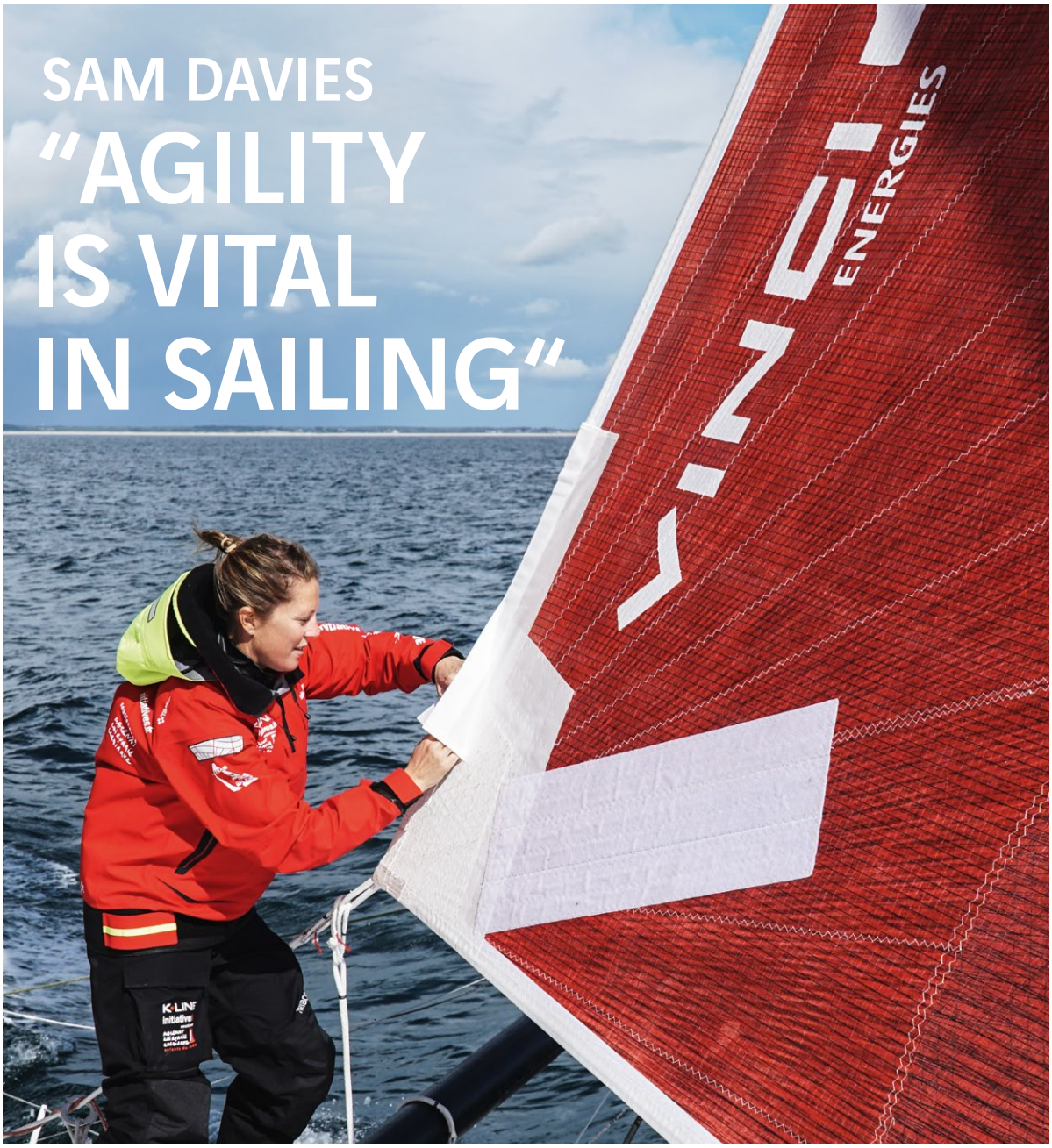
THE **AGILITY** EFFECT
MAGAZINE

THE FUTURE OF ROBOTS LIES IN WORKPLACE COMFORT

AGILITY **FOCUS**

CYBERCRIME: FACING UP TO THE ISSUE

SHOULD WE FEAR THE WORLD AHEAD?



VINCI ENERGIES

SUMMARY

EDITORIAL

This third issue of The Agility Effect Magazine brings you articles on a range of topics recently covered on the theagiliteffect.com platform, which an increasing number of you are perusing to keep abreast of the energy transition, the digital transformation and the changes under way in our markets and in our solutions and services.

Cybersecurity is a highly topical issue and clearly a matter requiring close attention during the current transformation. The feature story in this issue focuses on the topic and asks: Is cybersecurity the Achilles heel of the digital transformation? In a digitised world and a globalised economy, at a time when the number of cyberattacks is increasing, no one can claim to be safe.

Is exposure to cyberattacks inevitable? No. Steps can and must be taken to prevent cybercrime from impeding the momentous changes under way. After long failing to face up to the issue, we need to fight back.
But protecting against cybercrime is easier said than done. It takes careful planning and implementation.

Cybersecurity must be addressed from three angles: technical, operational and organisational. VINCI Energies and its Axians brand take this holistic approach in their work to support secure digital transformation.

We hope you enjoy reading this issue.

Olivier Genelot
Axians Brand Director

A SPACE FOR ACCELERATING INNOVATION

Over a 2,000 sq. metre ground-floor area, curving, light-filled spaces without internal walls open onto a central gathering place. Welcome to La Factory, the hub created by VINCI Energies to encourage innovation and accelerate the Group's ability to design innovative solutions and services (here, the IoT and Big Data hackathon organised in May 2017). VINCI Energies' three-part innovation policy comprises exploration to decode trends and prepare experiments; co-creation together with the ecosystem and the Group's in-house network of experts; and targeted acceleration to roll out innovations within VINCI Energies business units.

CITY TRANSFORMATION

TAKING BACK URBAN SPACE IS THE KEY TO COMMUNITY-BUILDING

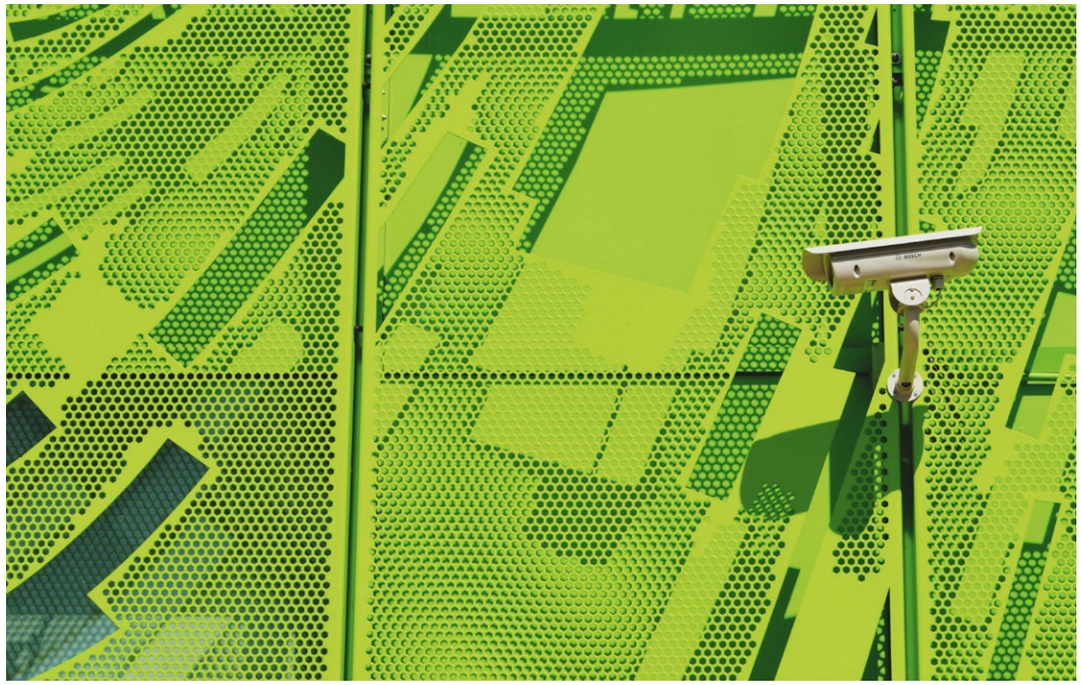
In his book Hacker Citizen(*), designer Geoffrey Dorne presents 50 ideas for hacking the city and reappropriating public space.

How did the idea for Hacker Citizen come about?

Geoffrey Dorne. The nexus between design and hacking has been a research interest of mine for more than ten years. As a student at the Ecole nationale supérieure des Arts Décoratifs in Paris, I was already working on anti-surveillance prototypes like RFID-blocking wallets and anti-Hadopi memory sticks. Since then, I have built and developed my professional activities around this interaction between art and digital technology, with a view to using design to help people be free. I created an agency called Design & Human to devise interfaces, products, services, identities, and, more broadly speaking, forms of contemporary expression through anthropocentric design. My book, Hacker Citizen, is congruent with this social, ethical, and radical vision for design. Nearly three years ago, I decided it would be interesting to compile projects developed by artists and designers to enable citizens to reclaim public space. That's how this book came about.

What does reappropriating the city mean for you?

Geoffrey Dorne. Wherever they go in the city, residents are filmed, geolocated, tagged, and turned into data. Currently in France with Vigipirate [the country's national security alert system] and the state of emergency, surveillance has not only become standard practice, it's been given force of law. For me, reappropriating the city is a way of building your community. It's about



restoring individual autonomy and freedom, and enabling interaction with others. Cities have always embodied this permanent tension between freedom and association.

Are you satisfied with the notion of the hacker?

Geoffrey Dorne. The hacker is often portrayed as a person working alone, driven by evil intentions and the urge to make money. The reality is completely different. Hackers are passionate explorers of the digital world, fascinated by diversionary tactics and network intelligence. I'm also a product of digital culture, yet when I say "hacker citizen" I refer to the end result of diversionary practices rather than the technical expertise required to carry them out. If our goal is to enable citizens to take back their urban space, we have to provide the means that allow them to do that. I like the term used by Tristan Nitot, the founder of Mozilla Europe, who wrote the preface to my book. He talks about "hackability." I'm very attached to the figure of the maker and to the DIY ethic. That's why I wanted to put as much distance as possible between my book and the geek sensibility. Most of the fifty hacks contained in the book require minimal action and low-tech means. Paper, glue, scissors, a screwdriver, and plants are of more use here than a smartphone.

> "Compile projects developed by artists and designers to enable citizens to take back public space."

What kind of action do you recommend in your book?

Geoffrey Dorne. I explain, for example, how to make a t-shirt that disrupts facial recognition algorithms, an infrared hood that blinds surveillance cameras, and a system that protects your RFID microchip cards. Readers can also learn how to create an urban nest for birds, and build "seed bombs" they can throw onto hard-to-get-to spots to grow plants. You can also find out how to turn a public bench into a shelter, install a library in a telephone box, and hack ads.

There's quite a bit of poetry and humour in your book.

Geoffrey Dorne. My position is deliberately constructive and progressive. Certainly, this book is political, but it's not a manifesto designed to destroy the system. You can game the system by making a game out of it. You can inject a little poetry into the system, add meaning to it, and maybe in the end also add value to it. And always keep in mind that humour plays a big part in all of this. In fact, the book invites readers to hack our own hacks!

*Hacker Citizen, Geoffrey Dorne, Tind Editions, 136 p., €24.90.

CITY INNOVATION

SION, FIRST SOLAR-POWERED CITY CAR

The product of research carried out by Munich start-up SonoMotors, this electric car could be mass-produced as soon as 2018. A technological feat for sure, but groundbreaking in other ways too.

It's the first electric city car that can be charged by the sun. Sion, a technological masterpiece on four wheels, is the result of four years of research and prototyping conducted in the garage of German start-up SonoMotors based in Munich. The fundamental technology isn't new, but it's the first time that a model running on solar power has been offered for city use as an everyday car.

7.5 m^2 of PV cells

Capable of reaching a speed of 140 km/h – over 120 km – Sion can generate 30 km of range every day through exposure to at least 5 hours of sunlight, even if it's cloudy. Furthermore, the solar energy stored by Sion is sufficient to power all the connected devices in the car's interior.
Sion's high solar-recharging capacity relies on 7.5 m^2 of photovoltaic (PV) cells directly integrated into its bodywork.
The car can also be recharged in a more "conventional" way. Either in rapid mode, via charging points that are compatible with other electric vehicles, or in slow mode, by connecting the car to a household power outlet for 8 hours.

Crowdfunding

It's not just Sion's technology that is innovative but also its financing. SonoMotors has chosen to promote its model on the international crowdfunding platform Indiegogo. The campaign has helped the start-up to raise €200,000 and further develop its prototype. Participants who contribute at least €100 have the option to test drive the car then pre-order a model. This pre-sale strategy should mean that the vehicle can be produced on a large scale, a step which is scheduled for 2018.
Sion will then be offered at entry-level for €12,000 (120 km of range with a 14.4 kWh battery) or as a premium model for €16,000 (250 km of range with a 30 kWh battery).

BUILDINGS | INNOVATION

THE FUTURE OF ROBOTS LIES IN WORKPLACE COMFORT

There are still very few robots to be found in commercial buildings, but it's an environment they can have a real future in if they focus on occupant comfort and behaviour. Philippe Conus, director of the VINCI Facilities brand, explains.

Are robots starting to carve out a place for themselves in businesses?

Ph.C. Robots haven't yet become commonplace in working environments. Far from it. The most "advanced" businesses are probably cleaning service providers that operate in industrial settings, primarily in highly standardised spatial configurations that present few obstacles to robot movement. I'm thinking of warehouses in particular. What few applications do exist in service businesses are usually part of pilot schemes.

Why is that?

Ph.C. The development of robotics in commercial environments is closely linked to the opportunities offered by artificial intelligence (AI) and its specific applications aimed at occupant comfort. Our expertise covers some of these applications, which are used under real conditions in a number of buildings. These include real-time analysis and modulation of air quality or of noise and light levels; early optimisation of space based on occupancy; optimal provision of communication tools and off-site travel management.

> "It's not a question of getting rid of duties, still less jobs, but about delivering real added value in terms of service."

And they go right through to "empathic buildings", which inform each occupant of the best way to use space and equipment depending on their personal profile. If robots are not seen first and foremost as a means to improve wellbeing and facilitate experiences, then they have no future. It's not a question of getting rid of duties, still less jobs, but about delivering real added value in terms of service. Robot deployment is therefore based both on AI innovation and on accurate monitoring of pilot schemes.

Which applications are you working on?

Ph.C. We will shortly be testing "robots as a service" on fairly low value-added repetitive tasks, such as visitor guidance. Here again, the aim is to enhance the human dimension.
By entrusting intelligent machines with guidance tasks, receptionists can focus on delivering quality service without any break in continuity. Furthermore, the beauty of robots is that they can perform a variety of tasks. When they're not being used as a guide, they can also be given technical administrative duties: headcounts, inventories, and detection of inappropriate objects on the premises and lighting faults. And of course they can send alerts.

In what way can robotics benefit from artificial intelligence?

Ph.C. The more information robots have, the more they will be able to refine the service they provide. That's why it's important to work in parallel not just on data analysis but also on intelligence.
For example, VINCI Facilities has created a mega-tool to visualise and manage data from all of its central applications (BMS, BIM, CMMS, IoT, and our client portal Wayin') in real time.
The next step, scheduled for 2018, is to add a layer of artificial intelligence that will make it possible – using recurrence, calculation and trend analysis – to send increasingly accurate alerts to the right place, and to refine and personalise the way we respond to end clients while at the same time optimising technician call-outs.

Key figures

+17%. Expected growth in robotics market between now and 2019, reaching a total value of $135.4 billion.
30%. The proportion of commercial service robotic applications that will be distributed "as a service" in 2019.
30%. The proportion of leading organisations that will implement a chief robotics officer role within the next two years.
60%. The proportion of robots that will depend on cloud-based software by 2020,
40%. Connected to a mesh of shared intelligence
Source: IDC

BUILDINGS INNOVATION

BETTER CONNECTING BUILDINGS TO THE CITY

The Smart Buildings Alliance has drawn up a first smart building guideline, "Ready to Services", and is working on a second label, "Ready to Grid", both of which focus on integrating the smart building with in the smart city.

At the end of 2016, the Smart Buildings Alliance (SBA), which brings together smart building and smart city stakeholders, finalised the Ready to Services (R2S) guideline. This document provides guidance for building programme managers so as to ensure that the connected building serves as a platform for services. The SBA has now moved on to the next project and is currently drawing up a supplementary guideline, Ready to Grid (R2G), set for publication in 2018.
"The idea for the first document," says Pierre Blanchet, innovation manager for the VINCI Energies service sector network in France, "was to draw up a sort of checklist to use when designing a building to be connected to its external environment." The principles defined by the working group that drew up the document cover IT and telecommunications networks. Emmanuel François, Chairman of the SBA, which published a "Manifesto", says that the R2S label is intended to encourage all participants in project and programme management and all users to opt for connected buildings.

The smart link between the building and the city

"The second guideline, Ready to Grid, will identify the prerequisites for a building that can both deliver and receive energy," says Pierre Blanchet, who is helping draw up the R2G, which focuses on fluids, i.e. electricity, and hot and chilled water. "Ready to Grid will address the necessary link between the smart building and the smart city." Required by the thermal regulations adopted in France, positive energy buildings with local renewable energy generation will interact with smart grids. Similarly, projects involving electric vehicles that are transformed into residential energy suppliers during peak demand periods will be included in these "smart grids".

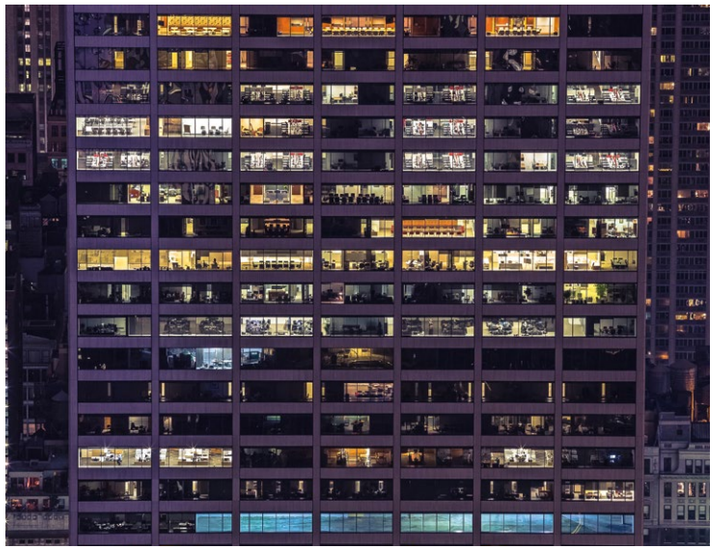
Moving from a centralised to a decentralised approach

"Photovoltaic solar will often be the solution chosen for local electricity generation," says Pierre Blanchet. "But the technology provides low power compared to the needs to be covered in an urban building."
It therefore makes sense, he says, "to include a second source of renewable energy, such as district heating systems using hot water produced outside the building and sometimes even outside the city."
"The guideline must also address energy storage in buildings," says Pierre Blanchet, adding that there is a further dimension in the Ready to Grid guideline being drawn up – the need to reason in terms of the neighbourhood rather than the isolated building and to pool local resources and infrastructure.
The SBA has set itself the goal of moving, within five to ten years, from a centralised to a decentralised approach based on digital technologies that will bring energy, mobility, healthcare, and work-related services closer to the user.

BUILDINGS CUSTOMIZATION

BUILDING MANAGEMENT SET TO BECOME MORE INTELLIGENT

Energy, connectivity, comfort ... Artificial intelligence is making inroads into Building Management Systems, opening up new prospects for occupant well-being.

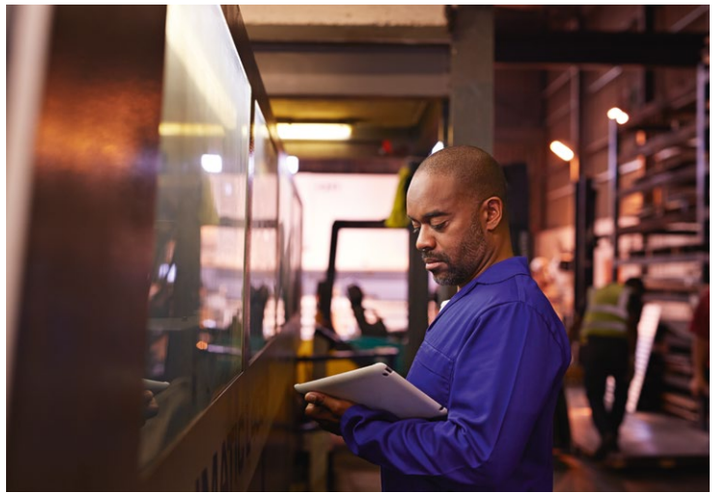


Building Management System (BMS) tools have been around for more than 30 years. During this time there have been changes in the way service sector environments are used as well as advances in digital technologies and artificial intelligence.
While BMS initially centred on equipment monitoring then on integrating management features, it has now moved into a new phase where building management is performed online from remote operations centres.
So what can we expect to see in the future? "The platforms in place will connect to a whole host of software programmes and digital applications designed by the most innovative start-ups.
This will unquestionably increase BMS accuracy and quality," asserts Pierre Blanchet, innovation manager of the VINCI Energies service sector network.
BMS has long been associated with technical and mechanical functions and, as a result, it has been relegated to building basements. But it is now taking on an increasingly digitised dimension, and is both highly centralised and controllable at an increasingly detailed scale.

Algorithms and predictive analytics

The development and increasing sophistication of BMS technology will change the landscape and its boundaries as players from various backgrounds – conventional building operators of course as well as start-ups and energy companies, all involved in software innovation and algorithmic research – coexist, challenge, and collaborate in the same market. "BMS is set to become more complex and at the same time more vital to building comfort, operation, energy efficiency, and connectivity," confirms Pierre.
For example, predictive analytics provide a solution to the issue of buildings failing to adapt to weather data. Whereas weather scales were carried out almost yearly 30 years ago, then weekly 10 years ago, it's now possible with the most modern tools to react within the minute.
"In two or three years, we'll be able to anticipate factors that are external to buildings so as to offer occupants a new level of comfort," says Pierre.

CHATBOTS SUPPORT "AUGMENTED MAINTENANCE"



Chatbots (from "chat" and "bot" for robot), these algorithm-based conversational agents that are all the rage in customer service, can prove highly useful for manufacturers. They enable engineers and technicians, who are sent to the field, to quickly retrieve information about the equipment they need to repair or replace.

"If a pipeline or transformer, say, is damaged, then while the technician or engineer is en route to the site, information on the type of equipment and nature of the problem is collected if the systems are fitted with sensors or connected devices that measure the health and performance of the asset," explains Rudolf Bauer, manager of the Advanced Analytics and Cognitive Solutions Business Unit at Axians Austria.

> "With our expertise, we can reduce development time and improve the performance of these artificial assistants."

This information is transmitted from the Cloud to the iPad, or similar device, of the technician upon request. "When they arrive on site, they start a conversation in their mother tongue with the chatbot, asking questions such as: What has happened with the equipment in the past few weeks? Is the spare part in stock? Is there potential danger?" says Rudolf Bauer.

"Smart advisors"

Of course, the point is not to inundate the technician with a stream of undifferentiated information, but to determine exactly what details match the situation. "It's a new way of making maintenance tasks more effective. And if the assets in question are connected to the internet, you can even predict possible failures and initiate preventive tasks," adds Rudolf Bauer.
"We call these chatbots 'smart advisors' to differentiate them from personal assistants like Amazon's Echo system and Apple's Siri, which tend to be used more in B2C situations," he says.
Axians Austria uses software packages available on the market or in open source, and assembles them to create solutions that draw on machine learning and artificial intelligence. "With our expertise, we can reduce development time and improve the performance of these artificial assistants," he concludes.

THE PROMISE OF 5G

Expected in 2020, the 5th generation of mobile communication is paving the way for improved performance. Trials are ongoing, for example in Sweden with Axians.

Fifth generation technology promises to revolutionise not just the telecommunications environment and our daily lives, but also the world of industry and services. Expected to reach us in 2020, 5G should be capable of technical feats that will deliver new services in the telemedicine, robotics, and driverless car sectors, among others. Virtual and augmented reality applications, which require high bandwidth, will become commonplace.
Tests conducted by Orange and Ericsson have produced speeds of 10 or even 20 gigabits per second and latency of about 1 millisecond, which means almost instantaneous data transmission.

Network slicing

To achieve this level of performance, 5G will use high frequencies (above 6 GHz compared with 900 MHz for 3G and 2.6 GHz for 4G), making it possible to use new technologies like beamforming, where the signal is concentrated and aimed at the target, and beam tracking, where radio waves converge towards the position of the mobile. "This way, everyone has their own 'mini-cell' that follows them wherever they go and that offers them an optimum speed," says a Bouygues Telecom expert. Telecoms operators will need to swap their current 2 m-high antennas for arrays of smaller square-shaped antennas. Networks will also move towards network slicing technology, where slices of virtual networks are allocated to meet demands.

Truck platooning

Axians Sweden is working on 5G with Ericsson, and has supplied it with two installations as part of a project with heavy goods vehicle manufacturer Scania and the Royal Institute of Technology.
The first installation was erected on the roof of Scania's R&D centre in Södertälje. "It will give Ericsson and Scania a better grasp of the needs involved in implementing platoons of trucks travelling at the same speed and at intervals of a few metres so as to use less fuel, and in ensuring that these connected vehicles mutually communicate," explains Kimon Konstantinidis, director of Axians Sweden.
Secondly, Axians has installed a 5G site in Järva with a tower-mounted antenna support. The site will be used by Ericsson, Scania, and the Royal Institute of Technology to explore future road transport solutions such as driverless buses and traffic management systems.
"There is strong demand for this type of technology both from consumers and businesses," says Kimon Konstantinidis. "With the Internet of Things, the massive amount of data generated will need to be analysed in real time. 5G and its near-zero latency will make this possible." But before that happens, devices such as smartphones and tablets will need to be capable of receiving these ultra-fast transmissions, which isn't yet the case.

"AGILITY IS VITAL IN SAILING"

Sailing involves steering a course but also forward planning, continuous adjustment and very rapid reaction. Sam Davies sees these skills as crucial to her sport. She has started from Le Havre (north west of France) on 5 November as co-skipper of the Initiatives-Coeur in the Transat Jacques Vabre race.

Famous English yachtswoman Sam Davies learned to walk and to swim at the same time, but in keeping with her temperament she is most at ease when she is upright and standing tall, both at sea and on land. The energetic 43-year-old spends months in Trégunc in western France, where she lives, painstakingly and actively preparing for each race.
She is currently getting ready for the Transat Jacques Vabre race, which starts on 5 November 2017 and in which she will co-skipper the Initiatives-Coeur monohull alongside Tanguy de Lamotte.
Once that Transatlantic race is over, she will be back at the helm of the boat, taking part in sailing races to save children suffering from severe heart defects.

Forward planning and leadership

Steering a boat like the Initiatives-Coeur is similar to being an entrepreneur. "A sailboat skipper has a lot in common with head of an 'onshore' company," says Sam Davies. "Both have to take risks, devise strategy and calculate and plan for every decision. They also both need to lead teams in the endeavour to achieve a goal."
Agility is central to racing, says Sam Davies. "In preparing for the race, and during the race itself, agility is constantly called for. You never know what may happen." The weather is one factor that cannot be controlled but that can have major consequences for sailboats, "mechanical machines".

During a race, you must be able "to react very fast." That of course can be learned and cultivated. "In our sport, one way to improve agility is to constantly train and prepare, over and over again."

A wide variety of skills

Sailboat racing involves "a wide variety of skills, from the technicians who work on the boat and its hydraulic and electronic systems to the people who help us with communication, accounting and marketing. It involves a lot of different personalities, and that is a great advantage," says Sam Davies. One of the tasks of the skipper and the crew is fundraising, and hence enlisting sponsors. The Initiatives-Coeur sponsors now include VINCI Energies, which signed on in September 2017 for a four-year partnership that, the Group explains, "strengthens the Initiatives-Coeur project and further helps achieve its charitable goal of working alongside Mécénat Chirurgie Cardiaque to save an increasing number of children requiring surgery that cannot be performed in their countries." As Sam Davies describes it, "our sponsors Initiatives, K Line and VINCI Energies enable us to race and to achieve these results, and also to share our passion with their employees and customers." The key to success is motivation. Presenting a meaningful project generates enthusiasm. "In a crisis or in difficulty, I always try to get everyone to focus on the primary goal: winning the race," says Sam Davies. "It is important to have this precise, clear objective that everyone can easily identify. It enables us to achieve other indirect, but far more important objectives, such as saving as many lives as possible with Mécénat Chirurgie Cardiaque."

"Great confidence"

Today, Sam Davies feels stronger than ever. She says her previous races, especially the 2008-2009 Vendée Globe, "taught her a lot." For her first solo around the world sailing race, she set herself the objective of finishing among the top 10, and came in fourth. She "gained a lot of confidence". What about her dismasting four years later during the same Vendée Globe race? "It enabled me to improve." Several months after this misadventure, a race only open to women (which stood in spectacular contrast to the very masculine world of sailboat racing) gave her a new taste for challenges, as did co-skippering with Tanguy Lamotte during the 2015 Transat Jacques Vabre. "Our backgrounds are different, our skills are different, our perspectives are different," says Sam Davies, "and together we have been able to build a very solid team. We exchange advice and techniques as we go, and this has enabled us to improve, both as a crew and as individuals." In taking the helm of the Initiatives-Coeur solo after the Transat Jacques Vabre, the British sailor will be making her already eventful career even more meaningful.

IS CYBERSECURITY THE ACHILLES HEEL OF THE DIGITAL TRANSFORMATION?

Businesses, administrations and even governments are increasingly being hit by cyberattacks. No one can now claim to be safe. Everyone must now **face up to the issue** (p. 20)... In a digitised world and a globalised economy with exponentially growing **volumes of data**, cyberprotection is becoming increasingly complex (p. 22)... IT networks are not the only systems to come under attack: malware is also targeting **electricity grids.** A major threat (p. 23)... **IoT** rollout exposes industry to cyberrisks and requires specific support (p. 25)... To combat cyberattacks, a **holistic approach** must be taken to security (p. 26)... **French companies**, for a time behindhand, are now aware of the risks and have decided to respond (p. 27)...

ICT TRANSFORMATION

CYBERCRIME: FACING UP TO THE ISSUE

Businesses, administrations and even governments are increasingly being hit by cyberattacks. In a digitalised world and a globalised economy, who can claim to be safe? Protection solutions do exist.

With the digital transformation, a large number of networks – telecommunications, computers, smartphone apps and connected objects – are now interlinked, giving hackers opportunities to seek security flaws in IT systems. "As business processes increasingly digitalise, their exposure to risk increases," says Vincent Bazillio, technologies marketing manager at Axians, the VINCI Energies brand dedicated to ICT solutions. Indeed there are a growing number of attacks against private sector businesses as well as public administrations and even governments. In May 2017, a widespread cyberattack targeting Russia, Taiwan, and Ukraine resulted in 126,000 infections, according to antivirus software publisher Avast. The attack used the WannaCry ransomware, which encrypts data and demands payment of a ransom, generally in bitcoins, to decrypt it. Companies such as Fedex, Telefónica, and Renault were hit, as were public administrations such as the National Health Service in the United Kingdom. Following this large-scale attack, the finance ministers of the G7 countries responded by issuing a communiqué stating that "We recognise that cyberincidents represent a growing threat for our economies and that appropriate economy-wide policy responses are needed."

> "Cyberincidents represent a growing threat for our economies."

In France, cybersecurity is now "priority number one" at the Agence Nationale de Sécurité des Systèmes d'Information (ANSSI – the French national cybersecurity agency). In its 2016 report, ANSSI mentioned 3,235 security alerts, including 79 involving "major events", 159 addressed, and 3 identified as "critical". Enhanced awareness among policy makers is perhaps not as widespread in the business community, even though the DFCG (French Chief Financial Officers and Controllers Association) and the Euler Hermes barometer found that 81% of companies were the victims of at least one attempted fraud in 2016, and that one in four companies was targeted more than five times.

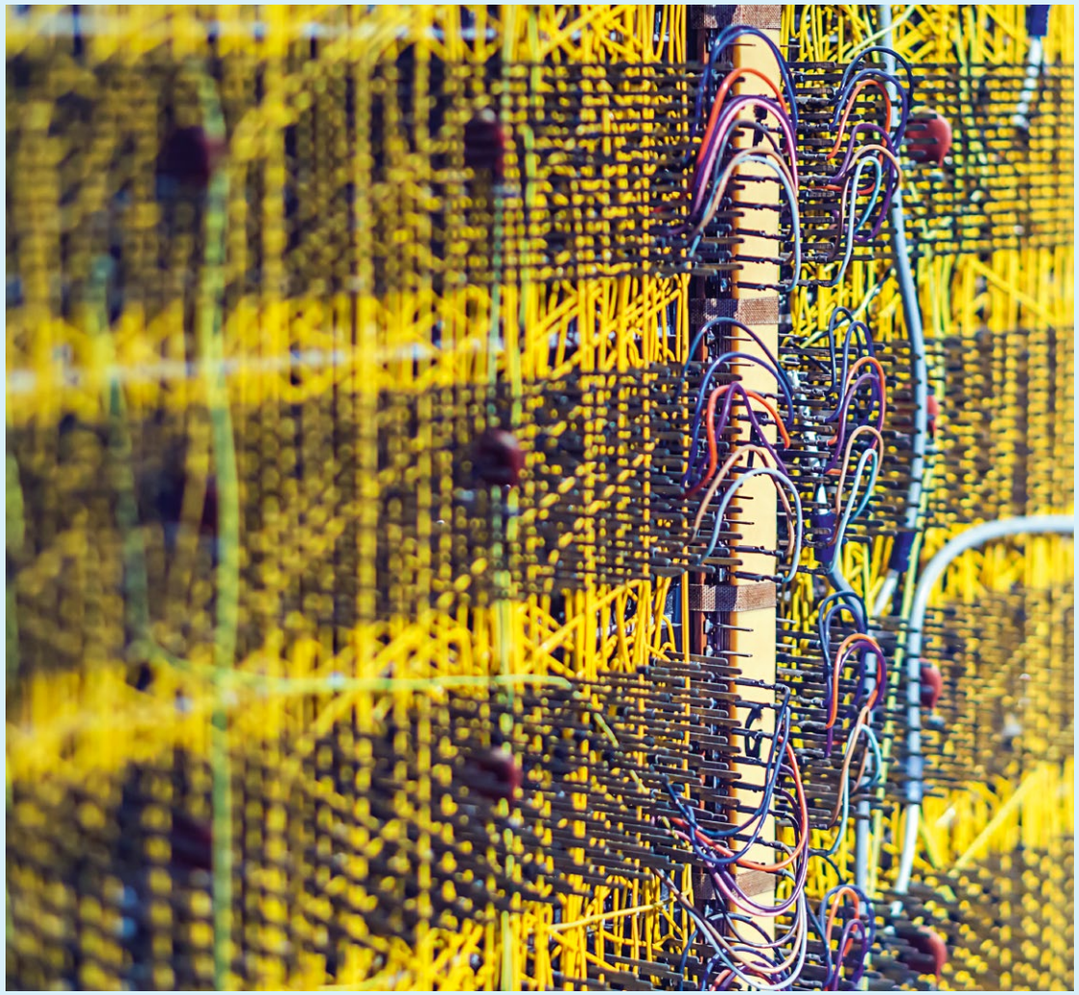
Detect and respond

The first step that companies must take, according to Vincent Bazillio of Axians, is to recognise that anyone can be affected. "What is needed is behavioural change. It is no longer enough for businesses to defend and protect themselves by building higher and higher walls. They must also be prepared to detect a threat and respond very quickly by isolating the infected component and protecting all the other parts of the system (users, computers, etc.) as quickly as possible."
In addition, there is an urgent need for safeguards against cyberattacks at a time when the legislative environment is changing, with the advent in May 2018 of the EU's GDPR (General Data Protection Regulation), which will require companies to warn users when a security breach may affect them. Security solution providers can no longer confine themselves to selling firewalls and antivirus software but must help their clients to better detect incidents. "For example, we can support them in extending their hours of coverage or carrying out round-the-clock monitoring to anticipate vulnerabilities in their IT systems," says Vincent Bazillio.

Poorly protected industrial sites

Cybersecurity specialists take on the task of auditing internal directories that authorise opening a Windows session on a PC or entering a site with a badge, to ensure that they are not vulnerable to possible intrusion. They also address a danger arising from the growing digitalisation of industrial sites, which can compromise the security of installations previously isolated from company IT networks. "For more than a year now, we have been doing more and more work to safeguard these sites exposed to major risks in the nuclear, railway, air transport, food processing, and pharmaceutical sectors," says the Axians technologies marketing manager. With industrial networks increasingly connected to the outside world in order to exchange information needed to rapidly adjust production or anticipate maintenance, for example, it is easier for hackers to take control of production systems.

"VINCI Energies combines Actemium's process expertise and Axians' IT capabilities to offer an intelligent IT security solution for every type of business," says Vincent Bazillio, adding that due to constantly changing digital technologies, "network security is an ongoing process that is never completed once and for all."



ICT PERFORMANCE

OPEN DATA AND CYBERSECURITY: AN IMPOSSIBLE EQUATION?

The exponential rise in the amount of public data is making cybersecurity in companies increasingly complex.

The results of the latest index produced by Cesin, a club of information and digital security experts, provide a rather worrying overview of cyberrisk for large businesses. More than one in five security managers (21%) from the association, which mainly represents CAC 40 companies listed on the Paris stock exchange, reported having experienced 15 or more attacks in 2016.
Some 80% said they had recorded at least one cyberattack in 2016, and 46% felt that the number of attacks had increased compared with 2015. As a result, 84% of them planned to acquire new technical solutions.

"Open Source material must also be protected"

Seen from this perspective, does the growth of open data pose a specific risk? Does it make information protection in businesses more complex? Contrary to widespread belief, open data is not limited to start-ups and young companies. The responsibility of using Open Source lies with the user themself, therefore the decision on whether the architecture's Open Source code is "secure" enough remains the user's responsibility.

"The open data principle is distinctive in that businesses haven't developed open source-related material with security requirements in mind. Having said that, I don't think that open data and cybersecurity are incompatible as approaches. People just need to be aware that open source material also needs to be protected to the extent possible," explains Niels Everstijn, Business Unit Manager of Axians Security Netherlands.

"An opportunity to be seized"

The latest ODI (Open Data Institute) report confirms that a parallel development is under way. Although companies are experiencing more and more attacks (there was an eightfold rise in ransom demands in 2016), they are also increasingly turning to open data, which in some respects is the best way of pulling the rug out from under the hackers.

> "Open data and cybersecurity: the two approaches are not incompatible."

According to Jeni Tennison, ODI's CEO, companies do not throw themselves into open data "for the sake of openness alone". "They see it as a way to fill gaps, reduce risks, and seize opportunities."
Axians, which created a structure enabling security managers to adopt various levels of prevention and response based on the nature of the evolving threat, is taking steps to adapt accordingly. "It's now easier to make cybersecurity a core element of company policy," confirms Niels Everstijn.

ICT TRANSFORMATION

THE THREAT TO POWER GRIDS

After computer networks, malware is now targeting power grids. This is a major threat requiring protection to avoid potential catastrophe.

The idea of malware being able to map the internal IT network of a transformer station and sabotage it is not science fiction. Ukraine faced this catastrophic scenario in December 2016 when the Pivnichna HV transformer station near the capital, Kiev, tripped, causing a blackout across an entire neighbourhood. Technicians restored power by manually resetting the circuit breakers, which are controlled via the IT system.
In Ukraine, what came to be called the Black Energy malware attacked the SCADA (Supervisory Control and Data Acquisition) system, which monitors and controls a full set of industrial equipment. How had it managed to infect the system? Previously, information from a substation sensor was transmitted via copper cable to a telecommunication station, which forwarded it via the switched telephone network. But power systems have now switched to digital transmission via optical fibre cable in order to reduce costs and improve efficiency. The move

ICT TRANSFORMATION

IS IOT A TROJAN HORSE SPREADING VIRUSES IN INDUSTRY?

The rollout of connected objects in industry entails cybersecurity risks. Operational technology specialists need security support.

makes them more vulnerable to cyberattack. The malware virus exploits computer vulnerabilities to attack conventional IT infrastructure. But the ultimate target is the automated power grid control system.

Blackout risk

The structure of the Ukrainian power grid is not necessarily identical with that used elsewhere. "In France, power grids are highly compartmentalised. For example, the power transmission system has its own optical fibre telecommunication system, which is not connected to the Internet," says Valentin Brehier, a systems engineer at SDEL Contrôle Commande, an Omexom network company.
The goal of the hacker is to take control of a large number of high-voltage transformer stations so as to isolate sensitive "pockets" (such as French departments or regions). "A region with high consumption and little generation capacity must be connected to a region that generates a large amount of electricity but consumes very little. If the attacker succeeds in separating them, one region will be over-producing and the power plant will be desynchronised, while the region that is over-consuming will cause the grid to collapse.
If the attack trips the right circuit breakers, it can cause a blackout across an entire country," says Valentin Brehier.

> Cyberweapons attack industrial facilities.

To protect against such potential blackouts, he says, parts of the grid can be segmented and privatised and "DMZs" (demilitarised zones) can be created. A service that cannot be completely isolated can then be placed in a particularly well-protected area.

The maintenance challenge

But the real problem facing industrial networks is their low level of maintenance. Industrial protocols lag behind those of IT systems: authentication and encryption procedures are weaker in industry for reasons related to performance. "The big challenge facing industrial infrastructure is upgrading systems that were not designed to be upgraded. In industry, a system that has been validated and meets functional needs typically remains unchanged. But if it is connected to an Internet gateway, it is no longer protected," says the SDEL Contrôle Commande systems engineer.
To protect it, a security layer must be built around these existing systems. "France has always been circumspect when it comes to digitisation – which is fortunate, since we are therefore less exposed to risks. The segment between the secure and non-secure parts of the grid is private so the virus cannot use it to attack the remote control system, which has no connection gateway," says Valentin Bréhier. Cyberattackers able to target a city or a country remotely tend to be State agencies, says the expert. 'Zero day' defects – IT vulnerabilities that have not been published or have no known countermeasures and can therefore be exploited to infect any machine – are available for purchase in the Darknet marketplace. For example, in 2010, the Stuxnet virus, the first cyberweapon deliberately created by hackers to remotely target and damage an industrial facility, targeted the centrifuges at the Natanz uranium enrichment plant in the Islamic Republic of Iran.

Traditionally, two separate communication spheres have coexisted in industry:
IT (information technology), i.e. central infrastructure (administration, HR, etc.), and OT (operational technology), i.e. communication systems tying together factory production areas.
The two are now beginning to converge. With the rollout of connected objects, the IT security risk has become serious.

Why?
"These objects can communicate with each other. Previously, the sensor transmitted information to a central unit, which forwarded it on to another sensor.
Now the two sensors communicate directly," says Actemium Business Development Director Thierry Delpech, who co-chairs a cybersecurity working group covering the VINCI Energies brand that specialises in solutions for industry.

How can the veracity and integrity of data exchanged between two sensors be ensured?

When these smart objects use a 2G, 3G, or 4G cellular network, they apply encryption keys and conformity certificates.

But when two objects communicate directly with each other, these methods of verifying information are absent.
This, says the Actemium expert, is the source of the danger.

Security protocol

As Thierry Delpech sees it, "OT needs cybersecurity support." Technical solutions exist. Specialised Actemium teams start by mapping industrial networks and identifying all connected equipment. They then install parallel sensors to feed back information about connected equipment and detect vulnerabilities. Lastly, corrective and preventive action is taken via analysis and self-learning systems applied to the information frames transmitted via the networks.

ICT PERFORMANCE

TRAINING PEOPLE TO THWART THE NEW THREATS

Installing security "tools" is not enough to protect companies from cyberattacks. Axians takes a holistic approach to security.

"In 2016, one in every two companies was a victim of a cyberattack," says Cédric Cailleaux, Head of the security excellence center at Axians (VINCI Energies). "SMEs and micro businesses are just as affected as CAC 40 corporations."

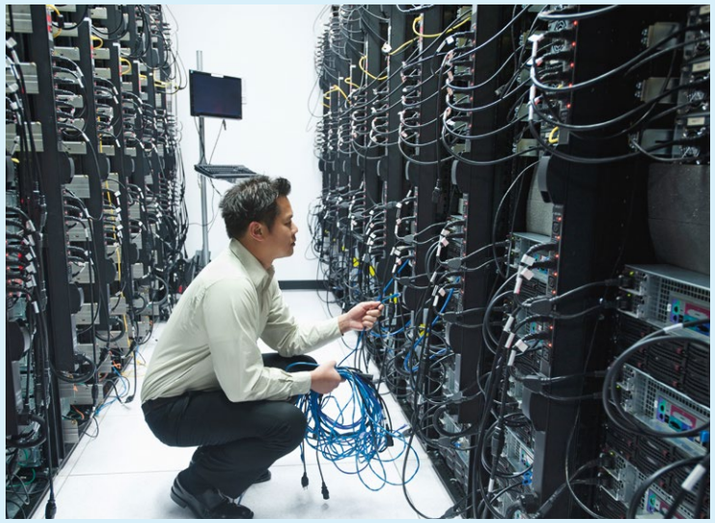
How can companies protect themselves from such attacks? "Companies often instinctively opt for a technical solution such as a firewall, an anti-spam system, or a URL filter," says the cybersecurity expert. "But in doing so, they create protection segments that weaken the overall system. Axians therefore takes a holistic approach to security." VINCI Energies' dedicated ICT brand focuses simultaneously on three intertwined aspects of security: technical, operational, and organisational.
Operational security involves, among other things, giving Information System and Information System Security managers more visibility regarding the protection of their systems. It also involves carrying out a technology watch and continuously raising awareness. In one company, Axians deliberately sent phishing emails to a range of departments as a lure in order to start a dialogue with the employees who unwisely clicked on them. Once the ill-advised responses had been identified and employee awareness raised, training was provided in the form of e-learning programmes or webinars.

Risk culture

The shared risk culture is the backbone of organisational security and the third aspect of the 360° approach that Cédric Cailleaux recommends.
Learning to manage risk involves first asking what needs to be protected, i.e. "the most sensitive assets, since you can't protect everything," says Cédric Cailleaux, who points out the most widespread shortcomings across organisations ranging from SMEs to multinationals.
"Of 50 companies that were asked about it at a recent meeting, only two had introduced an ISSP, an Information System Security Plan."

ICT TRANSFORMATION

FRENCH COMPANIES ARE BEHINDHAND, BUT NOT FOR MUCH LONGER



Companies have benefited from the enormous amount of attention that IT threats have received in the media in recent years. Now they are no longer confining themselves to simply installing antivirus software to safeguard all their terminals and data, but have become more cautious and more inclined to seek stronger protection. They now consider security a key part of their approach to every new technology. As a result, companies are now focusing more on security when considering new technologies – IoT, artificial intelligence, chatbots, etc. French companies realise that their data is exposed and are preparing to protect themselves from new potential threats. But the risk is not confined to data and IoT: 35% of security breaches are caused by the internal workforce, and a long-term effort must be made to raise security awareness among French employees.

The two complementary aspects of security

Beyond the purely technical issues, security has two complementary aspects that must be distinguished: organisational, which involves governance and compliance, and operational, which involves the tools used to report threats, awareness-raising, risk culture, technology watch, etc. On the organisational side, the European institutions are addressing the issue and have rolled out the General Data Protection Regulation (GDPR), to provide a European regulatory framework for cybersecurity, starting in 2018. In another positive move, the Regulation requires some companies to appoint a Data Protection Officer (DPO). Companies must now ensure that they comply with these new security rules, which have not come a moment too soon.
On the operational side, there are a wide variety of measurement and protection tools, but the threats are growing. In addition to raising awareness and building a risk culture, companies must introduce a technology watch as an indispensable part of protecting the company over the long term. Cybersecurity is constantly changing at a very rapid pace. Without a technology watch, awareness and risk culture are pointless. Meanwhile, each company must also carry out risk audits and analysis to adapt its security strategy to its specific sector and issues.
Now that French companies have gained a clear picture of their exposure, they are routinely raising awareness, building a risk culture, and introducing a technology watch. They are gradually catching up and making cybersecurity a strategic development focus, notwithstanding a recent IDC study showing that only 9% of French companies are compliant with this GDPR.

Cédric CAILLEAUX
Head of the security excellence center at Axians

INDUSTRY PERFORMANCE

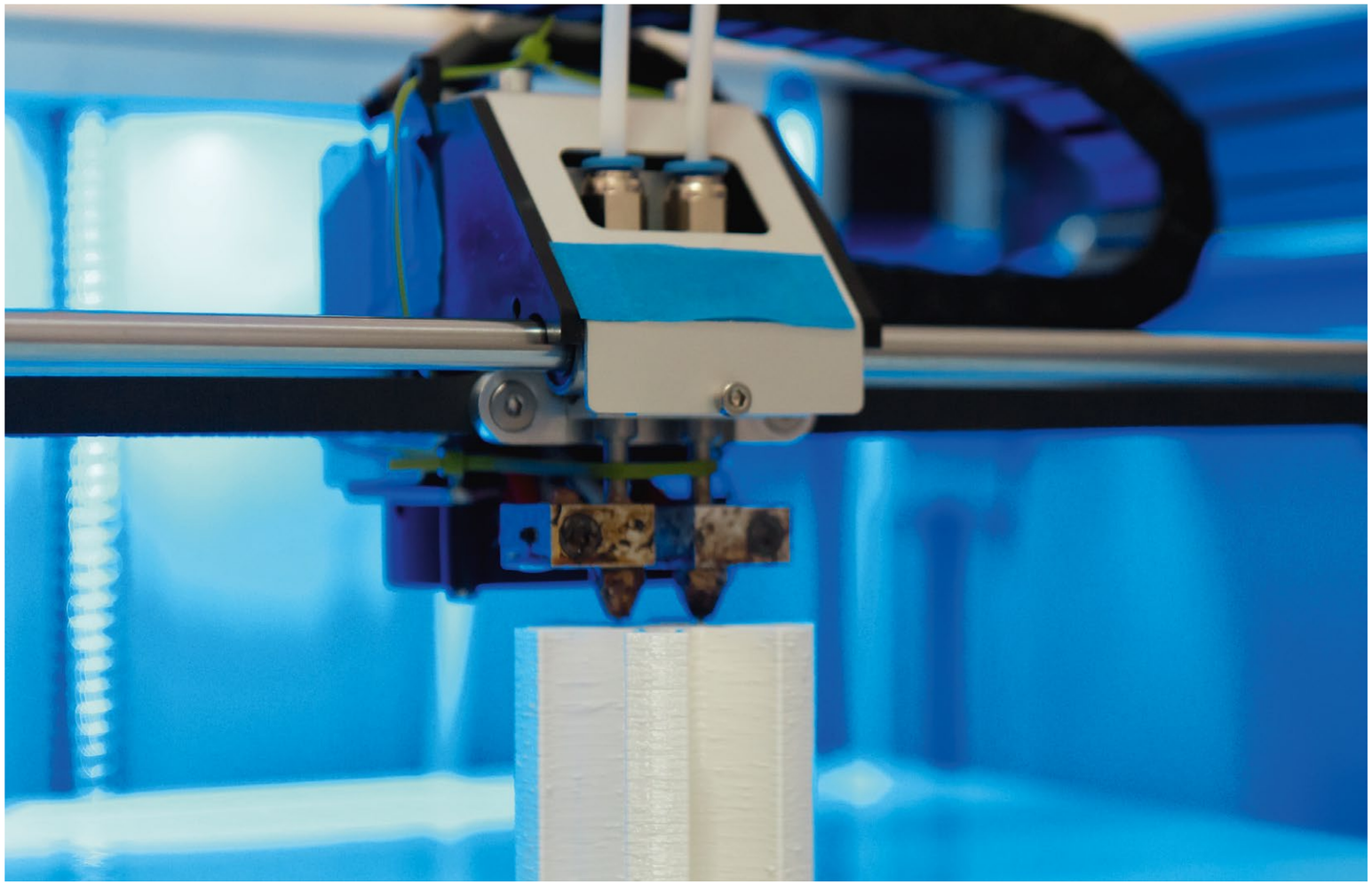
HOW ADDITIVE MANUFACTURING WILL TRANSFORM INDUSTRY

Additive manufacturing, a key technology of the industry of the future, is shaping up as a way to meet industrial goals by producing more, better, and at lower cost.

Because additive manufacturing shares features – autonomy, flexibility, intelligence, and adaptability – with the industry of the future, it can be considered a key factor in industrial transformation and acceleration.
"It is a fairly revolutionary procedure," says Alexandre Mandon, pre-sales engineer at Actemium Saint-Etienne Process Solutions (VINCI Energies). "So far, parts – especially machine parts – have mainly been manufactured by subtractive processes, in which material is removed to form the final part," he explains. "Additive manufacturing takes the opposite approach, adding layers of material to obtain the final product, for example via polymerisation in the case of plastic, fusion in the case of metal, and so on."
Additive manufacturing opens up new possibilities. "It can be used to make parts with complex geometry that are virtually impossible to produce with conventional processes, such as multidirectional and multichannel components, and lattice structures," says Alexandre Mandon.
Additive manufacturing can, for example, be applied in the major aerospace sector. "The most advantageous aspect in the aerospace sector is the fact that topological optimisation can substantially reduce part weight," says the Actemium expert. The weight of a titanium aluminide turbine blade can be reduced by 50% - a move that is clearly beneficial in the aerospace industry, since lower part weight means reduced fuel consumption.

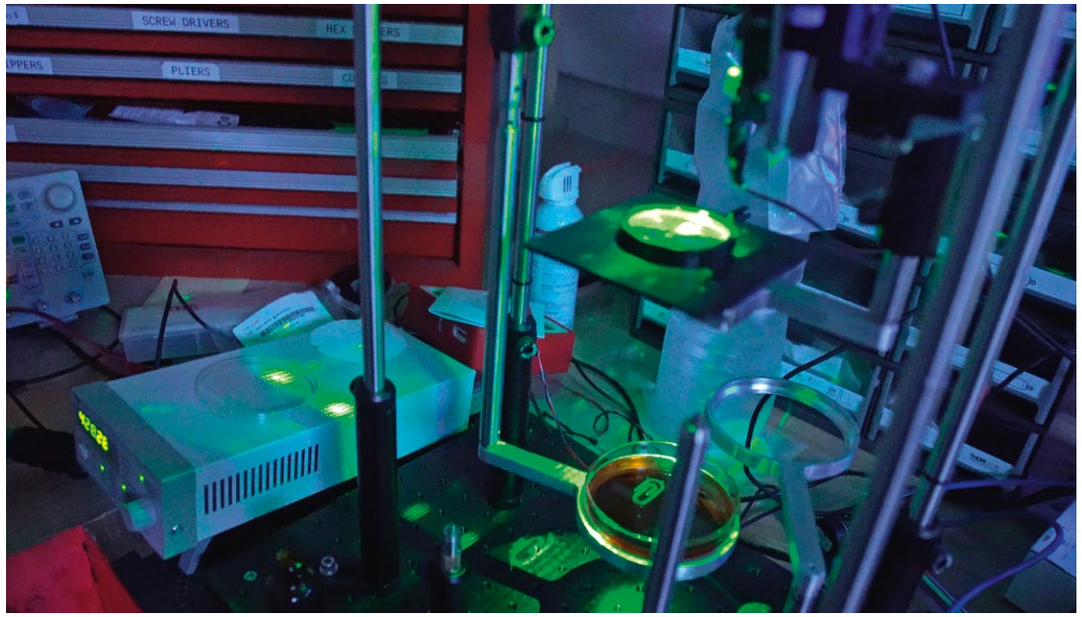
> Additive manufacturing accelerates innovation by reducing the time it takes to move from design to production.

The technology also accelerates innovation by reducing the time it takes to move from design to production. "A 3D model of the part is created via this technology. The manufacturing process can then be initiated immediately to obtain the final product" within one week instead of the eight weeks it takes to produce the same part via conventional casting, says Alexandre Mandon. "Additive manufacturing is therefore widely used in prototyping to validate products and components."
To take advantage of these features, five Actemium business units have joined forces within the "Tech Team" working group to set up the ALAFU (Atelier LAser du FUtur – laser of the future workshop) project. "We designed and modelled a turnkey solution based on Actemium's complementary solutions, and more specifically, centralised remote supervision, powder process equipment, automation, and robotisation of transfer and post-processing operations such as heat treatment, finishing, and non-destructive testing. The ultimate goal of the comprehensive additive metal manufacturing workshop is mass production," says Alexandre Mandon. Parts of the workshop have already been used in other projects carried out by the Actemium network, but what is new here is the fact that it covers the value chain as a whole, from supply of the powder to packaging of the parts. ALAFU thus addresses several industrial issues, such as the cost of parts.
"Additive manufacturing, especially the metal powder bed process, is very costly as things now stand, because some materials are very expensive. ALAFU brings our powder recycling expertise into the equation," says Alexandre Mandon. In addition, ALAFU automates and secures the process to make production more reliable and reduce costs, thus supporting mass production. The next step for ALAFU, in the run-up to a demonstrator, is immersion in the workshop via a virtual reality mask.



INDUSTRY ACCELERATION

MUCH FASTER 3D PRINTING?



Daqri, a start-up specialising in augmented reality, has presented a 3D printer that works 100 times faster than a conventional 3D printer.

How does it achieve this? By using a hologram. Daqri, a start-up specialising in augmented reality, uses a conventional 3D printing technology – a laser polymerisation – but at the beginning of this year it added a chip that it had developed to create a light field without complex optics. The resulting hologram is projected onto material. A few seconds later, the object appears – 100 times faster than an object created by a "conventional" 3D printer.

"By reducing cycle time, the technology could help boost industrial productivity and thereby bring down production costs."

5 seconds suffice

The tests only demonstrate how a simple paper clip is printed, but the printing speed heralds unlimited possibilities. In conventional 3D printing, an object typically requires several back-and-forth scans and therefore several minutes to produce, whereas the hologram process does the job in a single 5-second flash.

"By reducing cycle time, the technology could help boost industrial productivity and thereby bring down production costs. That is a major advantage," says Alexandre Mandon, pre-sales engineer at Actemium Saint-Etienne Process Solutions (VINCI Energies). Daqri claims that larger objects could be printed just as rapidly. The holographic 3D technique would also make it possible to avoid the defects that occur in conventional layer-by-layer printing, and thus eliminate weak areas and boost product reliability.

INDUSTRY PERFORMANCE

LEDS GIVE INDUSTRIAL PLANTS A BRIGHT FUTURE

Manufacturers have much to gain by switching to LED: energy savings, maintenance efficiencies, and employee comfort are just a few examples.

Upgrading a plant's lighting assets is not necessarily the first thing people think of when it comes to generating energy savings in industry. Yet lighting accounts for 2 to 15 per cent of a site's electricity consumption. Using much less power-hungry LED fixtures is a first step towards achieving these savings.

LEDs also offer considerable advantages from a maintenance point of view. "Although the potential savings are significant, they aren't as obvious, as they don't immediately spring to mind," confirms Jérémy Renaux, Energy Efficiency Engineer at Actemium, the VINCI Energies industrial processes brand.
An LED lamp has a lifespan that is on average five times longer than that of a fluorescent tube, so there are clear savings: LEDs require less maintenance and scheduled servicing to replace them, whereas conventional assets are difficult to maintain due to frequently challenging environments (accessibility of installations, production requirements, etc.).

An issue that needs to be looked at from a wider perspective

To achieve energy savings, merely changing the light fixtures is not enough. The overall context must be examined – environment, branch of industry, ambiance – to ensure equipment is reliable while at the same time complying with lighting standards. These standards set lighting requirements (lighting level, unified glare rating, illuminance uniformity, colour rendering index, etc.) based on the type of area, task and/or activity.

As well as offering high energy performance, light spectrums that replicate sunlight, and uniform lighting, LED technology also helps enhance employee comfort.

LED lighting has become smart, incorporating motion and light sensors so as to match lighting to needs. Connected to a building energy management system, "lighting assets become more interactive, can be logged and respond to orders. For example, it will be possible to determine the quality and quantity of light, the quantity of energy used, and so on," concludes Jérémy Renaux.

ENERGY INNOVATION

CAN BLOCKCHAIN REVOLUTIONISE THE ENERGY SECTOR?

This innovative and potent technology opens up new possibilities in the energy sector, especially with regard to decentralising networks.

The banking and financial sectors were the first areas impacted by blockchain, a breakthrough technology that enables transactions (sale, purchase, contract) without centralised control (by banks or any other intermediary) while reducing costs and speeding up the entire process. You can send money abroad quickly for example, with no banking charges, using bitcoin, the now well-known virtual currency that uses blockchain. Given its abundant potential applications, blockchain has elicited great interest in the energy sector as well. That is what a study carried out by PwC – published in December 2016 and titled "Blockchain: an opportunity for energy producers and consumers?" – has concluded. Energy-industry interest in blockchain lies mainly in its use as a peer-to-peer electricity system. Blockchain can be used to bypass intermediary parties, including distributors, and sell energy directly to consumers.

Peer-to-peer and beyond

A pilot project in Brooklyn has shown the feasibility of a decentralised energy system. Since April 2016, residents in this New York borough, whose homes are equipped with solar panels, can sell their surplus electrical power to their neighbours using blockchain. Energy-industry interest in blockchain, however, goes beyond creating a peer-to-peer electricity marketplace. In its study, PwC also describes the potential for developing automated systems for metering/processing/filing, billing, tracking the operational status of facilities, and assessing authenticity certificates (for example, for green electricity and CO_2 emission allowances).

Smart contracts

Using blockchain technology would, for example, facilitate payment for recharging electric vehicles: the exact amount of electricity supplied would be automatically calculated and invoiced. This is the notion of smart contracts, which use blockchain technology to trigger transactions automatically whenever specific "if… then" criteria are met. Start-up Slock.it and German energy distributor RWE are attempting to develop a smart-contract approach to recharging electric vehicles.

Blockchain may facilitate payment for recharging electric vehicles.

Despite blockchain's potential benefits, a number of problems, with respect for example to responsibility and safety, must be resolved before it can be widely deployed in the energy sector. Pascale Jean, a managing partner overseeing the energy sector at PwC, believes that it is too early to tell if blockchain will establish itself as a lasting presence in the energy sector. "This issue," she adds, "doesn't only depend on the system's technical capabilities but also, and above all, on the regulatory and legal framework, the technology's scalability and resilience, and its return on investment."

ENERGY PERFORMANCE

HOW DIGITAL TECHNOLOGIES ARE CHANGING THE OIL & GAS INDUSTRY

In response to the sharp decline in the price of oil, the traditionally fairly conservative oil and gas industry is reassessing its approach and adopting new methods.
The following provides three examples of digital solutions that are being used to boost efficiency and optimise production costs in the sector.

1. Markup Tool: delineating subsystems more efficiently

Markup is a colour-coding process used in commissioning activities, i.e. facility testing and start-up. It consists of dividing a platform into sub-systems. "Engineers go through and manually mark up hundreds, or even thousands, of documents submitted by the construction company, to show which subsystem each piece of equipment belongs to. In the case of large projects with several thousand documents, this time-consuming chore can easily take 8,000 to 10,000 man-hours to complete," says Thomas Seligmann, BU Manager at Actemium Oil & Gas Commissioning.
Actemium (VINCI Energies) therefore developed a digital tool to support the document markup process. "Markup Tool cuts the amount of time required by 40 to 50%," he says.
"Since the documents are digitised, classified, and sorted, the work is also better organised and we obtain better quality results."

2. Mobilicaps, paperless pre-commissioning

"Before visiting a platform, we used to print out test sheets generated by Icaps, Total's software commissioning tool, which we then filled in manually. On large projects, this could involve an enormous amount of paper – more than 500,000 sheets," says Thomas Seligmann. To simplify these tasks and avoid the use of paper, together an employee of Comsip (or the VE Oil and Gas division) and a Total employee developed Mobilicaps, a portable application that enables employees to fill in the sheets on a tablet computer during testing. The application is then synchronised with Icaps and can be used to access all drawings and engineering documents at any time. "This saves us a substantial amount of time. The work is simpler and more thorough because we have the documents with us at all times, which is not easy to achieve when the drawings and procedures are on paper."

3. Smart rooms, on-shore control centres

One way to boost performance in the Oil & Gas industry is to optimise maintenance costs. Changes in IT, transmission, and data exchange tools have led to the development of "Smart Rooms" to help achieve this. "The information available in a smart room enables us to better prepare and coordinate offshore activity in order to partly reduce the amount of offshore activity and the number of employees in the offshore facility," says Actemium Oil & Gas Maintenance activity manager, Hervé Thienot. The maintenance teams permanently stationed on the offshore platform have now been cut back to about 20-25 employees, who are able to handle most issues. "We operate in maintenance campaigns with maintenance activity prepared, planned, and organised ahead of time to boost performance. The campaign team is assembled on-shore as required and then sent to join the permanent maintenance team on the platform." The new work arrangement calls for far more flexibility.
"We are introducing a manpower planning system that is tailored to the activity and provides a detailed overview of the expertise provided by each member of the team," says Hervé Thienot. Meanwhile, Actemium uses E-brain, a tool developed by the brand that rounds out the employee recruitment and skills management process and makes it more reliable.
"The assessment covers everyone, with a questionnaire tailored to each job. This gives us an objective measurement of skills, which we use to qualify personnel for the customer and to set up training and career development support for our employees," says Hervé Thienot. "The tool professionalises our methods and gains valuable time. To give an example, by using these methods and tools, it took us just three months to put together a team of more than 140 people to work on the Girassol and Dalia FPSOs in Angola."

> "Markup Tool enables us to save a substantial amount of time. The documents are digitised, classified, and sorted, and the work is better organised. We obtain better quality results."

ENERGY PERFORMANCE

ARE MICROGRIDS A SOLUTION FOR URBAN ECOSYSTEMS?

An Enea Consulting study looks at the prerequisites for energy and economic efficiency in urban microgrids.

What value can microgrids bring to urban ecosystems, and under what circumstances? What challenges must be addressed in order to foster and accelerate their emergence? A study by Enea Consulting, carried out in partnership with Omexom (VINCI Energies), the ADP Group, the Caisse des Dépôts Group, Enedis, Total, and the Tuck Foundation, provides some initial answers to these questions.
The analysis is based on three case studies: an eco-neighbourhood in San Diego, California, with peak demand related to air conditioning; a French airport working to improve its carbon footprint; and an industrial site in France with substantial thermal energy requirements.
To understand the lessons to be learned from this study, a distinction must first be made between smart grids and microgrids. Microgrids are smart grids with an additional "islanding" capability – the ability to disconnect from the main grid and operate autonomously for a limited period of time.
For economic reasons, smart grids (without islanding capability) are better suited to urban settings with intermittent energy generation.

The microgrid case studies, investigated by the study partners and taken from the service sector (eco-neighbourhoods, buildings with low heating needs or heated electrically), confirmed that a microgrid is rarely viable economically. "On the other hand, more sustainable, lower-cost local electricity generation does not necessarily require islanding capability," says Enea Consulting analyst Maeva Faure.

Three design factors

What criteria should be used to design smart grids? The study identified three major markers: the grid tariff structure, the origin of the annual peak demand (heating or air conditioning), and the availability of renewable energy sources.
A first hypothesis assumes a situation in which tariffs are largely based on contract power, with substantial solar potential and an annual peak related to air conditioning. For an eco-neighbourhood equipped with roof-mounted solar panels and batteries, the economic optimum in 2020 would be achieved with 50% renewable energy.

A second hypothesis assumes tariffs based more on energy consumed, with limited solar potential and an annual peak related to electric heating.
In this configuration, local electricity generation is profitable when the levelized cost of energy lies below the electricity selling price. In this case, optimisation is based on total energy consumption (MWh) rather than electricity demand at any point in time (MW), and solar panels are sized to ensure that all electricity will be self-consumed.

Spark spread

What about an industrial site? The case study modelled by the study partners showed that microgrids are economically efficient only for industrial systems with strong thermal (heating and cooling) demand. The microgrid can be coupled with the heating network to optimise the energy system as a whole, with a substantial amount of cogeneration (thermal and electrical energy).

The takeaway from the study is that microgrids may be economically viable if they supply both electricity and heating or cooling, and if they are supplied by non-intermittent energy sources. Their cost rises substantially when intermittent energy is used. This cost must be estimated taking into account the added value generated by the islanding capability.

ICT TRANSFORMATION

SHOULD WE FEAR THE WORLD AHEAD?

Joël DE ROSNAY

Hervé ADAM

Does the development of artificial intelligence pose a threat to society and humanity? Is it inevitable that automation will destroy jobs? Will the Gafa (1) monopoly get the better of digital innovation? No, reply futurist Joël de Rosnay (2) and Hervé Adam, general manager of VINCI Energies France. Provided we defend a collective and connected vision of humanity.

Joël de Rosnay, whereas Bill Gates and Stephen Hawking have expressed their alarm at the consequences of the development of artificial intelligence, you defend an optimistic vision and welcome the prospect of "augmented collective intelligence" or what you refer to as "hyperhumanism".

Joël de Rosnay. I have criticised the position adopted by Bill Gates and Stephen Hawking, who defend a Malthusian vision in my opinion. Malthus was mistaken in maintaining that global food production would grow linearly and would therefore be insufficient to cover the needs of a world population increasing exponentially. Bill Gates and Stephen Hawking are right when they say that the development of artificial intelligence and robotics technology is exponential. But where they are wrong is in seeing the development of the human brain as linear. Because the evolution of the brain interconnected with artificial intelligence and the digital ecosystem, first in tandem then in symbiosis, is exponential. It leads to what I call augmented human intelligence or "hyperhumanism".

How does hyperhumanism differ from transhumanism?

J. de R. Transhumanism is elitist, egotistical and narcissistic. We futurists defend a collective vision of humanism, based on the idea of a human brain that is hyperconnected via a global network.

Hervé Adam. You can draw a parallel between the current and future development of artificial intelligence, and the mechanisation of agriculture a hundred odd years ago. The mechanisation process may also have been perceived as a threat to humans. But what happened? Machinery simply replaced humans in the execution of cumbersome and tedious tasks. Humans continued to develop their skills, and today the planet can feed infinitely more people than 100 years ago. It's a similar story for the brain. Artificial intelligence will complement our lives and enable people to develop their own specific characteristics and, as a result, strengthen their humanism.

Joël de Rosnay, what do you mean when you say that humans are developing new senses?

J. de R. Smartphones make us augmented humans. For example, our GPS systems and webcams give us a sense of ubiquity. Smartphones are much more than just a communication tool; they are a universal remote control that allow us to click in our environment (through RFID chips, QR codes, etc.) and to interact with data and information (virtual and augmented reality) which wouldn't be accessible without digital technology.

H. A. In industry, we're already seeing specific manifestations of what you're describing, and they're no longer at the experimental stage. The construction sector is also involved: I'm thinking for example of the explosion of BIM (Building Information Modelling). Likewise, geolocation applications make a major contribution to maintenance activities.

The impact of factory automation has not yet been properly measured. Some predict heavy job losses in industry, others see an opportunity for growth. What's your feeling on the subject?

H. A. I'm not worried. The developments in artificial intelligence and robotics will result in new jobs like data scientists, BIM managers and so on, but they will also contribute to the relocation of jobs in industrialised countries since they boost productivity and help create new use patterns.

J. de R. Robotics will destroy jobs in some areas but create them in others, if only in terms of robot creation and maintenance and the robot-machine interface.

The idea of taxing robots to fund social protection was discussed during the presidential election campaign in France. What do you make of the proposal?

J. de R. It's an idea worth pursuing. Already, the European Community is proposing creating the status of electronic person, with rights and obligations. This "accountability" may result in taxation. From the moment a robot replaces workers – whose contributions secure their social rights – it is theoretically conceivable that it should be taxed so as to finance the protection of these rights.

H. A. Why not? But it would have to be considered on a Europe-wide basis at the very least. If France is the only country to tax robots or if the practice isn't established in a coordinated way, that will put us at a disadvantage in relation to countries that can attract more production capacity and invest heavily in automation. If you look at Germany alone, automation is at a much more advanced stage than in France and it's clearly a key factor in the country's industrial success.

Digital transformation and green transition are terms that suggest a finite process. Could that be misleading?

J. de R. The word transition characterises a shift from one stage to another. Being a surfer, I see it a process of movement. You often hear it said that surfers need to have good sense of balance. But that's not the case – they need to be in a state of controlled imbalance. If they are balanced, they fall. This image should inspire company managers as they need to think about constantly maintaining the imbalance between an uncertain future and the need to stabilise the business in its environment.

There's a lot of talk of smart networks, smart vehicles and smart cities. Is everything turning smart? Does the term mean anything anymore?

"Innovation departments in businesses don't serve much purpose as such. What matters is the culture of innovation, the dynamic and systemic process that drives the emergence of innovative systems."

Joël DE ROSNAY

H. A. I'm not too keen on the term smart as it infers a concept of scale: if you become smart, it means you were less so before or that others are less so.

I prefer to talk about "connections"; our cities, cars and networks are becoming connected. In fact, that's what has been observed in the human brain or with artificial intelligence: "smartness" is to some extent proportional to the number of connections.

J. de R. I've often used the terms "intelligence" and "smart" myself in the past, but I'm critical of them now. It's not objects that are smart. It's humans – who are rich in the sort of intelligence that is made up of emotions, complex values and symbols which machines are unable to fully grasp. Having expressed this reservation, if I had to define object intelligence, I would say that it requires three things: interactivity, proactivity and real time.

Innovation is gathering increasing momentum. Does this acceleration raise concerns for futurists and more generally for those reflecting on the "world ahead"?

J. de R. I don't much like the word innovation. Manufacturers, politicians and even futurists present innovation as a sort of toolbox that simply needs to be financed for a new tool or service, like the smartphone or Google, to emerge from it. This being the case, people will wonder why France didn't invent the smartphone or Google. But innovation is not something isolated; it's a system. No matter how innovative it might be, a product or service will not change society. What does change society is when a community reappropriates an innovation as part of an integrated system. That's why innovation departments in businesses don't serve much purpose as such. What matters is the culture of innovation, the dynamic and systemic process that drives the emergence of innovative systems.

H. A. And that's very good news for VINCI Energies because our job is to identify the best innovations so that we can put them together and offer our clients their dream solutions! We're first and foremost integrated service providers. Our innovative strength doesn't lie in developing technologies but in being able to assemble and connect these technologies.

J. de R. Until now, the acceleration of innovation has been driven by fundamental sequences: printing, radio, television, internet, and so on. But we've now entered a process of continuous acceleration. We're no longer in a phase of linear growth but of exponential development where everything is constantly gaining pace. While politicians continue to adopt a sequential and linear way of thinking, we futurists have less difficulty grasping converging 50-year trends than in projecting ourselves three years ahead.

"If France is the only country to tax robots, that will put us at a disadvantage in relation to countries that can attract more production capacity and invest heavily in automation."

Hervé ADAM

Likewise, in industry, how can company managers reconcile medium to long-term planning with the acceleration of innovation?

H. A. Every year all our business unit managers present a 3-year strategic plan. It's a very difficult exercise as a lot of things can now happen in the space of three years. To come back to the surfer image, the concept of agility has become key throughout a business. An agile business is one that is capable of picking up the signals that will enable it to anticipate and redirect its choices so as to keep pace with its development.

The Gafa companies seem increasingly to alone concentrate the resources for long-term investment on basic research. Is that a risk?

J. de R. That's the reality we're facing, and it's a real concern. The Gafa companies have become "business-States"; they operate horizontally, they have a foothold everywhere, they are uncontrollable, and they fail to pay tax in the countries in which they produce. Their financial capacity has far outstripped that of the largest international businesses and even the budget of some States. They build digital monopolies and turn us into "pronetarians". We work for them and create added value for them.

What can be done?

J. de R. States are powerless to deal with these companies. I believe far more in co-regulation through citizen participation. Connected via a network, citizens themselves are capable, in the name of values, of opposing the monopoly. We're not yet able to properly measure the impact of mass citizen mobilisation, but a "cyberboycott" is undoubtedly an effective instrument.

H. A. What's new is that companies like Uber and Airbnb are managing to very quickly build enormous commercial and financial powerhouses while at the same time owning nothing but algorithms that link supply and demand. We might see a form of citizen counter-power emerge just as quickly through the development of systems like Blockchain.

Start-ups are thriving in all fields and segments, and they seem to be supplanting the capacity of big businesses to innovate. Is this a real perception or a "bubble"?

J. de R. Start-ups are more mobile, more interactive, better informed and focus more on forecasting the future. The best-performing big companies are no longer trying to produce intelligence themselves; they buy it wherever it happens to be.

H. A. VINCI Energies has always supported decentralisation, independence and empowerment via human-sized entities. It's a global group with around 65,000 employees, historically structured as a "federation of businesses". Today, I would say that we are a network of start-ups that is open to the outside world and fully equipped to foster creativity and innovation internally.

(1) Google, Apple, Facebook, Amazon

(2) Latest work: "Je cherche à comprendre… Les Codes cachés de la nature", published by Les Liens qui libèrent, October 2016

A NEW PUBLIC PRIVATE EQUILIBRIUM FOR URBAN DATA

The operations of local and regional authorities and traditional providers of urban services such as mobility, energy and housing are being disrupted as they face competition from digital operators (such as Citymapper, Strava, Uber, Blablacar and Waze) using data to provide new added value for users.
These new data service providers have not yet been able to deliver the major urban revolution they promise. Their ability to put data to use is not enough. Local authorities remain key actors and tend to remain loyal to their traditional partners, restricting the reach of the newcomers.
However, the advent of new operators has lent new urgency to addressing the urban data issue. New relations between the public and private sectors are taking shape. What will they ultimately look like? What role will data play in the interaction between the public and private sectors? How will the value and status of data be defined? What are the stakes for the actors involved? These key questions are the focus of the "Data Cités" (urban data) studies carried out by Chronos and OuiShare and supported by La Fabrique de la Cité.

Experimenting with a variety of models

Various public-private relations models are undergoing trials. Strava sells its traffic data to local authorities via the Strava Metro service. Waze is setting up free win-win data exchanges with local stakeholders via its Connected Citizens programme. A number of cities have placed restrictions, some quite stringent, on these platforms. Austin, Texas, for example, adopted rules that Uber considered too exacting, prompting the company to shut down its operations there. Starting in 2016, the Aquitaine-Euskadi Euroregion has been developing a mobility data system that pools the data of the region's public and private sector participants to provide a framework for shared use.
Thus, some data exchanges are controlled by the private sector and others by the public sector. For the time being none of the models is widely accepted and most remain experimental. All have advantages and drawbacks. Their success depends on variables such as context, region and participants involved.
A number of factors do however appear decisive in determining the direction in which these public-private relations will develop. The ability of cities to acquire relevant skills, train personnel and adapt to changing technologies will play a key role in establishing a balance of power in public-private exchanges. As experiments are carried out and the strategies of the traditional actors evolve, the emergence of viable and proven business models will dispel current uncertainties about the profitability of data services by defining the value and status of data. Clear-cut regulations defining the scope of the common data domain will also be crucial.

Alexandre GRASSIGNY
Project Manager at La Fabrique de la Cité

SELF-CONSUMPTION ACCELERATES THE ENERGY TRANSITION

Recent changes in regulations governing self-consumption will facilitate the implementation of the new modes of electricity generation and consumption.
In 2000, the French government introduced a purchase requirement to provide public support for the development of renewable energies. It gave individuals, businesses and administrations an incentive to generate electricity from renewable energy sources.
From 1 January 2016, the law on the energy transition and green growth has included a "supplementary remuneration" system that will partly replace the purchase requirement.
From now on every electricity producer using renewable energy sources or co-generation methods with a capacity of less than 100 kW will be able to locally join other producers to share the electricity generated and sell the surplus. There is one prerequisite: the parties must form an ad hoc legal entity that includes energy producers and final consumers.
The energy market is thus shifting from centralised production to electricity generation near the places where it is consumed. The change will be supported and amplified by grid parity, which France will reach within the next several years.

From individual to collective self-consumption

There are currently three types of self-consumption. Full individual self-consumption applies to situations in which the producer consumes the entire amount of energy he generates. This happens, for example, when a shopping centre uses all the electricity generated by photovoltaic panels placed on its buildings and/or car park to meet its own needs. The second type, partial individual self-consumption, applies to cases in which the producer generates more energy than he needs and sells the surplus. For example, a school equipped with photovoltaic panels may sell the electricity generated but not consumed during the school holidays.
Lastly, collective self-consumption, recently permitted under the regulation, allows a variety of parties – electricity producers and final consumers – to form a legal entity and within it to agree on the distribution of surplus energy. The prerequisite is that they must all be connected to the same medium and low voltage substation within the public grid. This means that within a neighbourhood, for example, households, businesses and administrations that have their own generating capacity will now be able to sell the surplus electricity they do not use themselves to final consumers within the same local legal entity.
To meet the critical challenges of the energy transition, new electricity consumption modes must be devised. Consumption must become more local, more responsible and more sustainable. Against this backdrop, self-consumption supported by regulatory changes and grid parity appears to be a key way forward.

Jean SONNET
Omexom Director in charge of self-consumption

HOW DRONES ARE USED

Drones – fast, unobtrusive and agile – are increasingly being used by businesses in a wide variety of fields. An agricultural drone fitted with a spectrometer can, for example, fly over a field to perform a very precise determination of soil composition. In another application, a drone carried out its first delivery for Amazon near Cambridge in the United Kingdom in December 2016. But the drone also holds out scope for more surprising applications. One is its use in construction, where the drone is fitted with an on-board camera to take large numbers of photographs that are then used in Building Information Modeling (BIM). A further application is an ambulance drone that can carry a defibrillator to victims of cardiac arrest in record time. Yet another is the real estate drone that can move around inside and outside a building to showcase a property for sale.

AGILITY **PROFILE**

VINCI ENERGIES, ACCELERATOR OF ENERGY AND DIGITAL TRANSFORMATION

In a world undergoing constant change, VINCI Energies focuses on connections, performance, energy efficiency and data to fast-track the rollout of new technologies and support two major changes: the digital transformation and the energy transition.

Keeping pace with market change, VINCI Energies supports its customers by offering increasingly innovative solutions and services, from design to implementation, operation and maintenance.

With their strong regional roots and agile organizational structure, VINCI Energies' 1,600 business units boost the reliability, safety and efficiency of energy, transport and communication infrastructure, factories and buildings.

The Group's business units are organized around five international brands – Omexom, Citeos, Actemium, VINCI Facilities and Axians – in addition to brands with a more regional identity.

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