Beyond 2020

By Joao Frasco, Chief Investment Officer, STANLIB Multi-Manager

One of my favourite TV shows growing up was an Australian TV show called “Towards 2000”, which later changed to “Beyond 2000” for what I hope are obvious reasons.

The program explored how companies and other institutions (e.g. research labs at universities) were developing technologies at the “bleeding edge” (a play on “leading edge” that is so far on the edge that it is invariably traumatic). Many people may not remember the pain of dialling up to the Internet at a baud rate of 300 kbps and waiting endlessly for a very small graphic to download. Most people probably don’t even remember the Internet before the World Wide Web (www) and hypertext transfer protocol (http). While many of the technologies explored in the TV show didn’t make it into our everyday lives, most were surpassed. Many futurists will recognise that technology (or the impact on our environment) is impossible to predict, and the Internet is a great example of this. What’s next on the horizon?

It’s a brave new world

As cliché as this may sound, this time could be very different, perhaps for reasons that are not that obvious. Whenever facing the unknown, it is normal to react with fear and apprehension. Some of the brave in these encounters, live to tell the story, while others perish in the annals of history. Historically though, we’ve at least come to know the “unknown”, even if it took some time to discover. This time however, we may find ourselves in the “dark” forever.

While most futurists think the “singularity” is a long time off (and some think it will never happen), there are some that think it is around the next corner. The “singularity” (a term hi-jacked from astronomy) refers to the point in time where humans will have developed a piece of technology (deliberately generic) that surpasses human level general intelligence, creating an intelligence explosion where machines become super intelligent, leaving the human race forever behind.

In this article, I will talk to some of what is happening in tech that is noteworthy (in my opinion), and introduce some of the topics that my fellow colleagues will explore in more detail.

Technology in general

Everyone understands the importance of technology within our personal lives and our economy more generally, but few may appreciate just how big and important it has become. Globally, Apple Inc. became the biggest company in the world (by market capitalisation) a couple of years ago, and recently became the first company to breach a market cap of $800 billion. Alphabet Inc. (holding company of Google) is not far behind at $682 billion, and is the second biggest company in the world. In case you were wondering, the next three biggest companies are also technology companies, namely Microsoft at $544 billion, Amazon at $476 billion, and Facebook at $442 billion (all numbers at 30 May 2017).

Closer to home, Naspers became the biggest share on the Johannesburg Securities Exchange (JSE) a couple of years ago, and has continued to dominate our market, all on the back of its holding in Tencent (itself in the top 10 largest companies in the world by market cap), another technology company. Many professional money managers are sceptical of technology company valuations, as they often trade on terrible value metrics (like the Price to Earnings (PE) ratio). Some money managers stay away because of the dot.com bubble where spectacular losses were made by companies that failed to monetise...
their value proposition. Unfortunately, these stocks can no longer be ignored. Warren Buffet (the sage of Omaha and CE of Berkshire Hathaway) and Charlie Munger apologised to investors at their latest AGM for a couple of their technology company blunders, including not investing in Google. They have recently invested in Apple, having stayed away from tech stocks for a long time.

**Artificial intelligence**

Technology by itself is not new (albeit interesting), as we have lived with tech for many years. What is far more interesting, is how the technology has begun transforming our lives and economy in ways that are different from any other time in history. Here, I’m talking about technology in its broadest sense i.e. the application of scientific knowledge for practical purposes. We are making tremendous progress across many disciplines, and technology is the key enabler in all of them. I want to focus on artificial intelligence (AI) generally, and specifically a branch of AI called machine learning.

Like many technologies that have come before it, machine learning adoption is undergoing massive acceleration because of the intersection of three big “pieces” (the proverbial “perfect storm”). The first is computing power (both in its magnitude and its cost) on the back of Moore’s law, which shows no sign of slowing down. We have unprecedented access to more computing power at lower costs than ever before. To make this “real”, my desktop PC runs at about 100 GFLOPS (100 000 000 000 floating point operations per second), where the Cray-2 supercomputer (from the 80’s) ran at about 2 GFLOPS (50 times slower for the world’s fastest supercomputer at the time).

The second is “big data”, or access to unprecedented amounts of data (both structured and unstructured). To make this “real”, and I am sure that you will look this up as the numbers are unbelievable, we now produce more data in two days, than we did in the entire history of humanity up until 2003 (and this is an old estimate dating back to 2010). Another estimate by IBM, has us producing 2.5 quintillion bytes of data (that’s 18 zeros) every day, or 90% of the world’s data was created in the last two years. The Large Hadron Collider in CERN alone, produces about 25 petabytes of data every year (that’s fifteen zeros, or 25000 1 terabyte hard drive every year).

The third and final piece of the puzzle relates to the advances in the state of the art, which includes everything from brain power (the advances that have been made by individuals and groups), to the software that utilises the computing power and data referred to above (specifically “deep learning” enabled by deep neural networks). A lot of this knowledge and software has been made available to the masses (democratised), allowing individuals and small enterprises to leverage the advances being made. Let’s briefly explore some of the things that this technology has enabled.

**Applications of machine learning**

Back in 1997, IBM’s supercomputer “Deep Blue” beat the reigning world champion (Gary Kasparov) at Chess by a score of 3.5 – 2.5. While many saw this coming given the progress that had been made over the years, and the limited number of moves in a chess game (albeit a very large number), it was still seen as a major milestone. Most people thought that the same feat would not be achieved for a very long time for the game “Go”, as the number of possibilities in this game is larger than the number of atoms in the universe, making a “brute force” solution impossible (which is essentially how the feat was achieved in chess, with Deep Blue able to calculate many move possibilities before every move). It was therefore a big surprise when AlphaGo (an AI computer program developed by Alphabet’s Google Deepmind) beat 9-dan professional, Lee Sedol, in 2016. More recently, AlphaGo beat the world number one ranked player, Ke Jie. In 2011, IBM Watson (another AI program able to process questions in natural language), beat two former winners of the quiz show “Jeopardy”.

Nowadays, we all have access to AI on our smart phones (Siri on Apple’s iPhone, and Google assistant on various platforms), where we too can pose questions
in natural language. This is enabled through two technologies that have made significant progress in the last decade, all based on machine learning. The first is speech recognition, and the second is natural language processing. Again, this has been made possible because of computing power and huge amounts of data. Another application that some of you may have tried, is translation (between languages), which can now be done in “real time” by pointing your smart phone at any written text and seeing the translation in place (using another technology called augmented reality).

At Google’s recent I/O (developer conference) the CEO, Sundar Pichai, announced that Google was changing from a “Mobile-First” company to an “AI-First” company, before introducing a slew of technologies and initiatives in support of this, including support for cloud machine learning using their TPUs (Tensor Processing Units – chips developed specifically for machine learning).

Some of these applications may appear silly or gimmicky, but there are far more serious applications being developed. Machine learning in image recognition has taken even bigger strides in the last decade and is being used in healthcare for diagnosis. The “killer app” for image recognition from machine learning has to be self-driving cars. Various companies are developing this technology, including Tesla (founded by none other than South African born, Elon Musk). What makes their solution particularly interesting (compared to Google say), is they are achieving this without LiDAR (the equivalent of laser radar – or the spinning cylinder you see on top of Google’s cars). Tesla uses eight video cameras and one radar (and ultrasonic devices), and of course a supercomputer powering the AI.

**Investments?**

Most of the topics discussed above make news headlines and are therefore known to most people. What most people may however not be aware of, is how AI and machine learning is being used in investing. This is however not something new, although it will have benefitted more recently from the same technologies already discussed. The flash crash of 2009 which resulted from algorithmic trading performed by computers looking to exploit pricing inefficiencies (resulting from information inefficiencies because of their ability to gather trading information on order books on various exchanges before their human counterparts), is very much a part of the AI revolution.

Unlike in other fields already discussed above though, when it comes to investing very little is known about who is doing what, for obvious reasons (why tell the world about how you are exploiting technology to make excess returns, or worse still, share the technology and knowledge). So why does this interest us, and why should it interest you? Let’s explore a couple of the main reasons.

The first reason, is that we need to understand the world we live in, and the markets and companies that compete (do business) in that world. We need to understand the opportunities for investing, so that we invest in companies that not only provide great short-term returns, but will also survive longer-term and hence keep generating positive returns. If we understand the themes and transformative (or disruptive) power of technologies, we may be able to identify themes for longer term investing. We are entrusted by our clients to do all of this on their behalf, and cannot shirk the responsibility by simply passing the money to our underlying managers.

This leads us to the second reason. If we allocate capital (our clients’ hard earned money) to these markets through asset managers, we need to ensure that our managers also understand this world. It is pointless to allocate the money to people that don’t understand technology and therefore will never invest in technology companies (famous words from Warren Buffet). Some managers don’t invest in growth companies as they believe that they are invariably over-valued, again possibly missing great opportunities. We need to be able to assess whether managers have the skills and knowledge to exploit as many opportunities as possible as they arise, and not merely invest in “old world” companies.
The third and final reason, is that we may ourselves be able to leverage these technologies in the work we do. We design and build solutions for many different clients, and machine learning may assist us with many parts of our investment process (from design to asset allocation, and from manager selection to portfolio construction). It is often the jobs / professions that we think are most secure from being automated by intelligent agents that will be the first to go in the AI revolution. We are looking at all of these and many more applications (including robo tools powered by machine learning for advisers) to understand whether there are opportunities to meet tomorrow’s demands utilising these and other new technologies.

**Conclusion**

I think this is an exciting time to be alive and working in investments, but also believe that these technological disruptions will be very painful for many people and businesses. Despite these disruptions, we attempt to have our eyes focussed on the horizon, with our feet firmly planted on the ground beneath us, thus ensuring that we make great investment decisions today for our clients for many years to come.

Technology broadly is changing our world, and AI/machine learning is leading the charge. We can either embrace it with both arms or risk getting left behind.

In the articles in this edition, we will explore the topic of technology in investments in more detail by digging a little deeper into some of the things discussed above. In the accompanying podcast, I’ll go further down the “rabbit hole” and discuss the world of AI and machine learning in more detail, and how companies like Apple, Google and Facebook are investing heavily in these technologies in an attempt to capture the “hearts and minds” of their huge client / “follower” base.

I hope you enjoy and learn something new.
Catching the artificial intelligence meme

By Jennifer Henry, Head of Portfolio Management: Retail, STANLIB Multi-Manager

A portfolio manager’s perspective of technology stocks as generational investment themes.

Investors who invested in Naspers have enjoyed bonanza returns of 1000% over the past five years and Naspers now has a market cap of over R1.1 trillion. Much of Naspers’ value lies in its 34% ownership of a Chinese internet company called Tencent, which captured the Internet meme that burgeoned from the early 2000’s. Tencent really capitalised on the “network” effect created by social media and as that industry matured the company caught the next wave into mobile. Naspers essentially benefitted from Tencent’s success in new technologies.

Fund managers that missed out on Naspers

While Naspers and many other global tech stocks tell a golden story for some investors, it is also a cautionary tale for investors that were negatively biased to tech stocks and “hung up” on the dot.com bubble (aka the Tech Bubble). During the inflation phase of the dot.com bubble (about 1997 to 2002), investors got caught up in the hype of internet companies which were being priced on some rather peculiar metrics. Whereas traditional fundamental analysis uses ratios such as Price-to-Earnings (P/E) or Price-to-Cash Flow (P/CF), these early internet companies were being priced on Price-to-Clicks or Price-to-Eyeballs (number of people viewing a site). What failed to materialise from these early internet companies was a business plan to derive revenue from the users of their websites. Therefore, many of these companies reported huge losses within months of their initial listing. This bubble started unwinding in 2000 with the Nasdaq losing approximately 78% of its value from peak-to-trough (Beattie, 2002).

The mental scar of the dot.com era was deep and far reaching, with South African fund managers feeling the aftershock. Investors then became resolutely “true-value” which means “buy cheap and sell high”. This hunt for cheapness even extended so far as to say that some fund managers avoided stocks with P/E ratios of some arbitrary value, such as 25x. So when Naspers made a small investment in Tencent for a total consideration of about R274 million in May 2001 (Naspers, 2002) it was probably viewed with some disdain. Furthermore, Naspers was already in negative earnings because of its pay-tv investments at that time. Tencent started contributing materially to Naspers’ earnings from around 2008 (about 20% of earnings). However, many investors remained unconvinced given perceived low barriers to entry for Tencent’s products and steered away from this growth company. Tencent subsequently delivered 40% compound annual growth in earnings since 2008. Was it worth the 60x P/E ratio that it was trading at in the start of 2008?

Footnotes:

Value versus Growth companies

To answer the question above, it is important to understand that there are fundamental distinctions between “value” and “growth” companies. To demonstrate the distinction, we use the common P/E ratio and the diagram below. “Value” companies trade on typically lower P/Es which investors believe to be cheap and trading at a large discount (called margin of safety) from the potential valuation. In the value box, we illustrate a stock as having a current P/E of 12x, which means that for every R1 of earnings, the stock is trading at 12x that i.e. R12. We use 12x in this case as it is close to the long-term P/E ratio for the overall South African Market. Trading close to the market P/E may also make investors feel more comfortable with the stock.

The company will continue to deliver its earnings and subsequent dividends, which may grow from one year to the next. The price of the company could also increase in line with its earnings growth. If at some time in the future, investors believe that the earnings growth is likely to be stronger than the past, they could pay-up for the company. This means that the P/E ratio would increase and we have used 14x to reflect this positive change. The change from 12x to 14x is the price appreciation of the company and part of the total return to the investor. There are many other factors that determine the “P” or price of the company such as the quality of the management, industry growth prospects etc. Fund managers with this resolutely value style are generally happy to have more predictability in the outcome and perhaps even smaller but steady earnings growth.

If investors see a high degree of potential growth from a company then they should be willing to pay a higher price, even if the earnings are small, tiny or even negative\(^1\). We illustrate a growth company trading at a P/E of 40x. However sometime in the future the “E” or Earnings of the ratio has grown tremendously and now the P/E could be much lower at say 10x. Tencent achieved exactly that with its P/E ratio reducing from 60x to 38x by December 2016. The ratio may still seem somewhat high but it shows that investors are still pricing in good earnings growth prospects for this company backed by their track record for being able to monetise (make money from) new technologies. As alluded to earlier, a large portion of South African investors (who generally prefer value stocks) avoided an early investment into Naspers.

Avoiding high P/E stocks and wanting to invest in something tangible (often referred to as bricks and mortar) is not just the premise of many South African fund managers. In a recent address to Berkshire Hathaway shareholders, Warren Buffett bemoaned the fact that he

Footnotes:  
1. Not all companies with high P/E ratios are growth companies. Some companies fall on hard times resulting in reduced or negative earnings and hence its P/E ratio could be high or negative.
had not invested in Google or Amazon early on (Google: The moat that Warren Buffett missed, 2017). He stayed true to the value investing philosophy and invested in stocks that he could understand. So he was unable to recognise the business opportunity of these tech stocks even though they presented multiple opportunities to do so.

**Megatrends and thematic investing**

The biggest missed opportunity of technology stocks (so far) is that they do not require large investments in fixed capital. Furthermore, these businesses have become scalable and have become faster at taking advantage of new technologies (see Tencent diagram on the following page). Investing in these low-capital intensive companies or capturing the growth of social media could be regarded as investing for a theme i.e. thematic investing. An easy starting point to understanding thematic investing is to observe some megatrends shaping our world. We have summarised Ipsos Global Trends research paper on megatrends in the diagram below (Kettrick, 2017). One of the megatrends is that “Climate change is happening faster than predicted”. There is now a focus on technologies such as renewable energy or a scalable way to desalinate sea water. Investors could capture this theme by investing in infrastructure projects or “green-chip” stocks. Tesla is one of the forerunners around this theme by building electric cars and solar cities. Given Tencent’s track record for identifying and capitalising new technologies it is not surprising that they bought 5% of Tesla’s stock early this year (amongst other investments into electric vehicles).

**Megatrends shaping the world**

- **Technological acceleration – rise of artificial intelligence**
  16% of US jobs will disappear due to automation by 2025. Seven times the number of connected devices as people on the planet by 2020.

- **Demographics: Emerging economy population growth**
  Africa’s population is set to double by 2050. By 2030 two-thirds of the world’s middle class will be living in Asia.

- **Climate change**
  Climate change is happening faster than predicted. 75% of the world’s largest coastal cities impacted by rising sea levels.

- **Multi polarity**
  GDP forecasts suggest that India could overtake the US as the world’s second largest economy by 2050. Forecasts show the ‘E7’ economies purchasing power overtaking the G7 by 2030.

Footnotes:

6 “Green Chip Stocks’ Shares of companies whose primary business is beneficial to the environment. Green chip stocks are generally likely to be concentrated in areas such as alternative energy, pollution control, carbon abatement and recycling” from Investopedia.
Themes often intersect. Tencent’s initial success was rooted in the social networking trend that gained momentum towards the end of 2007. At that time both Facebook and Tencent had approximately 100 million and 300 million users respectively. The number of Tencent accounts was equal to the number of internet users in China with an estimated 20% of the population being internet users. Ten years later, the Chinese internet penetration rate is now over 50% with approximately 730 million users. Tencent’s combined online and mobile internet user accounts is close to 900 million. The early investors into Tencent and other Chinese internet stocks (such as Baidu and Alibaba) saw this theme playing out and sought to capture it. In addition to these two themes (rising internet usage on growing social networks) Tencent also benefitted from a change in Chinese policy to promote the services side of the economy. This has provided further impetus for Tencent’s strong share price appreciation relative to other Hong Kong listed shares.

Another megatrend is that “by 2020 there will be close to seven times the number of connected devices as people on the planet”. This is coined the ‘Internet of Things’ (IoT). Both artificial intelligence (AI) and robotics represent major tech trends that will continue transforming our work and home lives. Examples of progress in these fields are Google’s self-driving cars and Alexa, which is Amazon’s voice-controlled personal assistant that simulates the human touch for a digitally co-ordinated experience.

The world’s largest tech companies are aggressively reshaping their future around AI. There are countless examples of businesses approaching AI from multiple angles. Apple for example is reportedly working on a dedicated AI chip that would power AI-related tasks on mobile devices (Statt, 2017). The chip may be called the Apple Neural Engine that would perform algorithms related to facial and speech recognition and augmented reality tasks that rely heavily on computer vision.

Facebook has created an Applied Machine Learning Group with the sole purpose of pushing AI across its product range. Google has completely redirected its focus from “Mobile First” to “AI First”. Tencent has also entered the AI race by opening a lab in Seattle with a focus on the practical application of AI (Sawers, 2017).8

Size now matters more

Tencent is now one of the top 10 stocks globally by market capitalisation (size) and Naspers represents approximately 20% of the FTSE/JSE Shareholder Weighted All Share Index (SWIX). Given Naspers’ large size in the index, even local fund managers who are unconstrained by an all-share benchmark had to seriously consider the risk of not holding any Naspers. This means that if Naspers’ share price continues to rise (and the fund managers have no exposure in their fund), all the alpha (outperformance) from other good stock picks could be wiped out. Therefore, in the last two years we have observed more managers buying into Naspers to manage this benchmark risk.

In conclusion

From its early development in 2001, Tencent took only five years to record a profit by 31 December 2006. Profits grew by over 330% in 2007 and nearly 10 years later the company still reported high growth of 30% (31 December 2016). Missing out on a company that has been successful in capturing a megatrend can be painful. Capturing these megatrends as part of a well-diversified portfolio may be beneficial to investors who have both the patience and risk appetite for it. History tells us the tech companies who have a robust path to monetising their value proposition and continue to develop new ways to derive revenue are more successful. At the same time, competition is high since tech companies have been characterised by low barriers to entry (remember Yahoo?). We think that finding and growing AI talent (AI and machine learning experts) could be the distinguishing feature of a great and revolutionary tech company.

Capturing megatrends as part of a well-diversified portfolio may be beneficial to investors who have both the patience and risk appetite for it.

STANLIB Multi-Manager is the largest Collective Investment Scheme in South Africa
Using artificial intelligence (AI) to invest globally

By Renate Potgieter, Global Portfolio Manager, STANLIB Multi-Manager

The investment industry has changed dramatically over the past few years...

As Joao mentions in his article, 90% of all data in existence was created in the previous two years. We have an ever-growing pile of analysts’ reports, regulatory filings, corporate presentations, as well as information from social media such as Twitter and Facebook. There is more information available on the companies we can invest in than ever before. Given this explosion in information, how do investors take advantage of it all? In order to decipher what has value versus what is just noise, asset managers are now required to be nimble and have skills in technology that was not required in the past. Innovation is not something to overlook, and requires a firm commitment from asset managers.

With the rapid advances in technology, we have also seen products like passive and alternative beta products gaining popularity. As a result, active management is under more scrutiny to prove their value in an era where machines can do a lot of the decision-making and synthesising of a lot of data and trends. Investors want sufficiently different outcomes for their higher fees and active managers will need to continue to show how they add value in the stock-picking process.

Russell and Norvig define artificial intelligence as when a machine mimics “cognitive” functions that humans associate with other human minds, such as “learning” and “problem solving”.

Quantitative investing has been around for over 70 years. Here, investment decisions are determined by numerical methods rather than by human judgement. With modern computers, technology is already deeply entrenched in investing. For example, high frequency trading allows asset managers to trade a large amount of orders at extremely high speeds using computers. However, artificial intelligence (AI) is vastly different to just the use of technology. As AI develops, its uses in investing also continue to expand. Given the sheer size of data available, it is beneficial to use tools and research methodologies for investment insights. This can include real-time market insights, improved economic indicators and greater understanding of investor sentiment.

Humans bring intelligence and understanding not easily replicated. We have a sixth sense, a gut feel that computers will struggle to replicate/synthesise. We are however, limited in terms of the amount of information we can process. In a data rich environment, human beings just cannot process all the information available at any given time. It will take a human being a certain number of hours to read a 100-page document. There are over 9 000 global equity companies. If you expand the universe to include frontier markets and smaller market capitalisations shares, this grows to over 15 000 companies. Given that this spans across 44 countries with many different languages and cultures, help from AI is welcomed. I cover four examples of AI in investing to demonstrate its power.

**Machine learning**

Machine learning is a type of AI that provides computers with the ability to learn without being explicitly programmed with rules or calculations i.e. it is given algorithms to discover patterns in data. In investments, it can be used to understand how seemingly unrelated stocks may move together. Given the universe of 15 000 companies, machine learning can find stocks...

Footnotes: 

1Wikipedia
that tend to move together from different sectors and/or geographies. This relationship can then be used when these two related stocks diverge for no apparent reason, providing an opportunity to potentially exploit this short-term pricing discrepancy.

Machine learning can also be used to understand whether a trade is crowded. If a trade is crowded and the investment view changes dramatically, it can result in many people trying to do the same thing. In this scenario, the portfolio manager may not hold the position as it introduces more risk. Alternatively, he may choose to hold the opposite position if it aligns with his fundamental view, as he will be trading “against” the market.

**Natural language processing**

Natural language processing (NLP) can be used to read thousands of analysts’ reports and can also be used to transcribe company presentations to text (through speech recognition) which can then in turn be used by asset managers to understand sentiment around the company or topic being discussed. Searching various analysts’ reports and the CEO’s company result presentations for positive words can indicate positive sentiment. If there are multiple references to words like upgrade or increased sales, it could indicate upcoming positive price movement. As per BlackRock, in 2015 there was an average of 4,000 brokerage reports per day. This totalled over 36,000 pages in 53 languages. It is virtually impossible for an investment team to use all this information without the help of machine learning technologies like NLP.

**Machine image recognition/classification (computer vision)**

In investments, image recognition can provide leading economic indicators. For example, satellite images can provide insights into consumer spending. By looking at the number of cars parked at shopping centres, we can get a sense of the strength of consumers and the particular retail centre. If no one is parking at malls to shop, we can expect retail companies to show poorer results in future. Economic surveys are very useful to investors and asset managers. They provide us with insight into how people are feeling. One of the downfalls though is that we can feel positive for some time before we take any action. Worse still, our positivity can change before we take any action. Furthermore, economic indicators take time to compile. Therefore, the information may be dated by the time it is available. Satellite images may be available a lot quicker, and therefore the portfolio manager will have data much sooner. This insight provides a distinct advantage over other investors who need to wait for the conventional economic data to be published.

**Companies using artificial intelligence**

Lastly, even if an asset manager is not incorporating AI into their investment philosophy or process, it remains important. Asset managers now need to include the impact of AI on the businesses they analyse (see Amira’s article on disruptive technologies). One example of machine learning that all of us have experienced is Recommender Systems. When purchasing something online, a website typically suggests additional products you may wish to consider (think Amazon or Netflix). This can result in increased sales as people buy additional items that are recommended for them.

Additional examples of artificial intelligence used by corporates:

- Legal firms can use natural language processing to check contracts for ambiguous clauses. By addressing these ambiguities, the contracts can be more robustly worded, protecting clients and legal firms.
- A possible “killer application” of machine learning is “chat bots” which will drive call centres of the future. These chat bots will be subject-matter experts based on information gleaned from company websites and the broader Internet, but have access to human experts in the background for questions that they don’t know the answers to. By being the interface between customers and expert humans, they will “learn” the answers to complex questions that they don’t know the answers to, eventually becoming
capable of answering these. This technology is scalable, can be offered 24 hours a day and can be available in multiple languages. This can save a corporate a lot of costs, and improve the customer’s experience.

- Machine learning can also aid with business retention (through lapse prediction). We all know the effort it takes to make a sale, and therefore we want to retain our clients. Lapse prediction can signal client behaviour that precedes him terminating your business relationship.

As can be seen, there are many possible ways to incorporate AI into investments. AI is truly beneficial when investing globally. The universe is very large and further complicated by different languages, geographies and cultures. AI makes this large universe more accessible and valuable. However, AI brings its own challenges. Any model is only useful if it is well specified and appropriately calibrated. Furthermore, models are backtested using historical data. Typically, historical data may not include outliers or extreme events. Therefore, if the regime changes or an extreme event occurs, the model may not know how to behave in this changed environment. An example of such an event is the Global Financial Crisis in 2008.

AI can be intimidating. Not everyone understands how it works, and therefore may not be comfortable to trust the ‘black box’ with their hard-earned savings. Humans will need to bridge this gap while investors get comfortable with the changes. Needless to say, we are living in a very exciting time.
Disruptive technologies

By Amira Abbas, Research Analyst, STANLIB Multi-Manager

The internet of things, big data, robotics, artificial intelligence – the list of “the next big thing” in the tech space keeps growing, leaving some overwhelmed and often misinformed as to which of these technologies actually have disruptive potential.

The term “disruptive technology” was coined in 1997 by Clayton Christensen, where he conveniently classified all technological advancements as either sustainable or disruptive. Sustainable development in particular, involves advancements in technology that is already known to us (think automated processes, refined apps, better mobile phones, and increases in computational power). Whilst these advancements have the potential to make some companies more competitive than others, they aren’t the ones that render entire industries obsolete or structurally change the way in which people live, work and interact.

In this article, I have outlined some disruptive innovations that have the potential to not only drastically alter industries, but to create entirely new ones.

Biometric authentication

Biometric authentication seeks to link personal information to biological data (such as your fingerprints or DNA). If implemented successfully, there will be no need to carry identification documents, credit cards or even wallets. Payments can be conducted using fingerprint scanners which will link to your personal information and update it in real-time, based on your transactions. This could revolutionise the payment system and massively mitigate fraud.

In South Africa, Grindrod Bank provides services for South African Social Security Agency (SASSA) grant recipients who register using their fingerprints for verification. Thereafter, they may collect their grants by scanning their fingerprints instead of presenting a card or identification document. “The new grant disbursement system was designed to minimise fraudulent grant applications and collections. This has resulted in direct savings of over R10 billion over the five years of distributing the grants as enumerated by SASSA, by the termination of questionable grant recipients from the SASSA database”.

Apple and Samsung have also kicked off the process of biometric authentication where you can unlock your phone with fingerprint access. Samsung have built in biometric eye-scanning that serves a similar purpose. With Apple Pay you can also make secure payments at retailers (using your iPhone or Apple Watch), again validated with your fingerprint, and you can also do this online.

Smart clothing

We have all seen the multi-faceted functionality of smart watches, but smart clothes could disrupt the entire retail industry.

These items can now monitor your heart rate, cadence, ground contact time, pelvic rotation and have GPS sensors that track your motion in real-time. The information tracked by smart clothing is also integrated with online systems allowing for broadcasting live training data, letting athletes and coaches monitor fitness levels.

Footnotes:

2. SASSA Project, Grindrod Bank (2016).
Smart swimsuits have waterproof sensors that tell you when you have spent too much time in the sun and remind you when to re-apply sunscreen based on the temperature and your individual skin type. All information can be tracked on a mobile app.

There are also smart clothing jumpers for babies which monitor their breathing, heart rate and sleeping activity.

From socks and hats, to full suits, smart clothing is not in its developmental phase anymore. They have been launched by big companies (such as Samsung) and are infiltrating the market. These clothes will be able to indicate whether your health is at risk, maintain and update your personal data and improve your overall lifestyle.

**Drones and robotics**

In addition to the hype around driverless cars, Dubai is aiming to release autonomous taxi drones in July 2017, with a quarter of all journeys to be autonomous by 2030. These drones have a flying range of about 30 kilometres and could impact the transportation industry drastically in the future.

Robotics have also spiked productivity for many fields. Medical robotics have allowed surgeons to increase efficiency and could perhaps soon replace them. In 2016, a bot performed surgery on a pig and stitched up its small intestine. It did this by using its own vision, tools, and intelligence. More importantly, the bot performed the operation better than human surgeons who were given the same task.

**Genetic code modification**

Perhaps the most controversial, we should expect a lot more projects involving genetic coding to emerge in the future. A technique called Crispr-Cas9 has allowed scientists to accomplish the unimaginable. It is now five years old and has achieved the ability to reverse mutations that cause blindness, stop cancer cells from multiplying, make cells immune to the virus that causes AIDS, and has even modified crops such that they are impervious to killer fungi and global warming conditions.

It is predicted that genetic modification will soon be able to fix broken genes in the brain, delay aging, and cure “incurable” diseases. New start-ups dedicated to the development of Crispr in agriculture, pharmaceuticals and other areas continue to grow, making this area an exciting one to watch.

**Cryptocurrency**

Bitcoin has been discussed relentlessly over the past few years, but most people are unaware of the multitude of cryptocurrencies, like Bitcoin, that exist and trade on exchanges much like traditional currencies do. Some examples are Monero, Ethereum, Litecoin and Ripple – all of which have their own supply and demand sensitivity factors.

They are essentially digital assets used as a medium of exchange that employs encryption to secure the transfer of units from one party to another. Although this could be viewed as a sustainable piece of technology (supplementing traditional currencies), when cryptocurrencies are coupled with the concept of blockchain, disruption becomes highly probable.

**Blockchain**

Put simply, a blockchain is a database that stores information, particularly transactional data. What makes this “database” special, however, is that it is distributed. In other words, the content is instantaneously shared across multiple users’ servers and nothing is owned or kept by a single provider – this makes the blockchain virtually impossible to hack and its data immutable.

The transactional data are grouped into “blocks” and linked, forming a chain, hence, the name blockchain. It also facilitates legitimate transactions between parties and removes the need for a middleman. Since the blockchain is self-regulating and not owned by any party, it can be viewed as a “single source of truth” with

regard to ownership of assets and no reconciliations would be needed. Cryptocurrencies, for example, make use of the blockchain functionality to transfer units.

Defining blockchain, however, doesn’t really illustrate its disruptive potential as well as examples of its applications do.

**Examples of blockchain applications:**

**Smart contracts**

Smart contracts can execute transactions automatically without default or the added expense of an intermediary. As a simple example, suppose you wish to rent an apartment from a friend where you will receive a security code that grants you access in exchange for R5000 per month. You would normally draft a lease agreement specifying the terms of the lease (date of occupation, rental amount, date of payment, etc.).

With a smart contract, all these terms are instead specified in code on the blockchain. You can convert your R5000 to cryptocurrency and pay it to the blockchain. Similarly, your friend can supply the digital code directly to the blockchain. The blockchain contract will hold both parties’ contributions until a specified execution date. It works on an “if-then” premise – if the money is received on the payment date, you will get the key. If the key is received on occupation date, your friend will receive the money. If your friend defaults, a refund is issued to you. Similarly, your friend will get the digital key back if you do not pay.

Smart contracts can be used for all sorts of situations that range from financial derivatives to insurance premiums, breach contracts, property law, credit enforcement, financial services, legal processes and crowd funding agreements. They are self-executing, so the blockchain monitors what payments are being made through code (for example, in the property market) and then transfers the deeds/ownership contracts to the correct parties once payment has been made, without manual error.

**Online identity management**

A large portion of time is spent collecting, changing and maintaining data from clients, vendors and institutions (FICA documentation for example). All of this admin and storage of data can be avoided through instantaneous data exchange on a blockchain platform. Users register with their information once and update any personal changes, hence updating across the entire network.

Think about when you apply for jobs and send out your CV. Instead, your CV could be sent directly through a blockchain platform to relevant companies. If any of your personal information changes, you simply update your CV and the updated information will reflect immediately. Similarly, your medical information can be shared and updated between you and your doctor in real time and only information you choose to send/receive with authorised parties will be shared.

**Audits and reconciliations**

Since the blockchain ledger is public (distributed across all users’ networks), all a company needs to do in order to be compliant with regulators in terms of transactions and transparency, is provide auditors with their unique ID on the blockchain (also referred to as a public key). That way, all the company’s dealings are available for regulators to check – reconciliations are not necessary as manual errors are removed and transactions executed automatically. This helps mitigate fraudulent transactions, promotes confidence in the financial industry and reduces auditing costs for companies and individuals.

**Trading, clearing and settlement**

One of the biggest benefits of blockchain is the speed at which transactions may be done. On top of that, the clearing and settlement is almost immediate and there is full transparency for all parties involved. Transferring Bitcoin now takes only 10 minutes for the transaction to be fully validated and settled. Local and offshore transfers could be conducted in this manner
and funds can be sent through almost immediately. If there are discrepancies, any party can simply refer to the ledger – this also mitigates counterparty risk.

With improved payment and settlement, stock trading could be done faster and more efficiently through a blockchain, eliminating brokerage costs.

**But technology is amoral**

Besides monitoring advancements to exploit efficiencies, we need to be aware of the risks they pose. Blockchain, along with cryptocurrencies, introduce anonymity amidst transactions, meaning traders could conduct illegal transactions with no consequences. Governments and regulators need to think of ways to mitigate misconduct in the crypto-investment world. Because technology is amoral, the onus is on the end user to decide whether or not to use this technology for “good or evil”.

**Conclusion**

Admittedly, tracking this relentless parade of new technology can be time consuming. On the other hand, it can also be the key to unlocking immense value for an organisation. If Kodak had the foresight of digital technology disrupting their industry, perhaps their business would still be around.

These examples are just some of the innovations that can shake up the world. Blockchain, along with cryptocurrencies, offer tremendous potential in the investment and asset management industries. It wouldn’t be a stretch to go as far as saying blockchain could be as big as the internet.

Productivity and cost saving could surge and investment markets as a whole, might be entirely different in years to come – we need to be ready for it.