Digital Industrial Policy Brief 8

INDUSTRIAL DEVELOPMENT THINK TANK

https://www.competition.org.za/idtt/

DIGITAL DISRUPTIONS IN THE YELLOW METALS INDUSTRY

THE ROLE FOR GOVERNMENT RESPONSE

Justin Barnes[1] and Mbongeni Ndlovu [2]

Introduction

The Yellow Metals industry is undergoing profound transformation. Rapid technology advances such as telematics and remote monitoring, hybrid powertrain technology, and autonomous vehicles have recently emerged to challenge the status quo. Furthermore, the combination of technology advances and increasing refinement of customer preferences is leading to a fundamental shift in the industry's commercial model: from the selling of products to the provision of Internet of Things (IoT) enabled heavy transport equipment services. This transformation is gaining momentum in several major Yellow Metal markets and is forecast to continue gaining momentum over the next decade. This transformation is already impacting South African Yellow Metal Original Equipment Manufacturers (OEMs) and distributors, who are needing to adapt their business models accordingly. The full range of Industry 4.0 disruptions are therefore evident within the Yellow Metals industry and the South African government will need to factor these disruptions into the support provided to the small local Yellow Metals industry.

For the purposes of this digitalisation briefing note, Yellow Metal[3] products are defined as off-highway vehicles for the construction, mining and agricultural sectors. The different types of Yellow Metal products can be segmented according to the major markets they serve, per the table below.

[1] Executive Director: Toyota Wessels Institute for Manufacturing Studies; Chairman: B&M Analysts. www.bmanalysts.com

[2] Research Manager: B&M Analysts.

[3] The term "Yellow Metals" is a widely used colloquial term that is not strictly defined, hence the importance of the defined products presented in the table.

Segment	Yellow metal products
Agriculture & Forestry	Articulated Tractor, Cane Loader, Agricultural Forklifts, Haulage Tractors, Feller Buncher, Forwarder, Harvester, Logger, Long Range Forwarder, Skidder, Timber Trucks
Mining & Construction	Rigid Dump Truck, Articulated Dump Truck (ADT), Crawler Dozer, Excavator, Motor Grader, Tipper Trucks, Tractor Loader Backhoe (TLB), Wheeled Loader, Roller, Paver, Cold Milling Machine, Crushing and Screening Machine, Concrete Mixer, Hook Lift Truck, Crane, Container Handler, Customised Load Body Trailers, Fire Trucks, Water Tankers

The primary inputs into Yellow Metal production are steel, aluminium, polymers, plastics, rubber and fiberglass. These inputs are developed into components, which are in turn engineered and assembled into Yellow Metal vehicles. The vehicles are either made to order or retailed through dealerships. Original Equipment Manufacturers (OEMs) are the lead firms in the value chain, taking responsibility for the design, manufacture and assembly of Yellow Metal products. It is these OEMs that are the most impacted by Industry 4.0 disruptions, and that by implication are also driving the Yellow Metal industry's rapid response to disruptions. OEMs are also often involved in the engineering and fabrication of key Yellow Metal components and sub-assemblies such as engines and cabins, while also holding ownership stakes in dealerships, and sometimes operating rental businesses.

Given the technical complexity of Yellow Metals machinery, barriers to entry into the industry are high. Significant financial investments are required, as is the ability to invest in R&D. Globally dominant OEMs such as Caterpillar, Volvo, Hyundai Heavy Industry, and Hitachi have secured their positions through decades of investment in designing and engineering high quality products. Consequently, the Yellow Metal market typically has a small number of large multinational players, operating in diverse product categories and numerous geographical markets.

The Yellow Metal industry's major customer base is equally technologically advanced, encompassing large mining companies and commercial farmers, as well as civil engineering and construction contractors. For the mining and construction equipment sectors, customers tend to purchase directly from the OEMs, while farmers tend to purchase from dealers. Pre-owned or rented machines are substitutes for new products.

From a product to service orientation

A recent Mckinsey and Company study surveyed Yellow Metals OEMs and industry experts from Europe to identify and rank the most significant trends affecting the industry.[4] The major trends identified, in order of importance, were: the increasing importance of the aftermarket, higher demand for customised/specialised machines for specific applications, increasing environmental requirements, revolutionary new technologies and ways of using machinery, and increasing demand for financing and leasing.

[4] Mckinsey & Company (2016). Reengineering construction equipment: from operations focused to customer centric. Advanced Industries. April 2016.

Global OEMs increasingly provide finance and aftermarket services (parts and servicing). The addition of finance assists customers to purchase Yellow Metals products on credit, at favourable interest rates. Aftermarket sales assist to increase customer loyalty and return purchases. For instance, Volvo Finance offers operating and finance leases, instalment sale contracts, working capital loans, insurance and wholesale financing plans to both customers and dealers to help support the purchase and lease of our equipment. Providing finance is also becoming a significant revenue stream for Yellow Metal OEMs. According to their Annual reports, Caterpillar financial services generated revenues of ~US$ 3 billion in 2016 and Volvo financial services revenues were ~US$ 1.5 billion. Accounting for 8% of Caterpillar and 4% of Volvo's revenues in 2016.

Modern Yellow Metal consumers prefer customised, purpose-specific, co-created products. At the same time, technological advances have transformed the Yellow Metal manufacturing process into a more rapid, cost effective and modular process. According to Sturgeon (2017), when combined, these factors of customisation and technology advancement tend towards a New Digital Economy (NDE). The NDE describes a prospective economy in which the processes of production and consumption will be increasingly digitised rather than operating through the current mechanical and micro-electronic technologies which characterise a modern industrial economy. Per Sturgeon[5], the NDE will be characterised by advanced manufacturing technologies, encompassing robotics and factory automation; new sources of data from mobile and ubiquitous internet connectivity; cloud computing; big data analytics; and increasing levels of artificial intelligence.

A key feature of the NDE era is the narrowing of the distance between the manufacturer and customer, allowing manufacturers to bypass traditional intermediaries. The nature of manufactured products will transform from material possessions that people or organisations own to physical assets that form part of a service package for which the users buy access.

The movement to service platforms represents a fundamental digital disruption for Yellow Metals OEMs. For example, when a mine purchases a transport solution package for its minerals extraction, rather than a fleet of Articulated Dump Trucks (ADTs), the entire business model changes for the OEMs. An OEM is now deeply integrated into the functionality of the products it offers, and essentially needs to convince the mining company of its service suitability over the period of the package contract, as opposed to product performance characteristics. From enabling Yellow Metal products with advanced telemetric processors to enable IoT capability for the mine, the balance now shifts to enabling the service platform to work seamlessly for the client to ensure that maximum minerals extraction is made possible. The functionality of the service becomes the responsibility of the OEMs.

Efficiency enhancements

The traditional business model of leading Yellow Metals OEMs is based on standardisation, low cost production and economies of scale. Multinational OEMs also use their access to global markets and extensive retail networks as a competitive advantage. Some of the

[5] Sturgeon, T. J. (2017:4). The New Digital Economy and Development. United Nations Conference on Trade and Development (UNCTAD), Division on Technology and Logistics Science, Technology and ICT Branch. ICT Policy Section. Technical Notes on ICT For Development. Technical Note No8 Unedited. TN/UNCTAD/ICT4D/08.

advancements in digitalisation technology are further driving the existing efficiency based competitive model of Yellow Metals OEMs.

OEMs are producing products that are heavier and more fuel efficient, which can increase payloads and lower the cost-per-tonne ratio of projects. For example, in 2016 Volvo Construction Equipment launched a 60-ton articulated hauler and 90-ton excavator[6]; and in 2017 Liebherr developed the HS8300 HD crawler crane which has 300-ton load capacity.[7] Lead OEMs also continue to implement enhanced process technologies in their manufacturing facilities to improve productivity and right first-time quality. Key to this evolution is more advanced machine learning algorithms that are continuously optimising equipment processes.

Vehicle emission reduction is predominantly linked to government regulation and has been a focus of OEMs for several years, consuming large parts of the leading firms' R&D expenditure. As an example, in September 2016 the European Union (EU) finalised Stage V emissions standards applicable to off road diesel engines from 0 to 56 kW and to all types of engines above 56 kW. In the same year, Volvo launched a hybrid wheel loader[8] and Komatsu developed 33 new models to comply with Stage IV emissions standards[9]. As OEMs reduce emissions and increase productivity, there is increasingly more room to divert resources to other research and development areas, which appear to be securing greater levels of expenditure. Key amongst these are telematics and vehicle autonomy.

Telematics and vehicle autonomy

Telematics describes technology that can monitor fuel patterns, loading and haulage rates and that can connect multiple pieces of equipment. Telematics systems combine GPS technology, on-board diagnostics and monitoring sensors to track, log and report data by cellular networks on the performance and operation of Yellow Metals equipment. Data from telematics systems are typically accessed through a web portal and can provide data on several machine systems. Common data points include GPS location, fuel consumption, idle times and machine alerts.

Telematics and remote monitoring are closely linked with better aligning product and/or service performance with customer requirements. Real-time data from machines can help increase performance, optimise maintenance, and reduce downtime. Longer-term benefits include refining machine design and functionality within contexts, as the lessons learnt from operational performance are applied back into the functioning of the machinery, thereby enhancing performance over time. However, at present, telematics and remote monitoring is mainly being used by Yellow Metal OEMs for more basic tracking of machine use and performance. For example, Caterpillar markets its telematics system under the brand Cat® Connect Technology and Services which it offers for monitoring of worksites, fuel consumption and utilisation across all its construction equipment products. Similarly, Komatsu uses

[6] Volvo (2016). Annual and Sustainability Report 2017. Available: http://www.volvogroup.com/en-en/investors/reports-and-presentations/annual-reports.html.
[7] Liebherr (2017). Annual Report 2017. [Online] Available: https://www.liebherr.com/en/zaf/about-liebherr/annual-reports/annual-reports.html.
[8] See footnote 6 above.
[9] Komatsu (2016). Komatsu Report 2016. [Online] Available: https://home.komatsu/en/ir/library/annual/.

KOMTRAX to monitor Komatsu equipment via satellite and Liebherr has Crane Planner 2.0 planning software for its cranes.[10]

Telematics and remote monitoring are the gateway to more advanced data-driven applications – both machine improvements and the provision of more advanced customer services and solutions. Furthermore, IoT-enabled telematic sensors are a key step towards the development of autonomous vehicles. Importantly, Yellow Metals OEMs have been working on the development of autonomous vehicles for the last 20 years. Autonomous vehicles are viewed as safer and more cost effective than their human drive equivalents across the mining, construction and agricultural sectors. Automation has been particularly significant in mining and quarrying machinery. Fully autonomous trucks use various sensors to continuously monitor their surroundings and can avoid both fixed and moving obstacles. Some examples of advancements in automation in the Yellow Metals sector cited in OEM annual reports include:

- Deere & Company developed a self-guided tractor, the John Deere AutoTrac™ in 2002.[11]
- Between 2013 and 2016 Caterpillar reported that they moved over 300 million tons autonomously, outpacing the growth in human-driven machinery by nearly 20 percent.[12]
- Volvo announced in September 2016 that its fully self-driving truck was first to market when tested in an underground mine, while Hitachi has announced that it has successfully developed an Autonomous Haulage System (AHS) for mining dump trucks.[13]

Machine-operating data appears to have reached a pivotal point for Yellow Metals OEMs, with this evident across their wide range of machinery. There are now large Yellow Metal vehicle fleets with installed sensors and a significant and rapidly growing cache of historical data. At the same time, the cost of collecting and processing this data is dropping, especially as machine learning and Artificial Intelligence take root. OEMs are therefore gaining ever keener insights into customer behaviour and activities (e.g. the driving patterns of operators) and are increasingly providing more tailored offerings in alignment with variable customer demands. Furthermore, the process of setting up sensors and analysing data has brought OEMs, dealers, and users closer together, establishing more interaction points related to the actual operation of machinery – and therefore providing the momentum towards platform service delivery over the sale of products.

Additive manufacturing

There is a growing demand for customised machines designed for specific applications. End customers are under continuous pressure to lift productivity on project sites, and thus require machines tailored precisely for their needs. Customised and specialised machines are however often more complicated to maintain and repair. Customers need to be closer to the OEMs (and their dealers) as well as component suppliers, as traditional repair shops and the customers' own mechanics are less able to address vehicle maintenance and repair needs.

[10] See footnotes 7 and 9 above.
[11] Deere & Company (2016). Deere & Company Annual Report 2016. [Online] Available: https://investor.deere.com/default.aspx?SectionId=2237b9ec-83f2-4f43-a172-a84c056c40fa&LanguageId=1.
[12] Caterpillar (2016). Caterpillar 2016 Annual Report. [Online] Available: https://www.caterpillar.com/en/investors/annual-report/archived-reports.html.
[13] See footnote 6 above.

Many customers are striving to focus on their core business and therefore want to increasingly outsource machine maintenance and repairs and, in some cases, even operations. These factors open opportunities for Yellow Metal OEMs to capture additional value adding activities within their product/service offering.

One major example of how digitisation opens additional value adding activities for OEMs is in the use of additive manufacturing to maintain and replace Yellow Metals components infield on a real time basis. Whereas mining companies in distant locations would previously wait many hours for a component to be delivered from a network of warehouses or hold large amounts of stock on site to pre-empt the negative potential operational impact of a component breakdown, additive manufacturing presents the opportunity for on-site component repair or replacement using digitally streamed data.

Data driven solutions

According to the Mckinsey and Company 2016 study the shift to offering software over hardware was ranked as only the twelfth most important issue for European OEMs, suggesting it is not yet a critical driver within the Yellow Metals industry – even in the world's most advanced market.[14] However, Mckinsey argues that the number one success criterion of Yellow Metal OEMs in the future is expected to be deep understanding of customers' businesses and how they create value. Big data solutions are therefore identified as a critical differentiation factor and value creation driver in the coming years, especially as data collection increases and customers become accustomed to using big-data-driven solutions.

An example of digital connectivity is the design of intelligent agricultural machines that can connect different data points in a working process and put them into a smart and optimised order by consulting, for instance, weather data, ordering spare parts or accessing field-specific information from a central, cloud-based farm management software. Digitalisation would facilitate the improved design and functionality of machines, as well as associated services. Machines may be redesigned to better fit their operating environment, while repair and maintenance services may be calibrated to optimise uptime during operating hours, consequently reducing service costs. Data solutions may also shorten project cycle times, thereby enhancing their utilisation.

In conclusion, whilst big data solutions and autonomous Yellow Metal vehicles are not yet seen as a major technology trend in the next ten years, experts are unanimously convinced that it will be central to the industry soon thereafter. There is wide agreement that these disruptions will likely impact industry dynamics and associated business models.

South African status quo

South Africa has two local Yellow Metals OEMs: Bell Equipment and Desmond Equipment. Both are based in KwaZulu-Natal, with Bell located in Richards Bay and Desmond in Port Shepstone. Bell is the dominant OEM within the South African Yellow Metals value chain, as it procures a substantial portion of its components and materials locally and has an established export presence in several major markets. Bell is listed on the Johannesburg Stock Exchange (JSE) and has a production facility in Germany. The rest of the South African Yellow Metals industry is comprised of importers and distributors of global OEM products. For example,

[14] See footnote 4 above.

Barloworld's Equipment division is the official dealer for Caterpillar construction and mining machines in southern Africa, while the company's re-manufacturing facility rebuilds Caterpillar machine and engine components. South African OEMs often also act as dealers for global manufacturers, enabling them to offer imported machines that complement their own range of products.

South Africa's dominant Yellow Metal OEM, Bell Equipment, has generally kept pace with global technological advancements in the sector. The company is, for instance, a leading global ADT specialist with 8% to 10% global market share.[15] Bell Equipment has been responding to the efficiency and environmental sustainability trends outlined above. The company has advanced its ADT offering to incorporate better fuel efficiency in its machines and has developed an advanced telemetry system as a service platform.

Bell has spent a significant percentage of its product development on reducing ADT engine emissions. The company claims that its machines either meet or surpass the emission requirements set in the different countries in which they operate. Currently, the focus is on reducing nitrogen oxides, hydrocarbons and particulate emissions, but in the future the company aims to focus on CO^2 emissions.

Bell's Telematic System, Fleetm@tic I, was launched in 2003 which was a first for the construction equipment industry in South Africa.[16] The system was able to monitor vehicle data on Geostationary Satellites. A single message was 11 bytes in size and the time lag was 2 minutes. The system was upgraded to Fleetm@tic II in 2008 using low-orbit satellites to improve its efficacy. Messages were now up to 64 bytes and the average time lag was only 10 seconds. Bell then launched an internet-based application in 2013, enabling customers to track performance data at substantially greater scale and real-time speed. Customers can now use the system to monitor and improve the operational efficiency of their products, with the system monitoring time of use, productivity information and all machinery associated log faults.

South African importers and distributors of global OEM products have also absorbed advanced technologies from their global partners. Barloworld Equipment, for instance, currently offers a Caterpillar *Cat Connect* service in South Africa which provides telematics solutions for better equipment management, safety, productivity and environmental impact reduction.[17] The company also has an SOS Laboratory in Boksburg, which undertakes wear analysis and interprets oil samples from machines in the field.[18] The SOS programme assists with early detection of problems with machines. The Laboratory in Boksburg has remanufacturing capabilities, and can repair and rebuild engines, transmissions, and drivetrains on selected Caterpillar machines.

In conclusion, South Africa has benefitted from being exposed to globally competitive yellow metal OEMs which have kept the country on the cutting edge of Industry 4.0 advancements in the sector. Bell Equipment moreover has globally competitive ADT technologies. In addition, local distributors of global OEMs such as Barloworld Equipment are absorbing technologies

[15] Bell Equipment (2018). Bell Equipment Annual Report 2017. [Online] Available: http://www.bellir.co.za/financials/pdfs/BELL_ir_17.pdf.
[16] Bell Equipment (2018) Industry 4.0 Policy Dialogue [Unpublished].
[17] Barloworld Equipment (2018). Cat connect. [Online] Available: https://www.barloworld-equipment.com/find-support/technology/cat-connect/.
[18] See footnote 17 above.

from their parent companies. Therefore, South Africa's challenge is to maintain Industry 4.0 competitiveness in this sector rather than having to catch up to substantially more advanced global technologies.

The role of government

The four primary areas in which government can play a positive role in facilitating digitisation in Yellow Metals are by providing R&D support, access to finance as the industry transitions from selling products to service platforms, skills development and broadband infrastructure.

Research & development

R&D is a key competitive advantage to Yellow Metals OEMs as the digital revolution unfolds. Whether in relation to advancing telemetry and autonomous vehicles, the use of IoT enabled big data to optimise the operational functionality of equipment and associated services, to the use of machine learning and Artificial Intelligence to drive process improvements and bespoke service offerings, to the use of additive manufacturing technologies to ensure machinery uptime, to the use of smart materials and nano-technologies to improve the robustness and durability of machines, R&D intensity within the Yellow Metals industry is likely to increase.

According to their annual reports, lead global OEMs currently spend between 3% and 6% of their revenues on R&D. The extent of this investment is made clear when considering that Caterpillar employs an R&D staff compliment of more than 10,000 engineers and more than 350 PhD level scientists and technology experts. The firm also has 15,953 Construction Equipment patents pending and was granted 1,667 patents worldwide in 2015, developing over 30 new models a year.[19] The level of R&D expenditure amongst the world's leading Yellow Metal OEMs is presented in the table below.

Table 1: R&D Expenditure by global OEMs in 2016 (US$ million)

	R&D Expenditure (2016)	% Revenue
Caterpillar	1 951	5.1%
Komatsu	607	3.8%
Hitachi	2 791	3.5%
Liebherr	601	6.3%
Volvo	1 586	4.8%

Source: Annual Reports.

This contrasts with South African OEMs. Bell Equipment, for example, only spent about 1% of its revenues on R&D in 2017.[20]

[19] See footnote 12 above.
[20] See footnote 15 above.

As highlighted by Timm, South Africa is ranked as having one of the lowest levels of government support for R&D (only 0.05% of GDP).[21] The South African government does have a R&D incentive administered by the Department of Science and technology (DST).[22] However, the experience of Yellow Metals manufacturers in respect of claiming the R&D incentive has not been positive. One of South Africa's yellow metals manufacturers has had a four-year protracted dispute with SARS regarding the acknowledgement of direct and indirect costs for claiming its R&D incentive. The dispute was settled only after extensive litigation, and certainly not to the satisfaction of the OEM. This is potentially a major issue for the domestic value chain, especially as technology disruption intensifies globally and South African firms are forced into greater levels of R&D expenditure to stay abreast of new market shaping technologies.

It is recommended that **the dti** engage with the Department of Science and Technology and National Treasury on more appropriate R&D tax incentive for Yellow Metals producers that can provide support for product (and associated service) enhancing R&D.

Access to finance for service platforms

The provision of competitiveness finance is emerging as a major competitive advantage to Yellow Metals OEMs as the market shifts from consuming products to using service platforms. While the operating margins for Yellow Metal OEMs may increase over time as service platforms are optimised through the wider application of digital technologies, the working capital requirements of effectively operating service fleets, as opposed to selling recently manufactured products, are potentially substantial. And yet, South African Yellow Metals manufacturers are already disadvantaged relative to international distributors with access to credit from state agencies at highly discounted interest rates. While South African manufacturers can access loans at preferential lending rates from the Industrial Development Corporate (IDC), stakeholder interviews highlighted that the IDC's funding criteria is highly risk averse and too conservative to provide the sector with any commercial advantage when competing against international competitors.

It is recommended that **the dti** engage with Development Finance Institutions (DFIs) to explore the provision of new discounted credit models for the financing of South African capital equipment service platforms into the mining, agriculture, and construction sectors.

Skills development

One of the major digitalisation challenges facing the South African Yellow Metals industry is the need to develop advanced skills in areas such as Data Analytics, Data Science and Software Development, alongside broader technology developments in base metals fabrication and engineering functions. The future of yellow metals production will require a combination of knowledge and experience from various disciplines, including Information Technologies, Computer Science, Engineering and Statistical Mathematics. The government has identified severe shortages of skilled artisans, technicians, engineers and project

[21] Timm, S. (2017). Over a year on, key reforms for SA's R&D tax incentive still not implemented. Available: http://ventureburn.com/2017/08/year-key-reforms-sas-rd-incentive-implemented/.
[22] Department of Science and Technology (2018). R&D tax incentive brochure. [Online] Available: http://www.dst.gov.za/index.php/services/the-rad-tax-incentives-programme.

managers in the metal fabrication, capital and transport equipment sectors[23], with the lack of skills in these areas suggesting that the industry is poorly positioned to absorb new technology disruptions, particularly those in the digital space.

Skills development within the Yellow Metals industry falls under the purview of the Manufacturing, Engineering and Related Services Sector Education Training Authority (MerSETA). However, research by B&M analysts suggests that the MerSETA is not currently serving the emerging skills requirements of the Yellow Metals OEMs. It was reported by stakeholders that manufacturers and distributors are relying on graduates from Universities of Technology and conducting their own in-house training to develop skills.

Bell Equipment, for instance, is involved in several skills' development programmes, including providing in service training to industrial and mechanical engineering students. The company also manages a two-year programme for B.Sc. mechanical engineering students. Bell further provides internal and external training through apprentice and product and operator training. Internally, the company trains its apprentices and provides apprentice training as a service to its customers. Bell's technical training team offers operator training courses for new operators, and refresher courses for seasoned operators, across the company's product range.

During 2015, Barloworld had 1,178 candidates in technical apprenticeship and learnership programmes.[24] The company also provided financial assistance to 222 employees studying towards degrees or diplomas, while 34 bursaries were granted to external students studying towards degrees. In addition, 210 external individuals were assisted in training through internship programmes. Barloworld Equipment's technical training centre trains and certifies Caterpillar earthmoving mechanics to NQF level 3 standard, and it fully complies with Caterpillar's global standards.

Yellow Metals value chain developments are not factored into SETA support frameworks for key firms: Advanced materials, telemetry, vehicle autonomy, IoT-based fleet management systems, use of "big data" for product/service optimisation, etc. It is therefore recommended that **the dti** convene a Yellow Metals skills summit with all relevant stakeholders – focusing on developing a Yellow Metals skills development framework that can meet both basic and advanced skills requirements in alignment with key value chain shifts.

IT platforms and infrastructure

Data driven solutions in the Yellow Metals sector will require more data to be generated and transmitted through digital platforms. This will in turn require more sophisticated IT applications and platforms to link machines to the internet, personal computers and portable devices such as mobile phones and tablet computers. In addition, more sophisticated IT software applications will require the physical broadband infrastructure to support them.

Bell Equipment reports that the speed within South Africa is acceptable but slow relative to international benchmarks. However, the cost of data roaming in South Africa is expensive.

[23] MerSETA (2018). Sector Skills Plan Update 2017/18-2021/22: Promoting Artisan Development for Employability. 1 August 2017.
[24] Barloworld Equipment (2016). Integrated Report 2016. [Online] Available: https://www.barloworld.com/investors/integrated-reports/.

This limits the data that is being transmitted. Slow data bandwidth can limit the customer experience of web applications.

Internet penetration in South Africa is relatively high. According to Statistics SA's 2015 General Household Survey 53.5% of households had at least one member who used the Internet either at home, workplace, place of study, or at an Internet café. However, the South African IT industry has been characterised by policy uncertainty over the last few years. The five-year delay in freeing up spectrum from the digital migration process has delayed the benefits associated with ICT, and the benefits of affordable and ubiquitous access to broadband. The World Bank estimates that a 10% increase in broadband penetration results in an increase of between 0.6% and 1.38% in GDP.[25] Government will thus have to resolve the policy uncertainty and invest in broadband infrastructure to support the development of the Yellow Metals industry as it transitions from a product to platform-based sector.

Conclusion

While the South African Yellow Metals industry is small, with only two OEMs and a range of distributors, who may do some basic vehicle assembly, it is important to the future development of the domestic economy, both as an intermediate capital input and as a contributor to industrial activity. Research completed by B&M Analysts highlights that the industry would employ 5,400 people and generate R1.3 bill in Gross Value Added (from 2,800 employees and R630 million GVA in 2017) by 2028, if local OEMs were able to increase their share of the domestic market to 16% (from 8% in 2017) However, this will only happen if the domestic Yellow Metals industry can respond to the digital disruptions that are fundamentally shifting the Yellow Metal market and production landscape – both locally and internationally. If the industry is to realise its potential, it will need to embrace a range of digital technologies, the most important of which relates to changes in the future Yellow Metal OEM business model: from a producer of advanced equipment embodied with performance enhancing digital technology; to a digital platform service solutions provider with both capital and digital assets that are contracted in by mining, construction and farming organisations on an hourly or tonnage use basis.

[25] World Bank (2016). Digital Dividends: Exploring the Relationship Between Broadband and Economic Growth. World Development Report. [Online] Available: http://pubdocs.worldbank.org/en/391452529895999/WDR16-BP-Exploring-the-Relationship-between-Broadband-and-Economic-Growth-Minges.pdf.