

THE **AGILITY** EFFECT

MAGAZINE

**BANQUE DE
FRANCE PRINTER
DEPLOYS ROBOTS**

AGILITY LEADER

**ASTRID GUYART,
ATTACKING ON ALL FRONTS**

**SMART
BUILDING: AFTER
BIM? BOS!**

AGILITY MAKES ITSELF HEARD

**New human-machine interfaces,
Voice assistants promise flexibility,
precision and efficiency in the workplace,
where they have not yet made their mark.**

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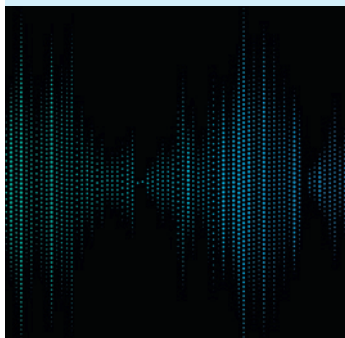
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EDITORIAL

Energy transition and digital transformation are having an impact on everyday life. To cover these two ongoing developments, VINCI Energies created The Agility Effect as an information platform and a biennial magazine at the end of 2016.

Three years later, our day-to-day discussions and projects demonstrate that the two trends are increasingly central concerns of our society.

The Agility Effect's original goal remains unchanged – to provide accurate and informative reporting about a fast-changing world that calls for agility to efficiently put the energy transition and digital transformation promise into practice in cities, infrastructure, buildings and industry.

Over the three-year period, more than 400 articles, videos and infographics have been posted on www.theagilityeffect.com to illustrate the issues on which we focus, our sources of inspiration and our innovations. Our brand experts and operational personnel use it to discuss their work in exploring and explaining the main challenges facing the world of the present and the future.

In this issue, we take a close look at voice technologies and attempt to see how their use will affect the workplace environment and require a new approach to security in communications.

I hope you enjoy reading it on www.theagilityeffect.com!

Sabrina Thibault,
Director of Communication, VINCI Energies
Director of Publication, The Agility Effect



AGILITY **PICTURE**

THE CAMERA THAT MAKES CITIES SMART

The Blaxtair camera manufactured by the Arcure company is designed to ensure safety of worksite machinery even more efficiently than reversing radar. It builds on artificial intelligence to learn and recognize shapes and movements behind a machine. The system is used in vehicles on the La Défense station worksite west of Paris, part of the RER Line E extension project. The image recognition technology, an effective way to ensure safety, is also used in many other urban applications, such as road tunnel monitoring and traffic flow management.

BRAZILIAN ENERGY MARKET OFFERS VAST POTENTIAL

Not only does Brazil enjoy substantial reserves of offshore oil, it also shows vast potential in terms of renewable energy sources. But to realise this potential, the “continent-country” will have to invest in its infrastructure.

Fifteen times the size of France and as big as a continent, Brazil presents a mixed energy picture, characterised by its geography and contrasting abundant resources – both fossil and renewable.

“The point of energy generation is often located far from the point of consumption,” remarks Dominique Ferreira, CEO of the VINCI Energies Brazil division. “The considerable distances involved in delivering electricity make transmission, and therefore access to energy, a critical issue.”

Eighty percent of the Brazilian population is concentrated in the country’s coastal areas, and dispersed communities can remain cut off, without power, for a long time, as in the Amazon rainforest. When looking at the geography, Brazil’s large reserves of oil are located offshore, more than 100 km off the coast and at depths of over 5,000 m.

The country has a vast supply of fossil fuels. Its primary energy resource is oil, with extraction from offshore platforms set to grow sharply. In 2016, black gold

accounted for 47.4% of Brazil’s energy generation and 38.4% of consumption. Natural gas is another abundant resource, covering 72% of consumption.

Potential renewable energy sources

To drive its energy transition, Brazil can rely on extensive potential sources of renewable energy. Ranked third worldwide in “green” electricity generation, it is especially active in the fields of hydropower and biomass. These two resources alone mean that the country’s recorded CO₂ emissions are 54% lower than the global average.

Indeed, Brazil, which has undertaken to cut its greenhouse gas emissions by 43% by 2030 (compared to 2005 levels) as part of COP 21, is a pioneer in biofuels, and biomass accounts for 30% of energy consumption. At 11.5%, hydropower accounts for less, but it contributes to the country’s

decarbonisation rate, which exceeds 45%. Hydropower is generated by giant dams like the Itaipu dam on the Paraná River, the world’s second largest power plant in terms of installed capacity (more than 90 TW per year), and by smaller structures like the cluster of dams refurbished by VINCI Energies brand Omexom on behalf of national distribution company Enel. Work on these structures involved “upgrading electrical systems, in particular instrumentation and control,” says Ferreira. “Automation and digitisation have helped reduce manual tasks and give Enel head office back control.”

Improving access to electricity thanks to solar and wind power

Because populations living in remote regions are so dispersed, Brazil decided to develop distributed power generation systems and install micro-grids that integrate photovoltaics and wind power. As part of this initiative, Omexom has deployed hundreds of mini solar plants in the south of Belem.

Wind power also contributes towards improving access to electricity and indeed towards optimising the energy mix. Its potential is estimated at 350 GW, and generation is concentrated

in the north-east of the country (in the states of Pernambuco and Bahia), where winds are favourable but demand is limited. This distortion means delivering electricity where it is required, thousands of kilometres to the south, in the state of Minas Gerais and the Rio region. “That’s one of the challenges in the country,” says Ferreira. “A national network must be built to increase transmission capacity and secure delivery. The poor quality of existing power lines can lead to blackouts.”

In 2009, due to harsh weather conditions, Brazil experienced a massive power outage after





“Brazil has a green energy matrix in terms of electricity generation.”

the failure of three national grid HV transmission lines leading from the Itaipu hydroelectric dam on the border with Paraguay. Some 90 million people (out of a population of 200 million) in Brazil were left without power. Around 90% of Paraguay’s territory was also affected by the blackout. Brazil has been involved since

1999 in a campaign to build and strengthen its national network with the help of Omexom, which is rolling out 1,000 km of 230 KV and 500 KV power lines. Demand in the country is considerable, since some 50,000 km of extra-high-voltage lines must be installed in the next 10 years!

Green matrix

Overall, “Brazil has a green energy matrix in terms of electricity generation,” says Dominique Ferreira, listing the various sources: 65% comes from hydropower, 20% from solar, wind and biomass

combined, and just 15% from thermal and nuclear power.

The share of renewable energies in the energy mix increased from 39.4% in 2014 to 41.2% in 2015. But he warns: “Studies point to the fact that while Brazil is seeing a return to economic growth, installed generation capacity will be insufficient.” With its energy consumption set to double by 2030, the country will undoubtedly have to accelerate the expansion of its infrastructure, both for oil – by building new offshore platforms – and for electricity, all the while pursuing its decarbonisation targets.

ENERGY

TRANSFORMATION

MOROCCO FORGES AHEAD WITH WIND FARM ROLLOUT

Several wind power projects have been developed in recent years on the Atlantic coast with the help of Omexom and are continuing to spread across the whole region.

Favourable weather conditions, an exceptional amount of sunshine, and strong and regular winds on the Atlantic coast make Morocco particularly well suited to developing renewable energies.

Indeed, the country plans to invest billions of dollars in reviewing its energy mix and focusing on low-carbon energy by 2030, when 52% of its installed capacity must come from solar, wind, and hydro power. As an intermediate step in this ambitious roadmap, Morocco aims to install 2,000 MW of wind, 2,000 MW of solar, and 2,000 MW of hydro power generation capacity by 2020, which will bring the share of renewables to 42% of installed capacity.

To accelerate the push towards a new energy balance, the country adopted law 13-09, which authorises the private sector to build renewable energy generation facilities and to sell green electricity to private industrial customers by using the public electricity grid of



power utility ONEE (Office national de l’Electricité et de l’eau potable). Renewable energy specialist Omexom (VINCI Energies) in Casablanca has been involved since 2012 in installing several wind farms near the Moroccan coastline, including Haouma to the east of Tangier (50 MW), Akhfennir 1 in the south of the country facing the Canary Islands (100 MW), Foumel-Oued to the south of Laayoune (50 MW), Akhfennir 2 (100 MW)

and Aftissat in the south of the region (200 MW). The commissioning by Omexom of the last farm in this series was finalised in June 2018 on the Khalladi site near Tangier. The 40 wind turbines, each with a 3 MW capacity, have a total installed capacity of 120 MW. Built by energy company Acwa Power, the farm will deliver an “annual reduction in CO₂ emissions of around 144,000 tonnes,” says Anas Zirari, Omexom business unit manager in Casablanca who managed the entire Khalladi project. The electricity evacuation works for the farm covered the supply, assembly, connection, and commissioning of the various facilities: control centres, underground networks to evacuate the electricity generated by the turbines, fibre-optic networks between the turbines, and connection to the national power grid.

The electricity generated on the Khalladi site is transported via the ONEE grid and sold to Moroccan manufacturers at very competitive prices. The added advantage for industrial companies is that they can showcase their involvement in the green transition and sustainable development.

ISOLATED FARMS IN AMAZON RAINFOREST FINALLY GET ACCESS TO ELECTRICITY

As part of an initiative to bring electricity to communities living on islands created by the Tucuruí dam in Brazil, Omexom has installed mini photovoltaic power plants. This agile solution was encouraged by the public authorities.

It is a cruel paradox that in the state of Pará in the Amazon rainforest, the workers who built the Tucuruí hydroelectric dam, one of the largest in the world, on the Tocantins River, 350 km to the south of Belém, have been living "in the dark" up till now. Settled among the region's hills, which became islands after the creation of a vast reservoir when the dam was built between 1974 and 1984, the workers and their families have had no access to electricity. Only a few farms had a diesel generator, relying on a highly expensive, polluting and non-renewable source to meet their most basic demands for energy.

The installation on these islands of 1,361 solar panel systems between January 2019 and January 2020 is set to change the lives of all these families who so far have used oil lamps for light and have preserved perishable goods in ice that they fetch by travelling by boat every day to the mainland. Works on the photovoltaic power generation



facilities are being carried out by Omexom's Brazil branch (VINCI Energies). The project is part of the "Luz para todos" programme introduced by the Brazilian government to supply electricity to the 10 million-plus people living in rural areas with no connection to the grid. The programme supports renewable

solutions, considered best suited to resolving the issue of isolated areas. According to the public authorities, which are financing up to 85% of the costs of implementing these projects, solar PV, wind power, mini hydroelectric power plants, and even in some cases natural gas, are the types of energy generation that should be promoted to bring

electricity to the areas in the rainforest and Pantanal that are "cut off from the world".

Social and environmental dimension

The hundreds of islands scattered across a 40 km² area around the

Solar photovoltaics, wind power and mini hydroelectric power plants are all solutions that should be promoted to bring electricity to areas that are "cut off from the world".

fridges and TVs," says Eduardo da Matta, solar business manager at Omexom in Brazil. The project has a strong social dimension in the sense that it "will change the lives of thousands of families by giving them access to power," he stresses. In a country that is seeking to rebalance its energy mix by focusing on renewables, particularly solar power, it also has an important environmental dimension. "For Brazil, this kind of off-grid project (involving stand-alone generation units not connected to the grid) shows a new trend, and Omexom is in the front line in contributing to its development," concludes da Matta.

THE AIRPORT OF THE FUTURE, DRIVEN BY NEW TECHNOLOGIES

From check in to baggage drop off and security screening, all stages of passenger movement through the airport are being automated to simplify the process. VINCI Airports is one of the main companies leading this transformation.

Online check in and ticket storage in smartphones are now giving the airline passenger a first glimpse of the digital transformation taking place in airports - but only a first glimpse, since the transformation that is increasingly being rolled out is set to completely overhaul the air travel experience. State-of-the-art technologies such as blockchain, robotics, and artificial intelligence are now being used to provide "smooth and seamless" travel, says VINCI Airports Technical Director Cédric Laurier. For VINCI Airports - which is part of the VINCI Group and operates 46 airports around the world - the airport is more than a transfer point through which it must be possible to move as smoothly as possible. "It is a gathering place where people accompany their family and friends, and it must be made more people-focused, while making the most of digital technology," says Cédric Laurier.

All stages of the passenger process, including check in, baggage drop and security are covered. VINCI Airports is currently testing an automated self bag drop system in three airports - Lisbon, Portugal; Nantes, France; and Kansai International, Japan. "So far the passenger was only able to check himself in to get a boarding pass. Now he will also be able to check in his own baggage," says the Technical Director.

Biometrics at the border

VINCI Airports has other innovations on the drawing board that use

biometrics to reduce queuing times at security screening, one of the bottlenecks in the passenger process. Optimised facial recognition will enable the passenger to go through border control without having to show his or her passport several times. This innovation is in keeping with the efforts of the main aeronautical industry service providers to make biometric identification the new benchmark in the airport. The passenger scans his or her passport and boarding card at a kiosk and then uses its built-in camera to take a photo. The software then compares the selfie to the passport photo

to confirm the passenger's identity. Providers say that three-quarters of the world's airports will soon be equipped with biometric identification systems.

BIM and predictive maintenance

Digital technologies that promise to gradually improve the passenger experience also help to "better manage the facility," says the VINCI Airports Technical Director, who emphasises the advantages of BIM. The BIM created during design and construction of new infrastructure such as the airports in Santiago



By the end of 2021, three-quarters of the world's airports will have biometric identity checking systems.

de Chile and Salvador de Bahia (Brazil) provides valuable information that can be used in subsequent airport operation. For example, the 3D representation includes data on the location of a lift as well as information concerning such things as its make, year of manufacture, component replacement dates, and maintenance schedule. The noise emitted by a moving sidewalk can be processed to anticipate a breakdown, send a maintenance team and prevent the problem rather than having to repair it. Predictive maintenance ensures better performance. It also boosts passenger comfort, by removing obstacles so the passenger has more time for himself or to interact with others.

THE NEXT STEP IN SMART BUILDING DEVELOPMENT AFTER BIM? BOS!

Next-generation buildings feature more and more digital applications, but struggle to make them communicate with each other. That's where BOS (Building Operating System) comes in – a solution linked to BIM (Building Information Modelling).

If the place it actually occupies in the urban landscape was to be measured against the media coverage it receives, then the smart building would today represent a new benchmark in the construction and maintenance market in this sector. There's no doubt that it's a growing industry. "Smart buildings, in other words buildings that incorporate automated systems and offer a range of services for owners, occupants and operators, first took root in commercial office buildings but are now entering other parts of the property market such as hospitals, supermarkets and museums.

What's more, they are being rolled out very quickly, across the whole country," says Aymeric Tissandier, engineering & works director for Building Solutions at VINCI Energies. But as this first generation of smart

buildings spreads, it is starting to show its limitations. The stumbling block is the same everywhere: poor data accessibility and management. It's precisely this building and occupant-generated data that is supposed to differentiate smart buildings from older structures. "In its current form, the smart building has not yet been able to deliver on its promises," says Houda Matta, smart building manager at VINCI Energies.

While the increasing number of applications using and generating large volumes of heterogeneous data adds a layer of complexity, the main issue to be resolved before smart buildings can become

mainstream is the capacity of the players involved to overcome their "silo" mentality and to find a way for buildings to function intelligently at the operational stage.

Operating system

In this, the market has a valuable ally: the Building Operating System. BOS is a central software platform that enables "business verticals", traditionally compartmentalised at all levels of building infrastructure and use, to communicate with each other.

"The purpose of BOS is to transform buildings into a scalable digital

platform that offers services with real added value. It is key to the smart building's service-based value proposition," stresses Philippe Conus, Building Solutions director at VINCI Energies.

Its innovative power is based on three things: visualisation, openness, and scalability. Directly linked to Building Information Modelling (BIM), this Building Operating System provides graphical, intuitive access to data. Each of the building's automated functions is positioned in the right place in a 3D representation. This means lighting fixture X in office Y at the end of a corridor on floor Z can be immediately





“The purpose of BOS is to transform buildings into a scalable digital platform that offers services with real added value.”

identified and serviced remotely, in real time. “This spatial qualification of raw data requires all players to have previously agreed to share standards. Whether infrastructure, computerised maintenance management systems (CMMS), BIM, building management systems (BMS), IoT or, by means of a trickle-down effect, service

applications more specifically aimed at building users, all of these functional building blocks must speak a common language,” explains Aymeric Tissandier.

New ways of working

Throughout its lifecycle, a building will collect data generated by its occupants. In this respect, the Building Operating System plays the role of translator to facilitate the interpretation, analysis, and correction in real time of user services (room reservations, lighting, temperature, air quality, connectivity, dialogue with applications outside the building, etc.). It ensures that updates are made over time, thus protecting the smart building from obsolescence. In short, BOS acts as an open, dynamic database that can be

modified in real time, connecting BIM data with other sources of building data.

“BOS will introduce new ways of working to our operations,” adds Philippe Conus, Building Solutions director. “To design and implement buildings equipped with self-learning and consequently scalable services, we will need to integrate new areas of expertise in network architecture, data interpretation, management, maintenance, and cybersecurity for infrastructure.” Furthermore, the VINCI group intends to play a pioneering role in this through its future head office in Nanterre (to the west of Paris), which is due for delivery in 2021. “Archipel”, which is set to be fully designed, built, and managed using a digital approach, will be the first large-scale, real site to run BOS at full throttle.



“**BOLD
TIMES
ARE
DRIVEN
BY
BOLD
PEOPLE**”

**SAMANTHA
DAVIES**
SKIPPER OF THE INITIATIVES-
CŒUR SAILBOAT.
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AGILITY **LEADER**

PERFORMANCE

ASTRID GUYART, ATTACKING ON ALL FRONTS

The fencing champion is pursuing a parallel career as an aerospace engineer. In her spare time, she also writes picture books for children. Life has taught her - a determined woman - to adapt.

Astrid Guyart has learned to face up to difficult challenges - in life and in fencing. As a fencing champion who has won many medals, she has been recovering from knee surgery since November 2018. At 36, she remains as determined as ever to participate in the May 2019 qualifying tournaments that will select the French team to take part in the Tokyo Olympics next year. "Adaptability is the key to a high-level career," says Astrid Guyart. Back in 2007, following a hip injury that prevented her from performing a conventional fencing attack, doctors gave her a choice between two options: stop competing to maintain her health, or completely overhaul her approach to the sport.

"I chose the second option so I could pursue my dream of competing in the Olympics," she says. "Learning the new technique enabled me to improve my game and move up a level. The new technique has now become my special move, the one my opponents fear. It is almost Darwinian: what enables you to survive at one point is what ultimately makes you stronger." Astrid Guyart started fencing very early, at age five, when she began accompanying her big brother Brice, who is also a fencing champion, to the Le Vésinet club on the outskirts of Paris once a week. At about the same time, Astrid discovered her other passion: space.

Starry-eyed

"The creation of the universe, the Big Bang theory, fascinated me," she says, and today she is still starry-eyed when speaking about it. Immediately after high school she therefore enrolled in both the INSEP Escrime fencing school and an aerospace engineering school in Sceaux, west of Paris. "A lot of people at the time told me I needed to choose one or the other, but I have learned that it is important to stay the course and always believe in what you are doing," she says. And she demonstrably succeeded: Astrid Guyart became a foil fencing champion and also joined EADS in



"There will always be people telling you that what you want to do is not possible. It is important to stay the course and believe in your dreams."

2006, Airbus in 2013 and finally the ArianeGroup in late 2016. Having started out in the preliminary design office, she was appointed head of the materials and processes laboratory developing new space technologies in 2016. Does she take the same approach to fencing and aerospace engineering? "I am the same person in both fields, and so I naturally apply the qualities I developed in high-level sports to my professional activities," she says. "Being able to work with the best (in sports,

you cannot succeed by yourself), remain open-minded and curious (in sports, you have to be constantly seeking new techniques and methods) and concentrate are important both in sports and at work, when you are at a meeting, a presentation to a client. In all these cases, you need to be focused on the present." In April 2019, Astrid Guyart took leave from ArianeGroup to devote herself full-time to preparing for the summer Olympics in Tokyo in 2020. The event is a crucial milestone in her sports career, but that doesn't keep her from continuing to actively take part in the Athletes' Committee chaired by Martin Fourcade, which is preparing and organising the 2024 Games in Paris. "Right now we are working on the design of the Olympic village. The work is very instructive. I am dealing with subjects I am not used to tackling," she says enthusiastically. "We don't always realise it, but actually we all have multiple skills."

Virtues of failure

Astrid Guyart intends to pursue another of her skills, which she

discovered in 2016: writing picture books for children. "I wanted to give my niece a book about sports. But I couldn't find one that could fire a child's enthusiasm for stories about the subject - so I decided to write one for her. That ended up starting the "Les Incroyables Rencontres de Jo" series, in which the hero, Jo (the name stands for Olympics in French), meets a future grand champion," she explains. Le Cherche Midi published the first three picture books in March 2017, with "Jo, Haut Perché" on the pole vault, "Le Face-à-face de Jo", on fencing and "Le Rebond de Jo", on basketball. Another book was added to the series in April 2018 ("Le Coup de Main de Jo", on handball) and a fifth was published in October 2019.

In writing, as in sports and in her professional life, Astrid has learned from her successes and also from her failures. "Victory confirms a step forward. Failure forces you to ask yourself: 'How can I do better? What does this setback have to teach me?'" Being dissatisfied pushes you to make sure it doesn't happen again. It accelerates your progress," says Astrid, an insatiable competitor.

AGILITY FOCUS

TRANSFORMATION

AGILITY MAKES ITSELF HEARD

Though they have now become a very popular consumer product, voice assistants have so far made few inroads in the business world. In some settings, such as factories, workshops and open-plan offices, ambient noise can prevent the devices from fully understanding voice instructions. In others, security of voice communications sent to the cloud, where algorithms process the data to provide answers or trigger action, can also be a concern.

Such constraints have prevented massive rollout of the technology in the BtoB environment.

But in the more or less foreseeable future, technological progress will overcome these obstacles. Already, a number of industrial and service sector activities are beginning to test the new human-machine communication resource, and business solutions are beginning to emerge, mainly in customer service and e-commerce applications such as voicebots - chatbots using voice rather than written communication.

SUMMARY. Voice must **make its way** in the business world, p.22... Still **at the factory gates**, p.24... The **smart building** seeks its voice, p.26... The voice **security** issue, p.28... **SARA** speaks up, p.30...

VOICE MUST MAKE ITS WAY IN THE BUSINESS WORLD

Voice assistants, a popular consumer product, have so far been little used in business environments. Yet already, a number of industrial and service sector activities are beginning to test the new human-machine communication interface.

Although Alexa, the voice assistant sold by Amazon, has so far been available only via Echo speakers, now in the United States, the huge American market leader has introduced a new range of Bluetooth accessories that enable people to talk to their voice assistant via connected earphones, rings, and glasses. The development reflects the success of the new human-machine interface introduced in 2011 with Siri in the Apple iPhone. Connected speakers (Amazon Echo, Google Home, Apple Home Pod) have been sold in the United States since 2014 (when Echo was introduced) and in France for the past two years. There are currently an estimated 114 million such speakers in operation around the world, and specialist consulting firms expect strong growth over the coming five years. In the United States, one household in four already has a connected speaker. And in France

there are now 3.2 million such devices, up from 1.7 million in 2018 (according to the Médiamétrie institute), and between 16 and 20 million voice assistants via smartphone (according to the Roland Berger consulting firm).

Noise and security issues

But in the work environment, it is still highly unusual for people to use a voice assistant. In some settings, such as factories, workshops and open-plan offices, ambient noise can prevent the devices from fully understanding voice instructions. In others, security of voice communications sent to the cloud, where algorithms process the data to provide answers or initiate action, can also be a concern. Such issues have prevented massive rollout of the technology in the B2B environment. The fact that Google and Amazon recently admitted that

conversations via their speakers were being listened to, including by human operators, has heightened the concern. To avoid having to rely on the GAFA companies for voice solutions, some 30 French public (research laboratories) and private (such as Snips and Kwalys) stakeholders have set up Le Voice Lab "to enable the French and European voice ecosystem to compete worldwide and to deliver an alternative to the existing range by offering high-performance IPAs and voice services."

Voice technology attracts but also causes concern

Apart from technical and security issues, there is also cost. Installing a voice solution in a business setting costs an estimated €300,000 and one year of development work if it is carried out in-house, €70,000 and six months if provided

by an agency, and €40,000 and two months if provided by a software publisher and its network of experts, says Hicham Tahiri, CEO of Smartly.ai. Despite these limitations, business solutions are beginning to appear, primarily in customer service and e-commerce voicebots (chatbots using voice rather than written communication) but also in workshops and factories. According to a study by the Pindrop company involving 500 heads of companies and IT managers, 85% of companies will have introduced voice technology to communicate with their customers by the end of 2019. But 85% of them also believe that their customers' fear of data abuse will slow the introduction of the technology.

This ambivalence is inherent in voice technology, which simultaneously attracts and causes concern. Conversational solutions are increasingly provided by companies such as startup Vivoka in eastern France, which offers software, and also Zac, a physical voice assistant for the hospitality industry. In June of this year, the company announced that it was opening the world's first voice technology marketplace, Voice Market, to help companies sort out the wide range of chatbot and other voice solutions now available.

Voice-controlled robots?

Simsoft Industry, a company in southern France, has developed Vogof, a smart voice assistant,

and Spix for "technicians working in Industry 4.0". For the time being, the main use to which voice technology is put in industrial environments is to assist maintenance technicians, for example those working on a power distribution grid. An American startup, iT SpeeX, has also developed a voice assistant to control machine tools. But before industrial robot lines can be controlled by voice, regulations will have to change, since the ISO standards do not yet cover the technology. Work will also be needed to demonstrate to operators that the new interface actually facilitates their work, and to train operators in vocabulary learning techniques to ensure that the voice assistant understands their requests.



STILL AT THE FACTORY GATES

Voice assistants are just starting to be seen in industry. But before an assembly line can be controlled by voice technology, constraints such as background noise and data structuring first need to be eliminated.

“ATHENA, warm up the machine,” commands a technician with a wireless headset standing by a machine tool. “The machine is warmed up,” answers an artificial woman’s voice. This conversation between a human and an AI system to control machines and industrial robots could one day become commonplace in workshops and plants.

Indeed, a human-machine interface called ATHENA has been developed by American startup iT SpeeX, which is part hardware (headset, computer, and peripherals), part software. It can be used to control the machine by voice, request status reports, and coach operators in other processes.

This new way of interacting with machines and industrial robots is still in its infancy, since iT SpeeX only presented its technology in September 2018 at Chicago’s IMTS show. It will be a while before the system has been tested, approved, and made available outside the US. In France, software publisher SimSoft Industry offers smart voice assistants like Spix or Vogof for industry. Vogof enables technicians

to control procedures or task schedules by voice, access relevant and context-driven information that will help them, and report structured information about the measurements or observations

“Voice is probably the most promising of the human senses if we’re speaking about productivity. But it’s only just starting to make inroads into industry.”

that they need to perform. This means that technicians can work hands-free and remain focused on their tasks, while maintaining connectivity with their information system. Parts manufacturer for the aircraft

and automotive sectors Ventana has been working with SimSoft Industry for the past two years, developing a voice assistant tailored to its business areas.

Structuring voice data

“Voice is probably the most promising of the human senses if we’re speaking about productivity. But it’s only just starting to make inroads into industry,” says Thomas Leseigneur, innovation manager at Actemium, the VINCI Energies industrial solutions brand. Voice-based AI and learning technology will need to incorporate the relevant technical vocabulary, in other words the specific characteristics of the industrial environment, since language processing systems work by learning. “Voice is unstructured data, just like images. So, voice assistant-driven data structuring is key to properly utilising all the information,” points out Leseigneur. Background noise, which can hamper understanding of



commands by the voice assistant, is another major constraint, particularly from a safety point of view. SimSoft Industry employs an ergonomist specialising in language so that the assistant fully understands the vocabulary used by operators. When it comes to reports, saying information out loud rather than writing it up saves a lot of time in document processing. “For example, if an operator is performing a survey of a machine and notices a problem with a part, they can log the information verbally.

The system can check in the CMMS (computerised maintenance management system) whether the part is available and automatically trigger, if necessary, an order for the spare part,” he explains. Voice assistants will need to play their part in the automation of business processes, which still rely on paper reports, and generate workflows between various workstations. For instance in assembly, where voice technology will deliver a more seamless interaction in the production process.

But manufacturers are still wary about having their data stored remotely. And if business voice assistants use the cloud like their consumer counterparts Alexa and Google Home, then data exchange via an embedded system will need to be considered so as to reassure industrial clients. Once all of these obstacles have been overcome, AI-driven voice assistants will one day be able to control the entire production chain. The outcome? Factories that look more like sci-fi films than Charlie Chaplin’s Modern Times.

THE SMART BUILDING SEEKS ITS VOICE

Voice assistants, increasingly used in the home, have not found their way into the work environment. Not yet. To do so, voice technologies will have to accommodate the specific features and limitations of work spaces.

"Say Siri, open the shutters." "OK Google, play the Beatles playlist." "Alexa, dim the lights in the living room." These requests to voice assistants are becoming routine in high-end apartment listings over the past several months. In the workplace, however, voice applications must adapt to the limitations of the work environment. Although voice assistants are becoming a popular consumer product – there are between 16 and 20 million users via smartphone and 1.7 million connected speakers in operation in France, according to the Roland Berger consulting firm – voice technology is not yet a focus of attention in business properties. As Diego Harari, Director of Innovation and Sustainable Development at VINCI Immobilier, explains, "Technologically, there are no obstacles. But interaction is different at work and in the home. I cannot imagine entering a meeting room and saying out loud, 'turn on the light'. This use case has no added value."

Interconnecting voice and the smart building

However, David Ernest, Director of Innovation and Business Development at VINCI Facilities, the VINCI Energies Facility Management brand, says that "We do not yet have a voice transformation strategy but we are preparing its advent." The first project will be to integrate voice technology in the work environment and foster communication between teams. "Voice technology is useful when it provides information for others, and a nuisance when my neighbour says things of that are of no consequence to me," says David Ernest. For Diego Harari, if tomorrow's smart building includes voice, the technology will interconnect with office information software, internal and external service providers, etc. "When you want to set up a meeting, you need to find a room, manage the diaries of the participants, order meal trays,

provide car park access for outside participants, etc. In terms of ergonomics, it is easier to use a connected voice assistant than to use several separate software applications."

Voice interfaces will no doubt be available to manage the many service applications making up the BOS (Building Operating System) systems that various publishers are expected to soon be offering.

"Several international IT majors (Google, Microsoft, etc.) appear to be developing such projects," says Diego Harari. Another technology tool coming into widespread use is chatbots. Some of them are migrating from text to voice and becoming "voicebots" that provide a human-machine interface closer to human interaction.

Which economic model

VINCI Facilities is also keeping close track of artificial intelligence



startup SPooN.ai, founded by the inventor of the Pepper robot, which is building "artificial creatures". But the business model has not yet been defined: who will pay to buy or rent the robot, and cover the cost of ensuring interoperability with the smart building? Nevertheless, David Ernest is confident that voice technology will spread to B2B and predicts that "the price of the technology will come down." He adds, "I think that in the short term we will have small microphones to manage all

"Voice technology is useful when it provides information for others, and a nuisance when my neighbour says things of that are of no consequence to me."

the necessary requests. These systems are part of our service interface roadmap." The VINCI Facilities Director of Innovation and Business Development says that he is also confident that these voice PLCs will not replace human beings. "The opposite may happen," he says. "Employees will be able to better focus on their actual jobs because a voice assistant will relieve them of tasks with no added value, such as reserving a meeting room."

THE VOICE SECURITY ISSUE

Specific - especially security-related - constraints must be addressed when integrating voice assistants in a work environment. Should a cloud solution provided by one of the major American suppliers be selected, or a local solution such as those offered by a number of startups?

Alexa is listening to you. All the time. Amazon's voice assistant is installed in all Echo connected speakers and in the new connected devices that the e-commerce giant has just unveiled: Buds (earphones), Loop (ring), and Frames (glasses). It sends voice requests to the cloud to be decoded by algorithms and receive appropriate responses. But AI is not the only thing at work here. It was recently revealed that human operators listen in on some conversations without the knowledge of the users. The resulting uproar also involved Google and its Google Home assistant. Since then, the two American companies have taken a range of corrective measures to reassure owners of the slightly-too-curious smart speakers. What might possibly be tolerable in private life is not acceptable in a work environment, where some conversations are strategic. Will voice technology now come up against a barrage of security issues? Alain de Pauw, Division Manager

at Axians Germany, downplays that danger. "I believe that voice technology is coming in any case. We will then need to add a security layer. But I haven't yet seen an Amazon Echo on the desk of any of our employees except for demo purposes," he says.

Protection and education

"The cloud and connected objects must of course be protected with stronger authentication. But actually, the most important thing is to educate users about what they may and may not do with the voice assistant. The same thing applies to email or even Cloud broker solution: What can you do and can't do in an e-mail or where to look at in any mail communication?" he adds. In Germany, VINCI Energies also carry out internal audits to assess the degree of compliance with security instructions governing any communication channel (written or voice communication, etc.). Axians receives a large number of requests related to IoT and smart solutions

like smart City, Industry, Buildings, etc. "When these technologies are introduced in the work environment, the devices will be connected devices. First, focus on the basics.

"What happens if I am in an office with a client and one of these speakers is there listening and transmitting the conversation to the cloud?"

Make sure your account, WiFi network, and other internet networks have strong, secure passwords hackers won't be able to easily guess. Regularly update the firmware of your router and other physical internet infrastructure

to protect against exploits, too", says Alain de Pauw. In terms of privacy, place those devices away from areas you'd rather it not potentially overhear conversations. The next step is to remove the ability of your device to send data.

Cloud alternative

These measures are not specific to voice technology - they apply to all connected objects. However, for voice assistants, appropriate solutions will have to be introduced to ensure security of communication and transfer of voice conversations. "What happens if I am in an office

with a client and one of these speakers is there listening and transmitting the conversation to the cloud? This is also something to think about when using Skype, WhatsApp and Microsoft Teams," says the division manager of Axians Germany.

There are solutions to ensure security for the cloud and on the cloud. The necessary measures include complex passwords, security patches, gateway protection, modification of the default names of voice devices, and the addition of authentication layers. Alongside the manufacturers of connected voice speakers such as Amazon and Google, which use

Amazon Web Services (AWS) and Google Cloud Platform, startups such as Snips in France offer a different model using a voice recognition technology for connected objects that does not send information to the cloud and instead retains requests locally in the devices. Snips offers a suite of solutions building on the Privacy by Design principle used in smart buildings, sales booths, and household appliances. The startup is expected to begin marketing a connected speaker in 2020. This alternative may prove beneficial for companies seeking to increase confidentiality once voice technologies have invaded the workplace.



SARA SPEAKS UP

The teams at Axians Portugal used artificial intelligence technologies to develop the SARA chatbot platform, which is already up and running in Belgium and will soon be operating across Europe as a whole. Voice technology is bringing major changes in marketing.

Chatbots, the conversational tools used by customer relations departments, have become widespread in recent years. Progress in artificial intelligence is now transforming these tools into "voicebots", giving them substantial added value. One example is SARA, the platform developed by Axians Portugal. The teams of the VINCI Energies brand specialising in the new communication technologies developed SARA using artificial intelligence tools called NLP (Natural Language Processing). "SARA was developed to create a multi-channel integration platform, remove the complexity of managing multiple bots separately, and create a standard development practice for multiple partners. We used Building Blocks with an Infrastructure as Code approach (the process of managing and provisioning applications through machine-readable definition files), cognitive services (simulation of human thought processes in a computer model), and an AI engine to enable the chatbot to generate the conversational Intelligence that powers SARA's "intelligence". The platform is prepared to integrate and is trained with enterprise systems like ERP and CRM and 3rd party solutions like contact centres and other bots," says José Marouço,

Cloud Business Development Manager at Axians Portugal. SARA is a multi-channel (Facebook, WhatsApp, Skype) tool that is also a voicebot able to answer customer requests by voice. When the conversational assistant does not know the answer,

"To improve on interactive voice servers, the game changer is artificial intelligence."

it forwards the request to a human contact. The first application was developed for a Belgian insurance company, Ageas, which operates in 22 countries. "They tested the chatbot here in Portugal. The platform was designed to use natural language via voice and not just text, so as to better understand customer requests," says José Marouço.

Added value

A quarter of the customer questions involve green automobile insurance

cards. With this technology, Ageas can relieve its employees of low-value-added tasks, such as questions about green cards, and instead assign them to work on managing marketing campaigns, which is of substantially greater value for the company. The other benefit of SARA is the ability it gives sales personnel to adjust their selling points in real time. For the Axians Portugal Cloud Business Development Manager, voice technology is bringing about a profound change in marketing. "To improve on interactive voice servers in which a voice asks the caller to press buttons to be put in touch with the relevant department - which consumers often find frustrating - the game changer is artificial intelligence, which substantially broadens the opportunity to converse in natural language. Clearly, voice is the way business will be done in future." To ensure security and confidentiality of conversations, as well as compliance with the GDPR, Axians uses Microsoft or Amazon cloud services. All conversations are scrubbed from the database after two hours. The SARA platform will soon be presented at company roadshows in several European countries, including France, Belgium, and Austria.

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WHICH COMMUNICATION INFRASTRUCTURE FOR THE SMART CITY?

Fibre, WiFi, LoRa, 4G, and soon 5G: which network is best for a smart, efficient, and well-run city?

The best answer is a combination of networks converging in a data-sharing platform, based on the existing urban infrastructure, and focused on open standards.

Fibre, 5G, WiFi, Bluetooth, LoRa, Sigfox, etc. Which is the ideal network for connecting the smart city's many communicating objects? None of the above, or rather all of them, say the experts. Axians (VINCI Energies) Business Unit Manager Stéphane Guidarini says that "There is no single, universal solution for connecting all the buses, cars, urban lighting, and water and energy systems that have built-in sensors.

The best solution for a municipality is a combination of mobile, fibre, WiFi, and LoRa. Each technology meets a specific need, in terms of coverage, reliability, and efficiency. "The choice of technology will depend on the priority – range, cost, energy consumption, bandwidth, latency, or data transfer rate.

Analytical smart camera

When a fibre optic network has already been rolled out in a municipality, it can be used to serve different points if a high data rate is needed – for example, to install analytical cameras, which can sometimes be more advantageous than a network of sensors. In Lisbon, Axians has rolled out a smart parking solution based on the technology, which combines video image capture and analysis not just to report information on parking space availability but to detect inappropriate vehicle behaviour or wrong-way traffic. Traffic analysis at the Place de la Nation in Paris is another example

of the use of the smart camera, which can recognise pedestrians, cars, and even abnormal vehicle behaviour within an urban area to detect an accident.

"The analytical camera is more precise and easier to install. It will come into widespread use in the smart city," says Stéphane Guidarini. This is particularly true now that edge computing can be used to process data locally and avoid reporting data that could be used to identify people or vehicles.

Promising 5G

Bandwidth is needed to transfer these large files and sometimes

WiFi is not enough. If, on the other hand, the municipality has decided to offer its residents this wireless Internet connection service, the network could also be used to interact with the citizen installing the app. WiFi service could also be used to count pedestrian traffic flows, as is now being done in Aix-en-Provence, in order to study how people move within the city. For services using sensors that transmit relatively little data, low data rate networks that consume little energy, such as LoRa and Sigfox, are appropriate. In Aix-en-Provence, sensors measuring such things as air quality and waste-bin-filling rates send the data once





“The core of the smart city information system is the pooled database that stores and correlates the data reported by the networks.”

an hour to the city's Lora network. The two-way network is also used to send instructions to connected objects to control such things as smart watering of city gardens. Lora is a technology based on open protocols, enabling the municipality to upgrade its smart city scenario over time while protecting its long-

term investment. The use of open protocols is recommended since interoperability is key to ensuring smart city efficiency. 5G technology, which has a promising future in the smart city, will not replace the other networks. Its higher cost will mean that it will be used for purposes requiring high data rates and high performance – for example, to manage mobility involving the connected vehicle, says the Axians Business Unit Manager.

In addition to technical features, it is important to consider other criteria when rolling out a city's communication infrastructure. First, "Start with the city's existing systems." Existing communication networks can be re-used in the new infrastructure. Then, "To keep costs under control over time and ensure that data governance is independent of

the stakeholders in the region, it is preferable for the city to own its communication networks," says Edouard Henry-Biabaud, Business Development Manager at Axians.

Communication networks are the first of the city's three basic technological components. "The second is the pooled database that stores and correlates all city data reported by the networks. Data centralisation is crucial in a Smart City programme because it increases the value added delivered by the third component - the applications that support new uses for citizens and city departments. The better these applications combine data from multiple sources to present a broad picture representative of the way the city actually works, the more useful they will be," says Edouard Henry-Biabaud.

ICT INNOVATION

4DX-ENABLED CINEMAS DELIVER THRILL RIDE

Equipped with this immersive technology, Pathé Gaumont cinemas put viewers at the heart of the action, giving them a physically-engaging experience.

Impressive stuff: 4DX, the latest technology being rolled out to rekindle interest in movie-going, blows wind and sprays water at the viewer whose seat starts to vibrate when the earth opens up on screen, while flashes of light mimic lightning bolts from the movie scene... The South Korean 4DX movement is supported in France by the Pathé Gaumont group which is carrying out a comprehensive retrofit programme, filling auditoriums with technology to deliver the ultimate experience. Having completed projects in three cities and with more under way, Cegelec Tours Electricité (VINCI Energies) specialises in the specific wiring required for 4DX-enabled cinemas. The combination of special effects is achieved by activating sophisticated mechanisms in the auditorium itself and in the articulated cinema seats which move in all directions and feature concealed sources of ventilation and mist in the headrest.



In the auditorium, two 6m-high articulated hoists and mounts with integrated fans, scent diffusers, and strobes are powered by cables that fold in and out "like snakes", with a capacity of up to 100 million cycles. As well as being technically complex, these installation projects involve time constraints that call for tight management, particularly in terms of human resources.

Time constraints

"We need to be able to start a project 48 hours after the order has been placed and to deliver a retrofitted auditorium within 5 to 6 weeks at the very most, taking into account

the absolute need to keep quiet in auditoriums while screenings are taking place next door and the 4-week period required for the delivery of seats and devices from Korea," says Jeremy Barque, project manager at Cegelec Tours Electricité.

At the end of the 5 weeks, the equipped auditorium still needs to get the go-ahead from the safety committee and the South Korean supplier. Barque points out that there is not a single detail missing at handover of the works, which are delivered without any complaints from the client and on time. Get ready for the ride with Godzilla and the X-Men!

BANQUE DE FRANCE PRINTER DEPLOYS ROBOTS

Actemium has designed and installed an automated banknote packaging production line for the Banque de France printer in Chamalières, central France. The processes improve security, productivity, and traceability.

In Chamalières in the Puy-de-Dôme department, the French central bank's printer is opening its doors to... robots. Faced with the need to upgrade the workshops that house its printing presses, the security printer called on ISI, an industrial solutions integrator that forms part of the Actemium network (VINCI Energies), to help revamp its banknote packaging production lines.

Before works got under way and as part of a competitive dialogue, ISI started by "holding discussions with senior executives from the Banque de France's printer about ways to introduce Industry 4.0," explains ISI manager François Gsell. The client particularly appreciated this phase, using the preliminary study to "explore the various automation scenarios that would enable it to deploy fully automated banknote packaging

production lines on the current site while anticipating their integration into the future plant that will bring together the paper mill and printing works," says Michel Antony, process buyer for banknote production at Banque de France. "This preliminary expertise phase is very important," stresses Gsell, "because that's where the source of gain is for the company." Here, the gain for the Banque de France printer is a qualitative leap in terms of security and faster packaging of bundles of 1,000 banknotes.

Security and productivity

Until the overhaul of the Chamalières workshops, the packaging process was partially automated, requiring human intervention to handle banknotes between two operations. It's this direct human contact with the notes that Banque de France banknote production managers wanted to avoid, both to enhance security and to improve working conditions on the production line by reducing simple handling tasks. "Complete traceability" is a further benefit of automation, says François Gsell.

Robots are now present throughout the entire new production line and the process is fully automated. Indeed, robots are used for transporting banknotes (around the workshop), applying film (bundles are wrapped in a film of plastic), labelling, packing in boxes and loading onto pallets, sorting boxes, and finally weighing and removing pallets.

A specific type of robot is implemented to navigate from one station to another in the workshop: an autonomous indoor vehicle (AIV) equipped with scanners, which is capable of moving autonomously while

avoiding fixed or mobile obstacles (personnel, pallets, other AIVs). "ISI innovated by installing a safe-type compartment on the vehicle chassis which can only be opened in authorised areas," explains Gsell.

Optimising flows

ISI met another, more conventional challenge by deploying the new finishing lines without interrupting production. Staggering the replacement of the 6 installations meant that 5 of the lines could remain operational at all times.

In a few years' time, the new plant, which will incorporate these new fully automated production lines, will come on stream. It will bring the paper mill and printing works under one roof, which will "help optimise flows and generate savings in terms of moving cash securely," points out Michel Antony. Indeed, the current separation of the two sites forces the Banque de France to use an expensive cash transport system.

And for this part of the process, in other words the secure transfer of banknotes, robots have not replaced humans.



VIRTUAL REALITY, SUPPORTING SAFETY

Cegelec and Actemium have developed a safety-training programme using virtual reality. The efficient and effective system has been adapted and applied in a variety of business units within the VINCI Energies Group, and will soon be adapted among their customers.

An electrician climbs into a lift platform to change a bulb at the top of a streetlight. The platform rises and stops near the top of the pole, the technician reaches out to remove the defective bulb and receives an electric shock. Disoriented, he tumbles from the platform ... and removes the virtual reality (VR) helmet that has just put him through this edifying experience. The experience is part of a safety-training programme developed at VINCI Energies. The employee is then debriefed: he had remembered to use his PPE (personal protection equipment) – helmet, harness and gloves – but had forgotten to lock out the electrical cabinet before entering the platform. Sébastien Bouteille, describing the scene, is happy with the effect it produced. “The fall that trainees suffer when they make that mistake is spectacular, and trainees will not soon forget it,” says the civil engineering worksite manager at Cegelec Tours Infras (VINCI Energies). The omission on the part of the Cegelec employee is one of the errors that can suddenly turn a job into a calamity. Rinus van

den Driest, Actemium Netherlands Business Unit Manager, and Dirk Schyvinck, his counterpart at Actemium Belgium, explain that their business units developing the VR training system based it on the ten most frequent mistakes made by their employees.

Better than a slideshow

“The total immersion provided by the virtual reality helmet has a far greater impact than conventional slide shows,” says Sébastien Bouteille, who appreciates the programme developed by his Belgian and Dutch colleagues. He adds that “VR puts the trainee in a technical environment - such as a power plant - that is not often available for training, and where you cannot risk making mistakes.” A final argument in favour of virtual reality is its economy of resources. To train employees under actual conditions, it is sometimes necessary to travel to a remote site. The helmet brings the employee to the training site virtually, saving the business unit time and travel costs.

Case studies

Thanks to virtual reality, safety training at VINCI Energies will be expanded beyond initial awareness raising to cover specific case studies. At Cegelec Tours Infras, Sébastien Bouteille is already developing further modules for his teams. One focus, for example, is on earthworks. A machine is excavating on the worksite, but the foreman has failed to carefully scrutinise the DICT (declaration of intent to begin works) documents, obtain information on existing utility lines, and carry out the appropriate markings on the

ground. The excavator rips out a cable. Here again the consequences for the technician are spectacular and harmful. Actemium Netherlands and Actemium Belgium are taking the same approach and “developing new safety training programmes,” says Actemium Belgium Business Unit Manager Dirk Schyvinck. The programmes focus on accident prevention when installing high-voltage power lines, preventing fire in underground connections, and avoiding risks relating to traffic, work at height, installation cleaning and similar situations.

Actemium and Cegelec business unit customers will be the next beneficiaries of these innovations.

Safety training will be expanded beyond initial awareness raising to cover specific case studies.



SMART ROBOT DATA SECURITY VIA THE BLOCKCHAIN

Industry could combine robots, artificial intelligence, and blockchain technology to ensure process security.

The combination of artificial intelligence and blockchain could accelerate the robotics sector and beyond it Industry 4.0 as a whole. With AI, the smart robot will have sufficient autonomy to do more than repeat programmed movements and will be able to use information supplied by its environment.

“Business’s blockchains that industry can use directly do not yet exist.”

The smart robot will directly use data from sensors to take decisions without human involvement. The blockchain will be used to secure the data, an essential requirement to safeguard the industrial process, and to guarantee the visibility and traceability of AI decisions. According to Industrie &



Technologies, a combined robot, AI, and blockchain proof of concept was to be initiated at the end of 2018 by the Akéo Plus company, which specialises in smart robots, and the CEA in Grenoble, with support from major industries. Traceability of information produced by an AI system is an issue that extends beyond the relationship between the robot and the production chain. Data exchanged via AI can involve different robots on the same assembly line but also robots in other plants, including supplier

plants, that are involved in the overall production process. Corrupted or modified data could have serious consequences, for example in the food processing or aerospace industries.

Blockchain interoperability

“No industry is currently able to guarantee its data,” says Stéphane Morel, who founded Akéo Plus. The three-year research programme carried out by the Distributed Systems and Blockchain R&D department of the CEA in Grenoble will also test the possibility of using private blockchains and the requirements for ensuring interoperability of different public or private blockchains, says the CEA project director, researcher Christine Hennebert, who points out that “Business’s blockchains that industry can use directly do not yet exist.”

Smart contracts are another focus of the test programme. The Akéo Plus founder believes that they will automate and speed up the supply chain, particularly in terms of maintenance. This would pave the way for the machine to order its own spare parts.

OSLO LEADS THE WAY IN GREEN AND INCLUSIVE SMART CITIES

The Norwegian capital designs and implements pilot programmes that forge a greener and more inclusive city using technological innovation.

Awarded the European Green Capital 2019 title by the European Commission, Oslo has equipped itself with the means to realise its environmental ambitions from a very early stage. The Norwegian

capital is also the world leader in electric cars, according to independent body OFV, and plans to ban the sale of internal combustion engine cars as of 2025 so as to meet its ambitious environmental

targets. These involve halving its greenhouse gas (GHG) emissions by 2020 (compared to 1990 levels) and becoming carbon neutral by 2050. Mobility is a key concern for a city in which car traffic accounts for



60% of GHG emissions. Oslo has not skimped on incentives to promote zero-emission cars, removing most taxes, offering free parking and access to charging points and ferries, and authorising the use of bus lanes – the congestion in these “free-flow lanes” being the price of the success of electric cars.

In the 1990s, the city introduced the Oslo Toll Ring. This automated toll system, deployed on the city’s access routes, offers incentive rates for zero-emission vehicles and generates revenues that part-finance the smart city’s mobility programmes: public transportation, cycle and pedestrian infrastructure. A powerful symbol of the city’s successful efforts to take climate and citizen well-being into account, cars are just one of the aspects of an overarching policy based on cooperation between the public sector and startups, and on implementation through a series of pilot programmes.

50 building and urban development projects

FutureBuilt is one such aspect. This 10-year programme involves setting up 50 building and neighbourhood development projects, by bringing together private and public partners. In order to be FutureBuilt-approved, the construction projects must reduce their carbon footprint by 50% compared to current standards, offer true urban and architectural quality, and be located near a public transport hub. Among these projects is the 800-student Bjørnsletta school, a model of passive energy design. Its indoor climate and energy use are fully automated, while

the number of car parking spaces has deliberately been kept to a minimum, with priority given to bike parking.

In order to be FutureBuilt-approved, the construction projects must reduce their carbon footprint by 50%, offer true urban and architectural quality, and be located near a public transport hub.

The same approach was adopted by another exemplary building, the Gullhaug Torg which doesn’t offer any parking for cars. Located close to a transport hub, the 16-storey tower includes offices and flats. Its energy consumption, offset by the amount of renewable energy generated, is practically zero, proving that buildings can be heated and cooled without using the electricity grid. Furthermore, care was taken to select recyclable materials and solutions.

A third flagship project in this programme, the New Munch Museum, also meets FutureBuilt criteria. This 12-storey building, which seems to defy the laws of physics, is protected by a ventilated

skin of corrugated, perforated aluminium sheets. The scope of the FutureBuilt programme also covers mobility. For example, a competition launched as part of the Oslo Bysykkel bike-sharing programme led to the creation of over 130 bike rental hubs in the city.

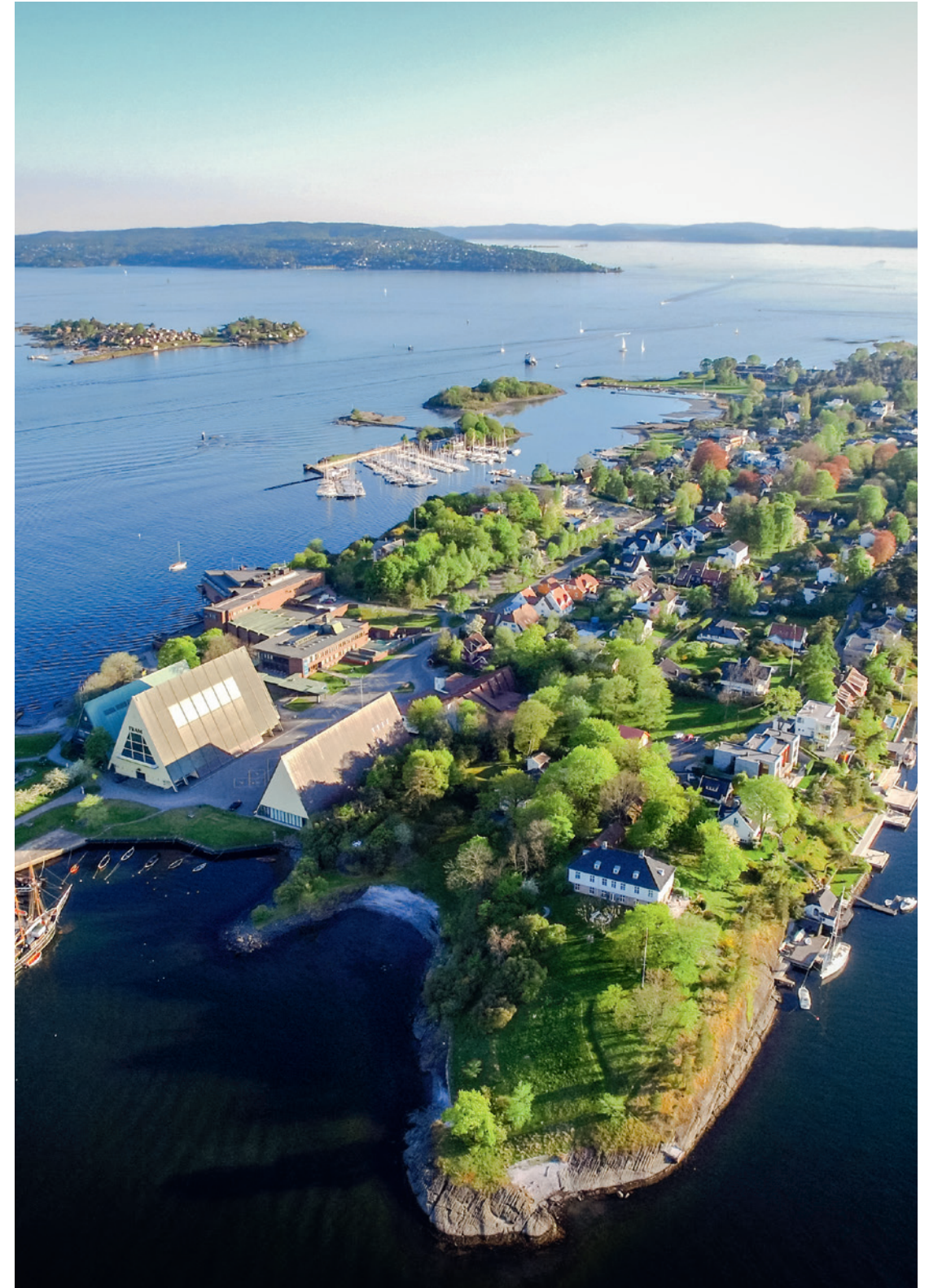
Public-private partnerships

One of the keys to the transformation of the Norwegian capital is the link between public authorities and private initiative. Smart Oslo Accelerator is a tool that provides an interface between local councillors and the private sector, particularly startups.

The organisation regularly holds a contest, called the Smart Oslo Pitch, which enables entrepreneurs to present innovations that improve residents’ daily lives in all areas. Such innovations in Oslo include the trenchless installation of water pipes, using techniques that have been tried and tested in the oil industry. The projects are shorter and less disruptive to traffic and local residents. Citizens, and in this case those most vulnerable, are the focus of the “Alma’s House” experiment.

Emblematic of the transformation vision pursued by the city of Oslo, this demonstration flat incorporates assistive technology and is geared towards patients living with dementia and their families.

Not only does it address the municipality’s concern that no one should get left behind in the smart city, but it also meets the need to find innovative solutions at a time of rising healthcare costs linked to an ageing population.



HOW DUBLIN HAS BECOME THE DATA CENTRE AND CLOUD CAPITAL OF EUROPE

The Irish capital has developed expertise in data hosting, benefitting the whole island's economy.

"People think that everything is going to come from the cloud. Well where's the cloud? The cloud is data centres and it's right here!" Here is Dublin, the Irish capital, and Brian Roe, commercial director at Servecentric, knows what he's talking about since his data centre company is one of many to have chosen the city to run its servers. Ireland is home to around 50 such data hosting centres and has become the country of choice for IT services companies, with its capital playing a full part in this digital business.

Thanks to the many assets it offers, Dublin is attracting interest from tech giants. Google, Amazon and Facebook, among others, store client data there. In Dublin and the surrounding area, the land

available to build warehouses is monitored in the same way as banks. Data security is taken seriously. There is no shortage of young, skilled techies in the labour market. And, as well as having one of the lowest corporation tax rates in the European Union at 12.5%, Dublin is particularly well-connected to the US and Europe. Ireland is unquestionably a bridge between Europe and America. Dublin and its data centres have excellent growth prospects ahead. Data volumes are continuing to rise, driven not just by the growth of smart technologies – including artificial intelligence, big data and blockchain – but also by developments in media and social networks featuring videos, files



much bigger than written text. The city's economy directly benefits from this surge of interest in data centres. The digital services sector directly and indirectly employs some 5,700 people in full-time equivalent roles, including 1,800 data centre operators, and the country estimates that data centre-related investment will reach €9 billion by 2021. The number of facilities in Ireland is set to double in the next 5 years, say experts quoted by Business France.

Energy-guzzling servers

However, operating these rows of computers is not carbon-neutral. The energy required to run and cool servers is far from being insignificant. According to Business France, data centre consumption is expected to represent 20% of the world's electricity by 2025. Data centres can consume as much as a large town and could account for 31% of Ireland's total energy demand by 2027, says national grid operator EirGrid ⁽¹⁾.

Data volumes are continuing to rise, driven by the growth of smart technologies and by developments in media and social networks.

To counter the critics who raise the point that Ireland is struggling to meet its climate change targets, Facebook rolled out a major communications campaign about its new data centre in Clonee, near Dublin, providing assurance that the facility was powered entirely by renewable energy. Likewise, Amazon issued a statement about

its decision to reuse the heat generated by its data centre in Tallaght (to the south-west of Dublin) to heat homes and offices in the area, an initiative that represents a reduction of 2,000 tonnes of CO₂ per year. For its part, Apple, in May 2018, abandoned its plan to build a new data centre in Athenry, in County Galway, western Ireland, for the same environmental reasons. The €875-million-scheme would have increased demand on the grid by 8%, according to opponents of the project.

Lessons learned

Another criticism levelled at these data centres is the opacity of the business surrounding the data transiting through Dublin. Some have doubts about the legality and even the ethics of data flows, referring to the Cambridge Analytica scandal, the firm accused of siphoning off the data of 87 million Facebook users. A researcher at Dublin City University, Paul O'Neill raises concerns about AWS, Amazon's cloud: "The ethical implications of hosting AWS data centres in Ireland are potentially vast."

But beyond this controversy, the business is generating beneficial effects: Dublin's reputation as a digital centre is opening up new prospects for the Irish capital, with the emergence of technology clusters. Educational institutions too are benefitting from the movement, setting up tailored study programmes in science, technology, and maths. The firms building data centres and modern digital infrastructure are developing expertise, and the recognition of this expertise is attracting foreign investors. Dublin is gradually reaping the benefits of a virtuous circle initiated by its specialisation in data centres and the cloud.

(1) Interview at Agence France Presse

THE THREE PILLARS OF THE DIGITAL TRANSFORMATION IN TALLINN

The capital of Estonia serves as a "smart city role model", drawing the entire country in its wake. The success of its digital transformation rests on three pillars: accessibility, interoperability, and user-friendliness.

History and geography could have conspired to hold Estonia back in its move to digital. But they turned out to be advantages. Forced to reinvent itself after leaving the Soviet bloc in 1991, the small country with a population of just over 1.3 million and an area the size of the Auvergne-Rhône-Alpes Region in France is currently one of the world top digital performers, with 85% of the population connected to broadband, 100% of medical prescriptions provided online, all schools connected, and 30% of Estonians voting electronically. But beyond the figures, what is particularly noticeable is the way in which Estonia has designed and carried out its digital transition, with its capital, Tallinn - home to over one-third of the country's population - leading the way. The winning formula can be stated in three words: accessibility, interoperability, and user-friendliness. The common denominator is the user. The user is the true

decision-maker and the artisan of the successful transition, because technology only exists if it is adopted by everyone. Toomas Sepp, Town Clerk and administrative manager of the Tallinn City Office, confirms that it "is important to ensure the citizens are both ready and prepared to use it."

To achieve this objective, Tallinn and, in its wake, Estonia as a whole, worked to introduce the necessary infrastructure, first (as a priority) in schools and then in administration and households, all of which, rural and urban, were to have a 100 Mb/s connection by 2015. The focus was also on mobility, with a large number of WiFi hotspots set up in all public spaces.

Education

The rollout was carefully supported by activities designed to help users take the tools and their environment on board. Education

was first undertaken in schools, where connected computers were rapidly installed. At age seven, students were given a training programme, not to teach them how to code in order to make them all into coders but to teach them, more intelligently, how the code and algorithms work, as an introduction to digital culture. The training programme was also designed for top leaders. Today, in Tallinn, the Council of Ministers prides itself on being the world's first "paperless cabinet". Senior civil servants in the capital were given an introduction to design thinking to enable them and their departments to design content and interfaces that genuinely meet user expectations and needs. User-friendliness was identified as a major goal in the adoption of digital technologies. The digital identity card has become the familiar key to the digitalised world. Currently 98% of the citizens have it. Together with their PIN (Personal Identification Number) code,

the card is used to authenticate and sign all types of transactions (bank, retail, and transport) and procedures. Only three types of document are excluded from e-signature: marriage, divorce, and real estate loans.

Open data

Motorists in Tallinn who are stopped by a traffic police officer do not need to pull out their driver's license: the electronic identification suffices to give the police access to all documents. Such smooth services, which are likewise to be found in such areas as healthcare, was one reason why Estonians adopted the digital technologies.

Smooth services are made possible by close cooperation between the public and private sectors, and by a policy that is resolutely geared to open data and interoperability. In 2001, the government introduced the X-Road programme to facilitate communication between the administration's various open databases. When a data point is created, for example when a birth is registered, it is automatically sent to all social and health departments, etc. This interconnection of databases and the resulting sharing of private data was made possible by a citizen contract based on trust. In Tallinn, an unabashed smart city, transparency, data security

and strict privacy protection are organised and covered by legislation.

Civil servants received introductory training in "design thinking" to enable them to design content and interfaces that genuinely meet user expectations and needs.



AGILITY **PICTURE**

ROTTERDAM PREPARES FOR THE SHIPS OF THE FUTURE

Rotterdam in the Netherlands serves 140,000 ships per year and is a leading world port and Europe's largest. The port authority intends to consolidate this position by completing its digital transformation. It is working with Axians (VINCI Energies), IBM and Cisco to roll out an IoT platform that will pool data from sensors to extend the limits of process automation and further improve its performance. By 2030, the connectivity and interconnection of big data generated by the full range of port stakeholders should be 100% secure and standardized to accommodate autonomous ships.



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OF ENERGY AND DIGITAL TRANSFORMATION

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