TRANSFORMING SOUTH AFRICAN INDUSTRY

IOT IN THE MINING, AUTOMOTIVE AND INSURANCE SECTORS

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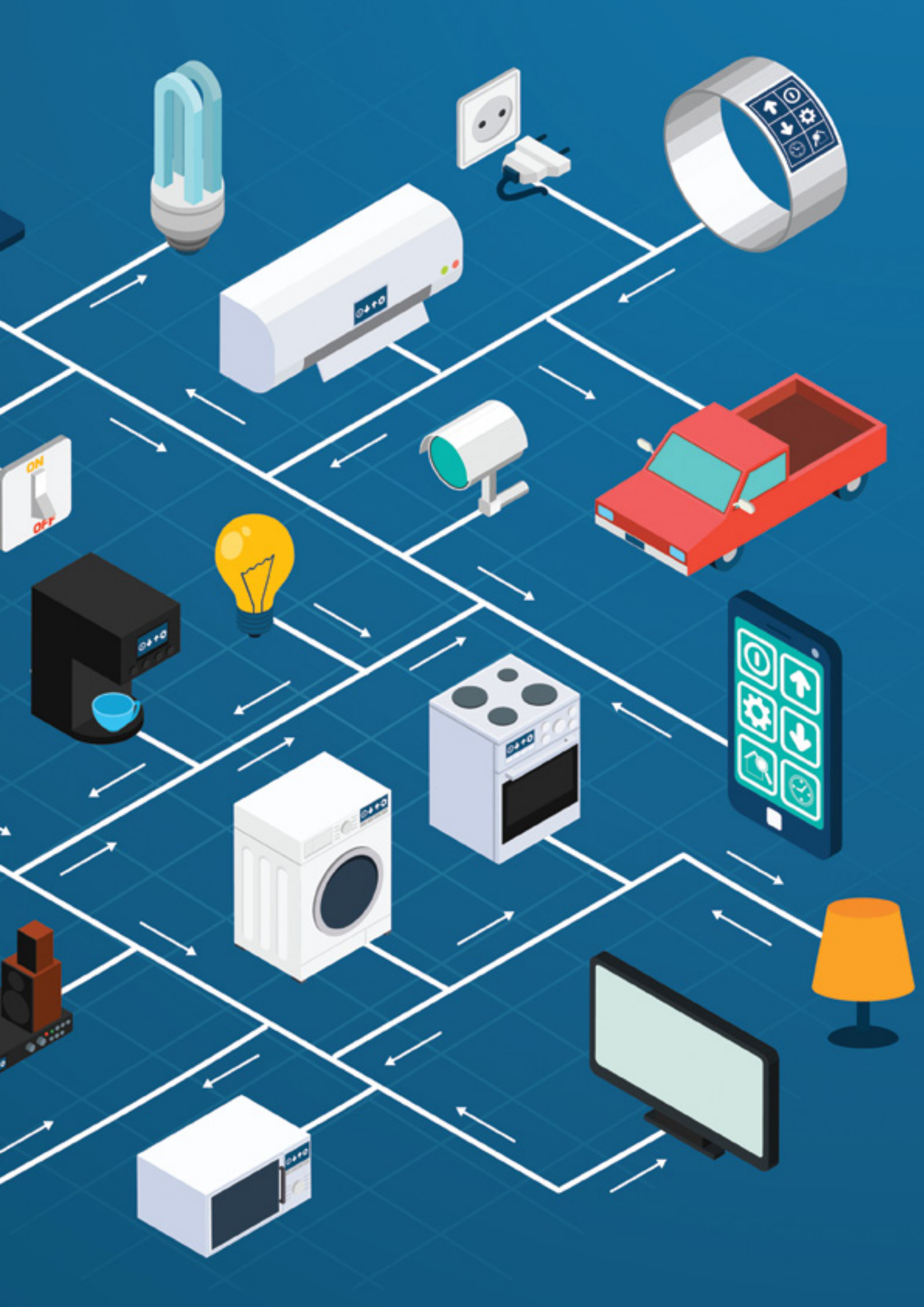
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INTRODUCTION

South Africa's economy has seen declining GDP growth since 2010, with an expansion of only 1.3% in 2015, substantially below government's target of 5.4%, as set out in the National Development Plan (NDP). According to ratings agency Moody's[1], growth is expected to slow further due to the impact of the drought, the worst seen in a century, low commodity prices and the volatility seen in global and domestic financial markets since December 2015. The International Monetary Fund is forecasting GDP growth of 0.7% this year and 1.8% in 2017[2]. (See Figure 1).

FIGURE 1: SOUTH AFRICA GDP ANNUAL GROWTH RATE

SOURCE: TRADINGECONOMICS.COM[3], STATISTICS SOUTH AFRICA

Can South Africa reach the NDP's 5.4% growth rate, which is seen as necessary to cut unemployment, where the official rate is around 25%, and eliminate extreme poverty? A 2015 report by consultancy McKinsey & Company predicts that focusing on five priorities could increase South Africa's GDP growth by a total of 1.1 percentage points a year by 2030 and create 3.4 million new jobs[4]. The five priority areas are advanced manufacturing, service exports, natural gas, infrastructure productivity and the agricultural value chain.

Currently, the largest sector in the economy is services, which accounts for around 73% of GDP. Within services, the most important are finance, real estate and business services (21.6%) and government services (17%). Manufacturing accounts for 13.9% of GDP; mining and quarrying for around 8.3% and agriculture for 2.6%, according to data from Trading Economics[5].

In this paper, we explore the digital disruption opportunities offered by the Internet of Things (IoT) for the three sectoral divisions of the South African economy. In the primary sector, we look at the impact of and opportunities presented by IoT for the mining industry; in the secondary sector, we consider IoT in the context of the automotive industry; and in the tertiary sector, we discuss IoT and its implications for the insurance sector.

The South African economy, led by an innovative services sector, creates opportunities for diverse IoT applications and for the capture of diverse business values in service ecosystems. In the automotive sector, where South Africa serves as an outsource location, automation offers opportunities to improve production efficiency, as well as alignment with consumer intelligence. The extraction sector is facing considerable structural challenges such as reduced international commodity prices, rising costs, an increasing regulatory burden and declining productivity. IoT offers opportunities for reconsidering the operational model of the sector.

METHOD AND SAMPLE

In order to collect opinions and experiences from stakeholders from the mining, automotive and insurance industries, we deployed a number of data collection tools.

In the mining sector, the researcher relied on publicly available documents, as few potential interviewees were open to discussions. In the automotive industry, data was collected through observations from field visits to two production plants in Rosslyn. These observations were combined with interview data and additional materials available online. In the insurance industry, the researcher organised four small group discussions, with two to three discussants in each. (See Figure 2 for a list of participants and data collection methods.) The data collection was carried out between 2 October and 25 November, 2015. In addition to the named participants from the insurance, automotive and mining industries we would like to thank Bruce Taylor (Dimension Data) and Martin Sanne (Siemens) for their contributions.

FIGURE 2: PARTICIPANTS

	FOCUS	DATA COLLECTION METHOD	ROLE
MINING	Anglo American	Secondary documents	
	SAP	Georg Gradl (interview)	Director: SAP for Mining and Metals
AUTOMOTIVE SECTOR	Nissan	Francois Retief (interview)	General Manager: Supply Chain AMI Region
		Clyde Phooko (Nissan Rosslyn plant tour)	Logistics Process & Quality Engineer
	BMW	Secondary documents BMW Rosslyn plant tour	
INSURANCE INDUSTRY	KPMG Africa	Frank Rizzo & Karin Kruger (group discussion)	Technology sector leader Associate Director
	Discovery Insure	Marty Epstein & Thembalihle Baloyi (group discussion)	Head of Telematics Founder and Executive Director
	CTrack	Mark Rousseau & Pierre Bruwer (group discussion)	DigiCore Group Chief Operating Officer Managing Director: Value Added Services
	Nedbank	Shannon Naidoo Bruce Barker Dimitri Kyriazis (group discussion)	Enterprise Architecture Executive IT Security Lead Architect

INSURANCE

INDUSTRY OVERVIEW

Services is the most important sector in the South African economy, contributing around 73% of GDP. Yet, there is untapped potential: according to McKinsey & Company, the country currently captures only 2% of the market for service imports in the rest of the continent[1], which is worth nearly half a trillion rand ($32.7 billion, or nearly 10% of South Africa's GDP). Promising growth areas include wholesale and retail banking, and insurance.

The long-term insurance market, which focuses on products such as life, health and disability insurance, is dominated by five players: Discovery, Liberty, MMI, Old Mutual and Sanlam. In 2014, the industry earned a return on average equity of 21%. Its total comprehensive income amounted to R28.4bn, reflecting a year-on-year increase of 17%, according to a PwC study[2]. It had total invested assets of R1.96 trillion at the end of 2014.

Challenges facing the long-term insurance industry includes a number of regulatory changes, such as Treating Customers Fairly (TCF) and the Retail Distribution Review (RDR), low economic growth, high levels of unemployment and energy constraints, PwC said. Client centricity also remains a key priority, and companies are seeking to better understand their clients' needs in order to provide fit-for-purpose products[2].

The short-term insurance market, which include products such as motor vehicle policies, is dominated by Mutual & Federal, OUTsurance, Santam and Zurich. In 2014, the sector reported earnings of R3.08bn, an increase of 23%, thanks to improved underwriting margins[3]. It had total invested assets of R26.6bn, reflecting an increase of 10%.

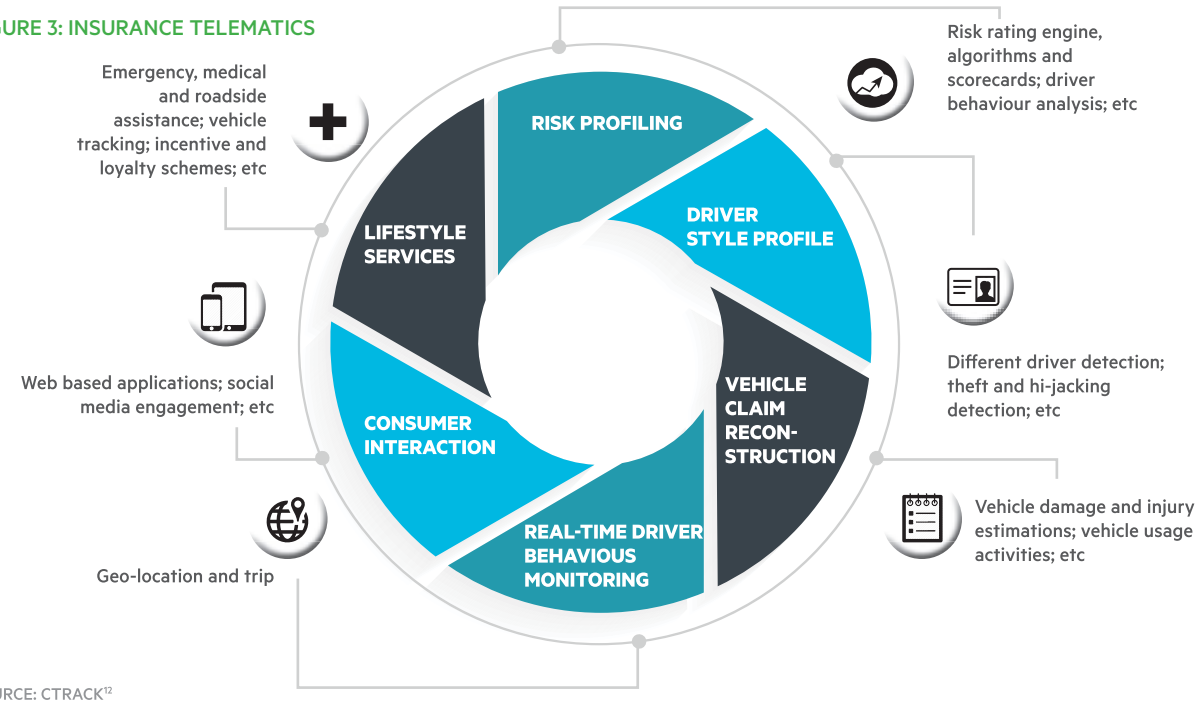
Key indicators for the short-term insurance market are the claims ratio, which is calculated as claims payable as a percentage of premium income; and the underwriting margin, which takes into account the profit earned on a premium after losses and administrative costs have been paid. The challenge for short-term insurers is therefore to reinsure their potential losses at competitive rates, and to cut costs and to handle their claims in the most efficient and accurate way possible[4].

THE POTENTIAL FOR IOT IN THE INSURANCE SECTOR

IoT is fundamentally changing what insurers know about their customers, and how they interact with them. These changes are affecting the core of the insurance business model by shifting the role of insurance companies from providing restitution to delivering prevention services.

New technologies are changing the way insurers determine risks by providing opportunities to directly monitor client behaviour and engage in advice-led customer interactions. Competitive demands in the sector require that underlying data is converted into information as rapidly as possible, preferably in real time, in order to deliver a competitive edge. Meanwhile, the level of personalisation is constrained by concerns of privacy protection and fairness. Insurers' growth prospects are impacted by a shifting risk landscape, new

FIGURE 3: INSURANCE TELEMATICS



SOURCE: CTRACK[12]

competition from both within and outside the traditional insurance industry, and the increasing risk of disintermediation. The level of transformation brought to the insurance industry by IoT requires considerable strategic foresight by insurance companies, the creative use of technology and a willingness to increase risk exposure. IoT technologies are shaking up established practices in the industry and the incumbent way insurers do business:

"The biggest barrier for existing insurers adopting this type of technology and using [IoT] is because they have an existing book. And their imagination is limited by what they have known. [...] So maybe we are not caught up in the sins of the incumbent. The incumbent only thinks of 'I've got a profitable book' and I need to protect this profitable book. But they forget that things are evolving rapidly going into the future." – Thembalihle Baloyi, Discovery Insure

IMPROVED RISK-CENTRIC ANALYTICS

One definition of information is that information is the reduction of uncertainty.[5] Measurable uncertainty is known as risk. Risk assessment is at the heart of the insurance industry. More accurate estimates of risk mean insurance companies can reduce costs and liabilities.

Traditionally, insurance companies have excelled in developing complex models for risk assessment, pricing and underwriting. The extensive analytic capabilities of IoT applications introduce new, interactive, personalised and real-time mechanisms for assessing risk. Insurers are no longer constrained by customer characteristics (e.g. age, sex, past claims) in assessing risk. Instead, they can rely on detailed data, collected in real time and modelled using tools for business intelligence, predictive modelling and real-time identification of patterns and trends. The case of using telematics data in the development of insurance products presents a clear illustration of the value of IoT technologies in transforming risk assessment. IoT allows vehicle insurance companies, for example, to complement established factors in risk assessment with the relative risk indicated by factors derived from real-time driving data, such as speeding. Access to IoT data enables vehicle insurers to price in this relative risk in the premiums they offer to customers:

"Within the traditional insurance market, they are likely to rate your age, your gender, etc. to come up with the price. We find that the variance of drivers, even if you do that thin slice of people, they are all young drivers, they are all males, that there is so much variance between good and bad drivers. If you don't understand that variance you are basically at tremendous risk of having a bad selection [of drivers]." – Marty Epstein, Discovery Insure

Figure 3 illustrates the chain of use of telematics for short-term vehicle insurance. Telematics data (e.g. kilometres driven, acceleration, location, speed), captured by dedicated tracking devices or mobile applications, is used to improve risk assessment, profiling and to adjust the price to the assessed risk. Access to such real-time monitoring data enables insurers to provide advisory insights into risks regarding vehicle theft and maintenance.

It also allows a quick reaction to incidents compromising security (e.g. hijacking) and driver safety. In response to the accumulated monitoring data, insurance companies are able to assist with emergency medical and roadside services.

CHANGING OPERATIONS

As new data collections and analytics tools are impacting the insurers' business model, technology innovations are starting to change the operations of insurance companies. Operational costs for claims assessments and investigations are being reduced by the availability of detailed monitoring data. For example, in the case of vehicle insurance, telematics data allow companies to process claims much more efficiently. Insurance

companies have access to detailed reports that allow them to determine exactly what they need to know in order to assess their liabilities:

"Where we have seen it, it impacts underwriting, and what premiums they give customers. It is now starting to enter into the claims process. I think it is going to start driving the entire value chain in the insurance world, where they start making decisions based on the data and not based on judgement." – Karin Kruger, KPMG

As insurance is increasingly becoming service-oriented, insurance companies are undergoing organisational changes. IT departments, technology development partnerships, customer engagement, delivering predictive, advisory and safety services; are becoming increasingly important. Discovery Insure, for example, now operates a 24-hour call centre. The human factor, alongside with the technology, allows them to deliver a customer-centred service that is up-to-the-minute, seamless and unprompted.

"Every time we get a very high G force reading, it sends an alert to our team. Then they can monitor the situation [...] and call out to see if the client needs assistance, and send emergency services as needed. So that is a real value add. Insurance, all of us think of insurance as a service. The insurance product becomes also about having a service, rather than just a policy." – Marty Epstein, Discovery Insure

In an increasingly complex business and economic environment, insurance companies need to be able to dynamically manage their structure. Building departments and processes that complement the evolving business model is essential.

CUSTOMER INTELLIGENCE AND ENGAGEMENT

Historically, insurers have studied their customers by segmenting markets, identifying prospects, measuring campaign effectiveness, and spotting cross-selling opportunities. The abundance of data presents insurers with the opportunity to "refocus their business on customers instead of products"[13]. They are able to acquire deep and comprehensive understandings of collective, as well as individual customer requirements and behaviours.

By relying on data from web navigation, social media use, data entry patterns, call centre conversations (i.e. mined in real-time for key phrases), insurers are able to focus on customer development, rather than product development. They are able to deliver personalised or tailor-made offerings to guide customers and to optimise pricing per product and per customer.

Consequently, technology-based mechanisms for customer engagement are becoming central to the operations of insurance companies. IoT technologies are increasingly becoming the interface for such customer engagements. In many cases, mobile phone applications are becoming the main touch point between insurance companies and their clients.

Mobile devices are able to collect considerable amounts of data about the behaviour of insurance policy holders. For example, in the case of telematics data, mobile devices compare favourably to existing telematics devices which are 15-20 years old. Mobile phone applications are practically free for the user, while they are able to collect additional data (e.g. mobile phone distractions while driving) which telematics black boxes do not provide. Furthermore, as opposed to legacy telematics tools, data from mobile phone apps is transmitted in real-, or almost real-, time. As such, it has a higher level of effectiveness:

"It is the real-time information that has a much more positive influence on changing behaviour than information that is historical. If I told you how you were driving last month, it is not very useful for your driving this month. When we ran the Discovery Insure driving challenge and compared drivers who use the app on a daily basis, to those who used the black box, we saw that there is a significant improvement for those who use the app." – Marty Epstein, Discovery Insure

Furthermore, mobile phones and applications are geared towards delivering satisfying user experiences and influencing behaviour through gamification. By using such tools, insurance companies are able to gain sustained engagement with their clients, position insurance products and services within the context of people's everyday lives, and increase their relevance.

"It speaks to this whole trend of gamification. I thought Discovery is starting with the gamification of this. They set targets for you, they set badges, rankings. So they encourage me and Person X to have a competition, to see who is the better driver. [...] The thinking is as a group, we as [Company Y], let's see who is the best driver of the week and it becomes a status thing." – Frank Rizzo, KPMG

As mobile devices are embedded in the hands of every user, insurance companies are in a position to interact continuously with their clients and detect their risk-prone behaviours.

DISCOVERY INSURE DRIVING CHALLENGE

"The value of the mobile app is that it is collecting a lot more data so we know that it is better. But it is not just that, it's because of the level of interaction, the kind of interaction points that you create for the client. And that is what is driving the change in driving behaviour." – Thembalihle Baloyi, Discovery Insure

The Discovery Insure Driving Challenge was introduced in 2014. As it was open to clients and non-clients of the company, it saw 60 000 participants download the app. Discovery was able to collect over 70 million kilometers of driving behaviour data. The average trip rating was 3.5 out of 5 over the three months of the first Challenge. On average, participants improved their driving behaviour by 20% within the first two days. Men were found to be more prone to speeding and harsh cornering, while

women had a tendency to harsh braking and cellphone use.

Discovery established that real time information, delivered via mobile phones, has a much more significant influence on changing behaviour than historical information. With the mobile app, Discovery were able to communicate clearly and in real-time to participants how they could correct their driving in order to be eligible for reduced premiums and fuel rewards. This contributed to the creation of a virtuous cycle where drivers received feedback on their driving, changed their behaviour, and the change was reinforced by financial incentives.

OTHER FINANCIAL SERVICES

As insurance is being transformed as a result of IoT by improved risk assessment tools, changing operations and customer engagements, it is becoming increasingly obvious that ripple effects are bound to emerge throughout the financial sector. The business case for IoT investments is typically bound up with the whole financial ecosystem. As data accumulates and improved understandings of risk are being developed, such information is becoming increasingly relevant to a broad range of financial institutions, including credit rating companies and banks. These institutions are increasingly becoming involved in looking for business processes which would allow them to leverage such information. Banks can e.g. IoT data on smart energy use towards the assessment of home loan applications, which may be used to determine the affordability of the applicant, or other products from the banking system:

> “ULTIMATELY, POSITIONING THE INNOVATIVE USE OF TECHNOLOGY WITHIN THE FINANCIAL SECTOR ECOSYSTEM IN ITS ENTIRETY WILL LIKELY HAVE SUFFICIENT BENEFITS TO JUSTIFY THE INVESTMENT REQUIRED.

“The new financial models or business models that might exist for banks [...] do require [IoT] information to come into the bank. And while we might not be the first level of interrogator to that information, we might be just behind the aggregators to take that information, to use it in some sort of cognitive way and drive our processes out.” – Shannon Naidoo, Nedbank

Ultimately, positioning the innovative use of technology within the financial sector ecosystem in its entirety will likely have sufficient benefits to justify the investment required. Thembalihle Baloyi, CEO of Discovery Insure, explains the development of their telematics-based vehicle insurance product as an element in the financial ecosystem:

“ So if it is insurance, what else could you use it for? Could you predict behaviour in terms of banking? Could you predict behaviour in terms of health? Can you predict behaviour in terms of credit card usage? All these things. When [we started] imagining that and looking at the prospect of using this information, to me, and to the business, it became [clear]: ‘Yes, this is one we want to try’. As opposed to this is purely an insurance play.” – Thembalihle Baloyi, Discovery Insure

MINING

INDUSTRY OVERVIEW

South Africa's mining industry is a key sector in the economy, accounting for around 8.3% of GDP, nearly half of exports[14] and employing around 480 000 people by the end of 2015[15]. The country is a major producer and exporter of gold, platinum group metals (PGM), iron ore, manganese and coal.

However, the industry has been under pressure. Recently, it has endured the impact of low commodity prices which put as many as 50 000 jobs in the sector at risk in 2016[16]. Other issues include declining productivity, rising costs and increased regulatory pressure, notably to increase black ownership in the sector[17].

Figure 4 shows the changing contribution to GDP from the mining sector over the past decade.

South African mining companies have been cushioned somewhat from the drop in international commodity prices by the weakening of the rand, which lost more than 30% of its value against the US dollar in 2015, according to Bloomberg data. The rand/dollar exchange rate continues to trade near historically low levels. However, the benefits of a weakening currency are seen to be short-term in nature due to the inflationary impact on the local economy. This will have knock-on effects, such as wage inflation and the increased cost of imported capital equipment, in the medium term[19].

Given the challenges facing the industry, mining companies need to re-asses and restructure their business models in order to stay competitive in a low-price environment, while economic, social and political pressures mean that there is clear need to re-invent the mining industry in South Africa.

THE POTENTIAL FOR IOT IN THE MINING INDUSTRY

By blending the boundaries between physical and digital assets, IoT is starting to influence the mining sector worldwide. IoT offers companies the opportunity to improve the efficiency of their operations by introducing new technologies and solutions:

"Investments [in IoT] are made mostly on [the grounds of] business benefits around cost savings. [...] If you bring IT into operations, the primary expectation is to run the same operation at a lower cost, or to add more efficiency into the operations. Whether it is based on shorter or longer maintenance cycles, so maintenance cost go down, or whether it is related to higher production output where the same amount of people, the same amount of trucks and so on [lead to increased production]. All of that is essentially the driver [for IoT adoption] from a mining point of view." – Georg Gradl, SAP

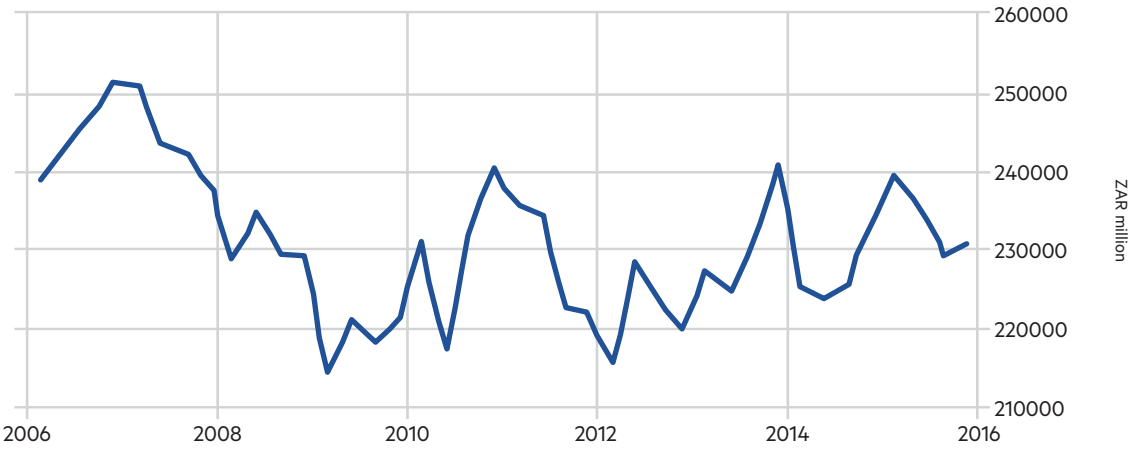
By integrating a web of technologies like virtualisation, sensors and robotics, IoT allows mining companies to manage the mine as a system over which it has complete control.

Many companies, especially those operating underground mines, are already putting radio-frequency identification (RFID) devices on employees' helmets and in their clothing to make sure they have an exact view on who is currently in which part of my mine. This visibility allows them to react quickly and to alert people immediately in case of an emergency.

In South Africa, the Mine Health and Safety Act[20] requires that any trackless vehicle (i.e. any self-propelled machine mobile by virtue of its movement on wheels, skids, tracks, or mechanical shoes, excluding rail bound equipment) should be able to detect the presence of pedestrians in its vicinity in order to avoid collisions.

Companies have started to implement IoT solutions in order to address such requirements. SAP[21] offers a solution where a person's RFID tag is read by sensors in the mine, and software in the truck makes its driver aware if there is anyone in the truck's proximity by sounding an alert. If a person comes close to the vehicle, the software prevents the truck from moving on. Data-intensive exploration can offer further gains. Figure 5 offers a view of the IoT pyramid in the mining industry. Information is collected by various pieces of equipment deployed in the mine (e.g. motors, pumps, drilling rigs, autonomous vehicles). This is then passed on for analysis via

FIGURE 4: SOUTH AFRICA GDP FROM MINING



SOURCE: TRADINGECONOMICS.COM[18], STATISTICS SOUTH AFRICA

[15] http://www.moneyweb.co.za/news-fast-news/south-africa-mines-dispute-pits-inequality-against-investors/
[15] http://www.statssa.gov.za/publications/P0211/P02114thQuarter2015.pdf
[16] http://ewn.co.za/2016/02/15/Job-cuts-to-escalate-in-South-African-mines-as-global-economy-slows
[17] http://www.moneyweb.co.za/news-fast-news/south-africa-mines-dispute-pits-inequality-against-investors/
[18] http://www.tradingeconomics.com/south-africa/gdp-from-mining

telecommunications carriers to IoT platforms, human and external interfaces.

IMPLICATIONS FOR OPERATIONS

Global market intelligence firm IDC has identified three critical elements of digital transformation in the mining industry[23]. First and foremost, mining companies are required to consider transforming their operating model in order to leverage connections among objects and people in order to create more effective and efficient operations. Solutions for asset management and predictive maintenance, for example, can minimise outages and improve performance. Meanwhile, integrating streams of operational data with outward-facing systems for tracking and logistics can bring gains through dynamic planning and scheduling.

Information transformation is the second change miners need to be aware of. By treating data collected across operations as an asset, it can be utilised to derive new analytical understandings and ultimately to create greater value:

"Take a Caterpillar truck which 10 years ago captured a certain amount of data about its conditions. If you look at it now and the amount of data it generates, it has been multiplied by a factor. [...] Many of these sensors are capturing individual messages. A truck in the mine captures the data whether it is loaded or not, how the engine is running, what the tyre pressure is; this is individually related to the truck.

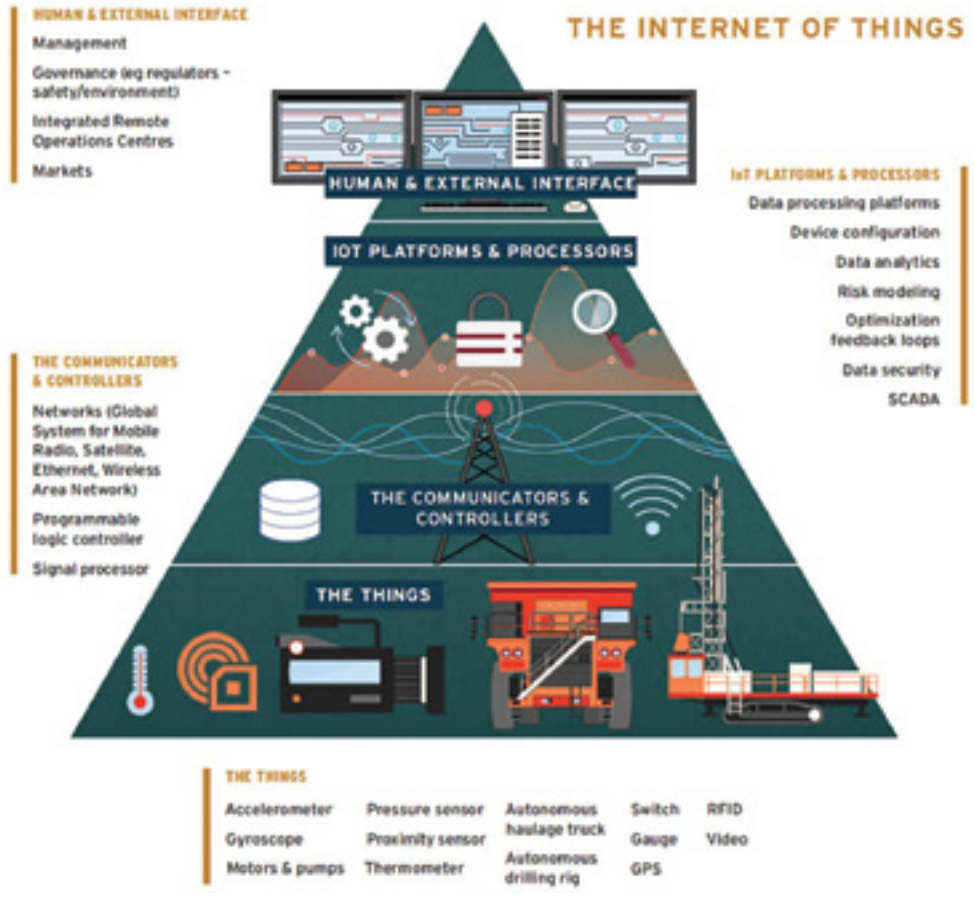
Then there is probably another sensor which captures which people are walking around in the mine and where they are, in which part of the mine. You need to bring these two together in order to avoid that a truck runs over a person, just as an example.

And you need to probably bring in weather conditions because it may also have an impact on how trucks are operating. [...] And it gives an indication as to why the output on a given day is lower than on another [day], given that the same number of trucks are operating, the same conditions have been applied elsewhere but another factor has changed." – Georg Gradl, SAP

Thirdly, increased digitisation in the mining sector requires companies to take steps towards transforming their workforce. Digitisation requires more sophisticated human resource interventions. Transforming workers' skills, changing work practices, revising employee roles and core mining processes, combined with the introduction of technology, offer a way for improving productivity.

Figure 4 summarizes how the transformational impact of IoT technologies is delivered in mining via things, communicators and controllers, IoT platforms and processors, as well as via the human and external interface.

FIGURE 5: IOT TECHNOLOGIES IN MINING



SOURCE: MARS[22]

[22] https://www.marsdd.com/news-and-insights/mining-industry-iot-technology/
[23] IDC, 2015

AUTOMOTIVE INDUSTRY

One of the priority areas that has been suggested by McKinsey & Company to increase growth in South Africa[24] is advanced manufacturing. McKinsey's proposal revolves around utilising the country's relatively skilled labour force to create a globally competitive manufacturing hub, which is focused on high-value added categories such as the automotive sector. In order to realize this opportunity, however, local manufacturers would need to improve their innovation and productivity levels.

INDUSTRY OVERVIEW

The automotive industry is one of the oldest manufacturing sectors in the country, and was established with the assembly of the Model T Ford in Port Elizabeth in February 1924. This was followed by the establishment of plants for General Motors SA (1926) and Chrysler (1937). Today, other manufacturers with local operations include Mercedes Benz, Toyota, BMW and and Nissan.

Automotive clusters have since developed in close proximity to supply routes in the Eastern Cape (Port Elizabeth and East London), KwaZulu-Natal (Durban) and Gauteng (Rosslyn, Pretoria).

The automotive industry is South Africa's largest manufacturing sector, accounting for 7.2% of GDP in 2014, down from a peak of 7.6% in 2006, according to date from the department of economic development[25].

Despite the country's long history as an automotive manufacturer, South Africa owns no domestic vehicle brands and remains a small cog in the global vehicle industry. The challenge for local producers is therefore to tap into global supply chains and international trends, and ensure that the local industry can remain globally competitive and relevant.

The National Association of Automobile Manufacturers of South Africa (Naamsa) is expecting new vehicle sales to decline by between 9% and 10% in volume terms in 2016 to about 375 000 units, down from 412 826 sold in 2016. This would be the third year of declines, following a 0.7% drop in 2014 and a 4.1% decline in 2015[27]. Exports could rise by as much as 12.5% this year, Naamsa said, assuming there is an improvement in the global economy.

Despite the challenging environment for local sales, South African vehicle production is conservatively expected to increase about 4% in volume terms to about 640 000 units. As a major employer – the new vehicle manufacturing industry alone employed more than 30 000 people by the end of 2015[28] – the industry has benefitted from government support in the form of the Automotive Production and Development Programme (APDP), which provides financial incentives to encourage investment in the sector and expires in 2020. In 2015, capital expenditure by Naamsa members totalled R6.6bn, the second highest yearly figure on record. This number is expected to increase to R7.6bn in 2016, and reflects manufacturers' investments under the APDP and the associated higher levels of production for the export market.

THE POTENTIAL FOR IOT IN THE AUTOMOTIVE SECTOR

DYNAMIC GLOBAL SUPPLY CHAINS

When a customer orders a vehicle at a dealership, he/she is issued a 'promise date'. Efforts throughout the industry's global supply chains are geared towards the goal of meeting this date. The timely identification of faults or delays in the production process allows manufacturers to ensure that the delivery 'promise date' is met:

"The key for a full supply chain to meet that [date] is to have accuracy throughout. Our container stock accuracy is 100% and warehouse stock accuracy is never below 99%. You need that accuracy to allow predictability to meet that promise date."
– Francois Retief, Nissan

Instrumentation of international supply chains is a long-standing process. South African manufacturers work with global and local suppliers in order to ensure so-called box-by-box traceability. As RFID-tagged boxes arrive in assembly plants, fixed RFID receivers detect them and notifications are automatically sent to warehouse operators, telling them where to bin the parts received, so that they are in position to hit the assembly line.

The control system ensures that the trim and assembly lines are mirrored on the warehouse floor, and dynamically allocates boxes based on the available space. While visibility of supply chains is high, instrumentation can be taken even further by means of IoT. For example, while orders are tracked during assembly, the individual unfinished vehicles are not. By using smart tags to track the manufacture process, automotive dealers may be able to ensure that the right customisations are installed on the specific vehicles.

Smart automotive supply chains use greater instrumentation and interconnectivity to improve product quality at delivery and

FIGURE 6: SA'S SHARE OF GLOBAL PRODUCTION (MILLIONS OF VEHICLES)

	2000	2006	2010	2011	2012	2013	2014	2015	% change 2015 / 2014
Global production	58.4	69.33	77.61	79.88	84.14	87.27	89.77	90.68	+1.0%
South africa production	0.357	0.588	0.472	0.533	0.546	0.546	0.566	0.616	+8.7%
SA share of global production	0.61%	0.85%	0.61%	0.67%	0.64%	0.63%	0.63%	0.68%	+7.9%

SOURCE: NAAMSA[26]

[26] http://www.naamsa.co.za/papers/2015_4thquarter/NAAMSA%20QUARTERLY%20REVIEW%20%20-%20%204TH%20QUARTER%202015.pdf
[27] http://www.moneyweb.co.za/news-fast-news/car-industry-faces-tough-2016-as-economy-falters/
[28] http://www.naamsa.co.za/papers/2015_4thquarter/NAAMSA%20QUARTERLY%20REVIEW%20%20-%20%204TH%20QUARTER%202015.pdf
[29] (Kagermann, Wahlster, & Helbig, 2013)

supply chain operations. Historically, dealers and service/repair shops possessed the most information about the consumer, with original equipment manufacturers (OEMs) and suppliers having the least. As the supply chain becomes more integrated, information is shared across the network and customer insights become increasingly informative of the production process.

DECOUPLED AND FULLY FLEXIBLE PRODUCTION

Ever since Ford piloted their Model T, automotive manufacturing has been synonymous with static production lines that follow strict, predefined sequences. Even small modifications of the product or introducing variants may require reconfigurations of the production line, adding considerable costs.

Incorporating customised requests, other than selections from a range of colours and features within the product group of a specific car model, has therefore not been economically viable. For example, including fittings (e.g. seats, lights, etc.) from a different model by the same manufacturer has been virtually unthinkable.

As technology has developed, many manufacturers are now relying extensively on robots and automated production lines. However, automation is mainly used for elements of the production process contained in the 'body shops', i.e. where building the metal body of the vehicle takes place. In contrast the trim lines, i.e. the part of the assembly process where vehicles are fitted with features inside and outside the cabin, continues to rely mainly on manual labour. In South Africa, largely due to the comparatively lower labour costs, the production process tends to be skewed towards manual input:

"The tendency is for body shops to be very automated, [...] in most cases a body shop is more than 80% automated. We are more manual [in South Africa] than some other countries [such as] Mexico, Spain, Japan, [where] body shops are fully automated. Trim lines [use] a lot of support tools to manufacture the vehicle but it is still quite manual."
Francois Retief, Nissan

Although full automation in automotive manufacturing is a worldwide trend, it remains relatively expensive and is largely limited to geographies where manufacturers are able to achieve appropriate returns on investment. Automation also requires highly skilled workers who are capable of maintaining the sophisticated equipment. These factors appear to limit the level of automation introduced in South African vehicle assembly plants.

"We make use of automated guided vehicles to move components to the production lines, […] not so much here because labour rates are not as expensive as in Europe, but the trend to expand the use of smart automation will continue as the cost of these technologies reduce." – Francois Retief, Nissan

The German Industry-Science Research Alliance[29] suggests that automotive manufacturing is due to be disrupted by dynamic production lines, due to the rise of connected objects and equipment.

> "HISTORICALLY, DEALERS AND SERVICE/REPAIR SHOPS POSESSED THE MOST INFORMATION ABOUT THE CONSUMER, WITH ORIGINAL EQUIPMENT MANUFACTURERS (OEMS) AND SUPPLIERS HAVING THE LEAST."

In this scenario, vehicles become 'smart products' which interact with smart production technologies and move autonomously throughout the assembly halls of automotive manufacturing plants. This progression from static to dynamic production lines will make it possible for vehicles to be fitted with any variation of components (e.g. fitting a seat from another vehicle series). As the production process does not have to follow any set sequence, vehicle manufacturing becomes much more flexible and responsive to external changes.

In order to stay relevant, South African automotive manufacturers need to develop strategies to address the rising automation challenge. Upskilling workers and integreating local production techniques with global trends will be key to remain globally competitive.

ELECTRIC (EVS) AND CONNECTED VEHICLES

One of the disruptive forces in the automotive industry is electric and connected vehicles. EVs tend to incorporate features of the 'connected vehicle' concept.

Current EV offerings incorporate IoT applications that improve the driving experience, as well as extensive aftersales packaged services for vehicle maintenance. For example, Nissan Leaf EVs offer remote controls via a mobile application, timers for cooling and heating and the transfer of driving instructions to the on-board computer. BMW offers TeleServices packages that rely on IoT concepts in order to determine exactly what servicing work needs to be carried out and ordering all the necessary spare parts, before arranging an appointment with the customer.

Finding the balance between price and the integration of IT into vehicles is complex. In Africa, the demand for EVs is insufficient to warrant their manufacture in South Africa. Challenges hampering EV take-up include cost and a lack of recharging infrastructure.

Finding ways to introduce such innovations to African consumers appears key to ensuring the relevance of the South African automotive manufacturing in the global industry. Enhancing locally relevant models with features of EVs and connected vehicles can serve as a strategy.

CONCLUSION

> “IF I WANT TO BECOME PART OF A BIGGER DIGITAL ECOSYSTEM, TO MAINTAIN MY REVENUE STREAMS AND BE PART OF A BIGGER [...] OUTCOME FURTHER DOWN THE LINE, I’VE GOT TO CHANGE MY APPROACH. IT CAN’T BE A ME-ONLY. IT’S GOT TO BE ME-WITH-THEM.” – BRUCE TAYLOR, DIMENSION DATA

There are a number of critical factors that will enable businesses to benefit from IoT and realise financial gains from introducing sensor-based technologies in their operational models:

1. END-TO-END PARTNERSHIPS ACROSS DISPARATE ECOSYSTEMS

Enterprise customers for IoT technologies need a compelling story to justify large investments in this transformational space. While large IoT vendors are ready to create end-to-end IoT solutions across vertical business units, it remains difficult to convince business executives of the investment case of these solutions.

Delivering end-to-end services to their customers require businesses to develop new skills within their organisational structures. Deriving value from IoT requires companies to develop a full end-to-end view: they cannot understand just the connectivity, just the sensors, or just the data. They also have to understand how to derive meaningful analytics from the data, how to visualise it, and how to apply the findings in their engagement with clients.

As a strategy for addressing this challenge, companies are finding partners who are looking for ways to work together and can contribute expertise. This can be a risky strategy, as more business partners mean more moving parts to manage.
Connected vehicles present a cross-cutting case. For example BMW, Bosch, Daimler, EnBW, RWE and Siemens have come together for the initiative “Hubject”1, with the aim of simplifying electric mobility. Hubject operates a cross-industry business and IT platform that connects charging infrastructure, service and mobility providers across Europe. This enables Hubject to connect electromobility service providers, charging station operators, energy suppliers, fleet managers and manufacturers, and to utilise analytics to provide value-add services (e.g., identifying the closest charging station and suggesting charging routines) to clients.

2. OPEN STANDARDS AND LOW-COST HARDWARE

As partnerships emerge across the IoT ecosystem (e.g. hardware vendors, software companies and network operators), there is a strong push towards the adoption of open standards, which can help to accelerate collaboration. Open standards can lead to improved data management and integration. The scalability of IoT also hinges on the availability of low-cost IP-enabled sensors and IoT-ready network infrastructure to achieve near-zero latency.

3. THE HUMAN FACTOR

As IoT applications mandate organizational development, growing IT skills and customer-centred operations, the human factor is a critical factor for its successful implementation. In the South African environment, automation and its impact on jobs can be the source of considerable tension. Upskilling is critical to maintain competitiveness:

“It is a myth that mechanisation destroys jobs, it doesn’t. Industry 4.0 and mechanisation in mining is proving that your job changes, your skill level changes, the type of jobs change. But a mine still needs people. It will never be 100% automated. The repetitive and dangerous jobs get automated. You can have a robot setting blast charges underground in dangerous areas [if something happens] oh well, I am sad about the robot but no one dies. At a different level you still need an operator of the robot as they are sitting underground, you have a higher skilled person sitting in a control centre, driving the robot. And the same applies in factories.” [Martin Sanne – Siemens]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