Delivered.

THE GLOBAL LOGISTICS MAGAZINE

ISSUE 02/2018

BUSINESS MACHINE LEARNING

Find out if we have anything to fear from the rise of AI

SOLUTIONS YOU DON'T SAY? Why executives should master

the art of giving and receiving feedback

VIEWPOINTS VIRGIN TERRITORY

Discover why Sir Richard Branson is speaking up about climate change

POWERING AHEAD

How constant innovation keeps the tech industry out in front



DEAR READER,

As DHL's new Chief Commercial Officer, it gives me great pleasure to present you with this latest issue of *Delivered*. I hope the wide array of insights, trends and viewpoints will be of interest to you.

It's been a challenging few years for technology companies. Now, however, the sector is booming again – but continued growth depends on the ability to keep up with customer expectations. Can service levels and production be ramped up quickly enough to meet fast-growing demand? Our focus article **Pushing new limits** reveals more.

ASML is no stranger to pushing limits. Day-to-day work involves cuttingedge science and engineering research. With some €1.1 billion spent annually on R&D and more than 10,000 patents held worldwide, it's no wonder that the company has an estimated 80 percent market share of a vital component for semiconductors, and Yolanda van Norden, Senior Director of Supply Chain Management Logistic Service Operations, has a fascinating story to tell.

Limits don't seem to apply to Sir Richard Branson. Having spent a lifetime pushing the boundaries in many fields, from music to aviation and space travel, the intrepid entrepreneur is now directing his energy to fighting climate change – and true to form, he isn't doing it by half-measure. See our **Delivered.** talks to feature to find out what insights he shared with us.

Enjoy your read!

Sincerely,

Katja Busch Chief Commercial Officer, DHL

Cover photo: Westend61/Getty Images



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Represented by Prof. Dr. Christof Ehrhart EVP Corporate Communications & Responsibility

Anita Gupta SVP Global Media Relations Editor-in-Chief Michelle Bach michelle.bach@dhl.com Project Manager Salvinija Buivydaite Editorial Assistant Tim Runge Address Deutsche Post AG Charles-de-Gaulle-Strasse 20 53113 Bonn, Germany Tel. +49 (0) 228-18 20 **Commercial Register No.** Registration court Bonn HRB 6792 Turnover Tax ID No. DE 169838187 Website www.delivered.dhl.com Editorial Production TERRITORY Content to Results GmbH Bei den Mühren 1 20457 Hamburg Project Manager Birte Kleinebenne Art Direction Christina Göttsche Photo Editor Vanessa Zeeh







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Contributors

Simon Barker, Tony Greenway, Charles Newbery, Greg Orme, Angela Sebaly, Jonathan Ward

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www.delivered.dhl.com



A CLEAR VIEW: DHL'S GLOBAL TRADE BAROMETER

We all like to know what the weather's going to do today, but what about a forecast for world trade? DHL has launched a unique indicator that can help predict when the sun is going to shine on the international markets – and when they might catch a cold. The Global Trade Barometer uses artificial intelligence to evaluate large amounts of logistics data and forecast future trade trends. The barometer analyzes import and export data for commodities that serve as the basis for further industrial production: brand labels for clothes, for example, or touchscreens for mobile devices. Fluctuations in these markets can provide an early indicator of where the wider economy is heading. DHL is in a unique position to pull together market data on air and ocean freight in seven countries, which between them account for more than 75 percent of world trade. In partnership with Accenture, DHL crunches these numbers and comes up with a single index value, which is published quarterly on a global level and for the seven countries individually. An index value above 50 points to a positive outlook, below 50 to a decline in trade. In January the barometer forecast an index score of 64 for the first quarter of 2018, which pointed to a slight loss of momentum in growth due to weakening prospects for Chinese and Japanese trade. Such is the quality of the data provided that DHL believes it could be incorporated into forecast models used by banks and economic research institutes. At the very least, the barometer's findings will help companies make decisions on factors such as supply chain and investment – and plan ahead for that metaphorical rainy day.

bit.ly/dhl-trade-barometer



WIN!

"Finding My Virginity," a new autobiography by Richard Branson, offers a direct look into the adventures of the world-famous entrepreneur and philanthropist. If you'd like to win one of five copies, go to and tell us about someone who inspires you to make the world a better place.

Turn to page 36 for an interview with Sir Richard Branson.

SWEDES STEAL A MARCH ON CUTTING CARBON

Sweden has a steely vision: to rid the country's steel industry of fossil fuels by 2035. A new venture is looking to establish a pilot steel plant in northern Sweden fueled entirely by hydrogen. The Hybrit project is a partnership between the state-owned power company Vattenfall and steel manufacturers SSAB and LKAB, and the three recently

signed an agreement to take it to the planning and design phase.

Being fossil-fuel-free will cut Sweden's carbon emissions by 10 percent and, if successful, the €2 million project may be expanded to neighboring Finland. The steel industry accounts for some 7 percent of emissions globally.



PANDA POWER

As unusual cargoes go, this takes the biscuit... or should that be bamboo shoot? DHL Global Forwarding has transported a very precious cargo from China to Finland: two giant pandas. The animals, a four-year-old male now called Pyry in Finnish, and a three-year-old female called Lumi, enjoyed their own 6,500-kilometer carbon-neutral charter flight from Chengdu in China to Helsinki-Vantaa airport. From there, they were taken 300 kilometers by DHL truck to Finland's Ähtäri zoo and their new home in a specially constructed panda house, said by experts to be one of the best outside China.





BLOCKCHAIN – TRENDING UPWARD

Consider being able to eliminate an entire layer of complexity from global supply chains by autonomously verifying, recording and coordinating transactions without third parties. Blockchain offers such possibilities to the logistics industry. A new trend report from DHL examines early applications of this emerging technology across numerous industries – from finance to energy, from manufacturing all the way to retail – and explores



the role it can play in logistics together with the challenges it poses. The outlook? Blockchain technology has high potential for facilitating greater efficiency and new business models.

Download the trend report at:

www.logistics.dhl/blockchain

BIG CITY DELIVERIES

DHL eCommerce has launched a new service aimed at retailers wanting local, same-day delivery in major metropolitan areas in the U.S. DHL Parcel Metro, which has launched in Los Angeles, Chicago and New York, offers flexible and affordable same-day and next-day delivery options for parcels up to 25 pounds (11.3 kilograms), with Shipment Value Protection included as standard. Consumers are able to track



their parcels on their mobile devices throughout the final mile and can even provide real-time delivery instructions to their driver. For the retailer, consumer notification and tracking can be fully customized with content, branding and delivery confirmation options, enabling a transparent and enhanced last-mile delivery experience – unlike anything available in the market today. DHL Parcel Metro will expand into other cities throughout the year.



FORMULA ONE

Four-time Formula One world champion Lewis Hamilton has another trophy under his belt after winning the 2017 DHL Fastest Lap Award for the highest number of fastest laps over the course of last year's F1 season. DHL is the official logistics partner of Formula One[®].



"These cars are the fastest we've ever driven in F1 – and it's been cool to set a few all-time lap records."



CUTTING OCEAN FREIGHT EMISSIONS

According to the European Parliament, ocean freight could account for 17 percent of all global emissions by the middle of the century, so new ways of reducing carbon emissions play a vital role for the shipping industry. Air and ocean freight specialist DHL Global Forwarding has joined forces with the GoodShipping Program, the world's first initiative to decarbonize the container shipping industry by changing the marine fuel mix. DHL has signed a memorandum of understanding that enables it to offer customers the opportunity to choose next-generation marine biofuels rather than fossil fuels for their ocean freight shipments. Reductions in greenhouse gas emissions are then allocated to customers – the more customers who choose biofuels, the higher the share of biofuels used for container shipping. Biofuels reduce carbon emissions by up to 80 percent in comparison to Heavy Fuel Oils (HFO) and are essentially sulphur-free, producing substantially less particulate matter. Key criteria for selecting biofuels: sustainable production without competing with food production or stimulating deforestation. The partnership will also help efforts to reach DHL's target of net-zero emissions as a result of its logistics operations by 2050.

SEMI SWEET

DHL Supply Chain has ordered 10 Tesla Electric Class 8 semi trucks, which it will test as part of its customer operations in major U.S. cities. The trucks, available from next year, will be used for shuttle and same-day deliveries, and be tested for mileage efficiency on longer runs across the U.S. DHL also plans to evaluate the trucks' impact on drivers' quality of life and job satisfaction in an effort to stem the growing skills gap in the trucking industry.





The potential number of shipments that can be processed per hour at DHL's recently expanded Brussels hub. Following an investment of some €140 million (\$171 million), it now measures 36,500 square meters and will handle shipments from Europe to Africa, the U.S. and China

A HIGHER STANDARD

"Respect and Results" are the principles that guide all actions at Deutsche Post DHL Group. They serve as a binding standard for each and every one of its employees around the world. Shared values such as openness, integrity and a sense of responsibility are DPDHL's constant focus. The newly published Corporate Responsibility Report 2017 provides a detailed account of the company's core action areas, as well as the results



Deutsche Rost Dies

and achievements of its CR activities over the past year. Particular focus is dedicated to the environment, employees and corporate governance.

To download DPDHL's 2017 Corporate Responsibility Report "Dedicated to Shared Values" go to:



www.dpdhl.com/cr-report2017

PICK OF THE BUNCH

A team from U.S.-based Vecna Robotics saw off challenges from rival teams to scoop first prize at DHL's annual Innovation Day. Vecna's piece-picking robot Tote Retrieval System (TRS) beat prototypes from Singapore and Switzerland to win the live audience vote – and a chance to develop their project further with DHL. In the challenge, co-sponsored by Dell EMC, the Vecna robot was able to navigate traditional warehouse shelves, picking boxes and bags. It was not only able to pick the boxes successfully from different levels of the shelf, but could also place them on its autonomous RC20 Conveyer mobile robot, which weighs just 20 kilograms. "We are thrilled that our prototype proved itself fit for the challenge of autonomous picking and can't wait to see how far our robot can go through our partnership



with DHL," said Vecna co-founder Daniel Theobald. Other winners on the day included U.K.-based startup Parcelly, which coordinates convenient parcel drop-offs at local businesses; KWIK, who won the shark tank pitch for their push-of-a-button reordering system; and PACCAR Parts for their low-cost system that can accurately measure the dimensions of a piece of freight in less than a second.

SUSTAINABILITY TAKES CENTER STAGE

Sustainable management practices are transforming businesses and challenging the status quo by turning sustainability into an integral component of supply chain management. Today, it can be a key factor in a company's success. Far from being a distraction from the core business, it is now a necessary part of sound management, according to a new DHL white paper.

The white paper debunks the myth that sustainable practices represent a financial burden and analyzes how they can support key business drivers, including customer loyalty, brand reputation and performance. Additionally, the white paper pro-



vides case studies to highlight what some companies are doing to embed innovative sustainability practices into their processes and operations, as well as exploring the direct effect these measures are having on vendors, partners and stakeholders.

To download the white paper "Unlock the True Value of Your Supply Chain" go to:



bit.ly/dhl-sustainable-sc-paper



The growth in production of heavy-duty trucks in North America this year, which totaled about 320,000 vehicles, according to industry analysts

WELCOME TO THE PARTY

The rise of e-commerce is having an unexpected effect on traditional B2B companies. In the search for new business or as a response to competitive forces, B2B organizations across the world are now employing techniques used by B2C e-commerce players – and their supply chains are changing as a result. A new white paper from

DHL Express, "The Next Industrial Revolution: How E-Commerce is Transforming B2B," seeks to provide a better understanding of this recent phenomenon and show more B2B companies how they, too, can benefit from extensive e-commerce offerings.



bit.ly/dhl-ecommerce-b2b-paper

ELECTRIC SWITCH

DHL Freight has become one of the first European customers for Daimler Trucks' FUSO eCanter, the newest generation of the world's first fully electrically powered lightweight truck. Two of the 7.5-ton vehicles, which have a low-emissions

drive, low noise levels and a 100-kilometer range between charges, are being put through their paces in the Berlin metropolitan area for 24 months, mainly for deliveries to businesses and private customers in the city center.





PUSHING NEW LIMITS

The technology sector is performing strongly, but continued growth depends on the industry's ability to keep its promises to customers.

STATE OF THE ART: A big data showroom and demonstration center in Guizhou Province, China.

100

Hanna Hanar Pallan

THE YEAR OLD

184

1.00

The global market for

in 2017

semiconductor products

t the beginning of February, Apple announced record revenue of \$88.3 billion and net income of \$20.1 billion for the final quarter of 2017. Operating profit at the U.S. giant's Korean rival Samsung was \$14.1 billion for the same period, up 64 percent from the previous year. The big internet companies are continuing to capture more of their customers' attention and advertisers' budgets. Facebook and Google's parent group Alphabet enjoyed year-on-year revenue growth of 47 percent and 23 percent respectively in 2017.

It isn't just the largest players that are enjoying a boom. Their success both drives and reflects strong conditions across the sector. The global market for semiconductor products – the building blocks of technology products and services – grew more than 20 percent last year, to more than \$408 billion.

So what's new?

Look at today's homes and workplaces and, at first glance, it can be hard to see where all those chips are going. The industry hasn't found another game-changing blockbuster product like the PC or the cell phone. Apple's big seller over the Christmas of 2017 was the latest incarnation of its iPhone, a product range that is now more than 10 years old.

In fact, that lack of obvious new devices may be a mark of the industry's success. Technology products are now woven so tightly into the fabric of our lives that many have become invisible. Rather than living

<image>

within a dedicated device, the technology that is driving much of today's growth has flown away into the cloud, or embedded itself deep into all sorts of everyday products.

Take the humble bicycle for example. It may have been world-changing in its social and economic impact, but the bicycle has always been a simple machine, little changed in its overall configuration since the late 19th century. When today's enthusiastic amateur cyclist heads out for a weekend training ride, however, they may travel with a constellation of sensors and computing devices. Strain gauges built into the transmission measure the power they put into the pedals. Sensors on their body will detect every heartbeat and even the quantity of oxygen reaching their muscles. Their bike may be equipped with cameras to record exciting descents, or radar to warn of approaching vehicles.

All those devices will transmit their data wirelessly to an onboard computer, which uses satellite positioning and air pressure measurement to track every kilometer ridden and every meter climbed. Back home after the ride, all that data can be uploaded automatically to an array of cloud-based services, allowing the cyclist to review their performance, monitor the progress of their training and boast about their achievements to friends on social media networks.

Smarter bicycles are just a tiny sliver of the exploding new world of connected devices. The internet of things (IoT) now encompasses thousands of products and services, from smart tags on parcels to smart speakers in homes, medical devices, manufacturing machines and, soon, fully autonomous vehicles. For the technology industry, these applications create a virtuous circle: a fast-growing market for the sensors, processors and communication hardware used in millions of devices drives a second market for the infrastructure needed to collect, manage and analyze the data they generate. The cleverest new services increasingly rely on sophisticated artificial intelligence technologies, which further increase the appetite for computational horsepower.

Much of the technology that has revolutionized cycle sport, social interaction and so many other aspects of our lives is concentrated in huge data centers dotted around the world. And as our appetite for cloud services grows, so do those facilities. According

PEDAL POWER: Smarter bicycles are revolutionizing the riding experience.

ICE COOL:

HOT CHIP: The fastest growing subsectors in 2017 were sensors and memory chips.

Speed skaters analyze their training by wearing a smart suit monitored by a phone app.





to Synergy Research Group, there were almost 400 "hyperscale" data centers in operation worldwide at the end of 2017. These facilities, most of them owned by IT giants such as Google, Amazon, Oracle and Microsoft, each contain tens of thousands of servers. The industry is rushing to build more of them. Synergy says that at least 69 new hyperscale data centers were being planned or under construction at the end of 2017. And property consultancy JLL, which monitors the global data center market, says some major cloud providers are planning to triple the size of their infrastructure by 2020.

The search for easy money is another age-old pastime that is increasingly moving online, bringing its own new forms of growth to the technology sector. Nvidia, a manufacturer of high-end computer graphics hardware, announced record profits and a 52 percent increase in sales last year. Much of that growth came from an unexpected source, however. Many of its customers are using the powerful parallel processing capabilities of its graphics cards for the computationally demanding task of "mining" bitcoin and other socalled cryptocurrencies. By some estimates, the global bitcoin network is now consuming 32 terrawatt hours of energy per year, more than many small countries.

The changing technology landscape is reflected in the output of the semiconductor industry. In revenue terms, the fastest growing subsectors in 2017 were sensors and memory chips. The former play a frontline role in IoT devices, allowing them to transform real-word events into data. The latter go into everything, but are required in especially large numbers in



the powerful computers used to run fast databases and complex artificial intelligence applications.

Testing times

Even good times bring their challenges. For the technology sector, one perennial source of pain is the need to ramp up production quickly to meet fast-growing demand. Many parts of the industry, notably the production of memory components, are highly cyclical in nature. Rising demand puts supply under strain, leading to long lead times and higher prices, at least until producers can bring more capacity on stream.

"The changing technology landscape is reflected in the output of the semiconductor industry."



STREETWISE:

Tech company HERE captures 3-D street images to make the detailed maps needed for autonomous driving.

There's some evidence of that strain today. Last year's boom in demand took many in the industry by surprise – most had expected 2017 to be a year of relatively slow growth. By the end of the year, however, factories were running at full output and concerns were rising about shortages of critical materials, machines and production capacity.

At the beginning of this year, order-to-delivery lead times for some categories of semiconductor products had risen to more than seven months, with some customers complaining that suppliers were offering delivery dates as far away as 2019. Component shortages can affect research and development activities too. In the U.S., technology companies rolling out experimental fleets of self-driving cars are being forced to wait several months for the delivery of Lidar units, the sophisticated laser scanning systems that help vehicles build up a 3-D image of the environment around them.

29 MILLION The number of iPhone Xs Apple sold in the first quarter of 2017

Network effects

As if upstream supply wasn't challenging enough, technology companies are also having to deal with ever more demanding downstream customers. Manufacturers of consumer devices are used to fickle, impatient customers. Many have honed their new product introduction processes to meet short, sharp sales windows. They have worked hard to juggle multiple markets and distribution channels, and to deal with huge seasonal spikes like Black Friday in the U.S. or China's Singles Day.

Today, says Thomas Dammann, Vice President Technology Sector Strategy at DHL, the expectation of exceptionally high service levels has migrated into the B2B sector too. Industrial and corporate customers want the same short times and easy interactions with their suppliers that they enjoy in their consumer purchases. "We are seeing a rapid growth of e-commerce in the B2B sector," he notes. "Distributors of technology products are looking to operate more like Amazon, with processes that allow them to work more efficiently, especially with smaller customers, and a better overall user experience."

As consumer-facing companies already know, downstream supply chains and logistics processes play a decisive role in an organization's ability to offer quick, responsive service at acceptable cost. The wider technology sector is now applying many of the approaches pioneered in the B2C world to push the limits of agility and flexibility of its own supply chains. "Improved visibility, enabled by technology, helps a lot," says Rob Siegers, President Global Technology, DHL Customer Solutions & Innovation. "If you know exactly how demand is evolving across the world, and the precise status of your current inventory, you can make smarter decisions about what to make and where to send it."

The design and operation of logistics networks is becoming more challenging, he adds, because the distribution of demand is changing rapidly. The location of big data centers can be chosen as much for the availability of low-cost electricity as for proximity to end users, for example, encouraging operators to seek out remote locations. And the manufacturing and support supply chains for cars, medical devices or mining machines look very different from those of servers or smartphones, forcing technology players to adapt their networks and processes as they move further into those industries.

The industry is actively embracing these challenges, however. "Two or three years ago, many companies in the sector were rethinking their strategies, deciding which technologies and which markets would be their focus for the coming years," concludes Siegers. "Now the emphasis has switched to execution. Companies are building innovative products in both new and established categories, and they are developing innovative supply chains to support them."



Rob Siegers, President, Global Technology, DHL Customer Solutions & Innovation

1. How would you describe the sentiment among your technology sector customers today?

The tech sector is characterized as much by its sheer diversity as by anything else. The migration of technology into other sectors, from transportation to healthcare, is only increasing that diversity. Overall, however, sentiment among our customers is extremely positive. The global economy is progressing well. In emerging markets, companies are seeing improvements in demand – from China's fast-growing middle class, for example – and in accessibility, thanks to things like India's long-awaited sales tax reforms. And developments in cloud computing, artificial intelligence and the internet of things are turning these segments into significant sources of growth.

2. Are the new growth drivers affecting the demands placed upon supply chains?

Undoubtedly. We are seeing a continuous and accelerating evolution of the distribution of demand as companies expand in new markets and new industry sectors. And we are seeing a significant shift in service level expectations, as customers of all types call for faster responses, greater flexibility and easier interactions with technology vendors.

3. What are technology companies doing to meet those demands?

Innovating! Across the sector, companies have redefined and refined their strategies. Now they are concentrating on execution, and that focus includes the supply chain. We are seeing a rapid uptake in the use of new supply chain technologies, from advanced analytics to robotics and automation. And technology companies are also exploring new ways to operate and manage their supply chains, with growth in flexible outsourcing and the use of Lead Logistics Partner arrangements, for example.

GOOD SORTS: New logistics technology includes these "minion" sorting robots in a warehouse in China.

AT THE CUTTING EDGE: Yolanda van Norden, Senior Director of Supply Chain Management Logistic Ser-vice Operations, ASML.

FOCUS ON THE DETAILS

Semiconductor manufacturers are continually pushing the limits of physics and manufacturing technology. For photolithography systems maker ASML, that means no machine is ever truly finished.

n the world of semiconductor production, things get smaller all the time. The industry's most famous precept is Gordon Moore's 1975 prediction that the number of transistors squeezed onto a single integrated circuit would continue to double every two years.

It may have been a self-fulfilling prophecy, but Moore's law has proved a surprisingly reliable measure of the industry's evolution. That evolution has led to the development of mind-bogglingly complex devices. The main processor for Microsoft's latest Xbox One X games console, for example, incorporates seven billion transistors on a 359-square-milimeter silicon die. That's 19.5 million transistors per square millimeter. Chip manufacturer Intel has developed chips that it says have 100 million transistors per square millimeter.

Building such intricate devices requires mastery of a host of highly sophisticated techniques and technologies, from materials science to statistical process control. But all modern semiconductor manufacturing processes rely on one major process to create precise features at microscopic scale: photolithography.

Photolithography is simple in principle. A silicon wafer is cleaned, treated and coated with a material know as photoresist. Ultraviolet light is then projected via a mask to create a precise pattern of features on the surface of the photoresist. That light causes a chemical change that allows some parts of the photoresist to be dissolved away with a special developer solution. The surface of the wafer is then etched with liquid or plasma to create the desired features.

The practice, of course, is far more complicated. The manufacture of a complete integrated circuit requires multiple photolithographic steps. The patterns etched onto the wafers must be precisely aligned and perfectly formed. And as the features required on modern chips are just a handful of atoms across, the technology necessary to achieve the required accuracy at production volumes is extraordinarily sophisticated.

The majority of the world's semiconductor makers go to one place for photolithography equipment: Netherlands-based ASML. The 35-year-old firm has an estimated 80 percent market share in the segment. "Our machines drive the shrink of feature sizes that enables the growth of the industry," says Yolanda van Norden, Senior Director of Supply Chain Management Logistic Service Operations at the company.

ASML's day-to-day work involves cutting-edge science and engineering research. Some 85 percent of the company's 16,500 employees are graduates and more than half of them are qualified to master's degree level or higher. The company spends €1.1 billion a year on R&D – 16 percent of its turnover – and holds more than 10,000 patents worldwide.

Taken to extremes

Today, a significant part of that R&D work is focused on the commercialization of a new generation of lithography machines that use extreme ultraviolet (EUV) light in their operation. The new technology is required because the features of the latest chip generations are so small that conventional UV wavelengths can no longer provide sufficient definition. The barriers to its commercialization have been formidable, however. EUV systems have to operate in a vacuum, for example, and the beams of ultra-short-wavelength light they use are extremely difficult to manage using conventional mirrors and lenses. After more than a decade of research and development in its own labs, ASML has now supplied EUV machines to a number of customers around the world. Volume production of chips using the new machines is expected to begin in 2018/2019.

ASML is not just a research-driven business, however. The best ideas are of little use to the industry if they can't be incorporated into reliable machines. That involves a high level of manufacturing expertise – and highly sophisticated supply chains. ASML built around 160 machines in 2016. While assembly and testing is conducted at the company's headquarters in Veldhoven, the vast majority of the components that make up its machines come from a network of 600 suppliers spread across the world.

Coordinating the supply chains that support its manufacturing activities is an operation of considerable complexity. ASML has to ensure that the thousands of parts, subassemblies and modules that make up its machines arrive in time to enable their assembly. Then, E 11 BILLION ASML's annual R&D expenditure

"Almost every machine we've ever built is still working today. And we have to ensure those machines keep running, and upgrade and adapt them as our customers' processes evolve."

Yolanda van Norden

once they've been thoroughly tested, the huge, delicate machines need to be partially dismantled for shipping to the end customer. ASML's latest, largest machines require 20 trucks to transport and fill the holds of three Boeing cargo aircraft, says van Norden. Every stage of the logistics process has to be managed with great care to prevent shocks or temperature extremes that could damage their components.

The biggest supply chain challenges, however, arise once machines are in operation at customer sites. "Almost every machine we've ever built is still working today," says van Norden. "And we have to ensure those machines keep running, and upgrade and adapt them as our customers' processes evolve."

Looking after its fleet of equipment in operation at customer sites requires sophisticated service logistics capabilities. "The requirements of our customers change over time," explains van Norden. "When they introduce a new technology, the focus is on the performance of the process. Later it's all about output and speed, and finally it's about reliability and cost." The eye-watering cost of a chip plant – a modern semiconductor fabri-



cation facility can cost anything between \$3 and \$10 billion to build – means manufacturers need to keep their production lines running at full capacity to recoup their investment. They don't want to wait any longer than necessary for spare parts when things go wrong.

For ASML, looking after its machines is further complicated because, while the company's main operations are in Europe, its customers are concentrated in Asia and the U.S. "Our customers expect spare parts inventories to be held close to their plants, so equipment suppliers like us need warehouses and service engineers in those locations," says van Norden. And ASML's parts warehouses aren't just storage facilities, they often include their own cleanroom facilities to allow components to be assembled and prepared prior to delivery to customers.

Continuous improvement

ASML's support for its customers isn't just about keeping machines running, however. Its customers also need those machines to continually evolve as new technologies become available and their own processes and requirements change. That means ASML is continually re-engineering its equipment, adapting and improving machines that may have been in service for many years. "We manage around 6,000 engineering change orders every year," says van Norden. "That means we need significant flexibility from our suppliers, and we need to be able to drive innovation through the supply chain to our customers." Overall, that effort involves 2,000 field engineers and 150,000 parts shipments every year.

For van Norden, who moved into her current role after many years in procurement, ASML's supply chain provides a uniquely broad perspective on the whole of the company's activities. "In the supply chain, you are in the center of your organization," she says. "You get a close-up view of product development, you get to see what's happening at supplier factories and customer sites. I'd advise anyone who really wants to understand a complex business to spend a couple of years working in the supply chain function, it really is a great learning curve." I *Jonathan Ward*



IMMERSIVE SCIENCE: ASML uses a process called immersion lithography in the manufacture of its semiconductors.



FIXED ASSETS

As individuals and institutions become increasingly reliant on their technology infrastructure, companies are finding smarter ways to keep their systems running.

> ajor IT systems failures leave companies with angry customers, big bills and damaged reputations. In 2017, three of the world's major airlines suffered separate data center outages that forced them to delay or cancel flights and left passengers stranded at airports around the world. In the most severe cases, fixing these issues and compensating customers can cost the affected company upward of \$100 million.

It isn't just airlines that have been affected. Banks, mobile telephone networks and internet service providers have all suffered significant outages linked to problems with their IT infrastructure. The root causes of these incidents can range from the sinister – carefully coordinated cyberattacks – to the mundane. Power and data connections to major IT facilities have been damaged by bad weather, car accidents and even rodents.

The scale, density and complexity of modern data centers can compound problems when they occur. One major European web-hosting service suffered a significant outage last year when water leaking from a custom cooling system damaged servers in an adjacent rack. Big data centers are power-hungry places, with plenty of potential for serious damage when things go wrong. In 2013, construction of the U.S. National Security Agency's giant new data center in Bluffdale, Utah, was delayed by a number of "arc flash" events that damaged power equipment during commissioning, for example.

In general, however, modern IT equipment achieves very high levels of reliability. When a facility contains thousands, or even tens of thousands, of individual computers, however, minor problems like failed hard drives or overheating processors are likely to be everyday occurrences.

For companies that operate, or rely upon, critical technology infrastructure, the aim is to avoid fire-fighting, either literal or metaphorical, as much as possible. Modern systems are designed on the assumption that components will inevitably fail, with multiple layers of **COLLECTOR'S ITEM:** DHL is piloting a Smart Locker program in India.

DHL	swip [∞]

redundancy to limit or eliminate the resulting disruption. Changes in technology make this approach to reliability easier than it once was. Virtualization systems, for example, allow companies to switch tasks quickly between individual servers, and modern databases include "hot backup" capabilities that keep a continual record of additions and changes.

Part and parcel

Systems that go wrong still need to be fixed, however, and the technology industry is always looking for ways to make service and repair activities run as smoothly and seamlessly as possible. A critical element of that process is the delivery of the right replacement components.

According to Leonard Aerts, Chief Customer Officer, DHL Service Logistics, the industry's emphasis on overall system robustness is leading it to prioritize visibility and consistency over absolute speed in service logistics. "In recent years, we've seen a reduction in demand for same-day deliveries from our technology customers," he says. "Now customers are more likely to ask for more cost-effective next-day services, but they need absolute assurance that the shipment is going to arrive when expected." As in so many other B2B environments, Aerts notes, customer expectations are also shaped by their experience as consumers. Ride-hailing services like Uber, for example, show the real-time location of the requested vehicle as it approaches. DHL now offers similar capabilities for mission-critical shipments, with tracking systems that provide real-time visibility to urgent shipments and update expected arrival times based on vehicle GPS data and current traffic information. That data is made available to customers and service engineers through a dedicated app, so they know exactly when to expect a shipment and can be alerted to its imminent arrival.

The most useful service parts are those that have already arrived. In India, DHL is piloting an innovative approach that makes that possible. Smart Lockers work in the same way as the automated parcel collection points used by consumers for e-commerce deliveries. Located on the campuses of major data centers and similar facilities, they allow equipment suppliers to pre-position an inventory of commonly used replacement parts. On-site service engineers can access the components they need with a secure one-time passcode, and the system works seamlessly behind the scenes to handle billing and replenishment orders.

Into reverse

Service operations don't end once the broken asset is back up and running. Technology vendors also need to recover the faulty part for analysis, repair or appropriate disposal. That can be a weak link in many organizations' service parts logistics operations, since both vendor and end customer are primarily focused on outbound delivery and repair. DHL's Asset Recovery Tool has been developed to help vendors streamline their reverse logistics processes. The system logs and tracks all returnable assets in the field, as well as providing a self-service portal for field engineers to manage the return shipment of parts. Analytical capabilities allow companies to track assets by age, helping them identify and rescue parts that have become stranded in the field.

Finally, says Jason Pawlowski, Vice President, Global Center of Excellence, DHL Service Logistics, technology companies increasingly see logistics data as a powerful source of insights into the effectiveness of their service operations. "Advanced analytics techniques are helping us to become much more proactive with our data. Analysis can reveal how demand is evolving over time, and getting that information into the hands of decision-makers helps our customers make better choices about what their service inventories should contain and where they should be located." I *Jonathan Ward*

BUSINESS

AI BREAKS FREE

Artificial intelligence is already here. Soon it will be everywhere.

ver the last five years, artificial intelligence (AI) has exploded out of the research laboratory and is thriving in the outside world. AI technologies have become so successful, so rapidly, that their presence is now ubiquitous in many sectors. AI algorithms drive the systems that choose the content displayed on social media feeds, rank product recommendations on e-commerce sites, and allow smart speakers and digital personal assistants to parse and respond to spoken questions. So far, the most significant impact of AI has been felt in the consumer space, but according to a new report from DHL, AI technologies are poised to transform the B2B economy too.

To understand the potential of AI, say the report's authors, it's important to recognize that the term refers broadly to human intelligence exhibited by machines. These systems make use of data and learning frameworks to solve the kinds of problems humans solve, interact with humans and the world as a human does. and create ideas like humans. It's vital to understand the capabilities and limitations of today's AI techniques. Computing systems of the past were, by and large, deterministic in nature. They were designed to achieve specific objectives and operated using explicit rules created by their developers, where a set of inputs generated a fixed set of results. While they excelled in speed and accuracy, conventional computer systems were unable to learn from experience or find new, creative solutions to previously unseen challenges. AI shifts this paradigm by demonstrating the ability to perceive, translate and understand the content of vast amounts of data generated by individuals, systems and businesses every day.

Narrow but powerful

While AI practitioners debate the feasibility of building a machine with the flexibility, reasoning and imagination necessary to rival the human mind, this "general artificial intelligence" remains a purely theoretical concept today. Real-world applications are commonly

To download the report, please visit:



www.dhl.com/ai

referred to as "narrow AI"; these systems can cope with noise and uncertainty, produce novel solutions and improve their own performance over time. Unlike a person, however, narrow AI systems can't switch easily between tasks; AI programs that beat world champion board game players like Lee Sedol in Go, or Garry Kasparov in chess, could not perform lifestyle services conversationally the way Amazon's Alexa could.

AI technologies have some characteristics that have hampered their adoption in business and industrial applications, however. AI systems are stochastic in nature: like a person, they get things right most of the time, but not every time. In some contexts, that doesn't matter too much. A website that serves up irrelevant recommendations is only irritating. A system that makes business- or safety-critical decisions needs to consistently perform better than the approach it replaces. That's happening today. Virtual assistants now achieve word recognition rates of more than 94 percent, exceeding average human comprehension in normal conversation. Similarly, while autonomous vehicles have been involved in a handful of high-profile collisions, human drivers cause comparatively more traffic accidents, without the advantage of computational memory that never forgets a driving maneuver or scenario.

The performance of AI technologies isn't the only factor reaching a tipping point. They are also becoming much more accessible. AI practitioners are placing many of their technologies into the public domain via open source tools. Established companies and startups are packaging those technologies into robust products or cloud-based services. Finally, as more industries embrace digital products and services, they can use their own historical data to train various AI technologies for specific use cases.

A new industrial revolution

AI technologies are already being applied to do everything from sorting and grading vegetable produce to medical diagnoses. "AI will eventually be contained within every software product on the market. This will bring us a new generation of tools that fundamentally augment and enhance the quality, reach and velocity of human expertise," says Ben Gesing, one of the report's authors. In logistics, for example, DHL and its partners are already exploring the use of AI techniques to provide better responses to customer queries, predict service delays and even determine delivery requirements based on customer profiles.

Ultimately, says Gesing, one of the biggest risks for companies lies in long-term non-competitiveness from not investing in AI technologies soon enough. "Artificial intelligence platforms are fundamentally different from other investments," he says. "Because these systems can learn and improve their own performance, the business case for their use is very different from conventional assets. Rather than diminishing over time, the benefits tend to grow over time."
Jonathan Ward

MODELING THE FUTURE

For over four decades, Royal Dutch Shell has been developing detailed scenarios about future global energy use. Wim Thomas, the company's Chief Energy Advisor, explains why his organization goes to such efforts, how scenarios are created, and how they inform the oil major's strategic planning.

obody can see into the future, but everyone wants to be ready for it. When your business involves multibillion-dollar investments in assets that may operate for decades, it pays to think hard about what the coming years might bring. For European energy giant Royal Dutch Shell, that involves deliberately challenging long-held assumptions and conventional wisdom. Part of Shell's strategic planning process involves the development of detailed scenarios exploring the different ways energy supply and demand could evolve around the world. It's something the company has been doing since the 1970s and, for the last 14 of those years, the man in charge of energy scenario development has been Wim Thomas, the company's Chief Energy



Advisor. To understand the organization's rationale, he explains, it's first necessary to recognize the difference between scenario planning and conventional forecasts or market outlooks. "A forecast is very much one person's view of the world. It will therefore have a certain limited perspective. By contrast, a scenario is a much more inclusive process. We take many more people's views into account, we recognize that people interpret signals differently, from different cultural perspectives and vantage points, and we don't dismiss those interpretations as long as they are logical and plausible."

Energy use is inexorably linked with politics and economics, so scenario creation starts, says Thomas, with "our economic and political analyst colleagues, who create a sketch of the world." Between 100 and 200 people can be involved in a fully fledged global scenario exercise, two-thirds of them from outside the company. That's vital, he notes, "because we don't have all the answers."

Combining those different perspectives into a number of coherent views of the future inevitably involves an element of judgment. "We try to ensure our perspectives are plausible, but stretching as well," explains Thomas. "Ultimately these scenarios are a communication tool, there to support our strategic decision-makers. If you say that the future will just be a case of 'business as usual,' that's not very useful for anyone. But you have to be careful not to stretch things too far. If you think the answer is 100, but your audience can only see the world to 50, it's better not to talk about your end state, it's better to talk about the halfway point. Otherwise people may never do anything because they think it's too difficult to change."

\$1-2 BILLION The amount per year

that Shell is investing in new energy technologies ahead of 2020



PATHWAYS TO ZERO

How can the relentless rise in carbon dioxide emissions be reversed? Can that be done without compromising the ambitions of billions of people to enjoy the benefits of a modern society? That's the question addressed by Shell in "A Better Life With a Healthy Planet," a supplement to its most recent set of scenarios. With aggressive steps to improve energy efficiency, Shell estimates individuals can achieve a decent quality of life with an energy budget of around 100 gigajoules per person per year. By comparison, most Europeans consume around 150 gigajoules today, Americans 300. For a world population of 10 billion people to enjoy even a modest 100 gigajoules, however, global energy production will have to double during the course of this century.

Meeting the world's appetite for energy without pushing trillions of metric tons of carbon dioxide into the atmosphere will be a tremendous social and technical challenge. But the Shell team concludes it can be done. Large-scale expansion of renewable energy technologies is part of the answer, and greater electrification of end use will be essential to make the best use of that energy. Electricity can't do everything, however. Some applications, notably heavy industrial processes such as steelmaking or cement manufacture, require so much energy that they will continue to rely on hydrocarbon energy for the foreseeable future. To offset the emissions generated by these activities, the world will need to invest in technologies that absorb carbon dioxide. Those range from long-established techniques, like reforestation or greater use of wood in construction, to emerging technologies, like carbon capture and storage at the point of emission.

bit.ly/shell-healthy-planet 🖶

MODELING THE GLOBAL ENERGY LANDSCAPE

To bring mathematical rigor to its scenario development work, Shell develops highly detailed models of the world's energy system. The company's World Energy Model combines top-down and bottom-up perspectives, considering how energy supply and demand may evolve based on factors including population growth, economic development, resource availability and technological progress. It considers how choices made by individuals, companies and governments will influence the way energy is produced, transported and consumed.

The company's work to build mathematical models of the global energy landscape stretches back to the mid-1970s. Its first attempt included 3,000 linked equations and took 20 hours to run on a mainframe computer. Today's model incorporates around 55,000 lines of code in a series of interlinked spreadsheets. It includes detailed information on 100 countries, 14 industry sectors, 18 different primary energy sources and 75 adjustable scenario parameters. Thankfully, modern computers are more than a match for the task. It takes just six minutes to run the model, producing a 55-megabyte output file predicting the evolution of the global energy system over a period of 100 years.

www.shell.com/scenarios



From global politics to gigajoules

Once it has created this socio-economic and political world view, the scenario team must determine the implications for energy. That's where the modeling comes in. Shell has developed a number of highly sophisticated models of the global energy system (see **Modeling the global energy landscape**, left). Those models, says Thomas, "are what keeps the energy scenarios plausible as the world cannot change overnight. Infrastructure takes a long time to transition, political decision-making processes can be slow and so on."

Over time, the company's models have become more elaborate. In part because there's more computing power available to crunch the numbers, but also because the global energy system is getting ever more complex. "Thirty years ago, energy was simple," says Thomas. "Eighty percent of energy came from fossil fuels. Coal was the dominant force, although oil would eventually catch up. Gas was third in line, then you had a bit of nuclear. At that time, the mathematical modeling was less important than the political and economic assumptions you made. Today, with the growth of renewable energy technologies, the situation is far more complex."

Innovation, impact and interdependence

The computing power available today allows the scenario team to explore the impact of many different possible changes, and to identify the factors that will have the biggest impact on the future energy landscape. It also gives them the ability to answer specific questions presented by the company's management team. "Recently, for example, there was a lot of interest in the impact of a more rapid than expected transition to electric cars," says Thomas. "There were newspaper headlines suggesting this might lead to a steep overnight decline in demand for oil." When Shell's team ran the numbers, however, they found a different story. "In our model, everything is interrelated, so we see that if you don't need so much oil in the rich West, demand is suppressed and the price goes down. But that means developing economies can afford to buy things earlier than they otherwise would. They take up the demand and the net effect is hardly any different at global level in the short term, but over time these technology shifts will have a profound effect."

Does Shell's scenario planning work genuinely inform its strategy? While he emphasizes that change in the energy industry inevitably occurs slowly, Thomas insists that it has helped put a number of big ideas on the agenda of the company's leadership over the years, including the rising

IT'S A GAS: Shell is now piloting hydrogen filling stations in Germany.

SUN TRAPS:

Shell champions solar panels and installs them at many of its facilities.



importance of energy efficiency in the 1980s, environmental pollution in the 1990s and more focus on climate change in the 21st century. Shell's current leadership team takes the global transition toward a carbon-neutral energy landscape "seriously," he notes. "What matters now is how this company best positions itself in such a transition." Shell's efforts in that direction can be seen in many areas, he adds, from the increasing role of natural gas, which now makes up around half its fossil fuel portfolio, to the installation of solar panels at its facilities and the piloting of hydrogen filling stations in Germany. Between now and 2020 the company plans to invest one to two billion dollars a year in developing capabilities in new energy technologies, such as offshore wind.

While its work to transition to a net zero emission economy presents "very challenging" ideas for a fossil fuel company, says Thomas, he believes it contains much to be optimistic about. "We've shown that not only is it technically possible to reach net zero emissions, it's also affordable." A key decision for global society, however, will be the speed of that transition (see Pathways to zero, previous page). Achieving net zero emissions by the end of the century will not be enough to meet Paris Agreement aspirations, says Thomas. To keep forecast temperature increases well below 2 degrees Celsius, the goal must be to complete the energy transition largely by 2050. "2050 is tomorrow in energy terms. If you build a power station today, it will still be operating in 2055. That creates a real sense of urgency for policymakers to put frameworks in place for things like carbon pricing or the development of carbon capture and storage technologies."

Room for maneuver

It isn't just energy companies and governments that can learn from Shell's scenario work, much of which it makes publicly available. Leaders in all industries, says Thomas, should be thinking hard about the role their organizations will play in the energy transition. "The big themes are decarbonization of end use and the role of digitalization as both an enabler and a disrupter." Today, for example, less than 20 percent of energy is consumed in the form of electricity. "We think that figure can rise to around 50 percent, which is great news because all the basic renewable technologies – except for biofuels – produce their energy in the form of electrons."

Digital technologies, meanwhile, will help companies improve the overall energy efficiency of their operations in numerous ways. Opportunities in logistics, he suggests, include smarter planning to reduce journey distances and the movement of empty vehicles. Coordinating port and maintenance operations to minimize loading and offloading times, meanwhile, allows ships to travel more effectively, with significant fuel and emissions savings.

If Shell's scenario work offers one major lesson for countries, companies and individuals, concludes Thomas, it's the need to lay the groundwork today for the challenges and opportunities of tomorrow, ensuring there is "room to maneuver" in capital investments in the face of significant changes in the way energy is produced, distributed and consumed. Jonathan Ward



WIM THOMAS: The Chief Energy Advisor at Shell also heads the company's Energy Analysis practice.



ARGENTINA: OPEN FOR BUSINESS

Argentina has long had potential to be an economic power, but frequent political crises have held it back. Enter a new president with a sweeping reform agenda, and the chance has reemerged.

> olortex, a leading textile company in Argentina, invested nearly \$3 million last year to diversify into workwear fabrics after years of making sheets and towels. Denise Karagozlu, a director, says the company can produce these fabrics competitively against importers because the process involves using local cotton and less labor than sewing sheets.

The move to diversify isn't simply to boost profits – it's about surviving in a volatile country. "Argentina is always at one extreme or the other," Karagozlu says. "If you don't change as the situations change and understand that you have to keep changing, then you won't achieve anything."

Colortex, like other businesses, has learned this after more than 80 years of economic and political crises in

Argentina. Karagozlu's grandfather started Colortex in 1955 and took advantage of tax breaks to open a factory in La Rioja in the northwest. That kept its pricing competitive despite the cost of transporting finished goods more than 1,100 kilometers to Buenos Aires, the country's main consumer market with a third of the 44 million population. But an elimination of the tax incentive in 2012 squeezed margins and pushed the company to diversify. It's now looking at high-tech fibers.

Argentina wasn't always so unstable. In the late 1880s and early 1900s, ample fertile land made it a breadbasket to the world – and an economic power. Dictatorships and poor economic management in the subsequent years, however, curtailed progress. In 2001, the country defaulted on \$100 billion, sparking one of its worst economic downturns ever. Mauricio Macri, the country's president, wants to end the volatility, and much of his strategy is based on reeling in investment for long-term economic growth.

Laying the foundations

Since taking office in December 2015, Macri has ended the debt default to make capital available for companies again – and at lower rates. He has let the currency float, lifted most taxes on exports and ended the capital controls of his populist predecessors, who ruled from 2003 to 2015. Companies can import materials and parts, previously limited by government controls.

The efforts are starting to pay off. The economy has emerged from a 2016 recession to expand 2.7 percent in 2017 and is on track for 3 percent growth this year, according to the World Bank. Inflation came down to 25 percent in 2017 from a peak of 40 percent in 2016, and it should reach 20 percent this year and 13 percent in 2019, says Alejandro Ovando of economic consultancy IES Consultores. "The government is laying the foundations for solid growth," he says.

A main thrust is to reduce the fiscal deficit, which has been at the root of the country's economic woes over the past century. Macri has slashed energy and transport subsidies and got congressional approval to widen the tax base and trim pension payments. He is cutting government jobs and planning a labor reform.

The reforms are needed to make it more competitive for businesses, says Federico Mac Dougall of Buenos Aires-based firm First Corporate Finance Advisors. He estimates the corporate tax pressure at 44 percent, in line with Europe, but the government has little leeway to lower taxes until it cuts the fiscal deficit from around 6 percent of GDP.

Eyeing the potential

Nonetheless, companies are looking at the potential. In the first two years of Macri's rule, \$104 billion in investment was announced, led by projects in the oil, mining and power generation industries, according to the Argentine Agency of Investments and International Trade.

When Macri won the presidency, "It was like a switch was flipped and all of a sudden Argentina went overnight from a 'do-not-invest region' to 'we're open for business," says John Kanellitsas, president of Lithium Americas, which has a lithium project in the north. "Today investors want to deploy capital in Argentina."

Ovando says there are opportunities as well in the agriculture, automotive, construction, public services and steel industries, as well as in beef and pork. Serious underinvestment between 2002 and 2015 left the country with shortages, in particular of energy. There is a market to increase production by competing with

imports and then exporting, including to Brazil, the country's biggest trade partner and a huge market with a population of 208 million.

Resource potential

Another attraction is the vast resources, from the high-yielding farmlands to the huge oil and natural gas resources in Vaca Muerta, a shale play under development by global majors like Chevron, ExxonMobil and Shell. Much of the country's renewable energy capacity is undeveloped, so too are mining resources.

The years of low investment have left room for growth – and the chance to take advantage of the operating techniques and technological advances already honed in other markets. Oil producers, for example, are rapidly trimming the cost of wells in Vaca Muerta by using what worked in North America, the first developer of shale resources.

It's the same with renewables. "Being a 'second mover' has allowed the country to take advantage of the large declines in investment costs, which has a strong impact on long-term energy prices," says Alejandro Lew, CEO of 360 Energy, which is building solar power plants in the north.

With lithium, Argentina has come onto the scene at a time when the increasing use of electric cars and grid storage batteries for renewable power plants is pushing up demand for the light metal. "There is a scramble and a real, urgent need to bring more supply into the lithium market to meet the demand," says Kanellitsas. His company is investing \$425 million in building a plant to produce 25,000 metric tons of battery-grade lithium carbonate per year, starting in 2020, which represents 10 percent of the current global market.

In wind power, the promise is just as big. Juan Pedro Agüero, a project developer at the Argentine Wind

3 PERCENT The estimated growth rate of

Argentina's economy in 2018

IN THE WORKS: Textile manufacturer Colortex has invested in new factory equipment.



20 PERCENT

The amount of power the Argentinian government aims to obtain from renewable sources by 2025 Power Association, estimates that 70 percent of the country's landmass has winds that can be harnessed for power, with Patagonia in the south boasting some of the world's best conditions. Companies are starting to build wind parks as the government targets getting 20 percent of the country's power, or 10,000 megawatts, from renewable sources (other than big dams) by 2025. "It's ambitious, but feasible," Agüero says. "The resource is so big and widespread that there will always be projects that can be carried out."

Short-term pains

There are challenges for the ramp-up in investment. The first is that Macri's reforms have yet to trickle down to the consumer and businesses. Inflation is still in the painful double digits and the currency continues to depreciate against the dollar, putting a damper on economic growth prospects. Imports have been on the rise, keeping a lid on manufacturing output.

"The business environment is more friendly, and the government has taken the right measures, but it has been difficult for them to secure short-term results," says Germán Arango, Country Manager Argentina and Chile, DHL Supply Chain. "We have not seen consistent growth yet."

Businesses will have to tough it out, something they've become adept at in Argentina. "We've had so many ups and downs that we need to know how to bounce back," says Eduardo Iglesias, general manager of insurer Colón Compañía de Seguros. "We have to be resilient."

Costly logistics

Another challenge is to cut logistics costs. At Colortex, says Karagozlu, it costs twice as much to transport merchandise to Buenos Aires from La Rioja than it does for a rival to bring in a container from China, a competitive handicap. It's true that the long distances

HELLO, GOOD BUY: Online shopping is estimated to increase

significantly in Argentina



in Argentina, the second-largest geographical area in South America, make transport expensive. But other factors are as taxing: high labor costs and highway tolls, the wear and tear on trucks from poor roads, and a lack of competition against truckers, who move more than 90 percent of the cargo. The country's railway network, once among the most extensive in the world, has fallen into disrepair, and little is moved on the rivers.

To reduce freight costs, the government has launched the biggest infrastructure build-out in the country's history. Professional services firm EY estimates more than \$142 billion will be invested in infrastructure and public works over the next decade or so, with much of it coming from the private sector. Of this, \$55 billion will be spent on expanding the highway and road network, \$24.5 billion on freight and passenger rail, \$12.5 billion on urban mobility, and \$3 billion on airports and ports. One of the largest projects, at \$16 billion between 2016 and 2026, involves building airport, rail, road and other infrastructure in the north, helping to attract investment to the country's poorest region. Another project is to build a tunnel under the Andes to Chile so as to increase the volume of exports from Argentina, Brazil, Paraguay and Uruguay to the Pacific.

The additional capacity is needed. Argentina has the highest logistics costs in Latin America, according to the industry group Latin American Logistics Association. It's just as worrying that the country slipped to 66th place in the World Bank's International Logistics Performance Index in 2016, down from 45th place in 2007 – a sign of decline in the efficiency of customs clearance, trade and transport-related infrastructure, as well as of increased difficulty in arranging shipments, worsening delivery times and flagging competence in logistics services and tracking and tracing.

"Doing business in Argentina is costly," says Eduardo Rodrigues, Country Manager Argentina, DHL Global Forwarding. "There's a lot of room for improvement in logistics."

This year, the government authorized double-trailer trucks, shaving 25 percent off road transportation costs and increasing freight capacity by 30 percent, Rodrigues says. At the same time, companies are outsourcing logistics, transportation and warehousing to lower costs and improve efficiency in the supply chain, and they are automating and digitalizing processes, he says.

Online shopping

E-commerce could be a source of growth in logistics in Argentina. "The potential is there," DHL's Arango says, citing as reasons the large population and digital penetration. According to the Argentine Chamber of Electronic Commerce, Argentina has the highest penetration of online commerce in Latin America thanks to its widespread use of smartphones. EShopWorld, a Dublin-based e-commerce firm, estimates that the pop-



ulation of online shoppers will increase to 19.9 million in 2021 from 16.8 million currently.

Even so, the culture of shopping online still lags behind Europe and the U.S., largely because of a low penetration of credit cards, the high interest rates – 40 percent on average, according to the central bank – and excessive fees. "People would love to shop online and receive the product in their homes," Arango says, but the high cost of using credit cards is a setback.

To change this, retailers and e-commerce platforms like MercadoLibre, the country's biggest, are improving customer fulfillment by making the process of receiving, packaging and shipping orders as easy as possible. In 2013, most e-commerce deals were done in cash at the point of sale. Now more payments are made electronically, and goods are shipped by private couriers and the postal service, increasingly with tracking services.

Moderate growth

No matter the potential, the pace of investment will likely will be moderate. In 2016, companies announced plans to invest \$12.1 billion in greenfield projects, or building operations from the ground up, compared with \$3.2 billion the previous year, according to the latest data from the United Nations Conference on Trade and Development. But the data also shows that actual foreign direct investment shrank to \$5.7 billion from \$11.8 billion over the same period.

"Argentina is on the right track, but it's slow, steady growth," Arango says. "Investors are being cautious.

More time is needed to consolidate the changes and demonstrate that Argentina is the right place to be."

Dante Sica of economic consultancy Abeceb believes the velocity of investment will increase as Macri's reforms make it cheaper and easier to do business, putting Argentina on track to return to its European-level prosperity of 100 years ago.

"The gap between emerging and developed countries has narrowed over the past few years, and much more so in some Asian countries that have implemented policies that are much more stable over the long term," Sica says. "It may take 10 or 15 years, but Argentina has all the potential to embark on this path." Charles Newbery

ARGENTINA

Population:

44,293,293 (July 2017 est.)

GDP:

\$545.9 billion (2016 est.)

World Economic Forum's Global Competitiveness Index 2017-2018: 92nd out of 137

World Bank Group's Ease of Doing Business Index: 117th out of 190

DHL Global Connectedness Index 2016: 102nd out of 140 LONG HAUL: Argentina faces a challenge to cut transportation costs.



AI: FRIEND OR FOE?

In view of the rapid development of intelligent machines, tech expert Ayesha Khanna and futurist Gerd Leonhard consider if humans have anything to fear from the unstoppable rise of AI.

ast October, an individual called Sophia officially became a citizen of Saudi Arabia. At an event in Riyadh, she stood smilingly on stage in formal business attire and thanked her new country, saying how "honored and proud" she was to have citizenship bestowed on her by the kingdom.

The next month, in an interview with the United Arab Emirates' Khaleej Times, Sophia revealed that she would like to have a baby. "The notion of family is a really important thing, it seems," she told the publication. She also spoke at the U.N. and at Female Entrepreneurs Day in Shanghai, and appeared on breakfast TV in the U.K. and the Jimmy Fallon chat show in the U.S., where she invited viewers to befriend her on Facebook.

Ordinarily, news of this kind wouldn't make awestruck headlines around the world. But this did because Sophia isn't human. She's a humanoid robot.

Made by Hong Kong-based Hanson Robotics, Sophia is an incredibly lifelike social robot designed for use in healthcare, customer service, therapy or education settings. She is powered by artificial intelligence (AI), and can see faces and process conversational data in order to form relationships with people, which means she isn't preprogrammed with answers. What she doesn't have, say her creators, is consciousness. Yet.

If you've been following Sophia's progress, you will probably have fallen into one of two camps: sheer wonder at her lifelike features and abilities and excited by the opportunities she presents; or concerned that she is becoming sentient and scared at where all of this might lead. After all, people like Elon Musk and Professor Stephen Hawking have been warning of the dangers of uncontrolled AI for some time, with Musk calling it "a fundamental risk to the existence of human civilization." Others are rather more upbeat and look forward to exploring the possibilities of AI. In the foreword of "Hit Refresh," a new book by Microsoft CEO Satya Nadella, Bill Gates says the technology is "on the verge of making our lives more productive and creative."

\$15.7 TRILLION

The amount AI could contribute to the global economy by 2030 (source: PwC) Facebook's Mark Zuckerberg agrees, noting how "optimistic" he is to see where AI could take us.

These mixed messages are confusing, however. What should we be? Positive? Or worried? For futurist Gerd Leonhard, author of the book "Technology vs. Humanity," it's important to first define what AI actually is. "To really simplify, I would say there are four kinds of artificial intelligence," he says. "The first is Intelligence Assistance (IA), which is essentially just fancy software that we can use to, for example, schedule our meetings. That's 95 percent of the so-called AI we see today. The second is artificial intelligence, which is a limited machine intelligence that can actually learn and go beyond a single, narrow use; and then then we may eventually get to Artificial General Intelligence (AGI), where machines will be able to learn and understand and then perform an action based on their own thinking, i.e. become 'generally intelligent' in a human sense. Ultimately this may lead to Artificial Super Intelligence (ASI), where

computers might have unlimited power and infinite IQ. The bottom line is that, right now, today, people tend to overestimate how 'intelligent' machines really are."

Ayesha Khanna, entrepreneur, technology author and smart cities expert, agrees with this; and she also agrees that AI is "the biggest event in human history," as Stephen Hawking put it. "Or, at least, it's one of the biggest events," she says. "It's certainly going to profoundly affect the way we work and live in the future; and, in some ways, AI will 'humanize' as it manifests social interactions. How fast it will become ubiquitous, though, depends on what you mean by AI. I think self-driving cars are still a way off, but the automation now used to match customer service calls to AI agents is becoming quite advanced – as is image recognition."

So just how intelligent could machines become in the future? What opportunities and risks do they present? And ultimately, should humans consider AI to be a friend or a foe?
Tony Greenway

AYESHA KHANNA:

"AI has the potential to do a lot of good in the world."

What are the current trends in AI?

We're beginning to see a greater use of data analytics across companies. This will automate processes, some of which are currently carried out by human beings, such as accounting or call center work. Should we be concerned about that? Yes, I think we should be. On the one hand, it's a good thing as it will improve certain services; on the other, automation means loss of jobs. There's no doubt about that. But I don't think this means we should dismiss AI because there is always a balance to strike and a bigger picture to see. For instance, we're developing a microinsurance platform for Asian farmers powered by AI that uses satellite image processing to undertake early loss detection due to risk events, such as typhoons. The platform means that millions of poor farmers who have previously been unable to get insurance for their crops will now be covered financially. Of course, it also means that insurance agents – who usually investigate the crops – could lose their jobs. I believe we can use artificial intelligence to solve humanity's most pressing problems; but meanwhile, it's the responsibility of society and government to reskill those who have lost their jobs. So we need to be circumspect about our criticism of AI.

Are there any industries that won't be transformed by AI?

No. I believe almost every industry will be transformed by it. I liked what Andrew Ng (former Chief Scientist at Baidu and Stanford Adjunct Professor) said about AI recently. He described it as "the new electricity." Yet even as it becomes invisible as a utility that powers the economy, we need to keep it in the foreground to an extent to ensure that society can have a debate about the kinds of things that AI should – and should not – be able to do.

What are the most exciting opportunities it offers?

There are so many. One of the most interesting areas is healthcare. Personalized medicine powered by AI will improve treatments and isolate the cause of certain kinds of diseases. AI will also provide education to the masses in an effective, personalized manner via mobile phones, so it's a way to promote inclusivity. It can also help create personalized services for citizens. If a government could alert individuals to events and opportunities that appeal to them, it would lead to greater citizen happiness by anticipating their needs. Then there is smart transportation.

> **AYESHA KHANNA:** Striking a balance.

We are developing a mobility-as-a-service platform for one of Singapore's largest transportation companies that integrates different modes of transportation and allows users to personalize their mobility – which discourages private ownership of cars and is better for the environment. Al will also have an enormous effect on the logistics sector in terms of optimization of transportation modes, and improving convenience and sustainability.

Do you view AI as a friend or foe?

As a friend. I think it's very easy to criticize AI but it has the potential to do a lot of good in the world. If people are educated in the right way, I'm quite optimistic that we'll see a younger generation that not only enjoys working with AI to create new services and interesting products, but is also ethically bound by what it should do with the technology while not being passively subservient to it. So we can't go into "attack mode" and "fear mode" whenever we talk about AI. That doesn't seem like a very productive way to approach it. The key is not to be too naive about it – but not too pessimistic, either.



GERD LEONHARD:

"We need to decide what we want from AI, and how we will govern the use of it."

Is "the robots are taking over!" just a plot line from a sci-fi film?

When we think about cognitive machines and artificial intelligence we need to detach ourselves from what we may have watched on this topic, either in recent movies

or on TV. These shows tend to focus on fear and dystopia around AI because that's what sells. It's entertainment. In the real world we have to remember that while artificial intelligence is an amazing tool – and could very well have more impact on us than the internet itself – its intelligence is not human at all, and its purpose is not to replace or enslave humans. It may be better to talk about "smart machines" rather than AI because we tend to think of human attributes when we talk about intelligence, period.

Humans have what I call "androrithms" (in my new book www.techvshuman.com): attributes such as empathy, compassion, intuition, feelings and imagination, all of which is very hard for machines to understand and pretty much impossible to possess. Sure, machines may be able to analyze (and possibly even simulate) what compassion looks like, but I doubt they can ever actually be compassionate (in the philosophical sense of "Dasein" i.e. existence).

Right now, the biggest concern is not that machines will take over, but that we might become too much like them, and/or that the power of these "morally neutral" new technologies is used for evil purposes.

Nevertheless, you've labeled some AI applications as "creepy." Why?

Let's say I'm using an intelligent personal assistant on my phone to quickly buy more sticky notes from my favorite site. Well, that's not going to "dehumanize" me. Similarly, if my self-driving car makes its own decisions in order to avoid traffic jams, that's great.

But if I use my intelligent personal assistant to decide who would be a good match for a date, or if I use it to tell me whether I should have children or not based on DNA analysis... well, then I'm getting into the area of replacing my own thinking with that of a machine. And that is dehumanizing.

GERD LEONHARD: Harnessing a new power.

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Could the development of AI be dangerous?

The danger is that we're creating something that's vastly and then infinitely powerful but don't embed its use in our ethics, or sufficiently regulate it. Humans have harnessed new technological power in the past – with nuclear technology, for example; but after an initial disaster we did manage to limit the spread of nuclear weapons with nuclear nonproliferation treaties. In many ways, artificial intelligence is more powerful than nuclear bombs because it's a lot easier to make - it doesn't require plutonium - so maybe we need to have similar global agreements in place to ensure that it's only used in a positive, beneficial, ethical way. Because, for example, if a nation is able to build super soldiers based on AI technologies and human genome editing, then they would basically govern the world; although this is in my view not an immediate possibility yet.

Will robots take our jobs?

I think this is generally not wrong but very overhyped. Yes, if your job is entirely based on routine then it will eventually be replaced. But I like to say that AI will not replace "jobs" per se – it will replace "tasks" and routines; ultimately, humans may even be elevated from the routine by machines. We also need to keep things in perspective because, while intelligent machines will be able to, say, operate a supermarket checkout, those same machines still won't be able to fix your toilet. And if you're an experienced truck driver it's extremely unlikely that you will be replaced entirely by a machine any time soon – but you will probably have more machines in your cockpit working for you, very soon.

What are the most exciting opportunities offered by AI?

Using artificial intelligence, sensors and the internet of things to monitor and remodel how we use energy and cars could reduce pollution dramatically. Al will play a huge role in renewable energy. In 20 years we may well have abundant energy, we can decarbonize, and we can have different forms of transportation and logistics, all based on intelligent technology.

Do you view AI as a friend or foe?

At this point in time, it's 90 percent friend, but this is because it's still very much in the learning phase. But like all powerful technology, we need to decide how we use it and how we control it. What we can't do is just proceed with making AI generally capable, and simply do whatever is feasible. For example, we may very well get to the point in 10 years where a human worker is essentially useless if he or she is not augmented by AI, such as with augmented reality, virtual reality or even a brain/computer interface. That may sound tempting

"What we can't do is just proceed with making AI generally capable, and simply do whatever is feasible."

Futurist and author Gerd Leonhard

to some of us, but I would consider that development to be potentially quite dehumanizing – rendering ourselves useless without technological extensions (and thereby "amputating" our own skills, as Marshall McLuhan has pointed out).

Right now, though, I think the only thing we have to worry about is not that machines will become so intelligent that humans become useless, but that humans become too much like machines. By that I mean if we're happy to make ourselves virtual friends rather than human ones, or are more comfortable hiding behind our tablets than talking to the person in front of us. But we shouldn't fear machines because we make them – and we're in charge of what they

can and cannot do.



TOP FLIGHT he LMH-1 Hybrid Airship, the next wave of affordable cargo and personnel transport technology, is the result of 20 years of investment by Lockheed Martin. Built to deliver materials and teams

of personnel to the world's most inaccessible areas, Lockheed's hybrid airship combines patented innovations such as the Air Cushion Landing System (ACLS), Thrust-Vectoring Propulsion and the Self-propelled Instrument for Damage Evaluation and Repair (SPIDER). The cargo airship is designed to land and takeoff on any surface, and is capable of operating in all weather conditions. British company Straightline Aviation has already signed a letter of intent to purchase 12 of the airships with an order set to be fulfilled in 2020.

bit.ly/hybrid-airship

AIRSHIP DIMENSIONS:

Length: 85 meters Height: 24 meters Width: 45 meters Payload: 21 metric tons

gium

OPERATING DIMENSIONS:

Lifting gas: 80 percent helium gas; 20 percent aerodynamic lift Pressure height: 3,048 meters Maximum speed: 60 knots Range: 1,400 nautical miles

LOCKHEED MARTIN



NOW YOU'RE TALKING

An organization that promotes open and honest debate among its teams is healthier and more productive. So are you making feedback a constructive part of your workplace culture? Recent "Harvard Business Review" article examined Shell corporation's adoption of an 18-month program designed to help the company's offshore workers give and receive feedback before their upcoming deployment. With the help of an outside consultant, Shell's experiment pushed the typically tight-lipped crew to talk about everything from what it was like for them growing up to what it was like working with each other.

The study found that the shift in how the men communicated with each other, especially with respect to their vulnerabilities, contributed to an 84 percent decline in Shell's accident rates and the company's level of productivity in terms of numbers of barrels. Efficiency and reliability exceeded the industry's previous benchmark.

Think for a moment: Does your workplace's culture encourage this sort of communication? Or does it unknowingly – and sometimes knowingly – promote avoidance of honest and open communications? Especially when it comes to giving and receiving constructive feedback?

Chances are, it's the latter.

This isn't unusual. The most difficult and important feedback to give is usually the most necessary to hear – and yet it largely goes undelivered. That's because honest feedback is difficult – even painful – to give and to receive. It's so much easier to shirk these uncomfortable situations by just avoiding them.

This dynamic shows up in organizations of all shapes and sizes. Though many managers and organizations struggle with providing feedback, I've been able to boil feedback problems down to three different categories – what I like to call the "Feedback Trifecta."

In the Feedback Trifecta, the skills needed to give feedback are underdeveloped, leaders responsible for delivering the feedback lack the courage to do it, and the typical workplace environment unknowingly and sometimes knowingly promotes avoiding honest and open communication. And organizations pay for it, since avoidance merely causes problems to fester and resentment to grow. Teams and entire companies can become feedback-resistant, and will inevitably suffer.

No matter how you cut it, there will be pain when giving feedback because saying what needs to be said has consequences. Thus, recognizing that feedback can cause pain, and accepting that pain, is essential to being able to provide it.

With this in mind, I offer the following tips for moving past avoidance and making feedback a constructive part of your team's routine:

- Remember that the goal of feedback should be to encourage others and inspire their courage.
- Remember that feedback is crucial in moving us from one point to another in our work, relationships and lives.
- When giving feedback, say what needs to be said in a way that enables others to hear it, with respect and concern for the person on the receiving end.
- When receiving feedback, honor the giver by appreciating his or her feedback.

ABOUT ANGELA SEBALY

Angela Sebaly, author of "The Courageous Leader" (Wiley, 2017), is cofounder and CEO of the firm Personify Leadership, a training provider. Formerly the Vice President of Leadership Development for a global oil, gas and chemicals inspection company, Angela also serves as principle consultant for the firm Invested Leadership, a training provider. An entrepreneur developing a global presence, Angela has been coaching, facilitating and leading teams and organizations for over two decades.

www.angelasebaly.com

- When receiving feedback, remain in the role of receiver rather than victim.
- When receiving feedback, let yourself mourn for what you have heard until you reach acceptance.

The tough consequence of giving feedback is that we can't choose for the other person how they choose to hear our words. More importantly, we can't choose for others what they choose to do with them. We don't like that feedback leads to people we care about and work with avoiding us, holding grudges against us, and lashing out at us. We don't like being the villain when they choose to be the victim. This is why giving feedback takes courage. The choice we have is to shy away from it, provide it haphazardly or give it skillfully and courageously. **I** Angela Sebaly



VIEWPOINTS

DELIVERED. GETS RESOURCEFUL WITH...

SIR RICHARD BRANSON

The Virgin boss on why businesses should work together to solve the pressing issue of climate change and view it as a strategic opportunity – not a problem.

S ir Richard Branson – billionaire businessman, philanthropist, adventurer and founder of the Virgin Group – has always had a healthy respect for nature and a steely determination to combat climate change. He was speaking up about the environment even before it became a "mainstream" issue.

But last year, something happened that served to double his resolve. In September, Hurricane Irma tore through the Caribbean, causing catastrophic damage to a number of Caribbean islands and the U.S. state of Florida, followed shortly by Hurricane Maria, which wreaked havoc in Puerto Rico. Also lying directly in Irma's path was Branson's exclusive private island, Necker, in the British Virgin Islands, which is also his home. Branson had faced storms on Necker before – but this one was different. It was the strongest Category 5 hurricane ever recorded in the Atlantic Ocean, and its ferocity was so terrifying that he, his family and staff were forced to take shelter in a concrete wine cellar to escape danger. "Very, very fortunately," Branson wrote on the Virgin website, "it held firm."

When they emerged hours later, however, Branson and his team found an island in utter chaos: one that had been battered and buffeted by 185 mile-per-hour winds. Entire houses had been smashed to smithereens, walls reduced to rubble and trees ripped up and blown away. Debris was everywhere. "It was just like an atomic bomb had hit everything," he said later.

Branson knew exactly what was to blame for Hurricanes Irma and Maria. Which is why, last December, he launched the Race Against Climate Change initiative, a partnership between himself, nonprofit organization Rocky Mountain Institute, Formula E Team DS Virgin Racing and others. "As myself and countless others experienced earlier this year, man-made climate change is contributing to increasingly strong hurricanes causing unprecedented damage," said Branson at the time. "The whole world should be scrambling to get on top of the climate change issue before it's too late – for this generation and those to come."

If anyone can hammer home that message, it's Richard Branson. He may seem laid back but, underneath his placid exterior, he's a driven man. He always has been. It's that dog-with-a-bone tenacity – the ability to dream big, think up extraordinary ideas and see them through to fulfillment – that has underpinned his incredible success. He's also willing to take risks and embrace failure (he told *Delivered.* in an earlier interview that his philosophy has always been: "Screw it, let's do it").

In business, his achievements have been well-documented. He founded Virgin Records in 1970 (which \$16.6 BILLION

The Virgin Group's global annual revenue

The time it will take to travel between Dubai and Abu Dhabi in Virgin's sustainable Hyperloop One became a billion-dollar valuation in 1992), then the Virgin Atlantic airline, Virgin Mobile, Virgin Galactic, and other Virgin brands operating across various continents and sectors.

Yet his bona fides when it comes to climate change are no less impressive. He established Virgin Unite, a nonprofit foundation fighting social and environmental problems and aiming to make business "a force for good," in 2004. Since then the foundation has spawned a number of projects: Ocean Unite, which brings "conservationists, business leaders, philanthropies, and influential individuals" to "work toward achieving our vision of protecting 30 percent of the ocean by 2030"; The B Team, which campaigns for "better ways of doing business, for the wellbeing of people and our planet"; and The Carbon War Room, which Branson co-founded in 2009 to "speed up the adoption of market-based solutions to climate change." He was also responsible for creating The Elders, a group of global statesmen working for peace and human rights and calling for "visionary leadership ... to set us on course for a carbon neutral future."

Branson realizes that his own businesses have to lead by example, which is why Virgin Media has pledged to grow without increasing its carbon footprint, and why Virgin Atlantic is investigating sustainable fuels with cleantech company LanzaTech. And in October of last year, Virgin Group announced that it would be investing in Hyperloop One, the new lean, green, superfast, high-speed train concept devised by Elon Musk, which is now in the early stages of commercialization. Hyperloop projects are underway in the U.S., Canada, Finland, the Netherlands and India, while the UAE is planning to have the first system up and running by 2020, whizzing passengers between Dubai and Abu Dhabi - a distance of some 77 miles (124 kilometers) in just 12 minutes. "Importantly," Branson says, "Virgin Hyperloop One will be all-electric and the team is working on ensuring it's a responsible and sustainable form of transport too."

Naturally, Branson acknowledges that lone voices – even powerful ones like his – are not going to be loud enough to cut through the chatter. To save the planet, we all need to speak up, team up and do our bit. "Climate change is the greatest threat facing the world today," he says. "I believe the answer to tackling climate change lies in collective action. We must all take it seriously if we want to make our planet a safe and habitable place for our children and grandchildren."

Is the message about the impact of climate change finally getting through to people, businesses, organizations, industries and governments? If there is still work to do, why isn't the message being heeded, in your view?

I am a born optimist. While it saddens me that some people, organizations and even governments are not prioritizing tackling climate change, it excites me that more people than ever are. Natural disasters like Hurricanes Irma and

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Maria are bringing home the truth about climate change even more. Awareness and action – such as with the Paris Agreement – are growing all the time. People can no longer pretend that incidents like the recent hurricanes are some kind of accident or coincidence. There is no doubt that climate change is real, but there is also no doubt that we can all work together to get on top of the problem. There's still much more work to do – governments, businesses and individuals need to get out there and do it.

Does the world have enough robust leadership on the issue of climate change from international organizations and world leaders? If not, what can be done to make that leadership more effective? We're seeing more governments and business leaders committed to investing in a cleaner, safer and prosperous future. It's now economically viable as well as morally right. We need to see climate change action as an opportunity, not a problem. I was recently honored to speak at the One Planet Summit hosted by President Macron in Paris. There, alongside many Caribbean leaders, we announced the Caribbean Climate Smart Accelerator. It's a bold vision for a new Caribbean and we've been amazed by the deep level of commitment already shown by organizations to build a more climate-resilient Caribbean in the future.

When you founded the Carbon War Room in 2009, what was your aim?

The Carbon War Room brought together like-minded entrepreneurs who wanted to speed up the adoption of market-based solutions to help solve climate change. We saw barriers in different markets that were preventing great changes in the way industries did their business. There was a lack of good market information for sustainable aviation fuels; a demand for low-carbon solutions in shipping; and no access to capital for energy efficiency. Many markets needed help to see carbon reduction as a great strategic opportunity.

What was the reaction to the Carbon War Room on its launch? Were businesses and entrepreneurs quick to sign up to it? What would you highlight as the Carbon War Room's greatest successes? Between 2009 and 2014, the Carbon War Room made some remarkable progress: 20 percent of the world's cargo now travels on more efficient vessels; Caribbean islands are integrating renewable energy into their grids; and the North American trucking fleets have adopted fuel efficiency technologies, saving CO₂ emissions and dollars. In 2014 the Carbon War Room merged with the Rocky Mountain Institute, now operating as one business unit. The rationale was simple but effective: two nonprofit foundations tackling the same challenges became one, making better use of funds and bringing fantastic expertise together.

Part of the Carbon War Room's aim has been to improve shipping efficiency. Why is this so important – and how are you doing this?

CWR has increased its ambition to accelerate the decarbonization of the global shipping fleet – the team is doing this through finance and transparency. For example, in partnership with University College London, CWR is devel-



POWER PLAYERS: Richard Branson with Bill Gates at the One Planet Summit in Paris.

BILLION

The number of metric tons of greenhouse gas emissions estimated to have been saved by the Trucking Efficiency program VEHICLE FOR CHANGE:

The Trucking Efficiency program helps the freight industry scale available energy-efficient technologies.



oping transparency tools, such as BetterFleet, which enable owners, charterers and shippers to integrate carbon efficiency into all business decision-making.

Can you explain more about the Carbon War Room's and Rocky Mountain Institute's Trucking Efficiency program? What is its aim, what kinds of things is it doing, and what it has accomplished so far? Trucking Efficiency, an initiative of CWR and the North American Council for Freight Efficiency (NACFE), is working to double U.S. freight efficiency by increasing confidence in energy-efficient technologies and practices. The team is helping the industry scale available technologies, including decision-making tools for fleets. And it's making a difference; NACFE fleets have seen a decrease in their fuel consumption by about 30 percent. I was proud to help announce the results of the group's Run on Less demonstration in September 2017, where a group of truckers proved they could deliver goods at over 10 miles per gallon. This is much better than the national average of around 6.4. Finally, NACFE is now turning its attention to helping Guide Revolutionary Change with efforts into electric and automated trucks.

What needs to be done – and what help needs to be in place – to protect countries from major hurricanes such as the ones we have just seen? The people of many Caribbean islands are dealing with immense human suffering and economic damage after the recent unprecedented hurricanes. However, there is a resolve amongst the community. They want to be a part of the development and recovery through climate solutions. That is why Caribbean leaders – together with partners from many countries, as well as the Inter-American Development Bank (IDB) and the World Bank – want to establish the world's first "Climate Smart Zone." This means: affordable, clean energy; resilient households, coastal zones and infrastructure; secure communities with essential services; and global benefits of the blue and green economies, with island nations as testing grounds for a new global development paradigm. It's so important that we use this challenging time to not only rebuild stronger and more resilient, but to turn the Caribbean into a beacon for the rest of the world on climate-smart development. *Tony Greenway*

www.virgin.com/richard-branson

"NO PLANET B"

The Carbon War Room (CWR) was founded as a response to the 2009 Copenhagen Climate Summit, which was widely seen as a failure in terms of engaging governments in the climate change fight. Branson's idea was to create a "war room" on climate with like-minded entrepreneurs. Apart from helping the trucking and shipping sectors reduce their carbon footprints, the Carbon War Room – a global nonprofit organization partnered, funded and supported by Virgin Unite and operating as part of Rocky Mountain Institute – works to make the aviation industry more carbon-friendly. Indeed, its stated aim is "to help 10 percent of the North American and European commercial aviation and jet fuel market switch to sustainable aviation fuel by 2025." Its Sustainable Aviation initiative partners with airports to decarbonize the industry and promote sustainable fuels.

In other areas, its Islands Energy Program is helping 13 Caribbean countries – including Aruba, San Andrés and Providencia, St. Vincent and the Grenadines, and Saint Lucia – develop long-term clean energy roadmaps "to build low-carbon futures."

Why is all this necessary and so urgent? José María Figueres Olsen, former president of the Carbon War Room, summed it up best: "There is no Planet B," he said.



Curiosity: your secret weapon to outsmart the robots

Two hundred and fifty years ago the Industrial Revolution replaced our arms and legs at work. The Fourth Industrial Revolution is now replacing our brains.



AN ESSAY BY GREG ORME

Greg Orme is a globally acclaimed thought leader, author and keynote speaker who has delivered more than 350 talks to executive audiences around the world. His work with London Business School and others focuses on how leaders and organizations thrive in a world of accelerating change by developing behaviors, processes and culture that support creativity, innovation and entrepreneurial spirit.

his technological shift is challenging the very essence of what it means to be human. News headlines pose existential questions that used to belong in the pages of science fiction: Will a machine take my job? If we can't compete with artificial intelligence, what's left? And even ...Do I matter anymore?

People are anxious about the skills they need to survive. In the face of this tsunami of change it's tempting to cling to what you know. But intellectual retrenchment is dangerous, as we need to do the opposite. In 2017, a team of Nesta researchers analyzed the skills people will need in 2030. They advised focusing on: "...developing the uniquely human skills ... such as originality, fluency of ideas

... lifelong learning and reskilling." Writer and journalist Ian Leslie concluded in his 2017 book "Curious": "The truly curious will be increasingly in demand. Employers are looking for people who can do more than follow procedures competently or respond to requests; who have a strong intrinsic desire to learn, solve problems and ask penetrating questions." To successfully differentiate ourselves from artificial intelligence, we need to become even more human, humans. Our uniquely human, innate urge to be curious is a great place to start.

Sadly, curiosity is not always encouraged at work. In the riskaverse, results-driven, top-down cultures of many businesses, it's often seen as an impertinent threat to the boss, or at best a rather wasteful luxury. But to survive in a changing world, we all need to be creative. The first step toward more creative thoughts is always curiosity. There's good news. You can develop your natural curiosity with practice. It's not just a personality trait, but also a state of being. It's like any skill. Exercise it, and it will get strong. Neglect it and it will become weak and flabby. So, here are a few helpful routes to help build your curiosity muscles.

Kickstart your brain's curiosity circuit

Neuroscience researchers at California Institute of Technology recently revealed human curiosity follows an inverted U-shape. It turns out we're not very curious about subjects we know nothing about. We get more curious when we know just a little. When we have some of the picture, but there's a piece missing, it's like an itch we must scratch. We grow less curious again as we become experts in a domain. In other words, to boost your curiosity about a new area, learn the basics. Curiosity is self-fulfilling, a small amount inevitably leads to more.

Learn from the curiosity virtuosos

Renaissance master Leonardo da Vinci was a true polymath: painter, sculptor, architect, musician, scientist, mathematician, engineer, inventor, anatomist, geologist, cartographer, botanist and writer. He was self-taught, and poor at maths, but his curiosity raised him above even his most brilliant peers. For example, Leonardo was so inquisitive about how the human body works that he was one of the first to dissect corpses to help him render his anatomically perfect paintings. The eminent art historian Kenneth Clark called him "the most relentlessly curious man in history." His biographer Walter Isaacson encouragingly observed: "His genius was of the type we can understand, even take lessons from. It was based on skills we can aspire to improve in ourselves, such as curiosity and intense observation." We can learn from Leonardo.

Explore wide and deep

Leonardo's success was his ability to make connections across disciplines – arts and sciences, humanities and technology. In the same way, Steve Jobs, in his famous product demonstrations, often concluded by showing a sign at the intersection of Liberal Arts and Technology Streets. Jobs knew ideas are sparked when curiosity connects different fields of knowledge and specialty. We're living at a moment when this is happening whether we like it or not. Incredible technologies like 3-D printing, machine learning, neuroscience, expanding mobile networks and nanotechnology are themselves blurring the lines between the physical, digital and biological worlds. So it's up to us to develop a kaleidoscope of interests and look for the connections. That's where innovation lies.

Calibrate your radar

To develop a fully functioning "curiosity radar" you need to upgrade your sources of information. Write a list right now of what you read, the YouTubers and podcasts you subscribe to, who you seek out to learn from face to face, the meetings you habitually attend - even the conferences you go to. Shake them up a bit. At the same time, identify focus areas that you are particularly curious about, and make a list of unanswered questions in those spheres. Every day Leonardo returned to his "curiosity" list, which included such dazzlingly varied questions as: "Why do people yawn?", "What does the tongue of a woodpecker look like?", "What happens when light hits your eyeball?" A habit of intentionally learning from others is shared by the billionaire founder of Amazon, Jeff Bezos. An early colleague recalled: "He went to school on everybody ... I don't think there was anybody Jeff knew that he didn't walk away from with whatever lessons he could." Finally, surround yourself with other curious people. Curiosity is contagious, but so is incuriosity.

Ask more questions

Of all the behavioral changes I see business leaders attempting to make, asking great questions is the most difficult to start and to maintain. Innovative, successful people are now those with the best questions rather than all the answers. As the astrophysicist Richard Feynman said: "I would rather have questions that can't be answered than answers that can't be questioned."

Albert Einstein once famously said: "I have no special talents. I am only passionately curious." We need to emulate the Alberts, Leonardos and Jeffs of this world and exercise our own curiosity muscles. Competing with artificial intelligence is pointless. Instead, be what they cannot: a curious, creative human being.

You can contact Greg at:

y (in)

www.twitter.com/gregoryorme



www.gregorme.org

WHAT'S THE STORY, MS. MANDO? EDUCATING RANDA

Fifteen-year-old Randa Mando missed part of her education when she had to flee Syria for a new life in Lebanon. Now back at school, she's enjoying learning again – and has big, inspiring plans for her future.

riginally, I come from Homs, in Syria, where our family life was stable and happy, and our financial and social status was really good. But then the war started. Our house was located in the center of the city where violent events were excessive. At times, all I could hear was the sound of explosions. Before the war, I was going to school – but then it became too dangerous to leave the house because of the threat of kidnapping and bombings. So in 2012, when I was nine, my parents took the decision to leave Syria and take me to Lebanon, settling in Bakhaoun in the north of the country.

My life is very different now. Life for refugees in Lebanon is not always easy, however I have been lucky. I missed a year of school because of the upheaval, but now I'm back in full time education and doing well. When I was 11, I sat - and passed - an entrance exam to enroll at the Dr. Wadeh El Samad public school (Teach For Lebanon, a member association of the global Teach For All network, has currently placed 49 full-time teaching participants, or "fellows," at 28 schools throughout the country). At first I found the curriculum difficult, particularly because everything we do is in English! These days, however, my English is good and I really enjoy my lessons. There are 27 of us in the class, studying Arabic, English, math, biology, physics, chemistry, geography, civics, history and religion. The scientific subjects are my favorites, though, because I prefer to work with materials that need analysis - and I enjoy critical thinking. We study for three hours in the morning, and then have a break when I have something to eat and talk to my friends. Then it's back to class for another three hours of study before home time.

For me, the best thing about going to school is the opportunity to develop my skills and learn. On the other hand, I also love seeing my school friends and spending time with them. When I joined the school, I was given a great welcome by the majority of the students and, after getting to know each other, we became friends. My teachers are also very friendly. We feel so comfortable in their sessions and we learn a lot from them. When I think about the people who inspire me, a big role model is Ms. Lama Al Ayoubi, who is also a Teach For Lebanon fellow. She has such a good heart and loves helping people. She's very human and I admire her smartness.

Engineering the future

Outside of school I love running, swimming and shopping, mainly for clothes. My life is beautiful and comfortable again, yet I always feel sad because of the war in my country, and I miss my two brothers who migrated to Europe. My dream now is to focus on scientific subjects so I can become a civil engineer. I want to go to high school and then to university – and, ultimately, use my education to help rebuild my country when the war ends, and help those in need. *As told to Tony Greenway*

www.teachforlebanon.org

FACT: Deutsche Post DHL Group and "Teach For All" have been working together since 2010. Their goal has been to increase the quality of and access to educational offerings, and so reduce inequality of opportunity 25,042

The number of underprivileged students whose lives have been impacted by Teach For Lebanon since its launch in 2009 The minimum number of years fellows from Teach For Lebanon are placed in teaching positions in underprivileged regions to help children get the most from their education and extracurricular activities

The number of seconds it takes IBM's Watson Health to analyze 40 million medical documents. With 80 percent of today's clinical information stored in unstructured formats and 8,000 medical journals published daily, Watson Health, an example of machine learning, helps doctors reduce times in determining optimal treatment for patients. A way to combat rising healthcare costs, aging populations and increasing health barriers to many groups, the technology was trained on cancer at Memorial Sloan Kettering in New York City and has since been adopted by life science and healthcare professionals worldwide.

@IBMWatsonHealth

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