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A man with a beard is wearing a VR headset and holding a controller. He is sitting at a desk with a computer monitor and keyboard. The scene is lit with warm, golden light, suggesting a sunset or sunrise. The background is slightly blurred, showing a typical office environment.

AN OVERVIEW OF VIRTUAL REALITY IN SOUTH AFRICA

PART ONE

SHAPING THE INDUSTRIAL LANDSCAPE THROUGH TECHNOLOGY

INTRODUCTION



“VR WAS ONCE THE DREAM OF SCIENCE FICTION. BUT THE INTERNET WAS ALSO ONCE A DREAM, AND SO WERE COMPUTERS AND SMARTPHONES. “

-MARK ZUCKERBERG

The last decade has seen the world become more virtual; in fact, the word ‘virtual’ has become one of the most frequently used words in the English language. Our daily environment is dominated by virtual training, virtual universities, virtual offices, virtual pets, virtual exhibitions, virtual museums and many more. Every experience possible suddenly has a virtual dimension. Every physical possibility has been complimented by a digitized dimension.

Since the early days of low resolution transmission, which were not too long ago, the VR landscape has already evolved, and functionality that was thought not to be possible has become a reality. The majority of phones are now smartphones; connectivity is omnipresent as we are connected anywhere and anytime. Computers are not only smaller but have greater processing power and anyone is able to purchase a notebook or tablet at an economical price. Additionally, as other technologies have increased in quality while decreased in price, the same trend has been noted in VR. Devices such as the Oculus Go are not only affordable, but deliver excellent visual quality, with the additional benefit of large amounts of content to choose from.

Focusing on Africa, and in particular South Africa, we have demonstrated the ability to leapfrog technology development and adoption while profiting from global learning from a hardware/software perspective within the VR space. This ability forms the foundation for solid prospects for VR in South Africa as well as the broader African continent.

It is believed that over the short to medium term, VR technology including its derivative content application and services will have the same transformative potential as television, computers, the Internet, and smartphones for South Africa. VR is adaptable, flexible, powerful and will impact the way we work, entertain, and socialise in the very near future.

Quick adoption of technology and the fitting use case goes hand-in-hand, South Africa may need to undergo a learning curve before these technologies are entirely adopted. It is essential for businesses to assess which use cases will ensure long-term, successful technology adoption, and picking the correct technology partner will form a critical part of this exercise. This report provides a high level view of the potential use cases for VR in the current South African market.

TERMS OF REFERENCE

VIRTUAL REALITY (VR)

A combination of video and audio, viewed via a headset, filling a single person's field of view that creates the illusion of being in the generated environment. Any head or hand controller movements will result in visual and audio changes in the headset, creating a complete sense of reality. VR allows the interaction between objects and people, tactile interfaces allowing objects in the virtual world to be manipulated. VR experiences can be undertaken individually or in a social collaborative environment, with individuals being able to interact with each other while being immersed in the environment.

AUGMENTED REALITY (AR)

Not to be confused with VR, AR has a very different purpose to VR. In this case an AR device is used to overlay 3D images onto the user's view of the real world. Examples include the Microsoft HoloLens which is an AR system, and Pokémon Go which successfully used AR in a commercial application.

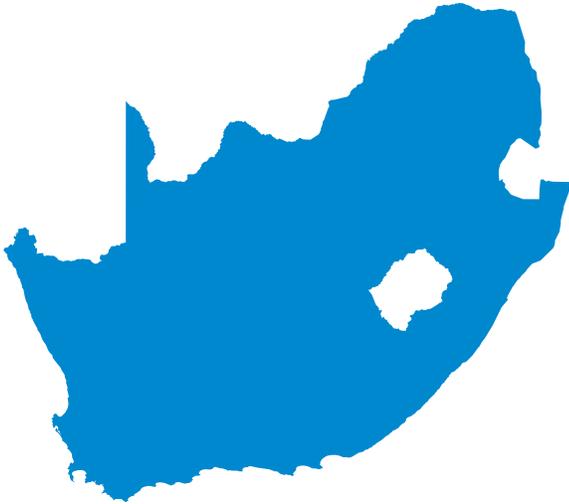
360° VIDEO

Using a special video recording technology camera, images are recorded in a continuous 360° image. This allows the user to navigate and engage in the environment, having a full 360° view of the surroundings. Some interaction can be included in the viewing experience.

UNTETHERED VIRTUAL REALITY

Your typical VR devices such as the Oculus Rift and HTC Vive use a headset that is connected to a laptop or PC via a cable. As this cable restricts the physical movement of the participant, there are more recently released devices such as the Oculus Go that are completely mobile.

WHY SOUTH AFRICA?



ECONOMIC GROWTH

-  Economic growth has been driven by trade, tourism and communication.
-  South Africa is quickly becoming a knowledge-based economy focused on technology, e-commerce and financial services.
-  South Africa has the largest economy in Africa, with an estimated Gross Domestic Product (GDP) of \$295 billion.

POPULATION STATS

-  South Africa has a population of 55.9 million - 57.06 million.
-  21 - 31 million South Africans are Internet users.
-  29 million people in South Africa make use of smartphones.

ADDITIONAL FACTORS

-  The gaming industry has grown from R29.7 million to R100 million since 2015.
-  Netflix will have more than 337 thousand subscribers in South Africa in 2020.
-  South Africa has a 44,6% high school drop out rate.

These statistics reflect that there is opportunity for swift advancement in technological literacy, a heightened understanding of consumer behaviour and an appropriateness for technological intervention within the South African landscape.

Source: Hootsuite/we are digital, Digital in 2018, January 2018

SOUTH AFRICAN OPPORTUNITY

Below is a comparative view of South Africa's digital footprint, as an indicator of perceived readiness of the market towards VR (January 2018):

GENERAL POPULATION VIEW

	Global	Africa	South Africa
Population	7.593 Billion	1.272 Billion	57.06 Million
% Urbanisation	55%	42%	66%
Median Age	30.6	19.5	27.4
Literacy % (total)	84%	78%	94%
GDP Per Capita (US\$)	\$15,000	\$1,450	\$13,248
Internet Users	4,021 Million	435 Million	31 Million
- Internet Penetration	53%	34%	54%
Active Social Media Users	3,196 Million	191 Million	18 Million
- Social Media Penetration	42%	15%	32%
Unique Mobile Users	5,135 Million	1,040 Million	38 Million
- Mobile Penetration	68%	82%	67%

DEVICE USAGE OF ADULT POPULATION

	South Africa
Smartphone	60%
Laptop/Desktop Computer	24%
Tablet	12%
Television (any type)	82%
Device to stream Internet content to television	3%
Average daily time spent using the Internet via any device	8H32M
Average daily time spent viewing television, Broadcast streaming, or Video on Demand	3H00M

Source: Hootsuite/we are digital, Digital in 2018, January 2018

SOUTH AFRICAN OPPORTUNITY

FINANCIAL INCLUSION FACTORS % of population 15+ (survey data)

	Global	South Africa
Has a bank account	62%	70%
Has a credit card	18%	13%
Make online purchases/pay bills online	17%	8%

ATTITUDE TOWARDS DIGITAL % of adult population using a device (survey data)

	South Africa
Believe that new technologies offer more opportunities than risks	66%
Prefer to complete tasks digitally whenever possible	61%

Source: Hootsuite/we are digital, Digital in 2018, January 2018



DIGITAL OPPORTUNITY

Nearly 40% of total entertainment and media consumer spend in South Africa will be derived from Internet access revenue in 2021.

As mobile Internet penetration increases growth in Internet access revenue will naturally slow somewhat. Mobile Internet penetration was measured at 52.3% in 2016 and is expected to rise to 77.8% in 2021. Overall, digital revenue's share of entertainment and media spend is already at 38%, and will rise to 49% in 2021 – still short of the symbolic tipping point of over 50%.

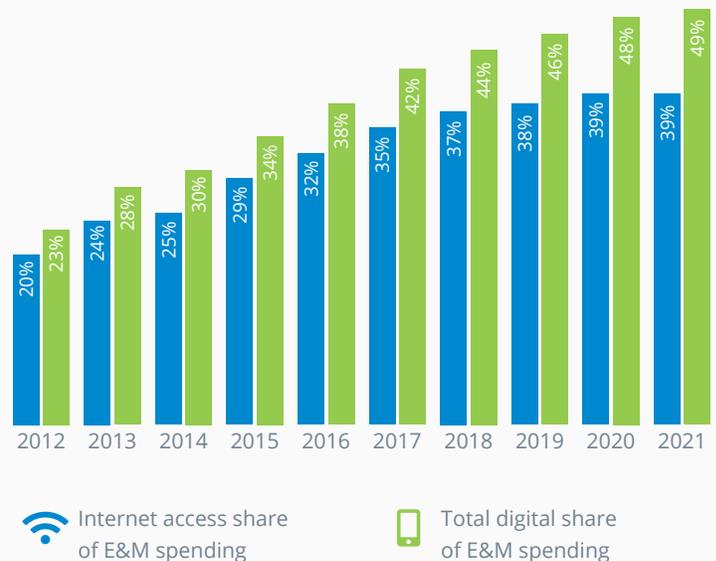
Digital revenue is the greatest contributor to the large majority of growth, rising at a combined Compound Annual Growth Rate (CAGR) of 11.3% to 2021. Non-digital revenue, by contrast, will rise at a 2.2% CAGR, contributing just R9.2 billion of the R45.2 billion additional revenue in the next five years.

CONSUMER SPEND

South Africa will see a CAGR of 7.2% for consumer revenue over the forecast period, rising from R87.4 billion in 2016 to R123.7 billion in 2021. Unsurprisingly, the largest contributor will be Internet access, with a 48% share in 2016 rising to 56% in 2021.

Although the Internet has created an expectation of free content for consumers, there are pockets of extremely successful consumer revenue opportunities enabled by its proliferation – from Subscription Video on Demand (SVOD) and music streaming to the swiftly expanding social/casual gaming environment and new VR market.

South African Entertainment & Media Spend



Source: PWC, Entertainment and media outlook: 2017 – 2021, An African perspective, September 2017

VR IN SOUTH AFRICA TO DATE

“Our predictions were wrong: a year ago we were saying that VR equipment was not going to be a mass consumed product...the speed of adoption has been amazing!”

– Ulric Grech-Cumbo, CEO of a cinematic VR content studio in Johannesburg



VR already has a presence in South Africa, with its uses in gaming and entertainment being the foremost areas of its popularity in the country. Certain providers have also seen excellent value in the use of VR for training purposes, specifically in the corporate sphere, and in areas where the task environment is hazardous, or presents the risk of damage to assets or profit margins. VR enables the user to be presented with real life scenarios under non threatening circumstances.

For example, the Naledi3d Factory, a company making use of customisable VR solutions in South Africa, reports successful use of VR in training people in the forestry industry in the wider Southern African region. They report using VR for skills development, particularly in local mines, as well as supporting the development of rural communities.

Sectors such as corporate education, tourism, and real estate have helped South African VR content developers gain traction in the industry. However broader applications and more cost effective options need to be developed.

LOCAL OPPORTUNITY

By 2021, the South African consumer VR content market will be worth R455 million – reflecting a CAGR of 72.6% for 2016 – 2021.

VR reached local consumers only in 2016, which causes almost the entire VR market to be in its infancy. This means that South Africa will not have any legacy issues, ‘problem children’ or false starts to look back on. However, this does make for a potentially immature market with few users, underdeveloped business models, unreliable hardware and lots of experimental or subpar content.

Markets such as South Africa, have a relatively small gaming market and a less competitive telco and pay-TV environment compared to other more mature countries. The consumer VR content market is projected to be worth R455 million by 2021, a CAGR of 72.6% over the forecast period. R282 million of this will be spent on VR video, at a CAGR of 161.7%, which represents 61.8% of overall content spend in 2021.

However, many developers, for example, Cape Town based Virtual Reality Marketing, are looking to business clients to pay the bills, developing VR and ultimately Augmented Reality (AR) applications for specific verticals like retail, automotive and healthcare.

VR Revenue Growth in South Africa



Total VR Revenue (ZAR millions)

Year on Year Growth (%)

Source: PWC, Entertainment and media outlook: 2017 – 2021, An African perspective, September 2017

EMPLOYMENT PER INDUSTRY

According to the results of the latest labour force survey, the largest employing industry in South Africa is the Community and Social Services Industry. This industry is largely made up of government departments. Education and Healthcare employment are included in this segment.

There are around 490 000 active Private Security employees in South Africa, working in armed response, cash-in-transit, and guarding.

The Manufacturing industry employs approximately 1,8 million people while the Mining industry employs 411 000 people. People employed under private households include domestic workers, nannies, gardeners etc.

Roughly 16.66 million people reported to have done some form of remunerative work during the course of 2017.

AVERAGE TRAINING BUDGET PER SELECT INDUSTRIES

HEALTH

R 64,027,333 (\$5,015,260)

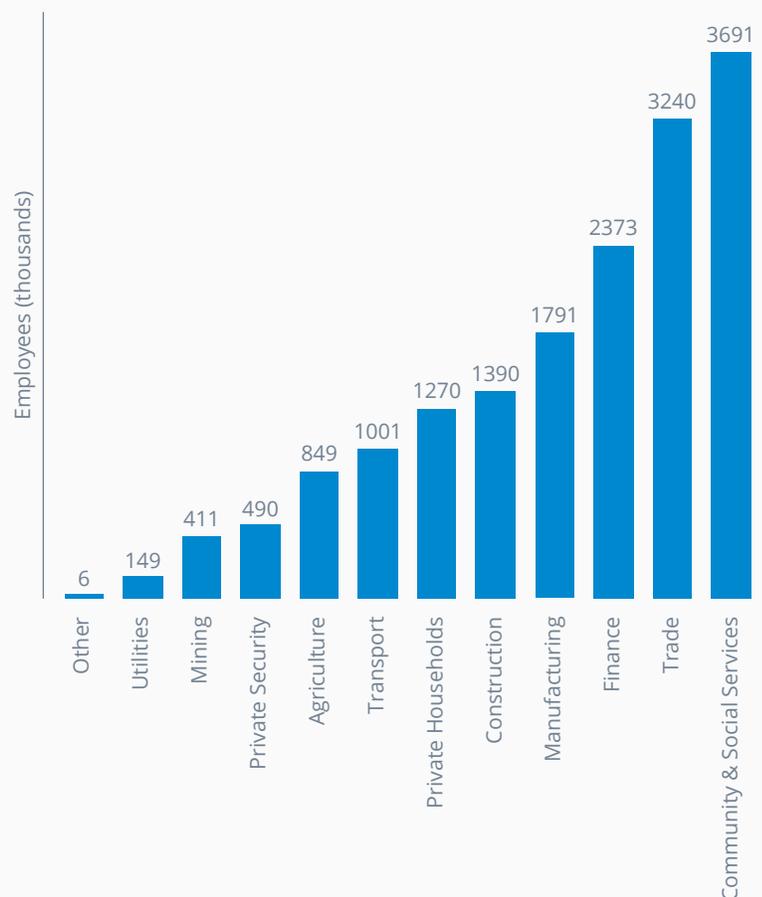
MANUFACTURING

R 119,740,000 (\$9,379,234)

MINING

R 324,500,000 (\$25,418,085)

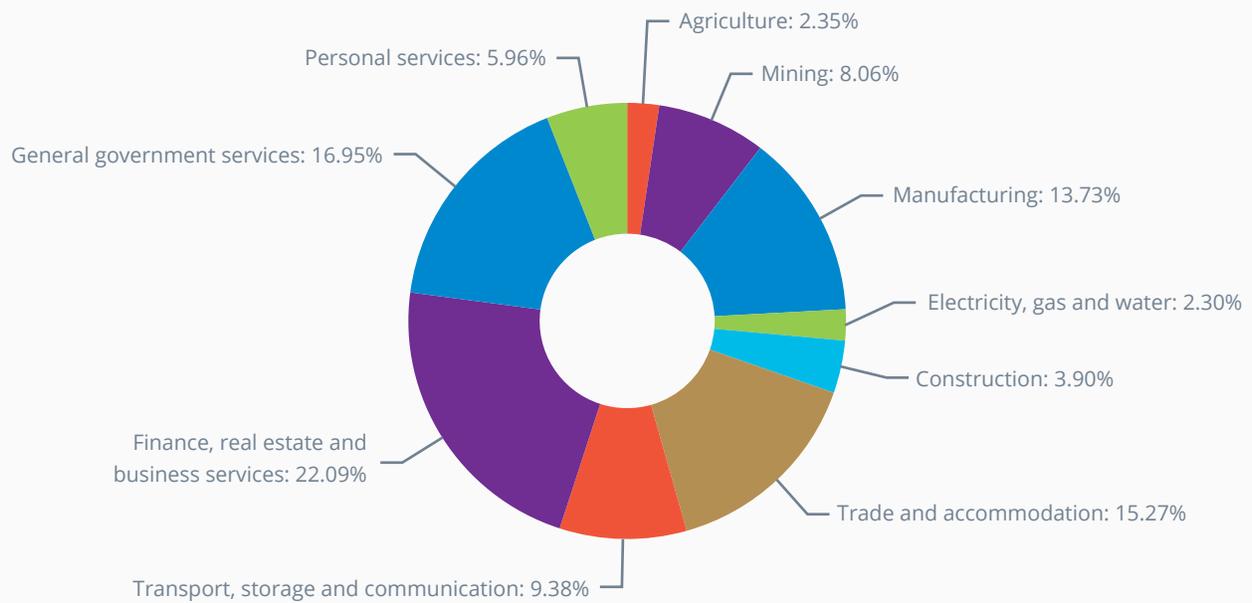
Employee Count per Industry in South Africa (2017)



Source: Statistics South Africa, Labour Force Survey Q4 2017; Secorex 2017

INDUSTRY OVERVIEW

Contribution to South African Economy by Industry



From this data we can see that the top three contributors are:

1. Finance, real estate and business Services 22.90%
2. General government services 16.95%
3. Trade and accommodation 13.90%

Despite the fact that mining is a vast source of employment in South Africa its overall contribution to the economy is a mere 8.06%. Similarly, the Agriculture industry contributes largely towards informal employment however it only 2.35% to the South African economy.

Source: Statistics South Africa, 2017 GDP data

TOP 5 INDUSTRIES RIPE FOR VR



Based on research conducted the 5 industries below are the top industries that VR should focus on:



EDUCATION
PUBLIC AND PRIVATE



HEALTHCARE



SECURITY/MILITARY



MINING



MANUFACTURING

We will elaborate on each industry further in detail throughout the upcoming sections of this report.

EDUCATION

Opportunity for investment in the South African education system is split between two very distinct spheres: public and private. The structure, funding and opportunities of each will be described in more detail later. The general overview from an investment perspective is as follows:

PUBLIC SCHOOLS



Approximately 23 500 schools; 26 tertiary institutions



Average annual school fees for primary or secondary school are between R32 000 - R40 000 (\$2543 - \$3179)



Average annual fees for tertiary education are R54 000 - R65 000 (\$4291 - \$5166)



Funding for primary and secondary public education is catered for in the budget for Basic Education, while the funding for tertiary education is under the budget for Higher Education

PRIVATE SCHOOLS



Approximately 1 500 schools; over 100 tertiary institutions



Average annual school fees for primary schools are about R80 000 (\$6358).



Average annual school fees for secondary schools are about R136 000 (\$10809).



Funding for private education is sourced from fees, various private investors and private education companies' benefactors

Sources: Unite4Education. (2016). Online. BusinessTech. (2017). Online.

EDUCATION

Government spending on combined national and provincial basic education (or consolidated basic education) for school children remains at 17% of total government expenditure. According to studies conducted by Unicef there are concerns about the lack of growth in education expenditures over the medium term.

“Basic education remains a key focus in the 2018 budget,”

-Malusi Gigaba (former Finance Minister) during the Budget Speech in February 2018.

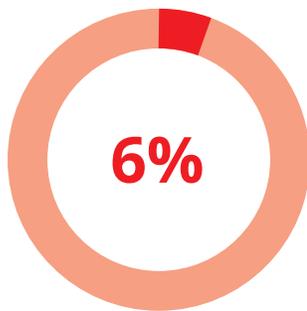
SOME KEY TAKEAWAYS FROM THE SPEECH INCLUDE THE FOLLOWING:

R246.8 billion	Total basic education allocation
R24.2 billion	Goods and services
R12.6 billion	Capital spending
R15.3 billion	Providing printed and digital content for learners and students. This includes the provision of 183 million workbooks and textbooks, teacher support aids, and increased access to information and communication technology.

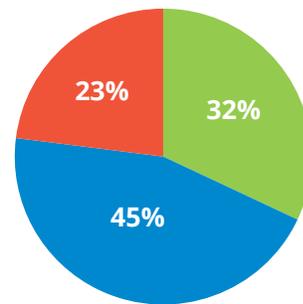
Sources: Unicef. (2018). Online.; IOL, (2018). Online.

EDUCATION

South Africa boasts some of the strongest performing universities on the African continent. In 2003, the higher education system was restructured to provide additional access to tertiary education and rectify historical imbalances. Smaller universities and technikons were amalgamated into larger institutions to form comprehensive universities. South African universities offer a combination of academic and vocational diplomas and degrees, while the country's universities of technology focus on vocationally oriented education. These institutions retain their autonomy and are governed by their own internal councils, however are state subsidised and fall within the ambit of the nation's Higher Education Act.



Education spend makes up approximately 6% of South Africa's GDP.



■ Fees
■ Grants
■ Other

Tertiary education funding allocation

#FEESMUSTFALL

In 2015, the #feesmustfall movement erupted at universities across South Africa, demanding free education for all. The protests escalated to demonstrations and violent riots at some campuses. At the beginning of 2018, former finance minister Malusi Gigaba announced that R57 billion had been allocated to fund free education for students who come from poor or working-class families with a combined income of R350 000 or less. This was surplus to the R10 billion that was provisionally allocated in the 2017 budget.

#BUDGET2018

Post school education and training is the fastest growing spending category in the 2018 budget, with an anticipated annual average growth rate of 13.7%. The 2018 budget allocated R324 billion to higher education and training in total - of this, the budget committed R56 billion over three years towards free higher education. While fee-free education is socially commendable, cutting fees from funding education will no doubt affect the total education budget. The state will have to source almost R22 billion to compensate for the gap.

Sources: Andersen, N. *The South African*. (2018). Online.; StatsSA (2017). Online.

EDUCATION

Responses to South Africa's education issues – from inequality in the system to fears around #feesmustfall – range from the demand for outright privatisation of education and the withdrawal of the state, to various versions of market-friendly policies and public-private partnerships. The private education market is, however, growing rapidly. Fund manager Paul Theron from Vestact South Africa says it's a good time to get into the private sector, as there is going to be a "listings boom" in response to government's struggle to reform education.

The market for private education to develop is promising, with plenty of room for expansion. Currently, private schools can only cater to around 5% of school-going aged children, thus there remains plenty of scope for growth.

The anxiety after #feesmustfall and the reform of government expenditure in the tertiary education space, caused a spike in interest in the tertiary education businesses.

Private education has previously appealed to the wealthier members of the population, meaning that there is major consumer pressure to establish affordable private schools.

The biggest players in the private education space:

PEMBURY LIFESTYLE GROUP

Market Cap

R 164.24 million (as of 17 April 2018)

Number of Schools

11 open currently, 1 primed to open in 2019

Offerings

Pre-primary, Primary and High Schools. The Pembury Lifestyle Group has a multipronged approach, however, also offering investment into retirement villages.

ADVTECH

Market Cap

R 8.87 billion (as of 17 April 2018)

Number of Schools

82 schools and 28 tertiary institutions

Offerings

Pre-primary, Primary, High Schools; Private Colleges and Institutions. The Advtech Group owns an astounding number of education brands in South Africa, some of which having been acquired by Advtech once established, and others having been formed by Advtech.

CURRO

Market Cap

R 13.5 billion (as of 17 April 2018)

Number of Schools

31 Curro Schools open currently, with an aim to have 80 schools, accommodating 80 000 learners, by 2020

Offerings

In addition to Curro Schools, Curro has Select Schools, Academy Schools, Meridian Schools and Castle Schools, which reach all levels of education, including tertiary.

Sources: Forbes. (2017). [Online](#). BusinessTech. (2017). [Online](#). Pembury. (2018). [Link to Pembury](#). Advtech. (2018) [Link to Advtech](#); Curro. (2018). [Link to Curro](#).

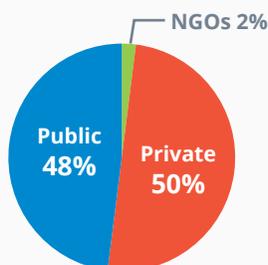
HEALTHCARE IN SOUTH AFRICA

According to the World Health Organisation (WHO), Africa carries 25% of the world's disease burden, but houses only 3% of doctors internationally, produces less than 2% of all medications consumed on the continent, and spends only the allocated 1% of the global healthcare budget. There is opportunity for VR applications to be used for routine diagnostics and treatments not requiring the presence of a physical doctor may significantly contribute to Africa's wellbeing.

Despite that South Africa has some of the best medical infrastructure on the African continent, and doctors whose skills are on par with international standards, the healthcare sector was ranked last among 19 nations in its ability to deliver maximum healthcare results at the lowest possible cost. This came from a 2017 global survey that measured healthcare system efficiency.

Not unlike the education system, the South African healthcare sector sees a rift between the private and government sectors, with investment capital seated predominantly in the private sector. Private sector partnerships and collaborations are likely to be the most fertile locus for innovation.

The public sector provides healthcare for **80%** of the population, whereas the private sector provides for the remainder.



Proportion of spend on healthcare in South Africa by sector

Interestingly enough, despite providing healthcare for the majority of the population - the public sector's proportion of spend is only 48% of the total healthcare spend within South Africa.

It is evident that the private sector has got the capital for investment and development purposes, the majority of this capital (81%) is sourced from private prepaid schemes.

3 BIGGEST PRIVATE HEALTHCARE SCHEMES IN SOUTH AFRICA

Discovery Health
2.707 million beneficiaries

Bonitas Medical Fund
676 785 beneficiaries

Momentum Health
257 371 beneficiaries

3 BIGGEST PRIVATE HEALTHCARE GROUPS IN SOUTH AFRICA (AS OF APRIL 2018)

Life Health Group
Market cap R 40.68 b'n

Mediclinic International
Market cap R 78,69 b'n

Netcare Limited
Market cap R 41.46 b'n

Source: Gray A, Vawda Y. Health Policy and Legislation. In: Padarath A, Barron P. South African Health Review (2017). [Online](#). McIntyre, D., Ataguba, J. (2016). Access to quality health care in South Africa. University of Cape Town. Bohpehlo Health. (2018). [Online](#). fin24, (2017). [Online](#).

HEALTHCARE OPPORTUNITIES

Analysts state that the private healthcare and health insurance industries – in partnership with governments and technology – can dramatically transform healthcare in Africa. While this offers a huge opportunity for new developments, innovation is thin on the ground. Consumers are at the centre of healthcare, and new business models that depend on collaboration are required.

The South African doctor-to-population ratio is estimated 0.77 per 1 000. However, due to the vast proportion of general practitioners (70%) practice in the private sector the ratio is estimated more realistically as 1:4200. As the saying goes, “desperate times call for desperate measures” and alternative means of diagnosis and treatment are most definitely required!

Studies confirm the notion that emerging economies usually give rise to innovation more readily than developed ones. Due to the fact that developed nations have more entrenched, regulated healthcare systems, less-developed countries adopt solutions generated by new disruptive forces more quickly.

In South Africa, technological barriers to entry in the medical field are negligible, with private sector medical infrastructure being comparable to international standards. The benefit of a new entrant launching in the South African healthcare market is that their products and services can be tested in a more receptive market before entering more established markets. South Africa is unique as it provides access to markets similar to those of other less developed nations, while having the buying power of more developed nations due to its private sector.

As the world approaches the ‘virtualisation of care’ – with the bundling of mobile, digital, and wireless offerings – these new entrants will be well positioned to offer amazing breakthroughs that help surpass healthcare boundaries and enable care anywhere.

According to research conducted in 2015, South African medical aid scheme consumers:

82% of patients are amenable to non-traditional ways of getting medical attention

74% are open to receiving a virtual doctor visit

55% trust the Internet more than the doctor

89% of private medical schemes would support telemedicine

Source: D., Ataguba, J. (2016). Access to quality health care in South Africa. Dr Rolene Wagner for UCT. (2017). [Online](#). pwc. (2017). [Online](#). The Medical Aid Survey (2015). [Online](#).

LOCAL MEDICAL TRAINING



Currently there are 9 medical schools in South Africa, one independent and the other 8 housed at various national universities

If medical schools leverage off virtual lecturers and training that mitigates the risk of teaching using human bodies - the opportunities are endless.



In 2016, there were only 9 293 undergraduate medical students enrolled in South Africa

The competition and demand for placement at medical schools are both incredibly high. As many as 42 000 applicants compete for as few as 1 800 first-year positions.



The lowest-weighted academic average or threshold for prospective Indian students is 90,86%, white students 87,66%, black African students 83,16% and coloured students 75,5%

Stringent entry requirements combined with race quotas mean that there are too few places for students. The discrepancy between applicants and uptake is not to suggest that the hopefuls that are not accepted have failed to meet a standard.

South Africa has lost more than US\$2 billion in investment from the emigration of domestically trained doctors. The high quality of medical training in South Africa makes the country's doctors attractive to other countries. This, coupled with the medical industry's slow reform – such as the decade-long wait for the implementation of the national health insurance scheme – explains the occurrence. However, it additionally demonstrates that there is a demand for medical professionals trained to a certain standard and proves that South Africa has the means of producing these individuals. When the output of new doctors is compared to the demand for positions, it is clear that South Africa could be producing many more young doctors, and profitably, than it is at present.

HEALTH INDUSTRY – TRAINING BUDGETS OF SELECT MARKET PLAYERS (APRIL 2016 – MARCH 2017)

Company/State Enterprise	Total Training Budget	Number of Employees	Allocation per Employee
Department of Health	R5 082 000	1837	R2 766.47
Life Health Care	R133 000 000	15 560	R8 547.56
Netcare	R54 000 000	19 934	R2 708.93

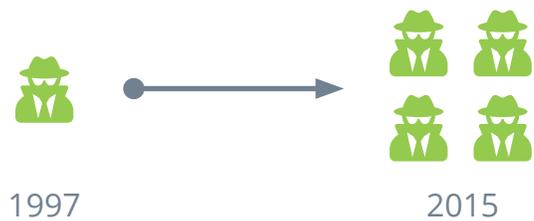
Source: D., Ataguba, J. (2016). *Access to quality health care in South Africa.*; Dr Rolene Wagner for UCT. (2017). [Online](#). pwc. (2017). [Online](#). News24. (2017) [Online](#). SAMJ, Medical Schools. (2017).

SECURITY/MILITARY

SIZE

South Africa has one of the largest private security industries in the world; It is the fourth largest per capita with South Africans spending R45 billion per year.

According to the Private Security Regulatory Authority (PSIRA), there are over 1.87 million registered security officers in South Africa of which 490,000 are active. This number indicates that South Africa's private security force has quadrupled between 1997-2015. While the majority of customers using private security services are businesses, individual users are beginning to invest more in security systems and the associated services, therefore the industry continues to grow.



DEVELOPMENTS

In response to the rapidly expanding market, private security companies are extending their operations. Some companies are adding high-quality security vehicles to their arsenal, complete with automatic license plate recognition, facial recognition, and other advanced features. In addition to more providers entering the industry, South Africa is also seeing an increase in the number of start-ups entering the security market. These new entrants are leveraging IT technology to provide security solutions for businesses and individuals, creating a highly competitive market.

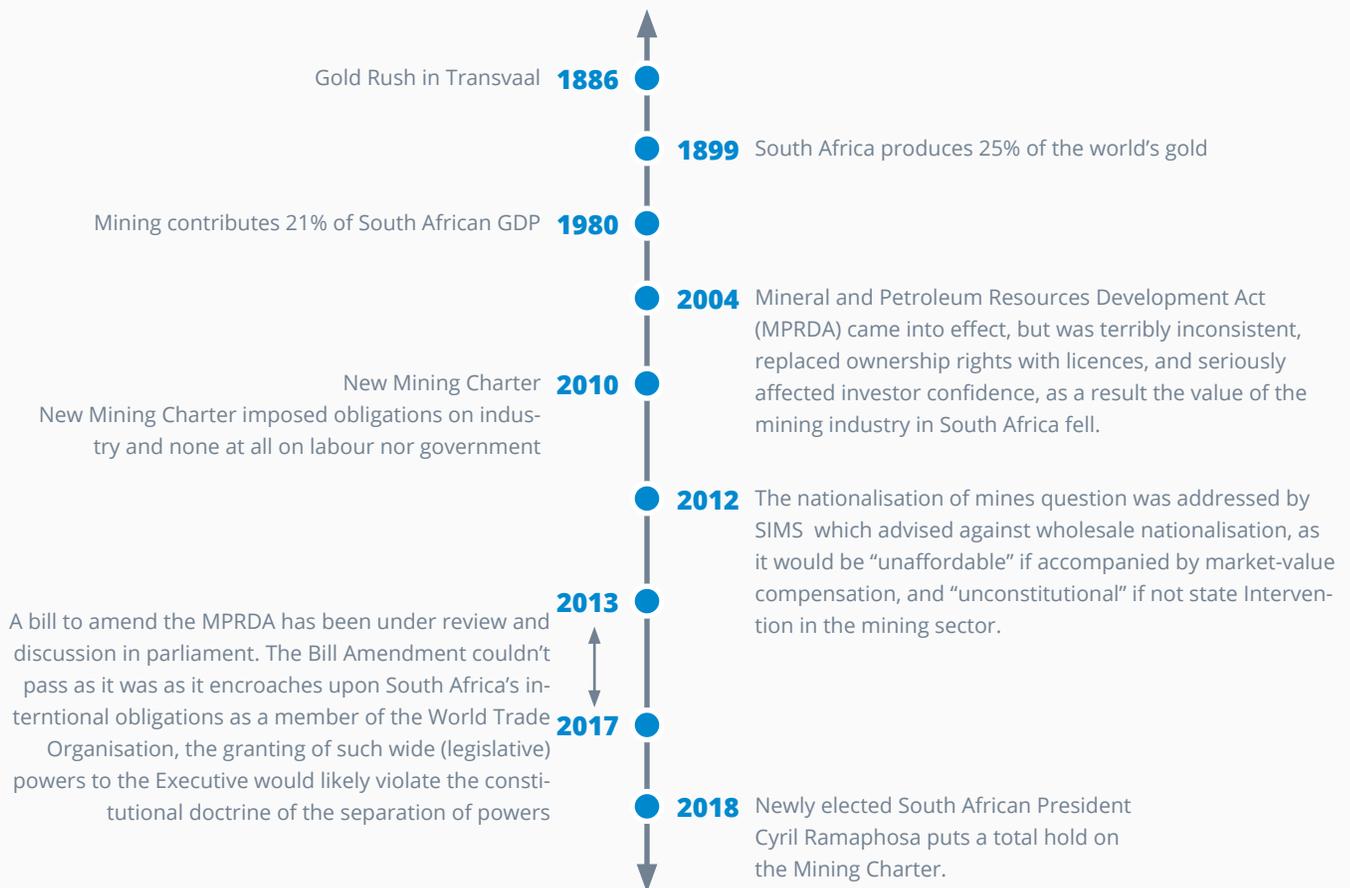
TRAINING/SIMULATION

There is a great deal of potential for VR in the private security industry. It is already being used in military training for similar skills required by private security officers. VR training allows one to be immersed in a 3D environment relevant to the subject matter at hand. For high-risk professions such as security, this allows for a safer training experience that still provides authentic expectation for the situations staff might encounter. For such a large industry, which is still growing, this makes training faster and affordable for each new intake. While the VR equipment used specifically for military training is extremely expensive, new VR applications are becoming more affordable and therefore more accessible as a training tool. The private security industry is also making increased use of technological developments for surveillance and response. These could be new to seasoned officers and VR could ensure they are trained effectively and efficiently in order to use these new developments to their advantage. The South African private sector is lucrative but high-risk, this combination would drive demand for innovative training solutions to keep both employees and the people they protect, safe.

Sources: [BizCommunity, 2017](#); [Business Tech, 2017](#); [Daily Maverick & Chronicle, 2017](#); [Wired, 2017](#); [Unimersiv, 2017](#)

MINING

Whatever the outcome of renewed deliberations around the future of South African mining, efforts to ensure a sustained growth path are vital to the livelihoods of communities that depend on the industry.



The numerous changes in mining legislation and the practice of the industry in South Africa make it an fascinating industry for investors to monitor. Transformation and the development of black-owned mines remains one of the central goals of the current government. With new mine owners coming into the field, and with new regulations due to be released by June 2018 – as promised by Mineral Resources Minister Gwede Mantashe – opportunities and crises could be cropping up all over the sector in no time at all. More mines and additional miners mean increased opportunity for training. New and updated legislation means further training or alternative methods will be needed. Less experienced mine superiors will rely heavily on third parties to help expedite processes involved in inducting new workers and initiating business procedures.

Source: Forbes, (2018). [Online](#); Mining Review, (2018). [Online](#); StatsSA, (2016). [Online](#).

LOCAL MINING INDUSTRY

The national Q4 2017 GDP results, published in March 2018, indicated that the mining and quarrying industry decreased by 4,4% and contributed -0,3 of a percentage point to GDP growth. However, mining remains a vital sector in South Africa.



Mining contributes to about 8% of GDP in South Africa



In 2016, the mining industry reported sales of over US\$ 30 billion



Since 2014, it has contributed R18 billion to the South African economy



Around 490 000 individuals work in the mining industry, with a trickle down supporting around 4.5 million people. Based on the companies in the table below the potential training budget for mining in South Africa is R4.8 billion at an average of R9797 per employee.

On average one South African mineworker dies every work day. Such high occurrence of accidents is often attributed to ineffective and inappropriate training methods and materials. Skills and safety training is required by legislation and South African mines are expected to have International Organization for Standardization (ISO) certification and Mining Qualifications Authority (MQA) accreditation in order to ensure the quality of miner training and to prevent deaths. As such, mining companies invest large amounts of time, money and resources into training initiatives, and are subjected to regular audits to check compliance.

The application of VR in providing a typical and realistic underground environment would be incredibly useful in the South African mining industry. Considering that much of the South African mining workforce is illiterate or not formally educated, VR also bridges learning gaps by being both visual and auditory. The plethora of training applications in which VR can be of use within mining represents a huge developmental opportunity.

MINING SECTOR – TRAINING BUDGETS OF SELECT MARKET PLAYERS (2017)

Company/State Enterprise	Total Training Budget	Number of Employees	Allocation per employee
African Rainbow Minerals	R180 000 000	24 106	R7 467,02
Harmony Mines	R409 000 000	35 300	R11 586,40
Implats	R548 000 000	53 000	R10 339,62

Sources: News24, (2018). [Online](#); StatsSA, (2018). [Online](#); History of mining StatsSA, (2016). [Online](#); Squelch, A. (2001). *Virtual reality for mine safety training in South Africa. The Journal of The South African Institute of Mining and Metallurgy*

MANUFACTURING

StatsSA reports that the manufacturing industry remains one of the biggest drivers of the economic growth that South Africa enjoyed at the end of 2017. Key contributors include the sub-sectors producing chemicals, as well as wood and paper, which altogether account for 36.2% of overall manufacturing output.

In 2016, capital expenditure declined in real terms, and investment spending in manufacturing only expanded by 0.6%. Research also shows that only 80% of the installed manufacturing capacity of South Africa is currently being utilised.

On the back of this, the inauguration of President Cyril Ramaphosa in February 2018, caused many industry experts, analysts and economists being decidedly more optimistic about a 'new dawn' for South African manufacturing.

“The President’s State of the Nation address demonstrated inspirational, unifying leadership of the kind that the South African manufacturing sector has sorely lacked over the past few years”

– Kaizer Nyatumba, CEO Steel and Engineering Industries Federation of Southern Africa (Seifsa)

However, the fact remains that South Africa suffers from a severe skills shortage in a number of key economic sectors. With the Fourth Industrial Revolution upon us, South Africa continues to produce too few engineers, artisans and technicians to achieve the National Development Plan’s long-awaited R845 billion strategic infrastructure projects.

Developing and retaining key technical skills is essential if South Africa is to meet the challenge of building massive new infrastructure, while simultaneously upgrading existing services. Necessary investments in technology are required to address these issues.

According to the Manufacturing, Engineering and Related Services Sector Education and Training Authority (MerSETA), the shortage of highly skilled individuals contributes to:

- slow adoption of technology
- lower productivity
- low competitiveness
- high production costs

Sources: Productivity SA, (2017). [Online](#); Cramer’s Engineering News, (2018). [Online](#); StatsSA, (2018). [Online](#).

MANUFACTURING

The manufacturing sector offers the greatest potential for job creation at respectable pay levels for unskilled and semi-skilled workers. Broadly, these workers fall into the following South African Manufacturing sub-sectors:

- Agriprocessing
- Automotive
- Chemicals
- ICT and electronics
- Metals
- Textiles, clothing and footwear

Manufacturing accounted for 11% of all formal sector employment in 2016, having decreased from 12,6% in 2015. However, other sectors recorded greater employment losses over this period.

Fiercely competitive pressures in the face of weak demand forced manufacturers to reduce employment levels since the Q1 of 2008. The sector has been experiencing negative growth in employment over the past decade, from over 2 million in 2008, to approximately 1.7 million employees in 2017.

Almost every one of the jobs in manufacturing in South Africa, regardless of sub-sector, requires employees to learn in a hands-on practical manner, often working with dangerous or expensive machinery. Virtual training mitigates the hazard and cost of training manufacturing sector workers on real machinery, and negates the lengthy and costly process of acquiring such equipment. Incorporating this kind of training into Technical and Vocational Education and Training (TVET) Colleges and Universities makes this type of quality training accessible to South African students and practitioners. For investors, the need for new artisans and technicians being experienced in the country – specifically those with skills capable of bridging existing gaps – presents an exciting opportunity.

MANUFACTURING SECTOR – TRAINING BUDGETS OF SELECT MARKET

Company/State Enterprise	Date of Research Finding	Total Training Budget	Number of Employees	Allocation per employee
Pick n Pay	2017	R322 500 000	52 900	R6 096,41
Woolworths	2017	R116 000 000	44 520	R2 605,57
Foschini Group	2016	R125 000 000	22 800	R5 482,46

Sources: Productivity SA, (2017). [Online](#); Cramer's Engineering News, (2018). [Online](#); StatsSA, (2018). [Online](#).

CONCLUSION

PROOF OF CONCEPT PREDICAMENT IN SOUTH AFRICA

One of the major challenges pertaining to the adoption of VR is attributable to lack of awareness and therefore lack of demand. Content providers are reluctant to invest resources in developing content without having an established base of consumers. Furthermore, industry players are hesitant to purchase technology offerings without functional content that enables the full VR experience. A positive partnership of both technology and content providers is required to drive market adoption.

“ Virtual Reality is the first step in a grand adventure into the landscape of the imagination. ”

Frank Biocca

WHAT NEXT?

It is up to South African companies to adopt VR software timeously in order to leverage the vast array of opportunities to apply VR within their industries. It would be wise and extremely beneficial for industry partners to immerse themselves into VR while the trend is in its infancy as VR is going to be vital to establishing market share and crucial to contributing to positive change in industries. VR is here, VR is now, VR is real.