Even though Software developer roles seem to be decreasing, roles such as DevOps Engineer and C# developer, which are in the software development domain, saw an increase between the three years

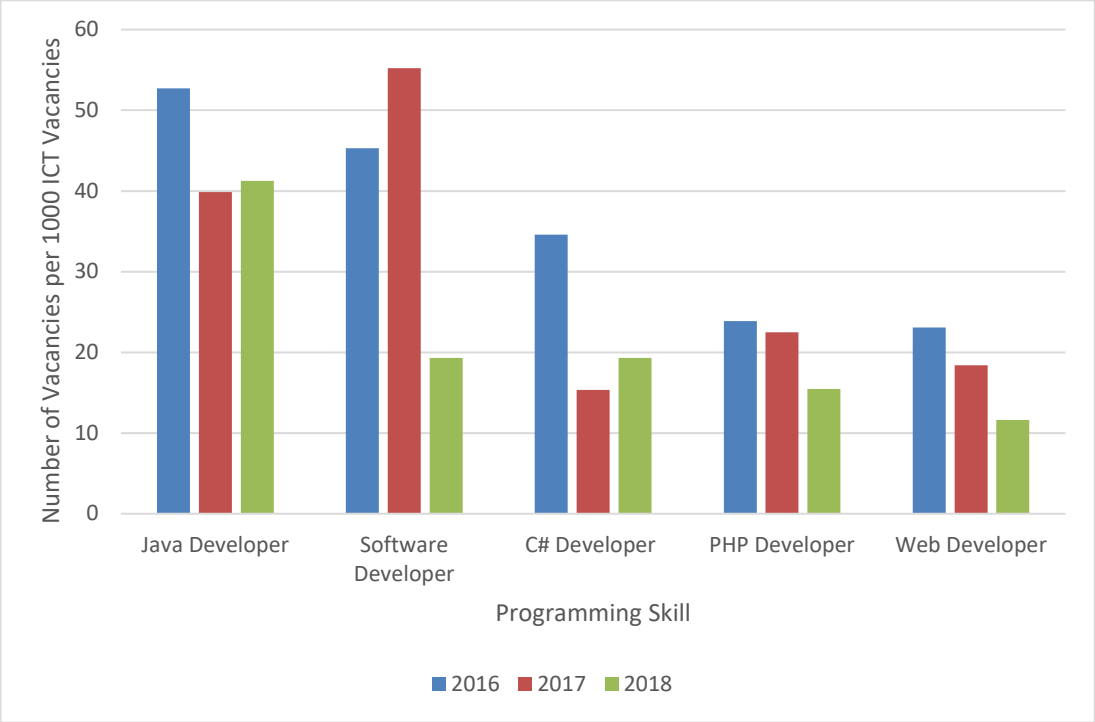


Figure 43: Top vacancies per 1000 ICT vacancies compared by year

- From the graphs above, it is established that the number of vacancies differs between months
- Therefore, in order to compare information on the same scale, the vacancy data is normalized by calculating the ratio per 1000 vacancies
- Each of the programming skill demand seems to be decreasing from 2016 to 2018. This might either be because, the overall demand in these fields have decreased, or that these vacancies are increasingly being posted on different channels, such as linkedin

1.7.3 ICT Vacancies by Sector

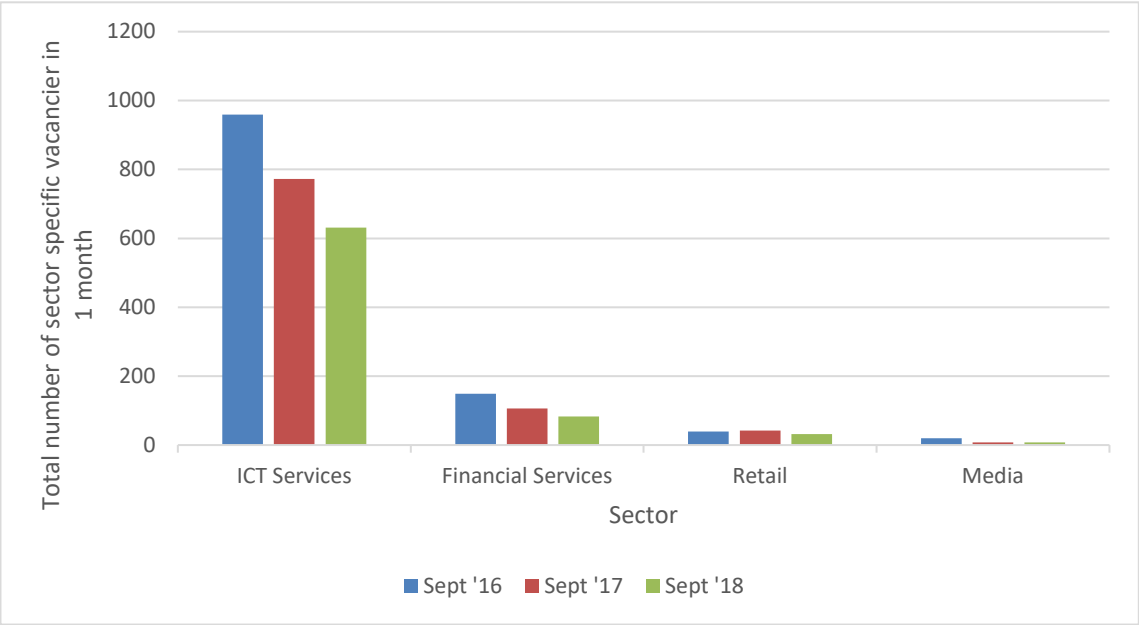


Figure 44:Vacancies per sector – Total number of vacancies

- This graph shows the total number of vacancies per sector in September of each of the three years
- The number of vacancies in each of the sectors is decreasing over the three years, this could also vacancies being increasingly posted on different channels such as linkedin

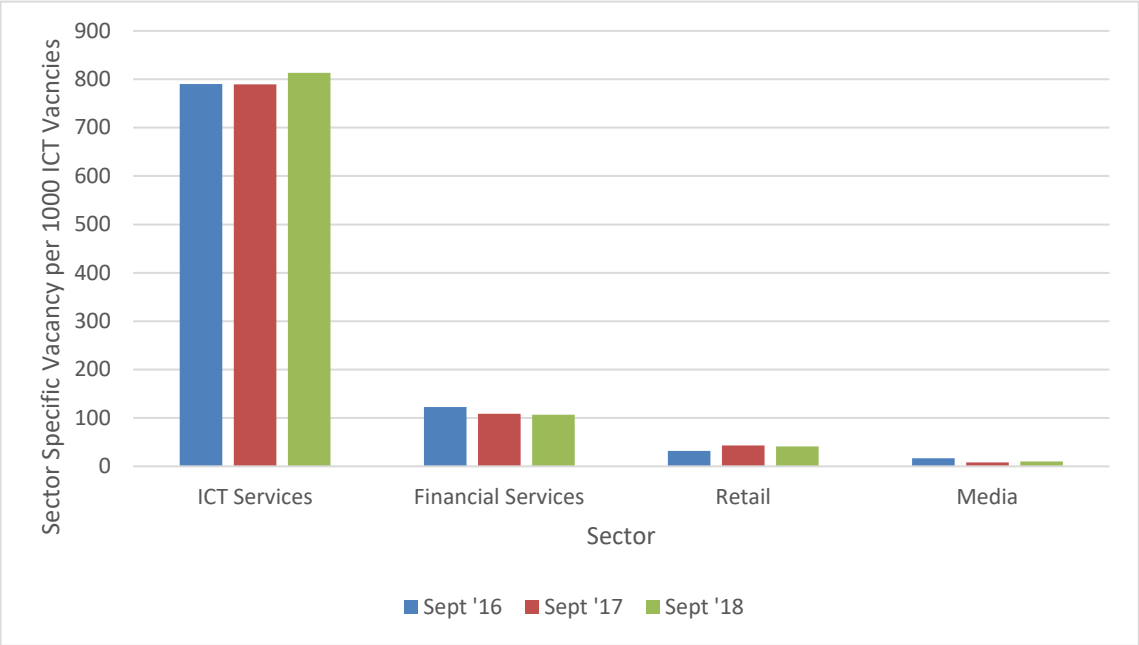


Figure 45: Vacancies by Sector - Per 1000 ICT Vacancies

- Similar to the data in the previous section, the vacancy data in this section is also normalised in order to allow comparison on the same scale

- This graph shows the year by year comparison of ICT vacancies per sector
- It can be noted here that even through the total number of vacancies in the ICT services was decreasing over the years, the ratio of ICT services vacancy per 1000 ICT vacancies actually increased
- The decrease in vacancies in the financial sector could be a result of outsourcing the work to the ICT services sector, which can be seen increasing at a similar rate

1.7.4 Programming Skills Required by Year

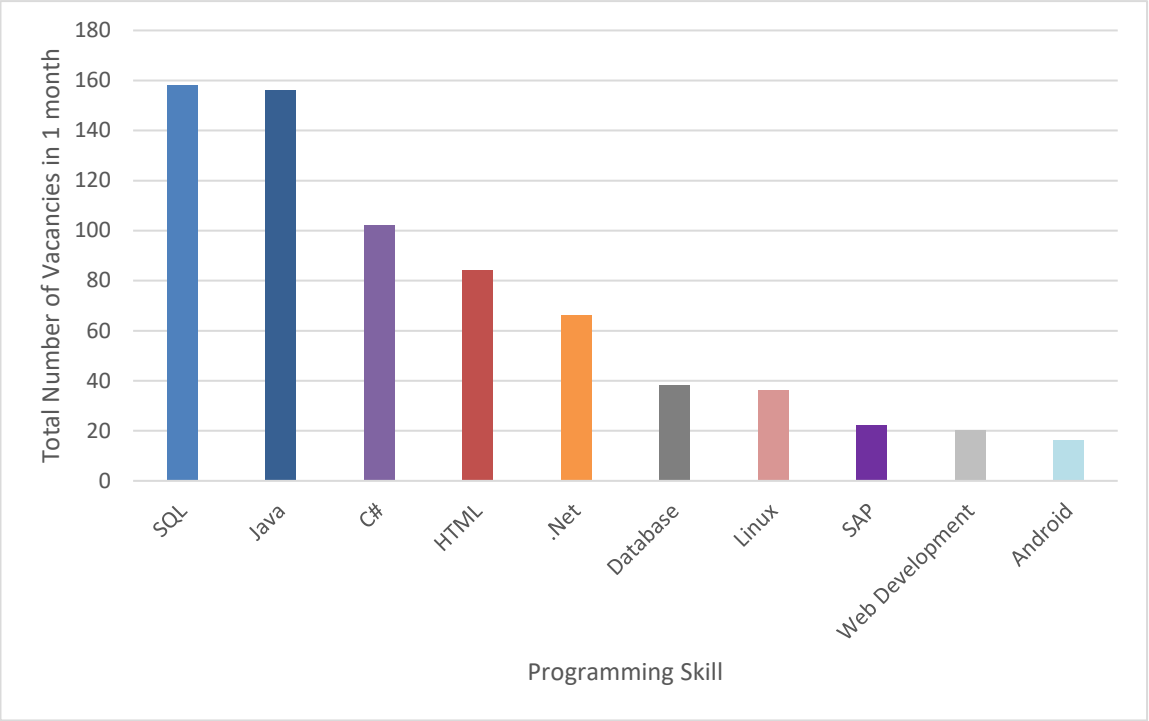


Figure 46:Programming skills required – Sept 2016

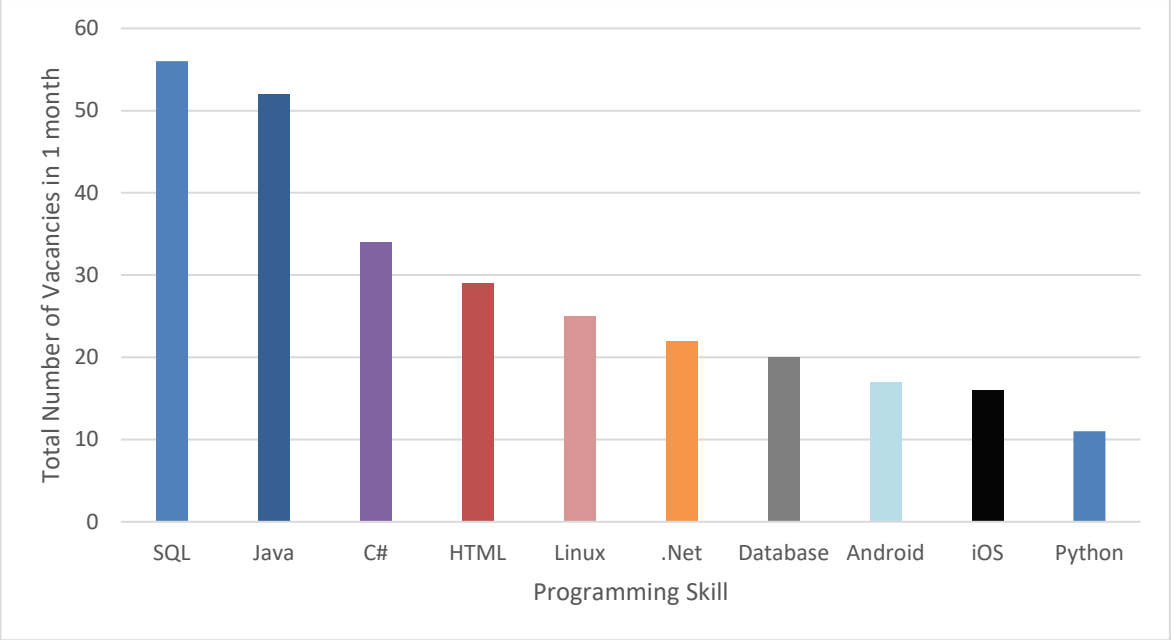


Figure 47: Programming skills required – Sept 2017

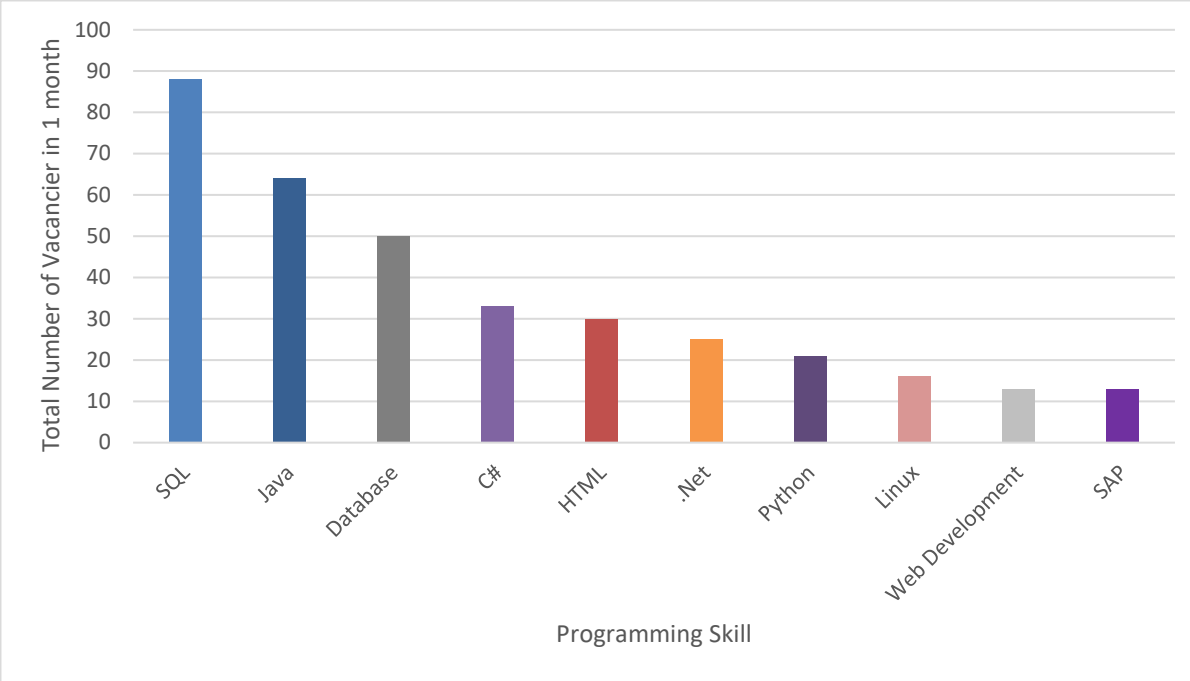


Figure 48: Programming skills required – Sept 2018

- The graphs show the top ten skills required in ICT vacancies in each year
- The rise in need for skills such as SQL, Java and Database, again, hint at the rising demand for data analysis skills
- Top requirements such as Java and C# could also hint at the field of mobile application development and software development

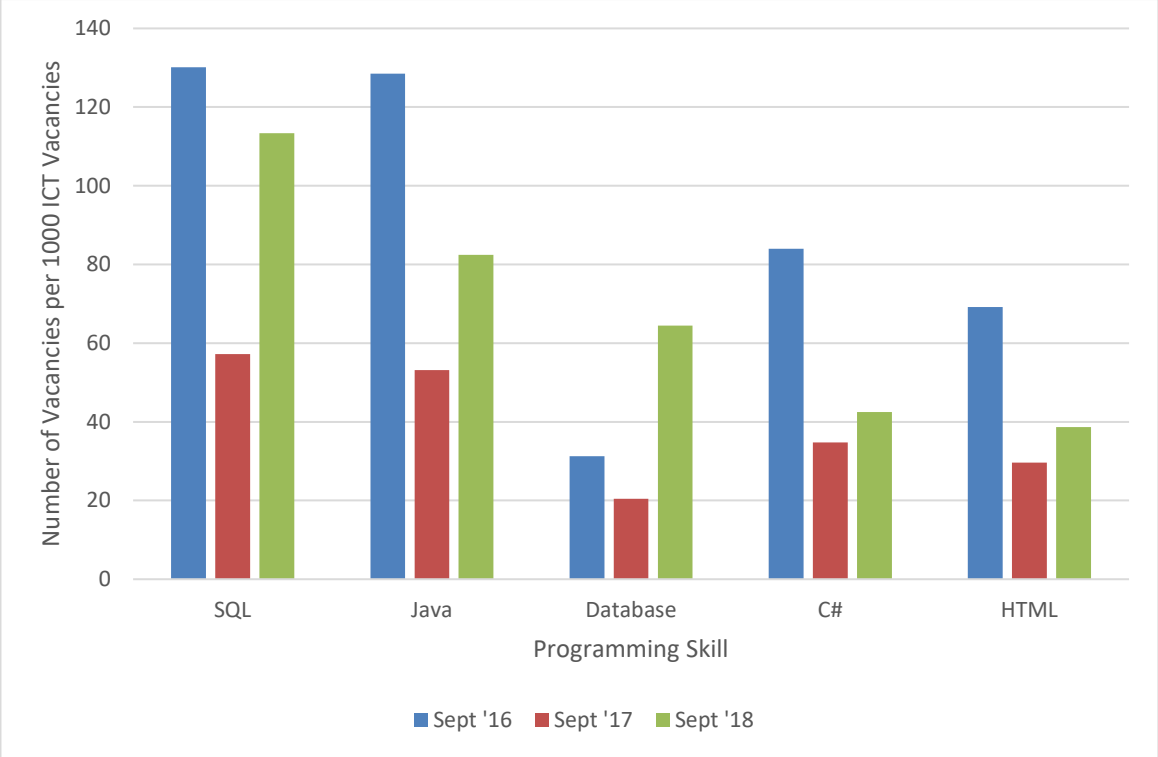


Figure 49:Top programming skills required per 1000 ICT vacancies compared by year

- This graph is normalised in order to compare the top programming skills requirement on the same scale
- The only programming skill that increased from 2016 to 2018 in ratio to 1000 ICT vacancies was “database”

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Report Quality Assurance Review Completed by:
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CBPEP AECOM TAT
Date:

Recommended/Not recommended

Mr… To include GTAC Project Manager
DIRECTOR:
Date:

Approved/Not approved
Comments