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THE GLOBAL LOGISTICS MAGAZINE

ISSUE 05/2015

BUSINESS
ON THE WATERFRONT

Learn why it's full steam ahead for Panama

SOLUTIONS
AGE OF THE MACHINE

Discover why robots are big business for growth industries

VIEWPOINTS
SOLID FOUNDATION

Find out what drives Mara Group entrepreneur, Ashish J. Thakkar

FOCUS

INNOVATION IN THE FRAME

How high-tech is driving an automotive revolution



DEAR READER,

Our cars are becoming an extension of our tech-laden lives. They are no longer vehicles that simply get us from A to B: they are entertainment centers full of software-based applications and innovations that are meant to enhance our driving experience. In this issue's focus feature we discuss the latest development trends in automotive high-tech, where they could take us into the future – and what they mean for supply chains. Talking of high-tech, robots are becoming ever-more sophisticated. We have long been used to machines making cars, but now robots are increasingly appearing in other industries too, from aerospace to agriculture and from surgery to logistics. As we report in our article The Robot Revolution, some of the latest innovations make the likes of R2-D2 look very old-fashioned indeed.

Back in 2011, The Economist wondered if Panama could become a kind of "Singapore for the Americas." What a difference four years make. With its strategic location, business-friendly environment and Colón Free Trade Zone, the country is experiencing a burst of growth and prosperity. It is also, of course, the home of the Panama Canal, which is nearing the end of a multibillion dollar expansion project that will double its current cargo and allow it to handle the world's biggest ships. In this edition of Delivered., we ask if Panama has indeed emulated the rise of Singapore and Dubai and become a hub for Latin America.

Enjoy your read!
Sincerely,

Bill Meahl

Bill Meahl
Chief Commercial Officer, DHL

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A NOTE FROM THE EDITOR

I met Ashish J. Thakkar – founder and CEO of the Mara Group and Mara Foundation – in Dubai this year. He has an impressive résumé. He became an entrepreneur from the tender age of 15 and his group of companies now spans 22 African countries and employs a workforce of 11,000 people – so it's no wonder Forbes named him on its 40 Under 40 list. If he sounds impressive on paper, he is even more so in person. Speaking at our Global Technology Conference, Ashish enthralled the audience with his passion, his insight into Africa and his human touch, for here is a successful entrepreneur for whom social responsibility isn't a mere byword. His Mara Foundation provides support to budding entrepreneurs across Africa and mentorship to many. Read more in *Delivered. gets down to business* with Ashish J. Thakkar.

Michelle Bach

Ashish J. Thakkar
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THE CAR INDUSTRY CHANGES GEAR

The automotive sector is undergoing a technical revolution that is going to change the face of the industry forever. Vehicles are becoming an extension of our computers and smartphones so that it is technology – not chassis design or braking systems – that buyers expect, and demand, when they come to make a purchase. Once, big original equipment manufacturers (OEMs) held all the market power; but this shift towards hi-tech has upended the traditional hierarchy of players in the industry, forcing every participant to focus on what it will take to build the future automotive business model. It has big implications for the supply chain, too, as a new DHL white paper

called “The Quiet Revolution: Convergence and the Future Automotive Supply Chain” makes clear. OEMs and suppliers are turning to smarter processes and information systems, moving from a reactive to proactive and, eventually, predictive supply chain operational model.

You can read more about the move to hi-tech in our focus feature beginning on page 8, and download the white paper at:



tinyurl.com/del-auto-convergence



CHARGING ALONG

While electric cars are gaining in popularity, one downside for potential buyers is their range before they need recharging. But what if you could recharge your vehicle as you drive along, using power from the streets themselves? An 18-month pilot scheme announced by the British Government aims to do just that – using wireless charging and roads that have “belowground technology.” The scheme will use a fake test road to begin with, but ministers have already committed £500 Million (US\$755 Million) over the next five years to develop the concept.



tinyurl.com/del-uk-roads

INNOVATION CENTERS ON SINGAPORE

This December, DHL will be opening a S\$10 million (US\$7 million) Asia Pacific Innovation Center (APIC) in Singapore. The center – the first of its type in the region – will work with customers, innovation partners and industry experts to pioneer new sustainable services and solutions in logistics.

As you'll read on page 30, robot technology is increasingly being used across various industries. This is why APIC will highlight this topic through a state-of-the-art centerpiece on robotics and automation – a robot that picks and packs items in a parcel that is then transported by an autonomous open shuttle. The center will focus on research to identify relevant robotics technologies for Asian markets. On show will be other cutting-edge logistics trends and best-practice solutions that showcase a futuristic view of the logistics world.



 tinyurl.com/del-innovation

750,000

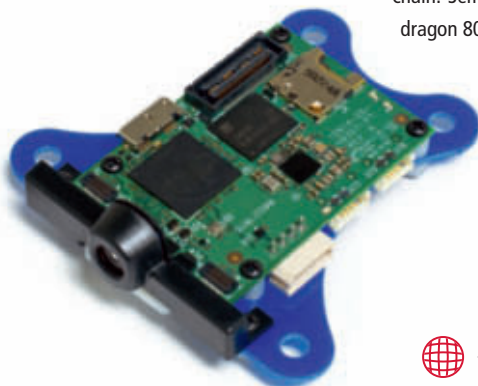


The number of transports completed using DHL SmartSensors – devices which measure the temperature and track the location of high-value biopharmaceutical shipments. Experts predict that SmartSensor shipments will reach the one million mark next year.

 tinyurl.com/del-sensor

DRONES: THE NEXT GENERATION

A super chip that has powered many recent smartphones may soon be behind the next generation of drones – which could be of great benefit to those parts of the logistics industry that want to use drones in their delivery chain. Semiconductor company Qualcomm has retooled its Snapdragon 800 system on a chip for a new “flight” version – and says the business card-sized board will allow drone manufacturers to build cheaper, lighter and smaller vehicles, bridging the gap between expensive UAVs (unmanned aerial vehicles) and “toy” drones. The first drone to use the Snapdragon will be made next year by Chinese aircraft manufacturer, Yuneec.



 tinyurl.com/del-qual-drone

THE STORY

FAIR AND RESPONSIBLE LOGISTICS

Ensuring a sustainable future in today's climate of mass production and overconsumption is more challenging than ever before. As a result, businesses will shift towards a new business paradigm that puts fairness and

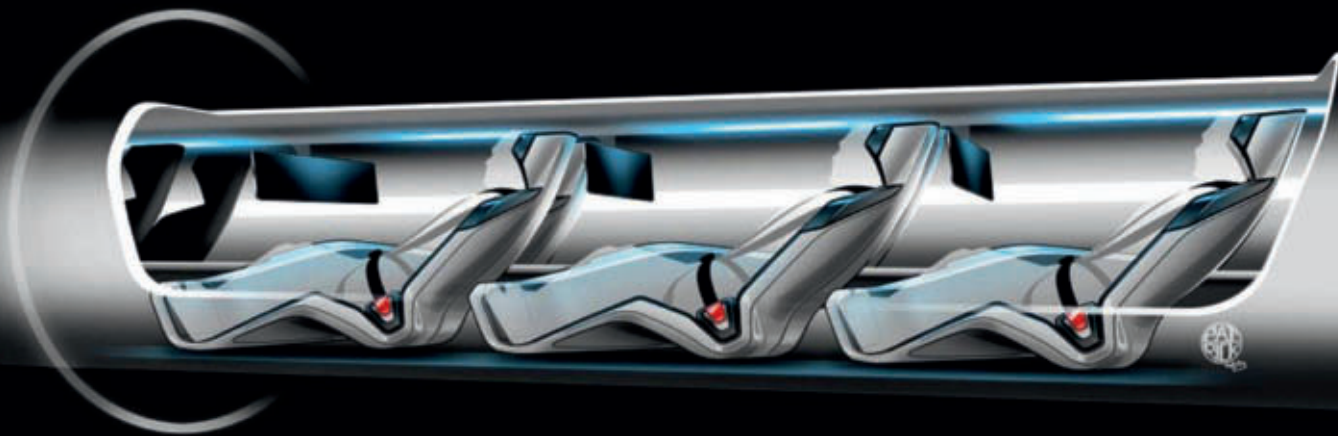


sustainability at the core of business. This responsibility transformation is being driven by different trend fusions such as changing societies, globalization and the proliferation of connection technologies. The new DHL Trend report “Fair and Responsible Logistics” takes a deep dive into this new phenomenon and examines potential implications and challenges of adopting fair and responsible business in the logistics industry. The report also investigates how logistics plays a key role in helping businesses to “go fair” and how fairly and responsibly logistics can generate new revenues as well as societal and environmental value for all stakeholders. One of the key actions of the report is that the logistics industry must leverage its global reach, assets and overview of supply chains, to become a guarantor for the circular economy and to enable fair access, production and trade.



To download the report, please visit:

 tinyurl.com/del-fair



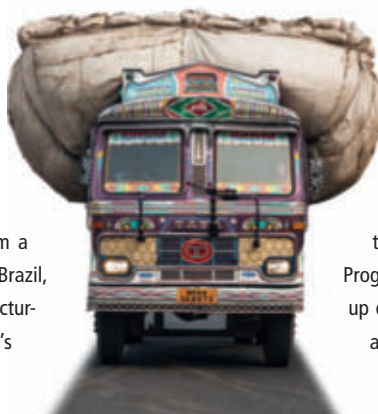
IN THE LOOP

US company Hyperloop Transportation Technologies (HTT) – a crowdsourced business that includes experts whose day jobs are at NASA and Boeing – is developing its own Hyperloop concept. This is a sci-fi style transport system which aims to whizz travelers at 700 mph along super-fast suction tubes. Things seem to be speeding up in

every sense: HTT has announced partnerships with firms that have worked on CERN's large hadron collider and the \$US22.9 billion Crossrail underground rail project in London; plus it wants to start building a five-mile-long, 200 mph test track at the proposed solar-powered city in California's Quay Valley next year.

LEEPING AHEAD

India's roads are the linchpin of its logistics network: some 60 percent of the total freight volume in the subcontinent nation is transported by road, but the country's increasingly obsolete trucks only cover about 300 km a day compared with 500 km a day in the emerging economies of the other BRICS countries – Brazil, Russia, China and South Africa. This means homegrown manufacturers are losing out to their foreign competitors. That's why India's



highways ministry is embarking on a major exercise to pinpoint the deficiencies of the road network, enhance the efficiency of logistics and cut the cost of transportation in the next couple of years. The Logistics Efficiency Enhancement Program, or LEEP, will look at the use of longer trailers, the setting up of hubs along transport routes to create "logistics corridors" and increasing the role of the railways in shipping freight.

LIVING RESPONSIBILITY



BLUE DART SCORES A BULLSEYE

More than half of India's population is under the age of 25, so education is key to the future success of the country. Unfortunately, many young Indians have little or no access to education, which is where a DHL initiative is helping to give some of them a brighter future.

Blue Edge: Empowering Lives, which operates in Mumbai, Chennai and Bangalore, is aimed at enriching the lives of young adults who have been unable to complete their educations because of their difficult circumstances. Run by South Asia courier Blue Dart, which is owned by DHL, the award-winning program has seen 885 students successfully com-

plete its courses since its inception in 2008. They have received training in reading and writing in English, basic computer skills, how to write résumés and job applications, and life skills such as health and hygiene, goal-setting and teamwork. Around 50 students pass through Blue Dart's centers every six months and graduates have found work in the telecoms, retail and aviation sectors, or have gone on to further education, kick-starting what should be stable careers and lives.



tinyurl.com/del-blue-dart

CARGO BIKE GETS A KICK-START

An innovative folding cargo bike raised more than half of its \$60,000 (€53,000) funding goal just one day after launching its campaign page on crowdsourcing website Kickstarter. Cargo Node is a partnership between Tern of Taiwan and California's Xtracycle. Its foldable design means it is perfect for taking on public transport and can help meet the growing challenge of urban logistics.



FLYING TO THE RESCUE

While many of us may be anticipating the time when we can have our books and DVDs delivered by drone, one partnership is planning to put the technology to more critical use. Leading architects Foster + Partners, working alongside technology company Afrotech, have unveiled designs for a drone port in Rwanda, where the mountainous terrain makes deliveries of medical supplies especially difficult. The drone port, will use smaller drones to deliver medical and emergency supplies up to 10 kg, and commercial drones to take equipment, electronics and e-commerce items weighing up to 100 kg.

 tinyurl.com/del-droneport



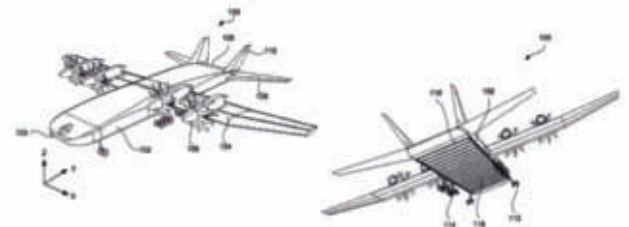
7 HOURS

The expected reduction in waiting times for ships passing through the Suez Canal after its ten year expansion plan is completed in April 2016.

 tinyurl.com/del-suez

HOLD FAST

Boeing has published a patent for a new generation of cargo aircraft that can carry a pod of containers similar to those used in shipping. The plane has a bottomless, unpressurized hold that would grab the containers and lock onto them. If realized, the aircraft could quickly deliver large quantities of cargo to destinations and offer an alternative to the slow but cost-effective shipment of low-priority cargo by sea, rail and road.



\$2.68 BILLION

The record online sales from Cyber Monday in 2014 – one of the biggest shopping days of the year in the US

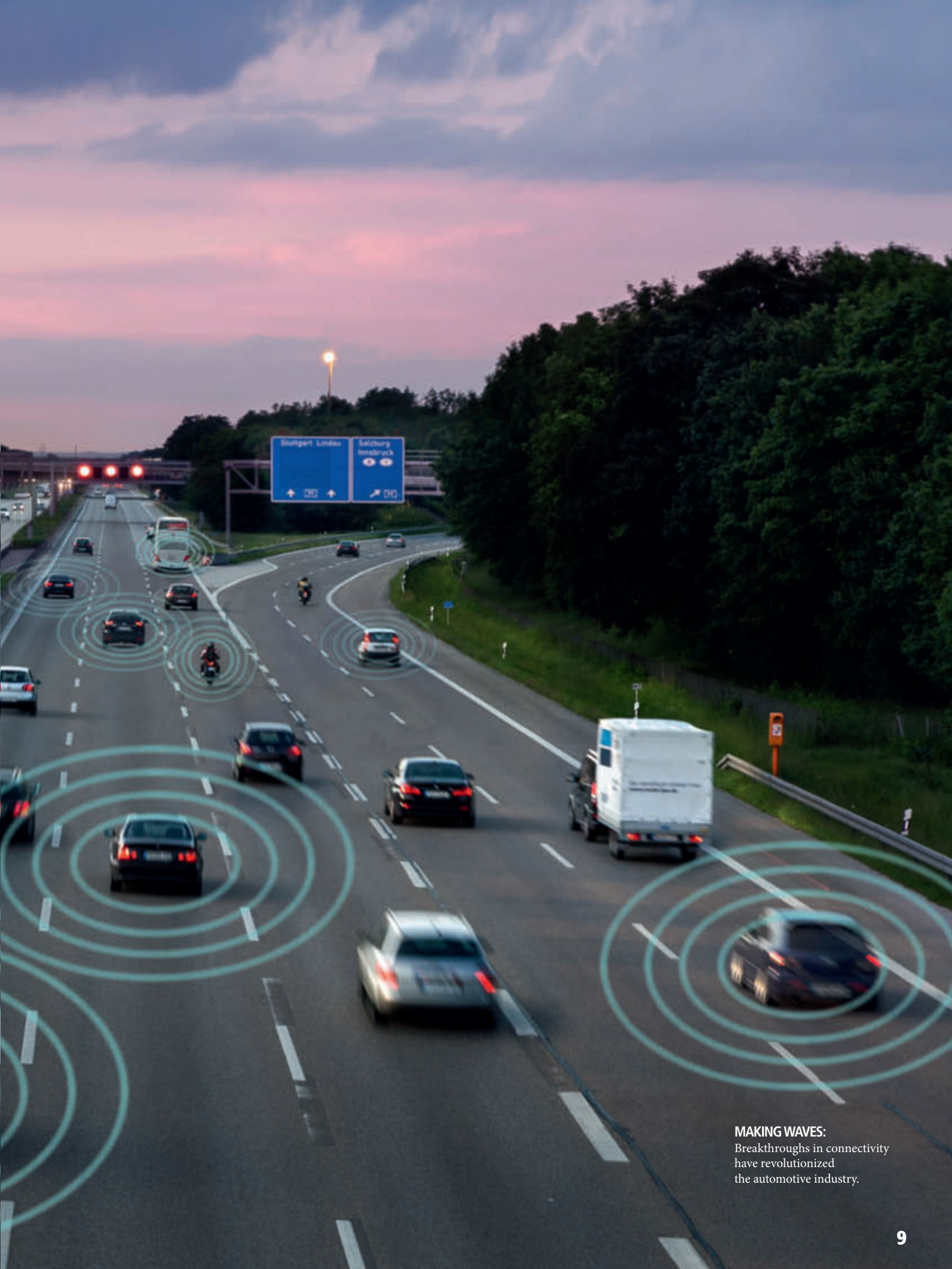


The 2014 total grossed by Singles Day, which originated in China and promotes the idea that people should buy gifts for themselves

BILLION

HIGH-TECH IN THE FAST LANE

The automotive industry is in the midst of a technological revolution, with innovation driving mobility developments at a rapid pace. So what are the latest high-tech trends – and the challenges lying on the road ahead?



MAKING WAVES:
Breakthroughs in connectivity
have revolutionized
the automotive industry.

For a century and more after the first engine-powered “horseless carriage” was created in the 1880s, the automotive industry was driven by evolution – not revolution.

True, there were numerous notable advances along the way; but power train technology barely changed from the 1920s onwards, and many safety-related innovations – including antilock brakes, traction control and airbags – were desperately slow to be adopted. However, as the 21st century fast approached, the advent of sophisticated chip-based technology signaled that dramatic changes were looming, especially for engine management control and safety systems. The move to high-tech started to speed up fast.

Other factors have been important too, including the trend for outsourced component production, more efficient supply chains and the adoption of innovative lightweight materials; but the genuine revolution for the industry has come via software-based control systems and advanced mobile technology, making today’s cars akin to computers on wheels. “A typical modern car already has more software code embedded in its systems than the latest jet fighter, because it needs so many sensors and has so much technology installed to enable it to understand its environment,” says Professor David Greenwood, of the Warwick Manufacturing Group (WMG). Take the BMW i8,

“A typical modern car already has more software code embedded in its systems than the latest jet fighter.”

Professor David Greenwood, Warwick Manufacturing Group (WMG)

for example – named one of CNET’s best tech cars of 2015 – which has a remote app that connects the car to the driver’s smartphone so they can find out its location and charge level, lock it and set the temperature before they even get in. Its Concierge Services facility, meanwhile, connects the driver to a dedicated customer information center, which locks on to information about the car’s location and then sends information about hotels, restaurants or local amenities directly to the vehicle.

Over the years, advances in engine management control and safety systems – with such features as adaptive cruise control, lane-changing systems and automated parking – have been growing incrementally. Analysts at the company manufacturing the USA’s oldest automotive marque, Buick, predict significant advances ahead in traction control, where unprecedented levels of stability will be achieved via “intelligent” control systems, working in tandem with a vehicle’s suspension. They believe collision-avoidance technolo-

CABIN CLASS:

High-tech vehicle interiors have turned today’s cars into computers on wheels.



FULLY AUTONOMOUS:
Digital solutions continue the acceleration
towards self-driving cars.

gy is coming fast to the mass market too, where radar, sophisticated sensors or cameras will warn drivers of potential collisions.

Cost savings

However, the most spectacular shift has come in new power train technologies, allowing cars also to be powered by fuel cells, electricity or hybrid engines. The former came to the mass market this October in the form of Toyota's Mirai, although significant technological challenges remain, notably the dearth of stations to refuel its hydrogen-powered cells. Further along the road are the electric cars, with Tesla the sector's most-notable new OEM. As always, cost is high for early adopters of technology, but Tesla CEO Elon Musk is confident his new Gigafactory, being built for an estimated \$5 billion in the Nevada Desert, will manufacture lithium-ion packs to power future Tesla vehicles for far less than today's variants. For the moment though, hybrid concepts have a commanding lead, particularly through the variants that combine an internal combustion engine and a battery-powered electric motor.

At the recent Frankfurt Motor Show, there were further clear statements of intent from OEMs with regard to power train innovations, advanced external structures, and the kind of software-driven changes that drivers will see in the medium term, such as the Intelligent Aerodynamic Automobile (IAA) Concept on show from Mercedes-Benz.

The IAA underlines the unprecedented pace of innovation as the auto industry strives to win the greatest prize of all: devising automation so advanced that it can replace a human in the driver's seat. Boston Consulting Group reckons the market for such vehicles will be worth a remarkable \$42 billion by 2025, after quizzing 1,500 drivers about future purchasing preferences. With 44% saying they'd likely buy a fully autonomous vehicle, and 55% keen to own a partially autonomous one, the potential rewards for original equipment manufacturers (OEMs) and their supply chains are evident. Professor Greenwood says the step-change for autonomous vehicles will be the development of infrastructure that allows cars to communicate with each other and their external environment. "We're seeing increasingly sophisticated digital solutions continuing to reduce a vehicle's dependency on a human driver, but it won't be possible to leverage the full benefits until every vehicle can 'talk' to each other. When the first generation of autonomous cars



KEY INVENTION:
The state-of-the-art key
fob to the BMW i8 –
one of CNET's best
tech cars of 2015.

appear, they will look at older vehicles as dumb objects."

"The pace of change is really starting to accelerate, because of the convergence of different technologies and innovations to create something new," says Fathi Tlatli, DHL's President of the Global Automotive Sector. "We have so much more connectivity nowadays, and it is remarkable to see what technology can achieve. I think that the next generation of diagnostic software will be able to offer 'maintenance on demand', because it will be constantly assessing and analyzing what is happening inside each vehicle." The BMW i8, for example, has a TeleServices facility, which allows the car to alert the driver or BMW if any maintenance issues arise.

Shared platforms

Of course, whilst delivering such technological innovations, the OEMs must also focus on increasing margins by stripping out costs from their manufacturing operations, and the use of shared platforms and common components is the most visible approach. Volkswagen was the first OEM to embrace such a strategy, by aiming to have just four modular platforms, whilst GM is looking to use the same number by 2025. Inevitably, the OEM's supply chains will be reduced by such strategies, forcing component manufacturers to become even more efficient to survive, and they – along with the OEMs – also face further challenges from the unstoppable consumer-led desire for more technology in their vehicles. As PwC's "2015 Auto Industry Trends" says: "The time frame

**\$148
BILLION**

The likely worth of the
networked mobility market
by 2020

APPLIED MECHANICS:

More hi-tech means shorter product and service development cycles for manufacturers.

for new vehicle launches is typically three to five years, but the cycle for new software iterations is measured in months. Software breakthroughs are becoming as critical as hardware innovation, and competition is increasingly coming from non-traditional players.” The latter trend will also place huge aftermarket pressure on automakers and their dealership networks, who will be forced to either upgrade both software and hardware for customers, or risk losing trade to more innovative rivals, as the effective “life span” for such products diverges ever further from the expected life of their vehicles. “By 2020, one in five cars will be connected to the Internet and OEMs will have to manage shorter product and service development cycles,” says McKinsey & Co’s “The road to 2020 and beyond” report.

Regional sourcing

There are also major strategic challenges ahead, and WMG’s Professor Janet Godsell, who held senior roles at the innovative vacuum manufacturer Dyson, before specializing in supply chain and operational management, says the ability to deliver incremental improvements to existing cars while developing next-gen vehicles will be critical. “Probably 80% of components will be the same, and of the 20%, most will relate to the power trains, as the gradual move from petrol engines to hybrids and electric power and, in the future, fuel cells and even solid-state batteries opens up the market for new players and new suppliers,” she says.



IN PRODUCTION:

Car components are increasingly being sourced regionally, rather than globally.

“At the same time, the previous trend for global sourcing is being largely reversed. OEMs are increasingly looking to regional sourcing to reduce the length of their supply chains, partly to reduce costs, but also to reduce risk and uncertainty. There will also be more use of logistics centers, or sequencing centers, between the OEMs and the component manufacturers to increase efficiency. As the switch to in-region manufacturing continues, supply chains will become much shorter, and much easier to manage, and developing the next generation of power trains will generally be much easier to manage because they are physically closer to their suppliers.”

However, while the relentless advance of technological connectivity offers huge benefits to the OEMs, their suppliers and their logistics providers, the downside is that many of the hi-tech components are sourced

3 QUESTIONS FOR

Fathi Tlatli
President, Global
Automotive Sector,
DHL Customer
Solutions &
Innovation



overseas and often in South east Asia. Japan and Korea are long-established production locations, China is fast becoming one, and even India is now looking to enter the same global supply chains, via its “Make in India” initiative. “Some components will still need to come from overseas, usually because of the presence of a particular raw material or mineral,” admits Professor Godsell. “OEMs will need to ensure they have full visibility along their supply chains so they are clear where components are being sourced.”

“Recent natural disasters in Japan and Thailand were defining moments,” recalls DHL’s Tlatli. “OEMs are now much more aware of the importance of identifying every aspect of their supply chain and focusing on certainty of supply, and we’re seeing dramatic improvements in risk management techniques because of the evolution of software “tools” which we can integrate into supply chains to assess how these chains are operating and to identify areas of potential risk.”

As the automotive industry drives towards an increasingly hi-tech future, there are both opportunities and challenges to navigate on the road ahead, but as The Economist Intelligence Unit noted in an article called The Hyperconnected Car, “the mechanical components of cars are increasingly permeated with digital functionality,” while every customer “is now used to a digital life and increasing amounts of technology.” There’s no putting the brakes on now.

Yet embedding more and more new technologies into cars is no use if the infrastructure investments that are vital to the broad adoption of those features are lagging behind. Questions remain: How do you ensure that the right standards are developed in terms of vehicle-to-vehicle communication to guarantee safe automated driving? How do you offset the anxiety that first-time buyers of electric vehicles are experiencing?

No visionary OEM or supplier can provide the solution alone. The mobility industry as a whole must join forces and collaborate to develop end-to-end concepts that will involve automotive manufacturers, infrastructure providers, logistics companies and regulatory bodies, as well as end consumers.

Much is already being done to reach that objective and DHL is an active contributor to the discussions through its involvement in the FIA Formula E Championship. Beyond the race, Formula E offers an unprecedented platform for companies willing to develop sustainable mobility solutions that rely on more and more advanced technologies. It also brings together all the relevant stakeholders through the “e-story” business initiative led by DHL, which will be described in a white paper signed by 13 companies. ■ *Ian Halstead*

1 MILLION

The number of miles completed by Google’s fleet of self-driving cars (in self-driving mode)

\$5 BILLION

The amount that electric vehicle pioneer Tesla is reported to be investing in its new Gigafactory in the Nevada Desert

1. We are seeing ever-more futuristic uses of technology in the auto industry. Does the pace of change ever surprise you?

To be honest, it doesn’t. In the modern world, I don’t think there are any limits to what can be achieved. You could even argue that some changes have been a long time coming. It’s a century since the first electric cars were invented and Da Vinci visualized flying machines some 500 years ago. However, if you consider the concept of driverless cars, for example, the core challenge is not technology, but public acceptance and how issues around risk mitigation are addressed and resolved.

2. Do you see innovations coming forward across the industry, or are particular OEMs leading the way in driving change?

It’s always been the case that innovation is more in the DNA of some corporations than in others. We are now seeing innovations happening within all the major car producers globally, but some are faster at bringing them to market, and in ways which makes people want to buy their vehicles. OEMs also have to be innovative at identifying risk in their business models and their supply chains, and in using the correct tools to reduce volatility throughout their operations.

3. Will the trend for outsourcing by OEMs continue, and how do you expect their relationships with their logistics partners to evolve?

Absolutely. There’s no doubt the major automotive players will continue to outsource all kinds of services which are not their core functions, particularly to increase productivity and boost their ROI. You’ll certainly see increasing integration between the OEMs and their logistics providers. There will also be greater connectivity between the OEMs and their supply chains, driven largely by new ways of collecting and using data to create innovative solutions.

CROSSING OVER

The logistics industry has become adept at “cross-pollinating” technology from the auto sector in order to enhance its own.

Using technology from one industry to improve another is not a new concept; but the pace at which such “cross-pollination” occurs has never been so swift.

It wasn't always this way. The first crank and connecting rod, for instance, came from a third-century sawmill in modern-day Turkey – but another 1,500 years passed before it became the crucial component of the first commercial steam engine, which helped spawn the industrial revolution.

Today though, the pace of technological advance is measured in mere months. Take the automotive sector, where innovations are quickly adopted by end customers – but have also been widely adapted to serve the requirements of the logistics industry. This is a sector, after all, which offers huge rewards to those providers who see new solutions elsewhere and adopt them, while others sit and wonder.

Arguably, the most successful examples of cross-pollination has been the adoption of automated guided vehicles (AGVs). Devised in the 1960s in the US, as driverless forklift-sized devices that slid along wires inside manufacturing plants, they have morphed in recent years into the ground-hugging smaller relative of the aerial drones familiar to us all. AGVs were used initially inside major manufacturing plants – typically aerospace and automotive – to shift massive loads and components safely and accurately, and the first generation navigated by magnets or magnetic tape.

However, they crossed over to the logistics sector in spectacular style in early 2012, when Amazon acquired Massachusetts-based warehouse robotics specialist Kiva Systems, to increase productivity and cut costs at its fast-growing chain of fulfillment centers. Now rebranded as Amazon Robotics, and with an R&D center in Berlin, the latest Kiva robots were launched in December 2014, when Amazon revealed that it already



ROBOT STORES:

Amazon uses Kiva robots to help in its US distribution network.

SMART MOVES:

Big data is increasingly found in logistics environments, helping “smart” fork-lifts improve efficiency.



operated 15,000 of the little orange devices in its US distribution network.

The latest generation of such vehicles, pioneered by Pittsburgh-based Seegrid, operate without lasers, magnets, tape or wires, and are capable of self-navigation using a 3D “grid” of their environment, causing them to be dubbed “vision-guided vehicles” (VGVs). AGVs are an increasingly common sight in logistics centers, but do represent significant investment and the likely cost of restructuring warehouses must also be taken into account, so their use isn’t always as obvious a strategic step as might be thought.

However, given the greater flexibility of VGVs, and their growing presence in manufacturing plants, it is surely only a matter of time before they too migrate to the upper echelons of the logistics industry.

Big data

Technology based on “big data” is also increasingly found in logistics warehouses and distribution centers, which certainly wasn’t the case in the recent past. “Historically, when product moved from a trailer into a warehouse, it was as if the shipment entered a big blank box you couldn’t see into,” Jim Gaskell, Director of Ohio-based materials handling equipment manufacturer, Crown Equipment, told Inbound Logistics magazine. “Today, companies need to continue to monitor those products, the equipment and the staff handling them, throughout the warehouse.”

Here, logistics providers have tailored technology originally devised for major manufacturers, production plants and trucking companies to provide their own solutions. Data is now increasingly extracted from “smart” forklifts within warehouse complexes, for example, to increase their efficiency, monitor their performance and reduce workplace accidents. The impact of such analysis can be truly remarkable.

One major US dairy (Golden Guernsey) installed “impact detectors” in its forklift fleet to discover how quickly they were being driven, how often they were involved in incidents and which drivers were responsible. After just two months, the company reported that its monthly impact total had fallen from 1,036 to just four.

More advanced sensors and telematics are also now used to increase connectivity between manufacturers, their logistics providers, on-the-road trucks and other

elements in their supply chains; both downstream and upstream. One of the most sophisticated uses of such technology was revealed by Jaguar Land Rover (JLR) this year, when its European distribution manager, Deborah Buswell, explained at an automotive logistics conference in Bonn that the manufacturer was taking advantage of the “track and trace” telematics installed in its latest vehicles to provide real-time data about every aspect of its deliveries to dealers. Impressively, the information even included the whereabouts of each new car in a dealer’s compound, to within two parking spaces.

The telematics are installed in each vehicle during the manufacturing process, passed on to JLR via its cloud service, and then sent on to the logistics provider responsible for delivering its vehicles, a level of communication which would have been considered impossible just a few years ago.

Likewise, the latest sensors and telematics are being used by logistics providers, both to monitor the performance of each individual truck in its fleet – providing advance warning about maintenance requirements and fuel consumption – and to deliver dynamic multi-stop route planning. This increases productivity by monitoring traffic flows in real time, reduces journey lengths and delivers goods more efficiently to domestic customers and corporate clients.

Devising schedules to cater to part-load shipments from multiple carriers was a long-term bugbear for all logistics providers, but such challenges can now be overcome in nanoseconds with software programs, which even tell drivers the optimum way in which their vehicles should be loaded via mobile handheld devices.

The latest analytical software also resolves another major headache for route planners, by maintaining centralized databases of historic deliveries across multiple distribution centers and clients, allowing easy ongoing evaluation of the business impact of every journey. ■ *Ian Halstead*



VOLVO CARS ROLLS OUT NEW INNOVATION

As Volvo Cars continues its renaissance under Chinese owners Geely, Kjell-Ake Eriksson, Vice President (Indirect Purchasing) at Volvo Cars, points out that innovation has always been its driving force.

Doing things differently has been a way of corporate life for Volvo Cars, since its astute founders realized that sheer speed was not a vehicle's only selling point.

The cars manufactured by Assar Gabrielsson and Gustaf Larson were designed to withstand both the rigors of Sweden's unforgiving climate and its challenging road conditions. Even before the first Volvo chugged off the production line in April 1927, protecting its occupants from harm was more important to them than simply propelling them forward as quickly as possible. Gabrielsson and Larson were also decades ahead of their contemporaries in creating a brand which spoke directly and powerfully to the consumer. Most auto industry pioneers emblazoned their names on their vehicles, their factories and their billboards. However, the two Swedish entrepreneurs preferred to create a brand which meant something; so, from the Latin verb "volvere" (to roll), they created Volvo: I roll.

Their first customers knew they were buying a car which would roll regardless of the weather or the uneven road surface; and the perception that Volvos are reliable and safe remains ingrained in the buying public's collective psyche. It remains so today. "Safety has become the central element of our long-term heritage," says Kjell-Ake Eriksson, Vice President (Indirect Purchasing) at Volvo Car Group. "We are always working to create very safe cars. We were the first carmaker to install seat belts in front and rear seats, and we designed the first three-point seat belt in 1959. Making engines with very low emission levels is also very important to us. We were the first carmaker to design an effective system for 'cleaning' exhaust gases, by using a three-way catalytic convertor."

That milestone was achieved back in 1976, and there have been many more since, including the intriguing concept of a "pedestrian airbag," which inflates to cover the windscreen after a collision, reducing the potential impact on people outside the vehicle. Adaptive cruise control, radar sensors offering 360-degree visibility of other vehicles, forward collision warning and even cyclist

detection devices are other Volvo Cars innovations, introduced through its IntelliSafe program – the suite of safety features found in its cars. The ultimate aim, says Eriksson, is to ensure that by 2020, no one traveling in a new Volvo will ever be seriously injured or killed, a visionary approach that would most certainly have been applauded by the company's founders. The engineers tasked with designing Volvo Cars' new generation of Drive-E power trains have been setting equally challenging goals: building units which deliver the low fuel consumption and emissions of a four-cylinder engine and the power and performance of a six or eight-cylinder variant.

That combination of commitment to safety and technological innovation was critical when Volvo Cars decided to take on the Chinese market, following its acquisition by Zhejiang Geely Holding in 2010. Its new owner immediately pledged to invest \$11 billion over the next five years to revitalize its model range and to expand its global footprint with both increased sales and in-country production plants, in the world's two largest auto markets, China and the United States. Volvo Cars had been in the latter market since the mid-1950s, but had never previously had the resources to set up a production plant. In China, the challenge was even greater, as other premium brands were already established there.

High demand

However, the huge Geely investment has paid off spectacularly. Volvo Cars now has three production sites in China. The first is in the Chengdu Economic and Technological Development

\$11 BILLION

The amount that Volvo's owner, Geely, is investing to create new models and drive global expansion



Zone in Southwest China; the second is located in Daqing, northeast China, where its best-selling XC60 is assembled for the local market; and the third is an engine plant in Zhangjiakou, northwest of Beijing, which supplies engines to Chengdu and Daqing. All sites have the same specification for technology, safety and the environment as Volvo Cars' earlier plants in Sweden and Belgium. "Chinese customers do not have lower expectations than Europeans," said Lars Danielson, Senior Vice President of Volvo Cars, China Operations, and CEO of Volvo Car China at the start of production of the XC60 in November of last year. "They expect premium quality products. Customers also have plenty of choice in the highly competitive market in China. That is why we make sure to deliver high-quality Volvo cars out of Chengdu that are at least as good as the cars we build in our European plants."

The five-year investment program has also enabled Volvo Cars to unveil plans for its first US plant. Around US\$500 million will now be invested in the factory, based just outside Charleston, South Carolina, and production is expected to begin in 2018. With a potential capacity of 100,000 vehicles annually, and 2014 US sales of just 56,000, the scale of the company's determination to regain market share and transform its presence in the country under a new leadership team is evident.

Even as those ambitious proposals were being announced, Volvo Cars already had much to celebrate, as its all-new SUV, the XC90, was launched to acclaim from dealers and drivers alike. "The demand was fantastic, higher than our forecasts," admits Eriksson. "We had 20,000 orders before the first one had reached the dealerships. Today, more than 65,000 XC90s have been sold. Such success brings its own challenges, of course, and as we establish our global footprint, the challenge is to be consistent with regard to quality. We are always monitoring our supply chains to ensure that optimum quality is being achieved."

"Equally though, we always need to have strong predictions about the potential impact of external influences, which is very challenging at the moment. The future

strength of China's economy isn't clear, Europe is also more or less flat, as is the US, and the absence of economic growth must influence demand. However, we still believe that our target of selling 800,000 vehicles in the medium term is achievable, because of the quality of our products and our relentless focus on innovation."

Being different

The Swedish automaker certainly took a radical approach to marketing this year, attending the Auto Shanghai exhibition in April, but not exhibiting in Frankfurt in September. "We are one of the world's smallest carmakers, so we cannot simply follow the mainstream," says Eriksson.

Volvo Cars is also focusing on innovations via the "connected car" concept, and used the world's largest mobile technology exhibition, in Barcelona this spring, to outline its plans. A pilot fleet of 1,000 cars is being trialled in Sweden and Norway, to see how "road status" data about traffic flows, journey times, accidents and other crucial information can be collected and then shared with other road users via the cloud. Volvo Cars' software engineers have even devised a "slippery road alert," so its vehicles can automatically warn both their driver and other drivers, of challenging driving conditions via an in-car app. Such innovations would require a next-gen road infrastructure to operate, but the trials underline the company's desire to become a pioneer of "connected" vehicles.

Eriksson is naturally enjoying Volvo Cars' renaissance under Geely, even if the demands of working life in Gothenburg, Sweden, mean his alarm is set for 5:15 a.m. every day. "I have always been motivated by enthusiasm," he says. "I have a very good team around me, and there is a powerful momentum in the company because we are going somewhere we have never been before. The new plant in Charleston is very much part of that journey, and I think I'm a very lucky person to be involved." ■ *Ian Halstead*



tinyurl.com/del-volvo-cars

LOOKING EAST:

Volvo Cars has established three production sites in China.



URBAN LOGISTICS GOES GREEN

Volvo Buses has some ingenious solutions to make city logistics more sustainable, including green vehicles – and an innovative bus stop.

Academics, politicians and observers from both the public and private sector agree that urbanization will be the major catalyst for global change in this century. The perception that cities should be considered as dynamic and living ecosystems, within which people, their homes, workplaces and vehicles will interconnect with the providers of goods, services, energy and big data has also gained widespread support.

Admittedly, there is less accord – for the moment – about how cities of the future will organize and operate their myriad functions to meet the fast-changing requirements of their residents. However, there is a clear global trend for the evolution of sustainable transport solutions based on electromobility, via the use of either hybrid power trains, electric fuel cells or batteries. One of the early movers in this fledgling sector is Volvo Buses, which has established a network of partnerships with major global cities.

Last year, two Volvo 7900 electric hybrids began operating in Hamburg, Germany, while a fleet of eight similar vehicles took to the roads of Stockholm, Sweden. The company has also received an order for 25 of its electric hybrid buses to operate in Edinburgh, Scotland. At the same time, Volvo Buses is collaborating with other major cities to create sustainable city traffic solutions based on electromobility, including Curitiba, Brazil, and Shanghai, China.

However, its most ambitious project was launched in June of this year, in Volvo's home city of Gothenburg, Sweden, where two variants of its latest buses are operating on route 55 within the local public transport system. Seven of the vehicles on the route are the 7900 electric hybrid, and three are all-electric concepts, featuring free Wi-Fi, power sockets to recharge phones and other mobile devices, and with the driver's seat in a central position to increase capacity. Although just 10.7 meters long, these vehicles can carry 86 passengers.

Innovative approach

Volvo Buses, which expects full commercial production of its all-electric buses to start in 2017, says energy consumption is around 80% lower than conventional vehicles. But there's more to the Route 55 project than technological advances. It's one of many schemes devised and delivered by ElectriCity, a collaboration between Volvo Buses, the local

authority, city planners, two science parks, the Swedish Energy Agency, and regional government, set up to develop, demonstrate and evaluate the next generation of sustainable public transport. "The Volvo Group aims to be the world leader in sustainable transport solutions," says Niklas Gustafsson, Chief Sustainability Officer, Volvo Group. "A unique collaboration in Gothenburg enables us to launch the electric bus route here and remain a leader in the development of future public transport."

Volvo Buses has also teamed with DHL Express to create a new bus stop design, which would include DHL SwipBox, secure delivery locations for customers of online retailers who prefer the convenience of picking up their orders from unattended locations rather than accepting them at their home or workplace. These "self-service locker stations" – which can only be accessed using a customer's PIN – are available to improve customer convenience. By adding new support services such as self-service locker stations, bus stops facilitate carbon-free mobility of people and goods.



80 PERCENT

The reduction in carbon emissions generated by Volvo's electric hybrid

"DHL Express is the first to launch this entirely new delivery option in the Swedish market and it is the rapidly growing e-commerce that creates the need for more customer-friendly transport solutions," says Ted Söderholm, Managing Director, DHL Express Sweden. It's an innovative approach to the "last mile" challenges faced by all logistics providers. Manoella Wilbaut, DHL Customer Solutions & Innovation, Head of Global Commercial Developments, is impressed by both the bus stop concept and the Route 55 project. "Through our City Mobility program we aim to develop sustainable solutions that reduce environmental impact, increase productivity and control or reduce costs, and Volvo Buses' philosophy certainly dovetails with ours," she says.

"It's also good to see the local and regional authorities in Gothenburg are collaborating on ElectriCity, because as cities of the future continue to evolve, the public sector will have a crucial role to play, not simply on individual projects such as Route 55, but in terms of both urban infrastructure and legislation." ■ Ian Halstead

 tinyurl.com/del-volvo-busses

PANAMA'S EXPANDING HORIZONS

Although it still has challenges to overcome, Panama is emerging as Latin America's logistics hub.

22
PERCENT

The amount of all container cranes in Latin America that can be found in Panamanian ports

Just over a century ago, the very first ship sailed through the Panama Canal, a 48-mile stretch of waterway hailed as “one of the seven wonders of the modern world.” By effectively splitting Panama in two to connect the Atlantic and Pacific Oceans, the canal acts as a crucial shortcut for shipping, making a long, slow haul around the tip of South America no longer necessary. No wonder that between 13,000 and 14,000 vessels sail through the canal every year. In 2010, it welcomed its one-millionth vessel since it opened in 1914.

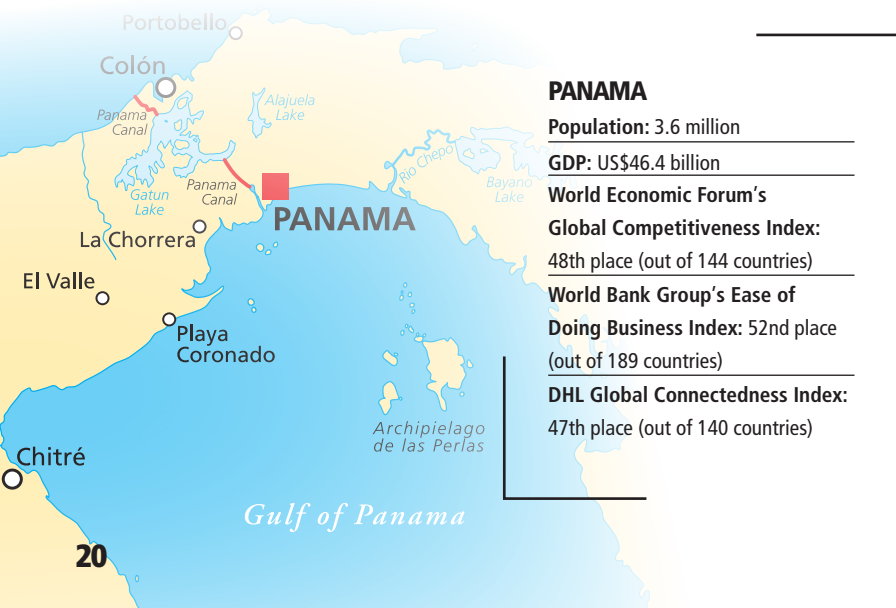
Next April, however, the canal will reach an even more important milestone – the completion of a hugely ambitious US\$5.2 billion expansion plan that is set to double its current cargo and allow it to handle the world's biggest ships (see box). This, says the website porttechnology.org, “will change world trade patterns and open the waterway to new markets.”

Panama – a country of just 3.6 million – might be small, occupying a sliver of land that serves as a continental bridge between Central and South America, but its incredible waterway has always underlined the country's strategic importance.

In terms of infrastructure, Panama is not only home to the canal, but also has two ports and two major free trade zones (its Coló FTZ on the Atlantic side of the canal is the biggest in the Americas) that serve as warehousing and distribution centers, and a growing economy. The potential for Panama to do more business in Latin America is also now better than ever, with the continent's 600+ million citizens – 90 million of whom have recently been lifted from poverty into the growing middle class – offering the country an increasingly robust consumer market, literally on its doorstep.

The fact is that the rise of Panama seems to echo the rise of Dubai and Singapore, both of which grew exponentially to become regional hubs. Take Dubai, once a small trading port, which used its strategic position at the crossroads of Europe, Africa and Asia to transform into a regional hub for trade, logistics, business, finance, retail and leisure. It did this partly by building world-class infrastructure and encouraging investment in a business-friendly environment. Singapore, too, capitalized on its geography, became a champion of free trade, grew a business-friendly reputation and positioned itself as a gateway to Asia. Could Panama follow their example and become a regional hub for Latin America?

“Based on conversations we've had with our partners and customers, the consensus is that Panama has the potential to be the ‘Singapore of Latin America’, especially with the canal expansion project,” says Erin O'Bannon, growth marketer with Weft, a global logistics data company. “Panama has a financial center





WATER TIGHT:
Vessels line up in the
Panama Canal

that supports more trade and manufacturing, as well as a gateway to get goods through to Central America and northern South America.” Indeed, in 2014, 22% of all container cranes in Latin America were to be found in Panamanian ports, according to John Knohr, Managing Director of Panama & Caribbean, DHL Global Forwarding, who questions the description of the country as a “potential” hub. “Isn’t it already the Singapore of Latin America?” he asks rhetorically. “I think Panama is already there.”

In the last decade or so, the country has made a conscious effort to establish its bona fides as a regional logistics hub. In 2004, it decided to create a second free trade zone, the Panama Pacifico Special Economic Zone, occupying an area once used as a US Air Force base on the outskirts of Panama City. Then, in 2007, the country broke ground on the canal’s expansion plan.

According to Knohr, Panams’s location helps in terms of consolidating and distributing cargo to the region. DHL Global Forwarding uses the country as a regional hub, and DHL Express and DHL Aviation have also invested substantially with three units. For warehousing and distribution, there’s an ease of doing

business in Panama, which is not as regulated as the United States, with customs rules and enforcement that are both considerably less stringent, especially for technological gadgets.

Then there is the potential the country has to expand its air freight business in Latin America, “especially for electronics or anything that is subject to obsolescence, such as pharmaceuticals,” says Knohr. It has been investing in airport infrastructure, and the national flagship carrier Copa Airlines has established itself as a regional hub for passenger travel.

\$5.25
BILLION

The cost of the Panama Canal
expansion project

Business environment

This logistics infrastructure and reputation as a good place to do business have helped attract investments from a broad range of multinationals, predominately from the US and Europe but also from Asia and other parts of Latin America. More than 100 companies have set up shop, according to a booster group called PanamaBusiness. They cover just about every sector from consumer goods to construction, including household names such as Procter & Gamble and HP. Computer manufacturer Dell has established itself in



PILOT PROJECT:
Panamanian pilot Tomas Martinez, on the CGM CGM Alcazar, monitors operations at the Pedro Miguel locks on the Canal.



HIGH-RISE:
Panama City, the country's financial, political and administrative center

Panama Pacifico. Compared to many other countries in Latin America, taxes are reasonable and labor laws are more favorable. Yet despite the presence of big names, the manufacturing sector lags behind, according to a report published last year by Deloitte. "Since the Panama Canal offers easy access to imported goods from Asia and North America, there is scant incentive for local production," it stated. "As such, the manufacturing sector is relatively small when compared with other Latin or Central American nations."

According to Deloitte, in addition to transportation and logistics, tourism, mining and construction are expected to drive growth in the Panamanian economy in the coming years. The electricity sector should help as well, notes a report released in January by Fitch Ratings, the global ratings firm. It predicted that energy demand will grow by 5% a year on average through 2018.

The country's most glaring weakness would be the quality of its workforce. "They have not been able to provide the amount of qualified labor needed in a country that has been growing by six to ten percent a

year over the last six or seven years," says Knohr. This shortage in trained labor might be partly a function of poverty: despite its recent economic growth – in 2014 its total exports were US\$15.3 billion and its gross domestic product (GDP) US\$46.4 billion – one-quarter of Panama's population lives below the poverty line. However, a World Bank-financed project to improve income generation – called Strengthening Social Protection and Inclusion Systems – was announced this year, and is to be "complemented with investments aimed at providing training and labor intermediation services." The initiative is thought to support new opportunities for 600,000 people living in poverty in Panama.

Improving infrastructure

When it comes to earning its stripes as a world-class hub, another weakness would be the relatively low levels of exports from Latin America, in O'Bannon's view. "Panama lacks the volume of exports and traffic that Singapore sees coming from China and its neighboring countries," he says. Much of Panama's volume is dependent on the economic and political winds in places that are often all too unpredictable. "The Coló Free Trade Zone still depends too much on neighboring countries such as Venezuela and Columbia," says Knohr. As growth has stalled in those countries, Panama's trade volumes have taken a hit.

Even so, if Panama still has some homework to do, it seems to have at least forged an across-the-spectrum political consensus to bet on the logistics sector. Since 1999 the country has had four presidents representing four political parties. Yet efforts to improve logistics and transportation infrastructure have continued apace. "The government has a solid plan for the next 20 years on how to make Panama a logistics center," says Knohr. "They integrate the government and the private sector. We meet on a regular basis." ■ *Bill Hinchberger*

GRAND CANAL

The Panama Canal expansion project will double the waterway's capacity by building two new sets of locks and increasing the size of man-made Gatun Lake. With inauguration of its new facilities next year, the canal will be able to accommodate ships carrying up to 13,000 20-foot containers of freight, three times the current limit.

The plan was approved by three-quarters of voters in a 2006 referendum – even though the US\$5.2 billion price tag represented nearly one-third of the country's gross domestic product at the time.

High growth in recent years has reduced the cost/GDP ratio, but delays have also pushed the inauguration back from its 2014 original target, set to coincide with the 100th anniversary of the canal's opening. According to the canal's official website, work was 93.1% complete at the end of August 2015.



THE FUTURE IS OMNI-CHANNEL

Consumers are increasingly demanding to buy across many different platforms – which means that retailers will have to adapt to a new reality if they are to survive.

The consumers of the future will expect to make purchases anytime, anywhere and any way they want. It's called omni-channel purchasing, and it's going to be a major challenge – and potential opportunity – for the logistics industry.

Of course, there will be retailers who try to fight this new future and attempt to stay as they have always been. Yet rapidly advancing technology will force them to adapt or die, according to “Omni-channel in Logistics,” a new DHL trend report. That comes down to one simple statistic: 90 percent of the world's population will be covered by a fast mobile internet connection by 2019. “The availability of information, speed of delivery and personalized experiences that these modern consumers' expectations require are simply not possible with the traditional channel-based approach,” notes the report.

Omni-channel is all about making the process of buying goods as easy as possible across multiple channels, from physical stores to online and mobile ordering and even social media. Some retailers are looking for still more unconventional ways to reach customers. Amazon, for example, is experimenting with “Dash Buttons” around the home that would make reordering common products like laundry detergent as easy as, well, pressing a button.

Stores that can seamlessly blend traditional bricks-and-mortar locations with a solid online presence will be at an advantage in the omni-channel game. Take returns as an example. According to one study, consumers return more than a quarter of clothes ordered online – often ordering multiple sizes with the express intention of sending the ill-fitting ones back.

Easy returns

Retailers know that making returns easy keeps customers coming back; so names such as Zara, Target, Mango and Macy's let people bring

90
PERCENT

The share of the global population expected to be covered by fast mobile internet connection by 2019

items ordered online back to retail stores or have it collected from home. Retailers could make that process even easier by picking up returns from parcel stations or car trunks.

Providing near-instant gratification also requires creative thinking to conquer geography, bringing manufacturing and customization as close to the customer as possible. DHL and others are already experimenting with customizing purchases (like football jerseys) at distribution centers, rather than central production facilities. On the distant horizon are “distributed manufacturing facilities” capable of creating products on the fly. Think 3D printers in delivery vans printing out products en route, providing delivery within an hour of an order.

Omni-channel in Logistics has some tips for organizations hoping to join the omni-channel revolution. First, integrate: online and offline marketing, merchandising and logistics need to work together to respond to customers across different channels. Second, make existing resources work harder: stores can double as distribution centers, and inventory technology can be leveraged to provide a better overview of what customers need and how to best get it to them.

Finally, and perhaps most importantly, businesses that succeed at omni-channel sales will be the ones that know their customers best. “Great customer experiences start with great interactions at all touch points,” says the report. “Logistics organizations need to ... develop solutions and system interfaces that meet their consumer's expectations.” ■ *Andrew Curry*

The trend report will be available in December 2015. To download it, please visit:



tinyurl.com/del-omni



BUILDING THE WORLD

A new DHL white paper analyzes the future supply chain challenges and opportunities in the engineering and manufacturing sector.

For three centuries since the dawn of the industrial era, manufacturing has driven national and global economies. Manufactured goods still account for over two-thirds of global trade. Each industrial job indirectly generates more than two others somewhere else. For the future, supply chains will be a key value driver of this sector.

In the 21st century, much of what we used to call industrial production is formally classified as E&M – engineering and manufacturing. E&M encompasses four subsectors: industrial equipment, aviation and aerospace, non-energy mining, and construction equipment, according to DHL's definition.

That amounts to a huge swath of the global economy. Yet, notwithstanding three centuries of industrial-strength staying power, each of these subsectors faces potentially game-changing opportunities and challenges.

Now, DHL has analyzed them in a white paper called "Engineering & Manufacturing 2025+: A DHL Perspective on Future Engineering & Manufacturing Supply Chains." The report identifies six major trends for the E&M sector over the next few decades. As befits a segment of the economy that looms both extensive and important, it covers just about everything: ecology,

economy, environment, politics, society, and technology. It also includes industry viewpoints and insights from major companies in the sector, adding to the report and its findings. The white paper first examines the current environment and trends, then how the sector is responding; and, finally, areas that need to be addressed in supply chain management.

E&M companies are already facing what the white paper calls shifting markets, with countries such as the MINTs and, of course, BRICs playing growing roles and intensifying global competition.

But that's not all. Customer requirements are changing: increasingly customers demand specially tailored products, solutions, and processes. The costs of regulatory compliance are on the upswing. Volatility presents ever greater threats, be it via fluctuations in commodity prices, political instability or natural disasters. Shortages of skilled labor are holding back expansion plans and reducing productivity: over a third of global companies in all industries report problems finding qualified applicants. On top of everything else, E&M companies face both challenges and opportunities from new technologies that include the Internet of Things, big data, additive production, artificial intelligence, automation, robotics and more.

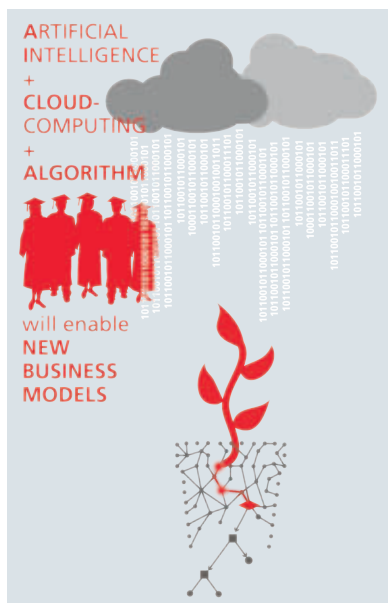
Improving competitiveness

Confronted with such an environment, companies are taking steps to focus more on the concerns of their customers and to improve their competitiveness. In some cases, they have "reengineered" production and business models. Over the coming years, everybody will need to follow suit, according to the white paper.

Due to the above-mentioned demands for tailored products, companies are looking to adopt what is known as "intelligent manufacturing" to create decentralized, modular, and flexible "smart factories." Encompassing what's known in Germany as Industry 4.0 or in the US as the Industrial Internet of Things, these adjustments aim to reduce product life cycles and adapt to changing customer demands.

Some companies are adopting sustainable manufacturing, aiming to become cleaner and greener with energy-efficient production and cradle-to-cradle concepts. Some are changing business models as clients demand additional value, core markets become increasingly saturated and product margins face added pressure. That includes "servitization" as companies strive to generate additional value by offering value-added services on top of their product portfolio.

New models of collaboration are also in vogue. These new forms of cooperation with suppliers and service providers are based on models pioneered by the automotive sector. According to the white paper, companies in other sectors are copycatting a concept that revolves around the creation of clusters in different regions.



"Each subsector of the engineering and manufacturing industry faces potentially game-changing opportunities and challenges."



88
PERCENT

The percentage of global CEOs who said the supply chain is an area of specific importance in their sustainability strategy (Source: 2012 survey by Accenture)

3. Sustainable Supply Chains

Environmental sustainability will be pushed by consumer demand, regulations, and economics. This will encompass elements that fall under the rubric of “reverse logistics,” including repair services, product returns, and recycling. “Companies will increasingly select their suppliers based on their environmental performance,” the report states.

4. Connected and Integrated Supply Chains

Using emerging technology, companies will have to build highly integrated supply chains connected from end-to-end and in real time. As a result, more companies will use lead logistics partners to achieve this.

5. Agile and Responsive Supply Chains

Supply chains will need to become more agile to respond effectively to requests for smaller batches of customized products and shorter product life cycles and withstand unpredictable disruptions. Build-to-order production will become the norm.

In summary, new supply chain concepts will enable E&M companies to differentiate themselves in the market and stay competitive going forward. In this respect the diversity of the E&M sector is an opportunity, as many E&M companies already successfully apply new supply chain concepts. Even more so, well-established concepts from other sectors can be applied in E&M, e.g. from the Automotive or Technology industry. ■ *Bill Hinchberger*

As success had fed success in the past, E&M companies grew accustomed to predictable demand and long lead times. As the scenario changes, they will need to adapt. The white paper suggests five things to watch for.

1. Regionalized Supply Chains

As emerging markets gain critical mass, global networks will be required to ensure “speed to market” and agile adaptations to changes in customer demand. Companies will need to establish regional networks of suppliers that are closer to their target markets and, ultimately, to consumers. All of this without ignoring old-school indicators such as total cost, efficiency, quality and delivery performance.

2. Resilient and Compliant Supply Chains

Faced with a volatile environment and potential external threats, companies will have to develop resilient supply chains, constantly monitor the trade-offs between efficiency and backups, develop contingency plans and place more emphasis on gathering timely information.

In the meantime, in terms of compliance, supply chain managers will need to keep tabs on an increasingly complex web of regulations, and adapt accordingly.

To download the white paper, please visit:

 tinyurl.com/del-e-m-dhl





AHEAD IN THE CLOUD

EMC, a global leader in information technology, is increasingly focused on the real-world impact of its supply chain, says Lisa Brady, Senior Director, Global Product Operations Sustainability.

31

The number of spot checks on supplier sites in six countries, carried out by EMC staff in 2014, to assess a set of key social and environmental indicators

From its early days producing memory chips for the emerging computing industry of the 1980s, EMC has grown into a global leader in the rapidly expanding world of cloud computing and information technology as a service (ITaaS). Today, the company employs around 70,000 people in 86 countries around the world, runs R&D facilities in ten locations and has its own manufacturing plants in Ireland and the US. EMC's products and services work behind the scenes to power the IT systems of thousands of companies, from start-ups to Fortune-500 organizations, in every sector from financial services, telecommunications and air transport to healthcare, education and public sector bodies.

As a significant player in its sector, and as a large global corporation in its own right, EMC has long recognized

the importance of sustainability. Since 2009, the company has collected and published data on its social and environmental impact, and shared its goals for improvement across a range of dimensions. Understanding that not even the largest and most capable organization can tackle every issue facing the planet today, EMC uses a sustainability materiality analysis to identify key issues upon which to concentrate. In this analysis, feedback from internal and external stakeholders – including academics, advisors, customers, partners, suppliers, employees, investors and non-governmental organizations (NGOs) – is used to rank more than 30 factors according to their likely impact on the organization, and on EMC's potential to positively impact that factor. This analysis has helped the company to identify nine key areas of focus for its sustainability efforts. One of those is its supply chain.

EMC's supply chain matters to its sustainability efforts, says Lisa Brady, Senior Director, Global Product Operations Sustainability, because in common with many organizations in its sector, so much of the company's value, and impact, now sits outside its four walls.

EMC's supply chain sustainability program has three principal elements, explains Brady. First, there is the creation of a resilient supply chain that can mitigate and respond to supply risks from social, environmental, and economic impacts. Second, the company aims to monitor and improve the social and environmental responsibility of its supply chain – ensuring that suppliers treat their employees well and reduce the negative impact of their own operations on the wider world. Finally, it conducts due diligence to avoid using so-called “conflict minerals” sourced from mines operated by armed militia in the Democratic Republic of the Congo.

Sustainability programs

Supply chain sustainability is a complex process. “Compared to sustainability programs for our internal operations, in the supply chain we have a wider reach, different sources of risk and less control over the outcomes,” says Brady.

To manage that complexity, EMC uses a structured approach that involves monitoring supplier performance and capabilities, assessing risks and implementing improvement activities where necessary. Its approach combines tools and techniques developed in-house with the adoption of industry standards where possible.

The company's supply chain business continuity planning approach has involved mapping the parts that make up its products to more than 900 tier one and tier two suppliers. Those suppliers are then rated according to their potential vulnerability to natural disasters and other geographic risks, their financial stability and the plans they have in place to recover from risk scenarios.

EMC's supply chain social and environmental responsibility program is based on an industry-wide standard: the Electronic Industry Citizenship Coalition (EICC) Code of Conduct. Suppliers are required to conform to agreed standards for labor, ethics, health and safety and environmental impact, and to have appropriate management systems in place to ensure they continue to meet those standards. A standard questionnaire and audit program makes it easier for suppliers to demonstrate their compliance with the code to different customers.

For EMC, supply chain Social and Environmental Responsibility (SER) is far more than a form-filling exercise, however. In addition to audits, the company conducts regular spot-checks on suppliers (more than 30 such checks in 2014) and its frontline staff that work on the ground with suppliers are trained to be on the lookout for potential problems. “If we find an issue at a supplier, we work with them to put a corrective action plan in place, and we follow up on that plan to make sure it has

been carried out,” says Brady. “We also conduct lots of capability building and training activities in the supply chain, and we share case studies of good practice with our suppliers.” This approach, she says, “means we can grow with our suppliers, and the whole supply chain matures over time.”

While a lot of effort inevitably goes into risk reduction, Brady points out that the company's supply chain SER program has plenty of direct positive effects too. “Lots of this work also drives cost savings, from things like optimizing packaging or reducing water consumption,” says Brady. “And when suppliers use good labor management practices, they have a happier workforce which leads to lower employee turnover, which helps to improve quality.”

The impact of logistics

EMC's logistics processes are a special area of focus for the company's SER program for a simple reason. “Logistics is an important source of scope 3 emissions,” says Brady (Scope 3 emissions of greenhouse gases are produced by activities not owned or controlled by an organization directly). The company measures the carbon-intensity of its logistics activities (in kg of CO₂e generated per metric ton km of freight carried) and has set an ambitious target to cut those emissions by 20 percent between 2013 and 2020. Achieving that target requires close cooperation with EMC's service providers, like DHL. “We have a continual pipeline of improvement activities in logistics,” says Brady. “We are looking at our transport modes, optimizing the structure of our network and identifying opportunities to merge shipments in transit.” The company has also worked hard to optimize the design of product packaging, both to increase the use of sustainable materials and to optimize package sizes for better transport utilization.

So what advice would Brady offer to other organizations seeking to improve the sustainability of their own supply chains? She has no hesitation in suggesting the best first step. “Publish a sustainability report. It's a very hard thing to do, but it makes you think strategically about your current impact, what is important to you, and what you are going to do about it.”

Once an organization begins to understand the social and environmental impact of its supply chain, it can set goals and targets for improvement, Brady continues. EMC has made SER metrics an intrinsic part of its sourcing decisions, alongside quality, cost and availability. A company also has to do the hard work of engaging the hearts and minds of employees and suppliers too. “We spend a lot of time explaining why these issues are so important. We want the whole organization and its supply chain not just to understand what they have to do to improve sustainability, but also why,” she concludes. ■

Jonathan Ward



tinyurl.com/del-emc

98 PERCENT

The percentage of EMC suppliers (by spend) who delivered environmental reporting



POWER TO THE PEOPLE

Donald Sadoway, a professor at the Massachusetts Institute of Technology, is developing a battery that might just revolutionize renewable energy.

For almost 20 years he taught the largest class at the Massachusetts Institute of Technology (MIT). His first investor was Bill Gates. Yet the man voted one of TIME Magazine's 100 most influential people in the world in 2012 deals in dirt: Donald Sadoway, a Canadian-born engineer and inventor, has created batteries that can be made from materials found in abundance everywhere around us.

Sadoway is developing a liquid metal battery that, noted the Financial Times, "could revolutionize the energy industry." He and his team at MIT have designed it as the missing link to store renewable energy on a grid-level scale.

"Batteries are boring, right?" says Sadoway, laughing and sighing at the same time. "Well, I hear that all the time. But people forget that almost everything that we have in the modern world is predicated on a reliable supply of electricity. Without electricity, there is no Internet, no telecommunications, no video. And the proper way to achieve this is with sustainable electricity. Because if we burn more carbon, our grandchildren will have a terrible world." So renewable energy is key.

All the energy we currently use via the electric grid has to be generated in real time because the electric grid, says Sadoway, is a peculiar device: the world's largest supply chain that has no "inventory" – or storage

capabilities. What we need, therefore, are batteries that store renewable energy – but not small ones, or expensive ones like the ones put in electric or fuel cell cars. Sadoway's aim is grid-level storage: giant, inexpensive, easy-to-build, modular batteries that can be added together as storage systems that are big enough to power whole cities. Ones that are silent, emissions-free, have no moving parts and can be remotely controlled. And who better to invent them than an expert in extreme electrochemical processes with 40 years of experience?

Usually, your typical university professor does not think about cost, admits Sadoway. "He thinks about fresh ideas, about doing something different. But I realized early on that if I wanted to invent something that has impact in the energy space then it is absolutely essential that it be cost-effective." He knows his battery must compete "in an area that is heavily subsidized. Coal and gas are abundant, entrenched and very, very cheap."

So Sadoway ruled out creating the battery using expensive materials. "If you want to make something dirt-cheap, make it out of dirt," he says. "Preferably dirt that's locally sourced." That is because the Professor wants his batteries to be produced anywhere on earth. "I am interested in science in service to society," he says. "I totally reject the model where everything is built in one giant factory and shipped all over the world. Part of my philosophy is 'batteries will be built wherever they are needed.'"

What Sadoway found was magnesium and antimony for his battery's electrodes with a layer of molten salt in the middle. There was one hitch: the battery required an operating temperature of 700 degrees Celsius. So Sadoway went back to the laminated periodic table sitting on his desk at MIT and another showing the earth's abundance of these elements. Now, with an alloy of antimony and lead in the positive electrode and another element from the northwest part of the periodic table in the negative electrode, the battery works at 450 to 500 degrees Celsius.

Cheap storage

"The lower the operating temperature, the less severe are the headaches," Sadoway explains. "The wear and tear on the housing will be lower." The batteries being tested have an efficiency of around 75 percent, which is on par with pumped hydroelectric power, the other main way of storing grid-level energy. "So they are competitive," says Sadoway. "But we also have some prototypes with efficiencies of 90 percent."

In order to build and commercialize his batteries, Sadoway and two of his students founded a company called Ambri in 2010, which now has more than 40 employees. Ambri has won a variety of clean tech awards such as the Rising Star of the Year. Ambri's company brochure notes that it can produce electrical storage

12 HOURS

The amount of energy the liquid metal battery can store – and it can then discharge this slowly over time

much more cheaply, maybe down to a tenth of the cost, than other battery technologies.

Prototype testing should have started already in Hawaii and off the Massachusetts coast, but has had to be delayed to 2016 due to "some operational details that have to be addressed." As Sadoway acknowledges: "Going from the laboratory to the marketplace is difficult." Still, his ultimate goal is to change society with his batteries. "I am very much in favor of power to the people, which in this case is to be taken literally," he says. "If you democratize the grid, the ability for people to generate their own energy is a fantastic idea."

He's not the only one who thinks so. In the lab and in the classroom, Sadoway was one of the first professors who went into online teaching in the early 2000s. This was how he came to meet Bill Gates, who was watching Sadoway's introductory chemistry class that every student at MIT has the option to take. Several years later, Gates had his assistant contact the professor. "I thought (Bill Gates') email was a student prank and initially didn't react," Sadoway remembers.

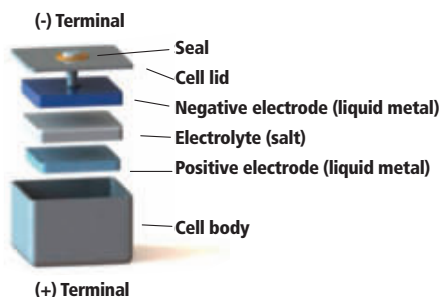
When they both finally met, they talked about all sorts of things – education, chemistry, long-distance learning. Only after a while did Sadoway mention his battery project. "I had no models or results at that time," he remembers. "I sketched my ideas on a whiteboard and Gates said: 'If you ever spin this off, let me know. I want to put some money into it.'" A year later Sadoway did just that and Bill Gates was the first investor in Ambri.

For Donald Sadoway there are, literally, electric times ahead. ■ Margaret Heckel

 tinyurl.com/del-sadoway

HOW THE BATTERY WORKS

Ambri has developed the only battery where all three active components are liquid when the battery is in operation, which means that the technology has a long life span and can be manufactured at comparatively low cost. Three simple components make up the cells – a salt (electrolyte), which separates two distinct metal layers (electrodes). "Cells operate at elevated temperature



and, upon melting, these three layers self-segregate and float on top of one another due to their different densities and levels of immiscibility," says Ambri.

WHEN PRODUCTIVITY IS ALL IN THE MIND

Forget multitasking. These days, mindfulness is the new buzzword. But what is it – and does it really work?

Sending a text message while walking down the street? Finishing a presentation and talking to your office colleagues about the next project? And that eternal classic: firing off e-mails while participating in a phone conference? Don't we just love being able to do all these things at once with our electronic devices, multitasking our way through work and daily life?

Well, we might be on the wrong track. More and more studies are cautioning that multitasking might decrease efficiency instead of increasing it.

With multitasking, the general idea is that we complete more than one task at a time, thus potentially increasing our productivity. Now, however, the experts in the labs are cautioning us that humans are not built to multitask because our brains do things sequentially, one after another. "When people think they're multitasking, they're actually just switching from one task to another very rapidly," says neuroscientist Earl Miller from the Massachusetts Institute of Technology (MIT) in *Inc.* magazine. "And every time they do, there's a cognitive cost."

And think about it – when you're on your smartphone sending an e-mail while simultaneously listening to someone making a presentation, do you really focus on both at a time?

To check this, researchers from Stanford University in California compared people who called themselves "heavy multitaskers" with a group who said they only do one thing at a time. The results showed that the multitaskers lost flat out: not only did they perform worse, but they were actually slower at switching from one task to another. This "switching cost" can add up to 40 percent

of someone's productive time, noted the study's author, David Meyer.

And it seems that always jumping around in our brain increases stress and lowers our IQ. A study at the University of London showed that multi-taskers experienced IQ-drops similar to people skipping a night of sleep. The scientists see only one exception: multi-tasking works if we combine a physical task that we do very often and that we are very good at with a mental task, such as walking and talking at the same time.

So are multi-taskers deluding their brains into how successful they are? There are a growing number of people who would argue just that and who are championing the polar opposite of multi-tasking. Their buzz-word is "mindfulness."

Improvement in productivity

More and more companies believe that mindfulness is the way forward: yoga mats are everywhere in Silicon Valley companies. Financial powerhouse Goldman Sachs offers meditation sessions in its office building in downtown Manhattan. And even Midwestern mainstay General Mills, producer of such classic household brands as Betty Crocker and Pillsbury, has meditation rooms in every one of their office buildings.

So what is mindfulness?

Jon Kabat-Zinn, probably the best known teacher of mindfulness worldwide, calls it "paying attention in a



Infographic: Till Nowis

particular way: on purpose, in the present moment, and non-judgmentally.”

Basically, it means being present. Being fully in the present moment, aware of your thoughts, physical sensations and surroundings. Contrast this with what most of us tend to do: being somewhere and not really taking in the moment at all, but focusing on the next issue, the next meeting, the next item on the task list.

In an interview on CBS's 60 Minutes program, Kabat-Zinn describes it this way: “When your alarm goes off and you jump out of bed, what is the nature of the mind in that moment? Are you already like, ‘oh my God’ your calendar pops into your mind and you’re driven already, or can you take a moment and just lie in bed and just feel your body breathing. And remember, ‘oh yeah, brand new day and I’m still alive.’ So, I get out of bed with awareness, brush my teeth with awareness. When you’re in the shower next time, check and see if you’re in the shower.” Because you may not be for, according to Kabat-Zinn: “You may be in your first meeting at work. You may have 50 people in the shower with you.”

After finishing a PhD in molecular biology and setting up a stress reduction clinic at the University of Massachusetts in 1979, Kabat-Zinn developed an eight-week program called the Mindfulness Based Stress Reduction, or MBSR, bringing together “mindfulness meditation and yoga.” Nowadays, more than 720 clinics in the US teach it and the corporate world is plainly interested in it.

40 PERCENT

The amount of reduction in stress experienced by people who took Be Mindful Online courses

One of the first companies to try Kabat-Zinn's meditative approach was Promega, a US biotech company, with surprising results. Those in the company that learned MBSR meditation techniques “were less stressed, felt less anxiety and had more energy at work” reports David Gelles, author of *Mindful Work: how meditation is changing business from the inside out*. The meditation was even said to have boosted their immune systems, when those that had practiced mindfulness techniques were found to have “significantly more flu antibodies in their blood.”

US-based health insurer Aetna discovered that its employees who took a Mindfulness at Work course paid \$US2,000 less in health care costs annually.

No wonder mindfulness advocates see it as a panacea to all sorts of ills. Harvard psychologist Ellen Langer thinks there are “many other advantages to mindfulness. It's easier to pay attention. You remember more of what you've done. You're more creative.”

“It's easier to pay attention. You remember more of what you've done. You're more creative.”

Harvard psychologist Ellen Langer on mindfulness



How does mindfulness do when pitted against multitasking? A University of Washington study tested this with three groups of human resource professionals who were either trained in mindfulness, learned simple relaxation techniques or did nothing. After eight weeks, the participants were tested as if it was their first day at the office and bombarded with different organizational tasks. Those with the mindfulness training managed to stay better focused: compared to the other two groups, they were 20 percent more concentrated, reports David Gelles. And they were 20 percent less likely to “bounce around from one thing to the next.”

With so much going for it, might it be time to give mindfulness a go? Whatever you are doing – getting out of bed, eating your lunch or sitting in an office meeting – check: are you living, fully present, in the moment however mundane it seems? Or is your mind racing at a million miles an hour (perhaps while you’re also checking your smartphone) as you hurtle towards your next meeting or deadline?

If the answer is: “Sorry, I haven’t got time to think about that right now,” you should definitely try to spend some time on the path marked “mindfulness.” ■

Margaret Heckel

 tinyurl.com/del-mindful

THE ROBOT REVOLUTION

Robots are on the march – and they are heading for unexpected new destinations.

An army of robots more than four million strong enters the world every year. Have they come to free humanity, or to enslave us? Perhaps neither. According to industry figures, toys, education kits, automated vacuum cleaners and lawn mowers account for the vast majority of those machines. But the changing nature of the final quarter of a million or so industrial and “professional service” robots reveals a revolution that is quietly, but profoundly, changing an increasing number of industries.

Take industrial robots for starters, which ISO 8373 (from the International Organization for Standardization) defines as: “An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications.” These robots come in hundreds of different types, from heavyweight arms manipulating crucibles of molten metal in foundries, to high-speed “pick and place” systems on electronics production lines.

TECHNOLOGY IN HAND

The science of bionics took a great leap forward in September when a paralyzed 28-year-old man was fitted with a robotic hand that was wired directly into his brain, allowing him to “feel.” The hand was developed at Johns Hopkins University in the US and is part of a research project into advanced replacement limbs, funded by the US’s Defense Advanced Research Projects Agency (DARPA). The hand technology is so advanced, the man is even able to tell which of his mechanical fingers is being gently touched.

“At one point, instead of pressing one finger, the team decided to press two without telling him,” remembers DARPA program manager Justin Sanchez. “He responded in jest asking whether somebody was trying to play a trick on him. That is when we knew that the feelings he was perceiving through the robotic hand were near-natural ...”



Wherever they work, industrial robots are enjoying a boom. In 2014, worldwide sales reached 225,000 units, a rise of 27 percent in a single year. Much of that growth was driven by exploding demand in Asia: China, now the largest robotics market, grew more than 50 percent between 2013 and 2014, but robot sales in Europe and the US also broke records.

According to Jonathan Tilley, a manufacturing expert at consultancy McKinsey, today’s rapid rise in the popularity of robots is the result a confluence of factors. “First, there’s cost,” he says. “Manufacturing wages in China are five times higher today than they were in 2008, while the price of robots has halved in real terms over the past 30 years.” Today’s industrial robots are also increasingly capable, he notes, as advances in hardware, sensors and data processing capacity mean they can work faster, move with greater precision and coordination, and respond to changes in their environment, allowing them to take on more complex tasks.

The final element in today’s industrial robotics revolution is firmly human, however. “When I started working with robots in the automotive industry in the 1980s, there was a real shortage of engineers with the skills to design and commission robotic production cells,” notes Tilley. Today, he says, improvements in software and the emergence of “plug and play” technologies for sensors and other components make it much easier to build robotic production systems. “And robotics is now widely taught in schools and colleges around the world, which means people with the right skills are much more readily available.”

Together, those changes mean the modern robot has a much broader range of job prospects than its predecessors. The first industrial robot, the General Motors Unimate, was built in 1961 specifically to work in dirty and dangerous foundry environments. And it was the automotive industry, with its unique combination of high production volumes, physically challenging but repeatable work, and a willingness to design products specifically for robotic assembly, which went on to become their biggest employer. Carmakers and their suppliers still account for around 40 percent of total industrial robot sales, and they are continuing to invest as they expand robotic production into new areas.

But where other sectors were once just a footnote on the industrial robot’s résumé, they are now catching up fast. The electronics industry, which has traditionally relied so heavily on the nimble fingers of human workers, is now facing more pressure to automate as it becomes increasingly hard to find enough factory workers to meet demand. Foxconn, the world’s largest contract electronics manufacturer, has been developing its own industrial robots since 2007, for example, and says it now uses 50,000 of them across its operations, with plans to grow that number by 10,000 a year.

100,000

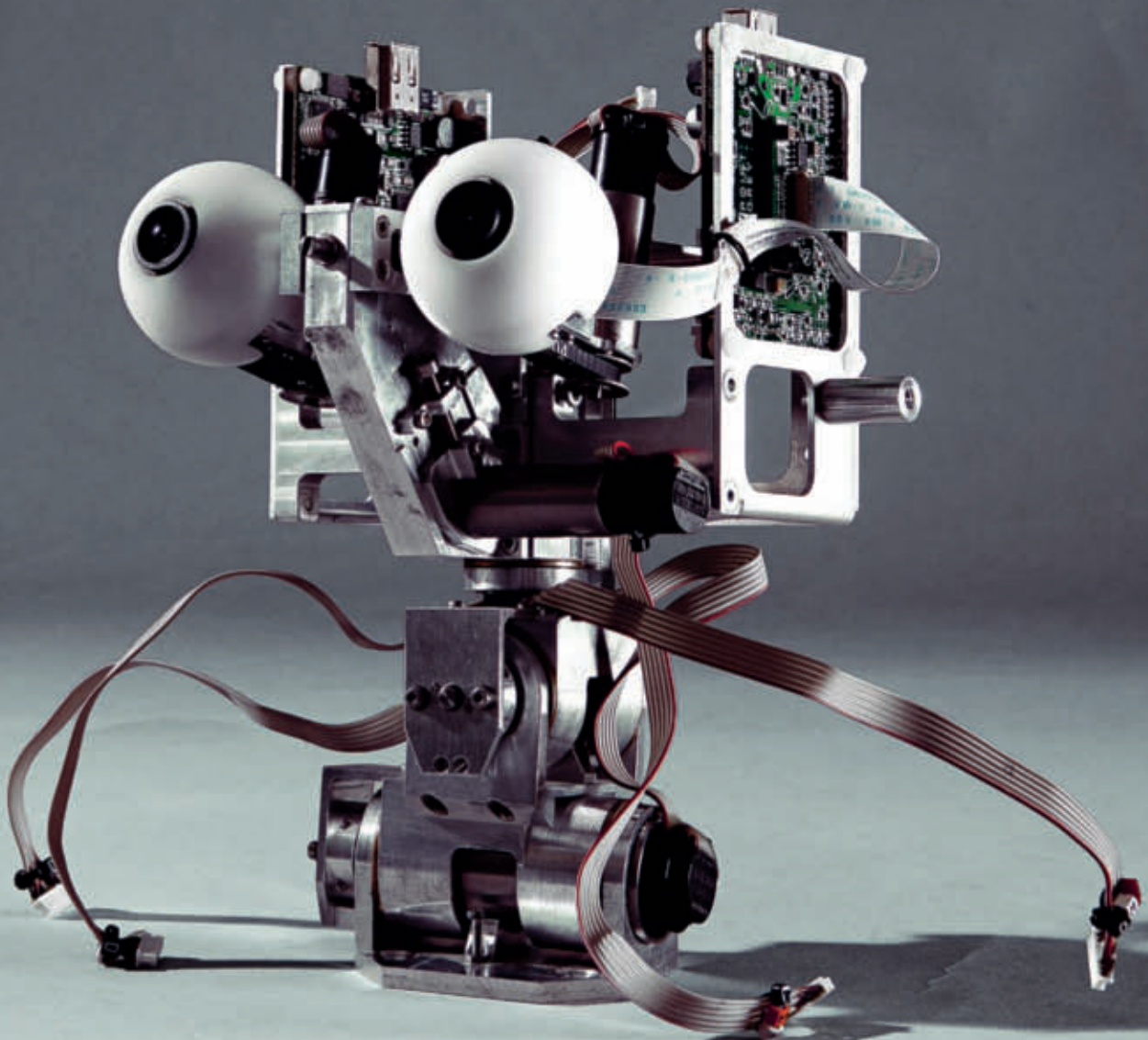
The amount of professional service robots sold in the past five years

50 PERCENT

The amount the robotics market grew in China between 2013 and 2014

\$65,000

The amount that the General Motors Unimate robot cost to make in 1961



BIG VISION:

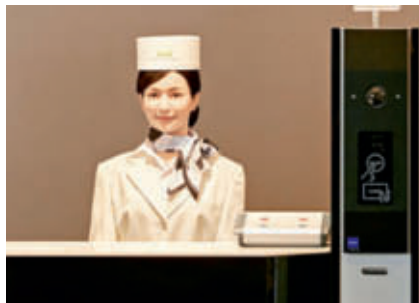
Part of a robot from the Italian Institute of Technology that develops machines which can see, grab and hear

ROBOTS AT YOUR SERVICE

Welcome to the Henn na Hotel in Japan – a world first because it's almost entirely staffed by robots. The humanoid doll at reception can help you with check-in, while the porter is an automated trolley which will take your luggage to your room. You can also talk to a robot concierge who sits on your bedside table and will answer questions such as "What time is it?" and "What is the weather tomorrow?" The hotel is run as a part of the Huis Ten Bosch amusement park in Sasebo, Nagasaki, but the owner, Hideo Sawada, insists it's no gimmick. This, he says, is a serious attempt to use technology and save on labor costs.



www.h-n-h.jp/en/



As robots get cheaper and more user-friendly, they increasingly make economic sense in other industries too, from aerospace to agriculture, which also have "dull, dirty or dangerous" jobs for which it is hard to find human workers, but which previously couldn't justify the cost of and complexity of buying and programming a robot to do them. Robots are even finding work in roles that require very high levels of precision and coordination, from surgery to watchmaking.

Advances in safety technology are making a big difference too. While earlier generations of industrial robots had to operate in cages to prevent them injuring human workers who accidentally came too close to a fast-moving arm, the latest models, such as Baxter from Rethink Robotics, include technologies that allow them to detect the presence of other workers and to modify their movements to avoid collisions. For the first time, this makes it possible for robots and people to work side by side on the same production lines, and for companies to consider automating individual parts of otherwise manual assembly jobs, or allowing robots and humans to share the same tasks depending on demand.

At your service

Robots aren't just finding new factory jobs. They are increasingly seeking employment in the wider world. Professional service robots have yet to achieve either the volume or the rapid growth rates of their industrial cousins, with sales of 21,000 units in 2013, according to the International Federation of Robotics (IFR). Smaller annual sales hide a long-term upward trend, however, and the IFR reports that more than 100,000 professional service robots have been sold in the past five years, compared with only 60,000 in the previous twelve.

37 PERCENT

The increase in sales of robotic logistics systems between 2012 and 2013

Nearly half of service robot sales are to the military, and the majority of these are unmanned aerial vehicles or drones, from lightweight, hand-launched reconnaissance craft like the Thales Fulmar to full-size combat aircraft like the Northrop Grumman Global Hawk. A much smaller number of unmanned ground vehicles were sold for specialist applications like bomb disposal.

Intriguingly, the largest civilian employer of service robots today is in agriculture, where robotic milking machines are an increasingly popular option for dairy farmers looking to cut labor costs and boost yields by allowing their cattle to "check in" for milking whenever they like.

That fastest growing civilian sector for service robots, however, is logistics. The IFR reports that sales of robotic logistics systems – principally automated guided vehicles for warehouse and factory applications – increased by 37 percent between 2012 and 2013. As with industrial robotics, the industry body suggests this growth is being driven by a number of underlying technological advances, including the increasing availability of detailed digital plans to aid route finding, smarter autonomous navigation and the availability of better energy storage and recharging technologies.

Of course, many players in the logistics space have even bigger ambitions for robotics, including the use of drones for fully automated last-mile delivery for smaller packages. DHL's own "Parcelcopter" drone became the world's first commercial drone delivery service in 2014, with the opening of an experimental route delivering medical supplies to the North Sea Island of Juist.

"MAY THE BEST ROBOT WIN"

What if robots could play a big part in humanitarian and disaster relief operations, going into areas too dangerous or unstable for humans? Could they save lives?

The US military's Defense Advanced Research Projects Agency (DARPA) thinks they could and, in 2012, launched the DARPA Robotics Challenge, a competition to build the most incredible robots the world has ever seen. Teams in the Challenge – battling for the chance to receive a share of millions of dollars of prize money – answered a brief to "develop human-supervised ground robots" that could do everything from driving a car down a road and passing over a barrier to climbing stairs, flipping a switch and opening doors.

In the end, after years of painstaking development, the winners – announced in June – were the DRC-Hubo robot from Team Kaist of the Republic of Korea, the Running Man robot from Team IHMC Robotics of the US and the CHIMP robot from Tartan Rescue, also from the US.



www.theroboticschallenge.org/



MACHINE-BUILT:

Robots work on Tesla Model S cars in the Tesla factory in Fremont, California.

Future forms

Military investment is an important driver of robotic technology. The US Defense Advanced Research Project Agency (DARPA) has organized a long-running series of open competitions for developers of autonomous vehicles and robotics technologies. Winner of the agency's \$2 million 2015 robotics challenge, the Korean DRC-Hubo humanoid robot, for example, had to complete eight tasks in a simulated humanitarian disaster scenario, including driving a vehicle, climbing up stairs and through rubble and shutting off valves and electrical circuit breakers.

Events like the DARPA challenge don't just attract the interest of generals. Schaft, the Japanese team behind the winner of a previous competition, was one of eight advanced robotics companies acquired by software giant Google in recent years, along with Boston Dynamics, which has built quadruped robots capable of running at more than 45 kph.

Through projects like these, the robotics industry isn't just developing and showcasing its skills, it is also asking fundamental questions about the forms that future robots will take. The answers to those questions are still emerging. Research teams around the world have been developing a whole kingdom of new robot designs, including forms derived from snakes, bees and hummingbirds.

The human body continues to set the benchmark for versatile machines, however. London-based Shadow Robot Company develops advanced manipulation systems for robots that mimic the form and function of the human hand. The company's devices are used by the research departments of universities, space agencies and military organizations around the world. "When we built our first products, we assumed that once we had solved the mechanical challenges, controlling the hand wouldn't be hard to do," says Managing Director Rich Walker, "In fact, what we had was so far in advance of anything avail-

able at the time that it has taken years of work alongside our customers to develop suitable capabilities."

Walker's company is now working with a number of partners to explore potential applications for its maturing technology. The company has just embarked on a UK Government-funded project to develop a robot that is capable of picking strawberries, for example. It is a classic example of an emerging robotics challenge, he says, difficult, poorly paid and unpopular work that is tough to automate. "Until you try to apply robotics to problems like these, you really don't know which parts will be hard to solve, and which will be easy."

Many of society's most pressing problems share similar characteristics, and present similar challenges and potential for robotic technology, says Walker. Agriculture and transportation are two key areas, as is the task of supporting an aging population. Society is struggling to meet its rising care burden, he notes, and "The best assistive technology solutions are beginning to look a lot like robots."

Ultimately, however, Walker suggests that the more robots enter our lives, the less visible they may actually become. From milking machines to self-driving cars, it's a fact of life for robotics innovators, that "when something works, we stop calling it a robot." ■ *Jonathan Ward*



Robotics is big news these days. You will be able to read more about the robotics industry and what it means for logistics in the upcoming trend report "Robotics in Logistics," published by DHL next year. More information will be featured in the next issue of *Delivered*.

FLEXPICKER:

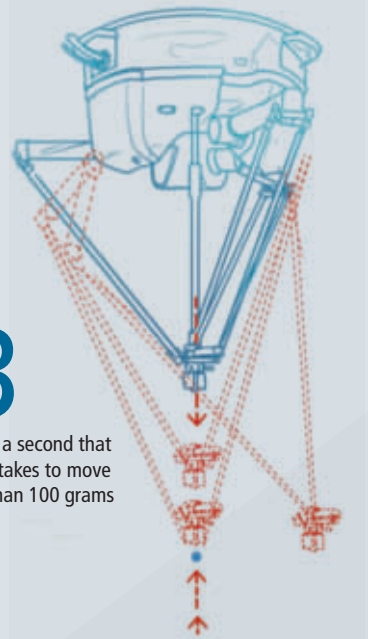
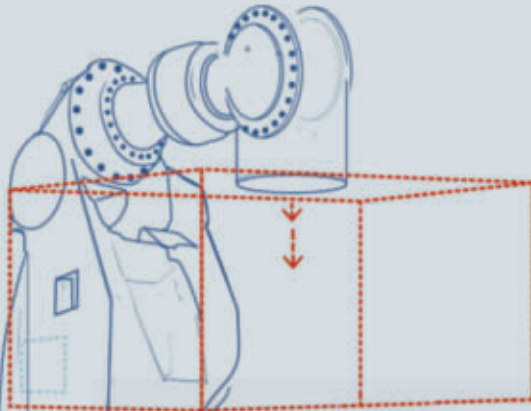
It might look like a weird robotic spider, but this is actually the last word in robotic picking and packing technology. The FlexPicker can pick up anything in its path and place it in its proper place – but it does so at superhuman speed, taking just three tenths of a second to move items of less than 100 grams.

0.3

The fraction of a second that the FlexPicker takes to move items of less than 100 grams

INDUSTRIAL ROBOT:

A game changer for the manufacturing industry when it was first introduced in the 1960s. That's because these robots are automatically controlled and reprogrammable and can assemble, pick, place, weld and paint – among other capabilities – with a high degree of accuracy.

**DA VINCI:**

A surgeon can perform minimally invasive operations using the da Vinci robot, which is equipped with tiny instruments that can bend and rotate much more effectively than the human wrist.

1.5
MILLION

The number of surgical procedures performed by Da Vinci robot

MEET THE TRANSFORMERS

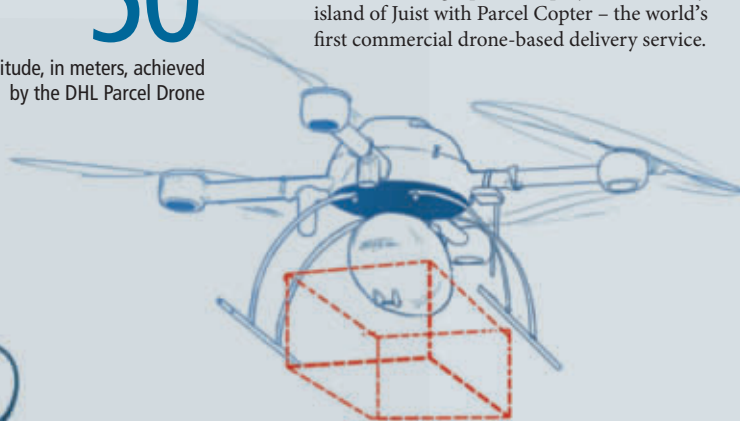
The robots are not coming. They're here already – and making a big impact in all sorts of incredible ways.

50

The altitude, in meters, achieved by the DHL Parcel Drone

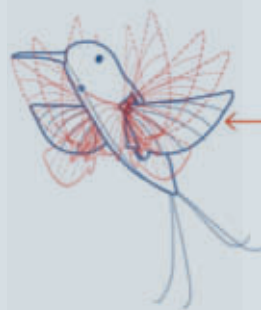
DHL PARCEL DRONE:

DHL is running a pilot/test project on the tiny island of Juist with Parcel Copter – the world's first commercial drone-based delivery service.



11

The speed, in mph, of the Nano Air Vehicle.

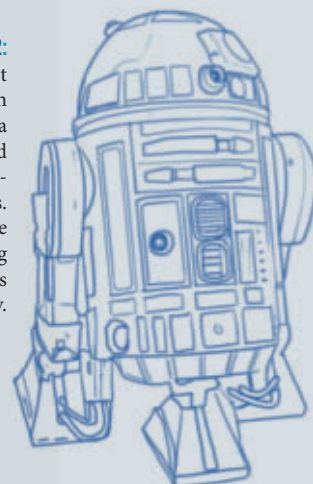


THE NANO AIR VEHICLE:

A tiny surveillance and renaissance aircraft – and one of TIME Magazine's 50 Best Inventions – that was built to hover and fly (at 11 miles an hour) just like a hummingbird.

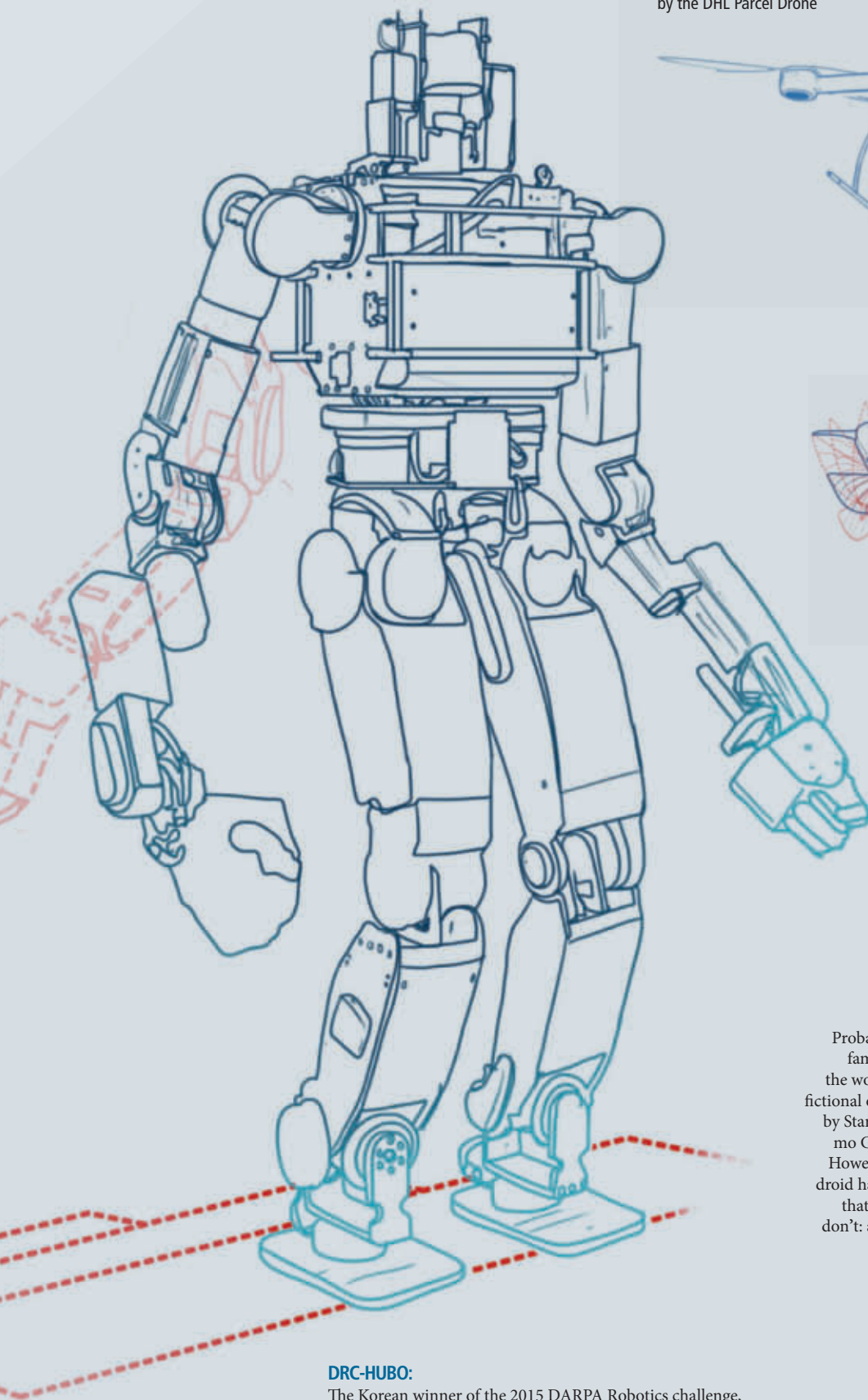
R2-D2:

Probably the most famous robot in the world – albeit a fictional one – created by Star Wars supreme George Lucas. However, this little droid has something that other robots don't: a personality.

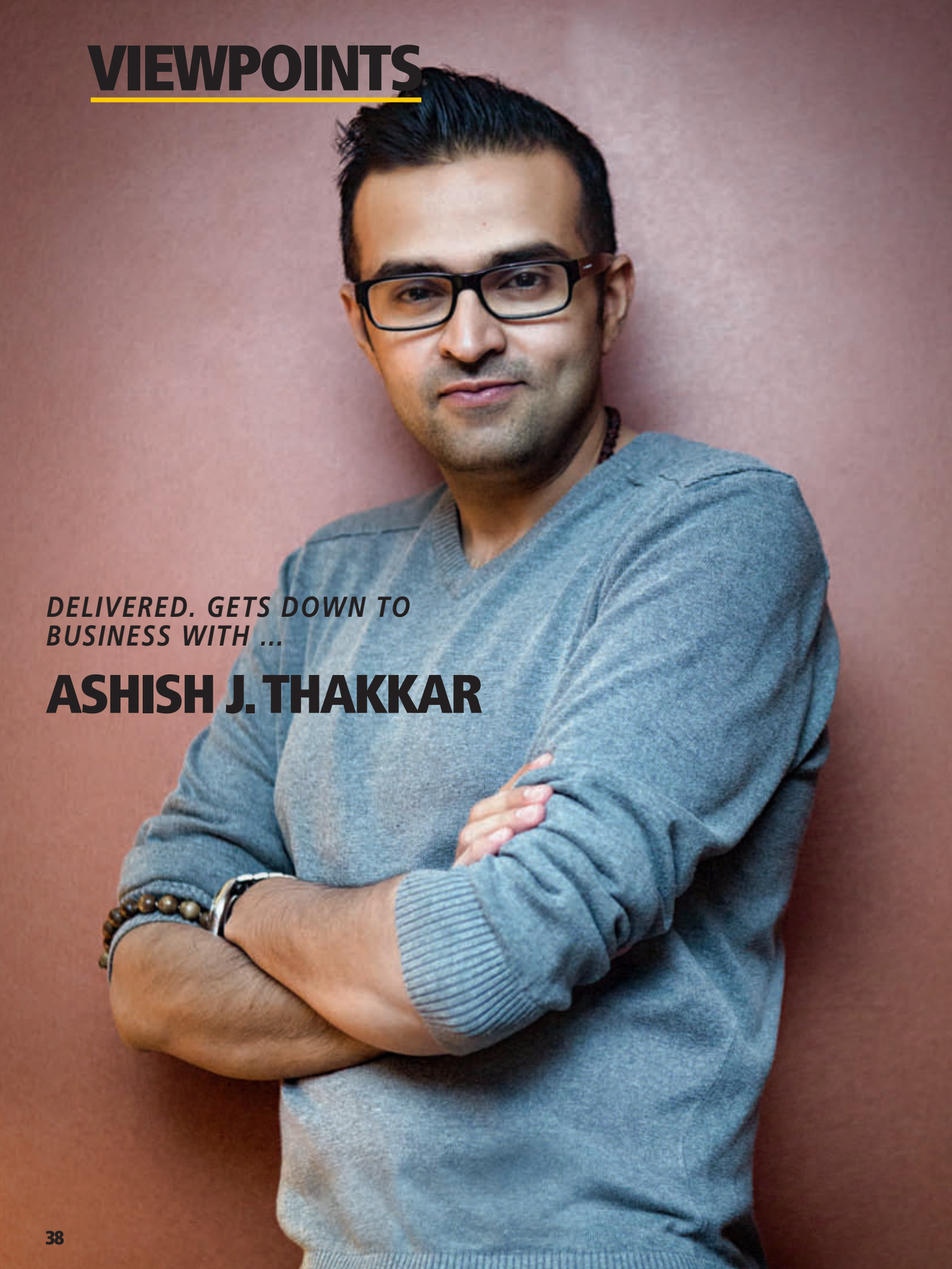


DRC-HUBO:

The Korean winner of the 2015 DARPA Robotics challenge, built to show how robots could assist in humanitarian disasters. It can walk on two legs, or kneel down and roll on wheels for speed over smoother terrain.



VIEWPOINTS

A portrait of Ashish J. Thakkar, a man with dark hair and glasses, wearing a blue V-neck sweater. He is standing with his arms crossed against a solid reddish-brown background. The text 'VIEWPOINTS' is at the top left, underlined. Below it, on the left side, is the text 'DELIVERED. GETS DOWN TO BUSINESS WITH ...' followed by 'ASHISH J. THAKKAR' in large bold letters. At the bottom left is the page number '38'.

*DELIVERED. GETS DOWN TO
BUSINESS WITH ...*

ASHISH J. THAKKAR

After fleeing the 1994 Rwandan genocide, Ashish J. Thakkar – aged just 15 – launched a company in Uganda which has grown into a Pan-African, multimillion dollar concern. He tells us what drives his extraordinary success.

Ashish J. Thakkar is, by his own admission, “quite stubborn by nature.” But, then, when you start your own business at just 15 years of age, it pays to be single-minded. “At 15 it can be difficult for people to take you seriously,” he admits. “I never took ‘no’ for an answer. I remained persistent and determined to make my vision a reality.”

That vision turned this young, award-winning African businessman into a hugely successful entrepreneur. In 1996, the then teenage Thakkar established an IT company in Uganda with a \$5,000 loan. Since then, it's blossomed into the Mara Group, a conglomerate with over 11,000 employees and operations across 25 African countries, with interests in technology, real estate, infrastructure and financial services. No wonder that Thakkar has been appointed a Young Global Leader by the World Economic Forum and has featured on Fortune Magazine's prestigious 40 Under 40 list (he's still only 34).

It's even more remarkable to think that he achieved all this as a refugee after fleeing to Uganda from the 1994 genocide in Rwanda (his parents had moved to the country when he was still a small boy). “I was 12 years old when the genocide began,” says Thakkar. “Although two decades have passed, the memories are still vivid. My family lost everything we had built and we had to start over. That experience taught me a powerful lesson of resilience, humility and hard work. I'm thankful for my parents who remained positive and persistent – these values remain with me.”

In 2009, Thakkar launched the Mara Foundation, a non-profit company that helps young entrepreneurs “build exciting African businesses that are sustainable and highly successful,” with a focus on women to emphasize that they shouldn't be left behind in this empowerment. This is partly done through a mentorship platform called Mara Mentor. “I know how important mentorship was to the growth of my early career,” says Thakkar. “I overcame many challenges by seeking help and guidance from the right people. Seeing the impact that Mara Mentor is having on the lives of young people on our continent is so far a very proud achievement. We recently announced a pledge to empower one million youth and women entrepreneurs in East Africa. We look forward to making that a reality.”

If anyone can do it, Ashish J. Thakkar can.

What motivates you?

My motivation to start my business came from seeing my family struggle during my early childhood – I wanted to help in some way, as they have supported me since the beginning. I am motivated when I can see the positive impact of my work on people's lives. I strive to play an active role in changing the narrative of Africa, while partnering with the best in the industry to build and grow the economies of the continent.

1
MILLION

The number of young and women entrepreneurs Mara Foundation pledges to empower in East Africa through its Mara Mentor Platform

15

Ashish Thakkar's age when he started Mara Group in Uganda in 1996

How did the Mara Group evolve?

We started in IT, then diversified into packaging and property development, and recently have expanded into other areas such as infrastructure and banking, with the creation of Atlas Mara, with my partner, Bob Diamond. Our goal there is to be Africa's premier financial institution. We are also in the process of rolling out an exciting new venture called Mara Sokoni, which will be a positive disruptive force in e-commerce on the continent. We go into areas that we are passionate about and understand well because our mission is always to shift the needle in whatever area we are involved in.

What has been the secret to your business success?

I strongly believe in doing good while doing well – driven by a strong commitment to maintaining sound business ethics. Businesses can be a strong force for social good. We have a dynamic team that is entrepreneurial and yet institutional.

What advice would you give to the 15-year-old Ashish Thakkar?

That success and failure go hand in hand and when you fail, learn quickly and don't make the same mistake. Failure is the best teacher, and entrepreneurship is all about how you respond to your failures. The most important thing is to have a very high moral ground. You need to be very ethical and transparent. Understanding this has been invaluable throughout my entrepreneurial journey.

What advice would you have for companies wanting to do business in Africa?

An understanding that Africa is diverse is important. The biggest problem that those who are new to doing business in Africa face, is that they tend to treat it as a homogenous entity. The reality is that it is a place where you have many different cultures, parliaments, political and regulatory systems. You cannot engage with Africa from a distance – you need to be able to gain firsthand knowledge of the environment in order to properly know the market.

Why did you want to set up the Mara Foundation?

We want to leverage our networks and experience across the continent to benefit emerging entrepreneurs. We started the Foundation based on a belief that entrepreneurs and, in turn, the SME sector will act as a channel for increasing employment and building economic growth across Africa. Small businesses are the largest employers in most economies and constitute 90% of sub-Saharan African businesses. SMEs provide a channel for an economy to grow, innovate and specialize.

What do you most enjoy about life?

Being able to truly make an impact in the lives of young people. There is no better feeling than making a difference, even if small, in the lives of others. I also enjoy tackling new challenges every day. Even though I've been doing business for 20 years now, I feel as if I am just getting started! ■ Tony Greenway

 tinyurl.com/del-mara

EMPOWERING RESPONSIBLE SUPPLY CHAINS

Are You Walking the Walk or Talking the Talk?

Fair wages, eco-friendly supply chains and healthy operating margins represent the benefits that businesses can realize as a result of maintaining responsible supply chains.

Although responsible supply chains are arguably a necessity for today's businesses, they struggle with the concept, as the World Economic Forum report, "Beyond Supply Chains – Empowering Responsible Value Chains," points out. The fundamental problem lies in how business decisions are made and perceived barriers to investing in supply chain improvements.

Furthermore, global supply chains are complex. Companies are expected to take responsibility for everything, from how materials they source are produced and delivered for use in their products to the distribution of their goods in the market. That includes suppliers, partners, contract manufacturers and others they work with.

To maintain profitable supply chains, businesses believe trade-offs are needed: that cheaper upstream labor affords better downstream customer service. Consequently, they struggle with the business case to create responsible value chains and find it hard to justify the investments.

The reality is that companies which "walk the walk" can reap benefits. Those that do not may see negative impact in the market as customers gain greater transparency via social media into business activities.

For instance, news of the Rana Plaza disaster circled the world. Consumers viewed reports of manufacturing sweat shops with disdain. A company that fails to ensure that factory workers who produce their products are not exploited by a sub-supplier will reap the ire of their global customer base. Customers who want companies to act responsibly will take their business elsewhere.

Additionally, analyst firms increasingly factor ethical behavior into their valuations. The UN Global Compact-Accenture CEO Study on Sustainability research found that 52 percent of executives say that investor interest provides an incentive for them to invest in sustainability.

And, the war talent is yet another factor. In fact, 46 percent of CEOs included in the UN Global Compact-Accenture CEO Study on Sustainability report that employees would be among those

AN ESSAY BY MARK PEARSON & ...

Mark Pearson is a Senior Managing Director for Accenture Strategy, focusing on automotive, industrial infrastructure and travel. Mark worked with the World Economic Forum to complete the report, "Beyond Supply Chains – Empowering Responsible Value Chains," and he is the author of "Walking the Walk: Driving Competitiveness through Ethical Supply Chains."



Illustration: André Gottschalk

... ALEXANDER HOLST

Alexander Holst is a Managing Director for Accenture Strategy and leads the Sustainability Practice in Germany, Austria and Switzerland. He focuses on integrating sustainability aspects into the core business of clients across numerous industries. Alexander Holst has been a project member for the report "Beyond Supply Chain – Empowering Responsible Value Chains."



having the most impact on their action regarding sustainability – second only to consumers over the next five years.

Taken collectively, the importance of establishing responsible supply chains is clear. For those who see ethical behaviors as giving them a "license to grow," the competitive barrier that responsible supply chains can create in the marketplace can be unassailable. In essence, being ethical is synonymous with being competitive. At the same time, these supply chains deliver benefits to the environment and society.

Companies that adopt practices that are good for the environment, local economies and societies also find that they contribute to their profitability, with revenue uplifts of 5 to 20 percent; supply chain cost reductions anywhere from 9 to 16 percent; and brand value increases from 15 to 30 percent, as well as significant risk reduction.

With such solid numbers supporting them, businesses can move forward with confidence and create a clear business case for actions that can boost their profits. Gaining transparency across their supply chain will be important as they move from thought to action.

Executives will find decision-support tools in the Forum's "Beyond Supply Chains" report helpful as they design responsible supply chains that can also deliver a competitive advantage. The toolset in the report can help executives clarify how to proceed. Among the decision framework's features are a landscape of 31 supply chain practices; a detailed value assessment; leading practices; and a decision matrix – all with the intent of helping companies identify and adopt practices that can help them drive benefits for the environment, local communities and their bottom lines.

The information, which includes product design, sourcing, manufacturing, distribution, product end-of-life considerations and other practices, dives into practical examples that worked well for other companies. It also outlines the value proposition associated with each practice based on experiences.

For instance, the report states that companies with leading supply chains already think about maximum recyclability and circularity within their product design phase, leading some companies to use 75

percent less material, increase their use of recycled materials and, ultimately, create products that are completely recyclable. As they use fewer materials, companies can also reduce waste and boost their brand while cutting down on energy consumption and carbon emissions.

Leading companies also consider their supply chain network, rethinking its setup, evaluating new cooperation models with competitors or even despeeding their fleet. Collaboration across the extended value chain of internal stakeholders, suppliers, subcontractors, sub subcontractors and consumers will be important as companies make their supply chains responsible. Each change a company makes in a product, service or process can have ripple effects that need to be understood to avoid unintended consequences. Collaboration across the supply chain will be important to maximize business results.

As found in the report, companies can experience a 10 to 20 percent reduction in transportation costs when outbound logistics operations are shared and cost savings through shared fixed costs in warehousing and increased utilization of trucks at slower speeds. Even a small reduction in the speed at which trucks travel can reduce the amount of fuel required and lower carbon emissions.

Entirely new opportunities have opened up for the use of digital and smart technologies. For instance, smart sensors and mobile apps can enable smart, green building deployments and completely new ways of managing crowd shipping and last mile delivery. The results have ranged from companies reporting a revenue uplift as a result of quicker deliveries, brand benefits, job creation, measurable reductions in carbon emission and greenhouse gas reductions due to using less energy for lighting, heating and refrigeration.

But that is just the beginning. While the talk is likely to continue about the need to create responsible business operations, companies need to "walk the walk" and adopt sustainable practices that can help them become more competitive as they identify new sources of growth and innovation. ■



www.accenture.com/BeyondSupplyChain

WHAT'S THE STORY, MS. MYKHAILOVA?

IULIIA'S BALANCING ACT



Even when I was a young girl growing up in the Ukraine I was always interested in contortion and knew I wanted to join a circus production that traveled around the world.

I went to a circus school in my home town of Kiev and then studied at the Kyiv Circus Academy before heading off to Europe to work on my balancing skills. Balance is very important in my life – but not just in my work. I need to make sure I am able to balance my role as a mother to my young daughter, which can be hard sometimes with such a demanding job.

Some people dream of running away to join the circus – but *Cirque du Soleil*® hand-balancing artist and contortionist Iuliia Mykhailova is lucky enough to be living that dream ...



I was invited to audition for *Cirque du Soleil* after I sent them a video of me performing. That was more than five years ago now, and I still enjoy what I do enormously. My favorite country to perform in is the United States. The audiences there really seem to appreciate how artistic and athletic circus skills can be.

Flexibility

We have been in rehearsals for our current production – *Amaluna*™, a celebration of the strength and power of women – for nine months. For the first time, the 46-strong cast is mainly female and there is an all-female band of musicians, too. The show is loosely based on Shakespeare's *The Tempest* and I play the lead character of Miranda who falls in love with a young man called Romeo, after he is shipwrecked on the island following a storm caused by her mother. Miranda is supposed to be 18 years old, a young girl becoming a woman, so I try to remember what life was like for me at that age.

One of the highlights of the show involves me balancing on a giant waterbowl. For this, I have to practice handstands constantly to maintain my balance, strength and flexibility.

We do 10 performances a week which can really take a toll on your body. I have to draw on an inner strength to constantly perform at such a high level but I can honestly say, with this job, going to work is never boring! ■



tinyurl.com/del-cds

FACT:

DHL is the Global Official Logistics Partner of *Cirque du Soleil* touring shows.

250,000

The number of items that are transported from show to show

80

The number of 40 ft containers DHL use to ship inventory for *Cirque du Soleil*



1954

IS IT A CAR? IS IT A PLANE?

Actually, it was just an example of style and imagination. The Ford FX Atmos (the FX stands for 'Future Experimental') was a concept automobile created by Ford in the middle of the 20th century that looked sharp – literally – but had no engine and was never intended to be put into production. Even if it had been able to take to the road, it wasn't exactly practical, including chrome "pedestrian spears" (actually radio antennae) on its already overlong front fenders. The car featured at the Chicago Auto Show of 1954.

LIFE ON PLANET EARTH IS GETTING BETTER, **THANKS TO GLOBAL TRADE.**

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