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The Positive Way

WAVESTONE

TECHNOLOGY

Editorial

Dear readers,

The 2019 edition of VivaTech beat all records with 124,000 attendees, among which were 13,000 startups, 3,300 investors and 2,500 journalists from all over the world. VivaTech is the leading global technology event in Europe, with the aim of enabling European startups to become the digital champions of tomorrow and to support major groups in their digital transformation to innovate collectively, for the common good.

This year once again, artificial intelligence was at the heart of all debates, even if other cutting-edge technologies have opened up new horizons such as in the new space,

which tends to make space accessible to all, or in the mobility sector. Quantum computing, still in its infancy but promising, has left its mark on people's minds and crypto-currencies have raised many questions about the sovereignty of States.

Technology allows us to invent new business models, create new opportunities for all sectors and leads us to rethink our society to meet tomorrow's environmental, human and political challenges.

These are all subjects that Wavestone has endeavoured to present through this publication. I sincerely thank them for this invaluable work and wish you a pleasant reading

JULIE RANTY
Executive Director
Viva Technology

For several years, innovations have been transforming the world in a fundamental way, at an unprecedented rate. The new waves of technological innovation promise to be just as powerful.

They will create new opportunities, generate new business and provide entrepreneurs and companies with incredible areas to work with.

They will also have fundamental consequences, not always predictable and for the most part irreversible. They will change our lives, our societies and our economies. Are we really moving towards increased intelligence? Will we live in space, will we be happy there? Will urban air mobility appeal to the widest possible audience?

Will crypto-currency keep the promise of accessibility for all, especially the poorest, or will it become a machine for laundering illegal money? Will the quantum computer help us solve the unsolvable problems of today?

Will technological innovations be combined with energy efficiency and access to education for all?

We are very fortunate to be able to witness these developments. It is up to us to answer these questions and build the world we want. We are responsible for the world of tomorrow. Thanks to Viva-Tech for being VivaPeople and VivaPlanet too!

Partner Wavestone

Summary





Previously, the industry's historical monopolies (NASA, ESA, ArianeGroup) granted countries sole competence over the aerospace sector, thereby consolidating their global power. Today, the emergence of new players and technological advances has made this business highly lucrative. With their different value proposals, the likes of SpaceX, Blue Origin, Hiber or ICEYE, all new players in this sector, were present at the VivaTech 2019.

This trend has picked up in recent years, thanks in particular to the collapse of the sector's entry barriers: reduced costs, notably through the reuse of rockets, miniaturization of satellites, and a wider supply of launch vehicles. This booming sector now seeks to revolutionize actual uses. One of the asserted objectives of New Space is to save humanity, no less. But is that realistic?

According to NASA, it is quite possible to develop life on the Moon then on Mars. During the conference, there was talk of the «Moon Village», i.e. the first step towards an Earth-Mars mission, as envisioned by Jan Woerner, Director General of the European Space Agency (ESA). Participants in the «Fly me to Mars... and Beyond»round table concurred that developing humanity beyond the Earth is technologically feasible. In their view, collaboration between robots and humans is key to achieving this, where the robots will serve to construct and test an ecosystem viable for human life.

However, choosing to develop an ecosystem outside of the earth system is sometimes considered as overly ambitious rather than a genuine solution: lots of questions, many of them ethical, have yet to find an answer. Be that as it may, in the short term, these ambitious objectives are pushing forward not only science, but also human progress, as shown by major technological advances, such as satellite miniaturization, or rocket reuse.

NEW SPACE, WHAT DOES THIS NEW BUSINESS HOLD IN STORE?

The Moon
referred to as the
8th continent
on Earth



€0,5

Cost of a flight to the Moon per European

The Moon
eferred to as th
sth continent
on Earth

According to Jean-Christophe
Henoux in his "Beam me up Scotty,
the new space race" conference
at VivaTech 2019

JEAN-CHRISTOPHE HENOUX

ArianeGroup VivaTech 2019

"The next challenge we face is not merely going back to the moon, it's staying there."

HOLLY RIDINGS

NASA VivaTech 2019

«There is room and space for all of us [Private and Public initiatives].»



Urban Air Mobility

With transportation accounting for 30% of greenhouse gas emissions1 and considering that 8 French people in 10 own a car2, the guestion of moving on towards new urban mobility models is more relevant than ever. Uber, RATP or start-up Lilium are all hedging their bets on urban air mobility.

In 2019, the RATP signed a partnership agreement with Airbus to study the integration of flying vehicles within urban transportation. and to introduce autonomous urban air taxis within the next five years. Lilium, often credited with having the most advanced technology, is developing an aircraft capable of transporting 5 people at a speed of 300km/h using electrical batteries. Considering that French people spend an average of 3 years and 10 months of their lives inside their cars3, Vertical and Take-Off Landing (V-TOL) aircraft augur a substantial time gain for users. Accessible to all, Urban Air Mobility as a Service, may well lie at the heart of the fifth mobility revolution.

1 https://www.transportshaker-wavestone.com/la-loi-do-

rientation-des-mobilites-une-boite-outil-pour-la-mobilite-

2 Round table «Le Club Les Echos Prospective» in

down the process.

In fact, the use of airways is subject to regulations and air traffic management. French legislation currently prohibits drones from flying over cities without special authorization. Moreover, only 40% of French people say that they would be willing to get inside a self-driving car4. Hence the decision to push back self-flying planes to a subsequent phase and thus limit the psychological barriers. Lastly, considering factors such as noise pollution, safety and value creation, the deployment of this mode of transportation remains questionable.

While V-TOL aircraft appear to hold considerable promise, and even though the technologies involved are gaining ground, there are still a great many obstacles - and questions - concerning their use, and these are slowing

3 CSA Research / Citroën - «Nos vies en voiture» (Our lives in cars) - August 2016

4 Round table «Le Club Les Echos Prospective» with Wavestone - The transportation industry faced with the new challenges of urban mobility.



50%

of the public space in Paris is taken up by cars.

This mode of transportation thus remains dominant.

According to Christophe Naidovski, Urban conference, 2019

hours per year spent in traffic jams by every inhabitant of San Francisco.

According to a white paper released by the Uber Elevate Program, entitled «Fast-Forwarding to a Future on-Demand Urban Air Transportation», 2016

50%

of users would be willing to use urban air transportation modes.

According to a study by Airbus entitled «Urban Air Mobility: on the path to public acceptance,» 2019

«Lilium jet will integrate the system, not replace or eliminate another mode of transportation.»

PATRICK NATHEN

Lilium

VivaTech 2019

partnership with Wavestone - The transportation industry faced with new challenges of urban mobility.

du-quotidien/# ftn1

Artificial Intelligence

Artificial Intelligence can be defined as the simulation of human intelligence using computer systems. By working with humans, this technology could serve to amplify human intelligence and obtain an augmented form of intelligence.

There are already a great many AI use cases, notably in the fields of medicine, safety and mobility. Robot assistants, predictive security or robot-assisted surgery all represent high hopes. At the Hôpital de la Pitié-Salpétrière in Paris, artificial intelligence is already used to assist physicians with the diagnosis of cancers. The machine is able to identify information that can sometimes be undetectable to humans. This is a shining example of how augmented intelligence can be used effectively, via a human-machine combination, to tackle the challenges of our time.

In some cases then, artificial intelligence can help humans to make faster, more rational decisions. However, the development of AI raises the question of its supervision and the associated guidelines. Distortions, or biases, can be incorporated into the process for acquiring information and its processing by humans in algorithms. These are referred to as cognitive biases. Among these biases, artificial intelligence can reproduce the stereotypical biases that might appear during recruitment or when granting a loan. Hence Amazon's decision to abandon this technology after trying it out for recruitment purposes in 2014. The computer program graded applicants for technical positions in a sexist manner by disregarding applications made by female applicants. In light of these biases, and considering that, in 2017, 55% of US human resources departments were considering integrating artificial intelligence into their recruitment process, should the application of AI be restricted to certain fields?

It is through the complementarity of human intelligence and artificial intelligence that humans can capitalize on the use of machines and the opportunities that they offer.

1 Background report for the Canadian G7 Innovation Ministers' Meeting: «Transformative technologies and jobs of the future", Montréal, CANADA, 27-28 March 2018, Page 7 Bounie, Stephan Clémençon and Patrick Waelbroeck, February 2019

ARTIFICIAL INTELLIGENCE OR AUGMENTED INTELLIGENCE?

ARNAUD LEGRAND

Energiency VivaTech 2019

11

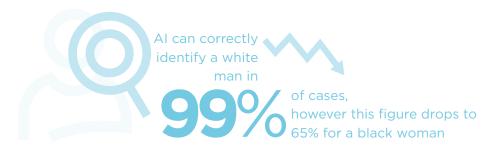
«Al represents much more of an opportunity than a risk. We have everything to gain, and very little to lose.»

20 billion

20 billion euros in public and private investments. This is the sum that the European Commission plans to earmark for research and innovation in the field of AI by the end of 2020.

According to the European Council's Coordinated Plan on Artificial Intelligence, 2018

FACIAL RECOGNITION



Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification, MIT Media Lab, 2018

Quantum Computing

No idea what the word «quantum» actually means? Rest assured, you're not alone. «Nobody understands quantum mechanics», observed physician R. Feynman in 1965. Fifty years later, research has made leaps and bounds, and the advent of quantum computing seems to be just around the corner.

Just as new digital practices require ever more powerful computers, so major companies have taken up the challenge of creating a super quantum computer. The potential of this technology is unlimited: making Al algorithms more powerful according to Google, improving battery life and recharge times according to Daimler and Volkswagen, building catalysts capable of removing carbon dioxide from the atmosphere according to Microsoft, or synthesizing new drugs and materials by simulating subatomic chemical reactions.

The common denominator for all of these endeavors is that they require proficiency in quantum physics. Today's computers encode information into bits. However a bit can

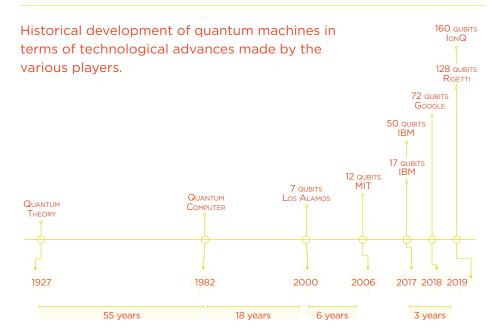
only take the values 0 and 1, and only one at a time. Accordingly, its state is always either 1 or 0. The use of the qubit brings down the barriers that limit the capabilities of conventional computers, because it allows these two states to overlap.

And yet, neither current progress nor the claims of digital heavyweights can hide the fact that this technology is still in its infancy. Giving substance to the promise of quantum computing will require long-term investments, standardized processes, searching for complementarities with classic IT, and more equantic aware developers. So, in a nutshell, no need to start saving up for the next iPhone Q.

Nevertheless, it is here and now that we must set up the framework for this technology, which promises to create considerable value. Invented in the mid-20th century, information technology presented pros and cons that were impossible for its designers to predict. The same goes for the era of quantum computing.

IS **QUANTUM COMPUTING**GOING TO REVOLUTIONIZE IT?

QUBIT COUNTER



The idea [of Strangeworks] is to create a community around QC to solve some of the biggest problems facing us as a species.

WHURLEY

13

Strangeworks VivaTech 2019

MAUD VINET

CEA VivaTech 2019

«What is interesting is not what we currently have. It is the rate at which we are making progress.»

Cryptocurrency

Cryptocurrencies are a means of virtual payment, used mainly over the Internet. This form of payment uses cryptography to ensure secure financial transactions and create units of currency that escape the control of regulators and central banks1.

Cryptocurrencies bear the promise of being accessible to all, irrespective of citizens' access to financial institutions. Their universal nature also means that they facilitate transactions made between countries in different currencies, with charges pegged to the exchange rates. As such, cryptocurrencies may well provide a fallback solution for countries with high inflation by guaranteeing complete access to adequate data through blockchain technology, and helping to improve the financial system's transparency, often the subject of criticism.

Their growing use raises a number of issues. The reliability of these currencies is in doubt considering their highly volatile rates. Many observers have warned States and users alike of the speculative bubble which they can engender. Moreover, since this parallel environment escapes the financial system's regulations, it can facilitate money laundering. A further issue is that of the governance of these currencies and the control exercised by States.

The growth of cryptocurrencies will depend on the regulations adopted by States and financial regulators on the one hand, and the extent to which they are adopted by citizens and local authorities on the other. Their price performance and the appearance of a fixed number of stable currencies are therefore kev indicators to be monitored carefully.

CRYPTOCURRENCY, COVERT OR ACCESSIBLE TO ALL?

«If you look at crypto: that's inherently the money of the future. It is basically global money.»

GUY-PHILIPPE GOLDSTEIN

GPG consulting VivaTech 2019

15

"What's interesting with crypto" is its inherent transparency.»

MICHAEL GRONAGER

Chainalysis VivaTech 2019

«It is quite inefficient in terms of energy use.»

\$19 783

The price of one bitcoin, reached in December 2017, before losing 50% of its value in January 2018.

According to NBC Markets

61 TWH

The bitcoin's estimated annual energy consumption. i.e. roughly equivalent to that of Switzerland.

the International Energy Agency (IEA)

According to a study by Digiconomist, based on figures from

1 Larousse 2020

Advanced by speakers in their respective roles, these arguments reflect the opposing positions to be found on the subject of cryptocurrencies.



Energyconsumption and innovation

While technological innovations will undoubtedly continue to advance, they now come up against the biggest challenge of the century, namely controlling our energy consumption.

In fact, the challenge of technological innovation is now twofold: innovating while taking into account global warming. The sustainability of innovation has become a recurring theme, one that has been discussed repeatedly at VivaTech.

Many of the innovations showcased are still confronted with the challenges of their energy consumption. Quantum computing could help reduce mankind's carbon footprint in the future with, for example, the creation of high-speed, magnetic levitation trains, or cryptocurrencies and their promise of universal currency. But while these

may well revolutionize uses, they are also extremely energy-intensive.

Consequently, reconciling technological innovation with controlled energy consumption and a reduced environmental impact is an all-important challenge. This explains why more and more innovations give consideration to their ensuing energy consumption. New mobilities offer an excellent example: innovations in the automotive sector are now focused on reducing greenhouse gas emissions, due in large part to modes of transportation.

While the alliance between technological performance and respect for the environment is the responsibility of those who innovate, we must not overlook that of the citizens who actually use these new technologies.

«We have to find the right balance between mobility, increase of mobility, easiness of mobility, and at the same time to take care of the environment.»

JACQUES ASCHENBROICH

Valeo VivaTech 2019

NEW TECHNOLOGIES: SOLUTIONS OR AN ENVIRONMENTAL HEADLONG RUSH?

resulting from one bitcoin tran saction, according to specialist digiconomist.



Expected share of worldwide energy consumption for the storage of digital information in 2025.

Gautier Virol, L'Usine Nouvelle, 06/30/2019. «Un nouveau mode de stockage qui associe vitesse, long terme et économies d'énergie» (A new storage method that combines speed, long term and energy savings).

MAUD VINET

CEA VivaTech 2019

«The energy consumed by quantum computers is one of today's research problems.»

HOLLY RIDINGS

NASA VivaTech 2019

«Moon 2024 is about getting out there, getting something done but it has to be followed by the sustainability piece.»

19

Changing education and training

Even though it is difficult to predict with any certainty what the core trades of tomorrow's economy will be, it is vital to adapt - right now - the education and training offered to students and existing employees in order to supplement certain forms of know-how that could become obsolete.

This is what certain new-collar workers are already doing by developing their own technical and soft skills through so-called New Ways of Learning, allowing them to keep up with new technologies.

A new type of school is now emerging and setting the tone for a new form of education. For example, the TUMO Center for Creative Technologies, an innovative, extra-curricular educational program based on digital creation in which programming, code, modeling, 3D animation or robotics are studied. Or the technologies.

It follows that the traditional education system must achieve a rapid, transformational change in order to accommodate new changes. This revolution could also be the perfect opportunity to quickly break down education's gender considerations and give women the kevs needed to participate in tomorrow's economy on the same terms as men. Accordingly, the challenge for tomorrow's education is threefold: it must be adapted to future needs, more egalitarian, and promote continuous training.

«42» computer programming school, based on self-training, personalized subjects, learner autonomy and collaboration to allow students to unleash their creative potential. The goal of these new forms of training is to reduce the digital divide by allowing everyone to acquire the skills needed to cope with new





or

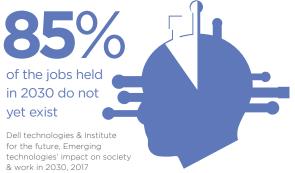
of jobs destroyed by artificial Intelligence between now and 2025?

ACCORDING

Carl Benedikt Frey & Michael A. Osborne, "The future of work; how susceptible are jobs to computerization?" Oxford University, Working paper of the Programme on the impacts of future technology, 2013.

ACCORDING

Melanie Arntz, Terry Gregory, Ulrich Zierahn, The Risk of Automation for Jobs in OECD Countries, 2016



«Behind the digital transformation. it is people and customers who are being transformed. We could talk about VivaPeople rather than VivaTech.»

FRANÇOIS RENARD

Renault

VivaTech 2019

«There has never been a better time to start learning quantum.»

VICTORIA TURK

Wired UK

VivaTech 2019



Collaboration, vital for growth

Major groups and startups, private sector and public sector organizations: all were called upon to collaborate at the 2019 edition of VivaTech in order to jointly push forward technological advances. But is collaboration really a driver of innovation?

A great deal of synergy can be created by tapping into the complementarity of various entities whose core businesses are often quite different: NASA adopting reusable rockets from Space X, traditional banks incorporating FinTech innovations offer two prime examples. Today, collaboration has come to represent a corporate strategy that is vital for growth: start-ups specialized in data and machine learning now offer disruptive solutions to traditional companies, allowing them

too to adapt to the changing economy more quickly. This is the goal of open innovation, i.e. innovation founded on sharing and collaboration.

As with the millions of visitors who connect every month to the Stack Overflow collaborative software development platform, innovation is now «open to all» and «transparent». It links up the agility and innovative capacity of small structures with the financial clout of major groups. It is the basis of the Plug & Play Tech Center, which reconciles the best startups with major groups in order to kick-start collaboration. A great many projects have seen the light of day as a result of this initiative, such as Dropbox, PayPal, N26, etc.







50 million

unique visitors connect to Stack Overflow every month to help solve code-related problems and develop new skills



For 66% of respondent companies,

the Innovation department spearheads
the departments involved in
collaborations with start-ups

The French Tech barometer for collaboration between start-ups and major groups in France - 1st edition

«Large companies have to integrate the culture of change, digital transformation and young people.»

SAEED AMIDI

Plug and Play VivaTech 2019

SEBASTIEN BAZIN

Accor

VivaTech 2019

«We have to establish a two-way dialog and listen to one another. I know what my employees expect of me, and they know precisely what I expect of them."

Which framework for consumer data?

USE OF PERSONAL DATA: ARE WE THE HELPLESS VICTIMS OF MISUSE?

Representing the new oil of the 21st century, consumers' personal data is now the very fuel of corporate growth. How then can this data's use be managed to achieve a trade-off between business and ethics?

At a time when companies must constantly adapt to changing customer expectations and adhere to the rules of competition, data has become all-important in order to stand out in the market and get close to the client. By tracing personal data and profiling consumer behavior, companies can not only optimize their products and services through hyper-targeting, they can also adjust their prices in line with supply and demand, the competition, and even the purchaser's zip code.

All sorts of techniques are employed to acquire this precious data (browsing history, consumer characteristics, etc.), often without the consumer even knowing.

The Facebook-Cambridge Analytica data scandal in 2018 provided insight into the commercial and political uses of this data. Personal data feeds new economic models through which they leverage influence.

All of which raises the question of the appropriate legislative framework, for which the General Data Protection Regulation (GDPR) requires transparent processing of data collected on people by companies. This regulation allows users to gain control over the data that they share, and its use by companies.

Today, offering tailored products or services and personalized consumer paths implies giving consideration to ethical aspects, and ensuring transparent use of personal data. In this situation, consumers are no longer merely purchasers, they are veritable stakeholders in company strategies.

On average, companies only analyze **6%** of the consumer data in their possession.

Source: Amélie Oudéa-Castera (Head of E-commerce, Data & Digital at Carrefour)



of citizens state that they are concerned about their right to privacy, an increase of 19% in two years.

Source: Wavestone report on the protection of privacy in the digital era. 2019

cyberattacks were recorded worldwide in 2017.

Cybercrime Report 2017: A Year in Review

«As marketing professionals, the wealth of data with which we now work is unprecedented. It allows us to understand the basic expectations of our customers, and how they change.»

MICHELLE PELUSO

> IBM VivaTech 2019

Supervising the emergence of new technologies

By investing massively in new technologies, companies are creating the services, products and jobs of tomorrow. However, these externalities, while positive for our societies, must not overshadow the potential abuses of new technologies: fake news, cognitive biases, digital divide, concentration of wealth, and so on. These are all new challenges which States must take up by adapting their legislative frameworks.

New technologies represent a huge source of opportunity for our companies. In fact, private players were the first to lay the foundations of this new digital world.

However, countries must retain their role as regulators of private initiatives: only through legislative supervision can individuals be effectively protected against cybercrime.

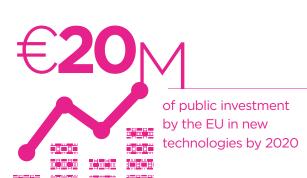
While the era of new technologies is often described as belonging to the digital giants, countries must not abandon their prerogatives. The frameworks they define will be the catalysts of future innovation, oriented towards the common good, and responding to emerging societal problems.

In Canada: a «Digital Charter» to oversee new uses

For Canada's Prime Minister Justin Trudeau, VivaTech was the chance to showcase various measures taken by the Canadian government to supervise digital practices. Formalized by a «Digital Charter», Canada has set up a new legal framework intended to restore user confidence in the digital era, ensure the privacy of individuals, and hold online platforms accountable in case of abuse.



NEW TECHNOLOGIES: A PUBLIC FRAMEWORK IS NEEDED TO REGULATE PRIVATE INITIATIVES



Source: An investment plan to boost European growth Gouv.fr



Source: «Roundup of investment in Machine Learning and AI in 2017», Forbes

Confronting machines will only end in stalemate; on the contrary, we must learn to work with them.

> GARY KASPAROV

Avast

VivaTech 2019

JUSTIN TRUDEAU

Justin Trudeau, Canadian Prime Minister

«6 millennials in 10 are victims of fake news.
Online platforms must not be used to
propagate invalid or inappropriate content or to
spread crime.»

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Club Les Echos Prospective:

Can financial services companies successfully become agile, safely?

Banque du futur:

The financial security of online transactions in 2020: what will the effect of PSD2 be?

ENERGY

The Energy Transition: a Major Challenge for Innovation

Electric vehicles:

how to win over customers?

NEW TECH

Quantum computing: ready for the huge leap?

Intelligence artificielle et cybersécurité:

protéger dès maintenant le monde de demain

2019 UK Cybersecurity Start-Up Radar

Réalité augmentée, virtuelle et mixte arrivent à maturité

5G: a new generation of technology, but where will the innovation come from?

TRANSPORTS

Les cahiers TransportShaker

Quel rôle des startups dans le secteur aérien?

MODERNISATION DE L'ÉTAT

Réinventer les services publics de demain

Radar Govtech des startups françaises



http://vivatechnology.com

Co-organized by Publicis Groupe and Groupe Les Echos, VivaTech is the world's rendezvous for startups and leaders to celebrate innovation. This international event is dedicated to the growth of startups, digital transformation and innovation. More than 124,000 visitors attended the fourth edition, an increase of more than 24% in one year. Viva Technology 2020 will build on this success and will bring together from June 11 to 13, 2020 startups, business leaders and executives, investors, academics, students and media from around the globe.

The Positive Way

WAVESTONE

www.wavestone.com

In a world where knowing how to drive transformation is the key to success, Wavestone's mission is to guide large companies and organizations in shedding new light on their most critical transformation projects, with the ambition of creating a positive impact for all stakeholders.

That's what we call "The Positive Way".

Wavestone brings together more than 3000 employees across 8 countries. It is amongst the leading independent firms in consulting in Europe, and the n°1 independent consulting firm in France.

Wavestone is listed on Euronext, Paris, andis recognized as a Great Place To Work*.

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