

Happen

18
19

THINK LUXEMBOURG

Industry 4.0

The smart (R)evolution

 LUXEMBOURG
TRADE & INVEST

Space
A space agency for business

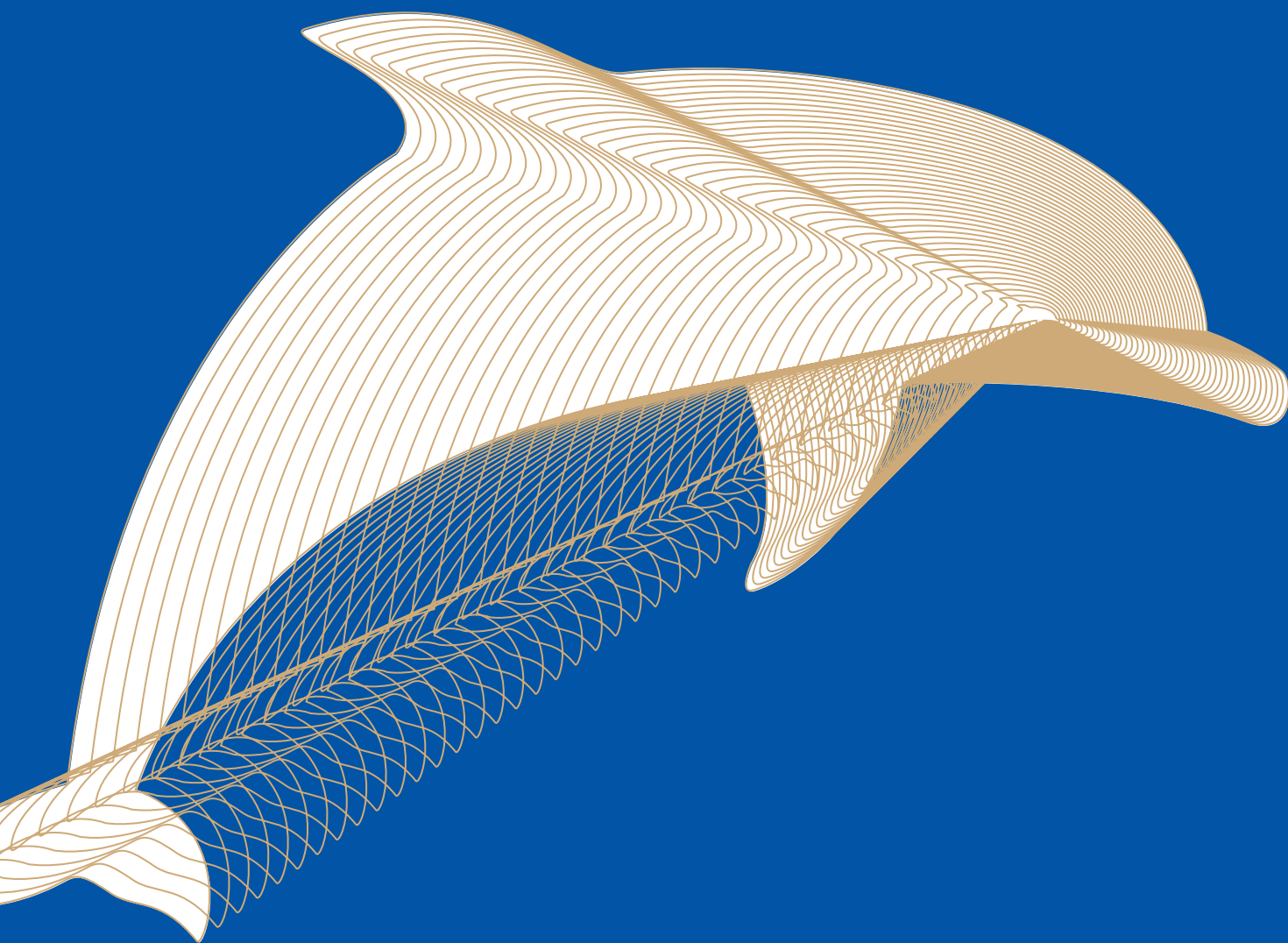
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Welcome

Already one year! The first edition of *Happen* magazine, published in autumn 2017, focused on the SpaceResources.lu initiative and on how Luxembourg has positioned itself as a pioneer in the field of exploration and mining of celestial bodies.

The central theme of the second issue of the magazine is Industry 4.0 and the related topics such as connected objects and artificial intelligence. There is an increasing awareness of how critical these issues are for economic development. Hence, the importance the Luxembourg government attaches to these topics in carrying out policies that foster innovation and digitisation throughout the economy.

Luxinnovation, the national innovation agency, plays an essential role in the implementation of the government's policies. The agency is there to encourage and support companies in their innovation efforts, help them grow in a smart manner and prepare themselves for the many challenges of the future, as well as to act as a gateway to public funding. Regardless of whether companies are already well established in Luxembourg or are seriously considering locating their activities here, they can count on a business-friendly and international environment where policy-makers understand the needs of business thanks to the close interaction that a country the size of Luxembourg allows.

As you explore the pages of this magazine, you will discover how Luxembourg seizes opportunities in areas of key importance to the country's economic development, such as eco-innovation, information and communication technologies or the space industry. Our aim is to reveal the technological know-how that exists within Luxembourg's ecosystem, the opportunities it offers for innovation, and thus spark the interest of international technology and business leaders and innovators.

As you read about the accomplishments of companies that have chosen Luxembourg as their home, you'll understand our national motto. It's an invitation to all those who would like to become part of our story: "Luxembourg – Let's make it happen." **X**

Sasha Baillie
CEO, Luxinnovation



WHO IS SASHA BAILLIE?

Born
April 1970

From May 2018 –
CEO, Luxinnovation

From 2015 –
Chairman of the board, GovSat

From 2014 –
Chairman of the board,
Nation Branding Committee

June 2014 – April 2018
Diplomatic Advisor,
Deputy Chief of Staff
to the Deputy Prime Minister,
Ministry of the Economy

August 2013 – June 2014
Director for International
Economic Relations and European
Affairs, Ministry of Foreign
Affairs, Luxembourg

May 2010 – July 2013
Deputy Secretary General,
Ministry of Foreign Affairs,
Luxembourg



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We bring people and companies together in an environment where innovation flourishes. We act as facilitator for those who plan to start a business. We fuel the innovative spark that helps companies improve their performance. We stimulate the international expansion of players in a variety of key sectors. What's more, we guide foreign investors to the best opportunities Luxembourg has to offer. **Together, we can accomplish great things.**

info@luxinnovation.lu
www.luxinnovation.lu



LUXINNOVATION
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Happen

THINK LUXEMBOURG

Impressum

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Cover
The CR-15iA, the latest collaborative
robot from FANUC.

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Daniel Da Cruz



On the road to a coherent

Economic Development

The international promotion of the Luxembourg economy, which was restructured two years ago, is now running well, supported by a strong network of representative offices abroad.

Explanations from the president of the Trade & Investment Steering Committee, the body in charge of the implementation of this promotion.

WHO IS HE?

Name

Daniel Da Cruz

Born

October 1971

From 2018

Chairman, Trade & Investment Steering Committee

From 2016

Head of DG 5 (promotion of foreign trade and investment), Ministry of the Economy

2011 - 2016

Deputy Permanent Representative, Permanent Representation of Luxembourg to the United Nations in Geneva

Holder of a Bachelor in Journalism and Communication and a Master's degree in Law, Daniel Da Cruz, 47, had an international career in Brussels (press officer of the Luxembourg delegation of the Party of European Socialists), in Lisbon (First Secretary at the Luxembourg Embassy) and in Geneva (Deputy Permanent Representative to the United Nations). Since 2016, he is in charge of promoting foreign trade and investments at the Ministry of the Economy. **X**

Daniel Da Cruz, what was the rationale behind setting up the Trade & Investment Board (TIB) and the Trade & Investment Steering Committee (TISC)?

It was part of the economic advancement reform initiated in 2016 with the aim of optimising the coordination and consistency of initiatives related to promoting external trade and prospecting, as well as to clarifying the roles of the various players involved.

This being the case, a foreign trade and investment steering committee, the TISC, made up of representatives of the Ministry of the Economy, the Ministry of Foreign Affairs, the Ministry of State, the Chamber of Commerce and Luxinnovation, was set up with the aim of producing an advancement strategy. This strategy would be submitted to the TIB, the leading supervisory body for approval.

The Trade & Investment Board is chaired by the Minister of the Economy, with the Hereditary Grand Duke as its Honorary Chair. In addition to the institutions already represented on the TISC, representatives of the Ministry of Finance, the Ministry of Higher Education and Research, FEDIL and the Chamber of Skilled Crafts also hold seats on the committee. It is important to have this mix of public and private players who are all affected by efforts to promote the country on the international stage. This global strategy reflects a common vision that can be broken down into a series of strategic objectives combined with operational objectives that will make it possible to monitor the situation. At the same time entrusting Luxinnovation with a number of new tasks.

Was it difficult to get so many players involved at the same time?

In the beginning, yes, of course, but very soon everyone saw the added value that such an organisation could provide, and eventually everyone got involved. The idea is really for everyone to work together to better optimise and identify a new approach to achieving consistent economic development. The word “together”

is essential here, since everyone has their part to play and can make a contribution.

Does that mean that what was happening before was unsatisfactory or not effective enough?

I wouldn't say that, no, it's just that things didn't really "gel". Take the Luxembourg for Business economic advancement agency, for example, it had only two full-time employees and acted only within the Ministry of the Economy. Whilst it did contribute to developing efforts to advance foreign trade, there wasn't really any consistency and there was clearly a pressing need to redefine its scope of activity.

The main idea behind the reform also involved coming up with a more professional, more targeted framework. These days, it's not enough to simply sell the assets that Luxembourg has as a multilingual, welcoming, and politically and fiscally stable country; companies clearly need more information about their respective sectors, which requires a lot more in-depth work. Hence the importance, and indeed, the relevance of the connection with Luxinnovation, which already has significant expertise in various sectors.

Data and economic intelligence really are the black gold of the 21st century. So it's vital that we take advantage of this expertise when it comes to market intelligence in order to better identify both sector-specific and geographic priorities whilst, of course, targeting those activities that could help improve the ecosystem. This particularly concerns the sectors targeted by national economic diversification policy, which notably include the space industry, eco-technologies, ICT and smart mobility, among others.

How is the implementation of this new strategy progressing?

For the time being, we have mainly focused on the background work. The first major asset that we have is the fact that we have a common image and a common brand linked to the "Luxembourg – Let's make it happen" nation branding initiative, and I am pleased that all of the stakeholders

involved have been able to adopt this. This initial point was really critical.

Then, of course, we began planning and coordinating the various initiatives in order to better synchronise our respective calendars and know who was going where, when. Between State visits, working visits, fairs and exhibitions, the TISC plays a vital role as an executive and even coordinating body.

At the moment, for example, we are heavily involved in the issue of talent management, which means not only attracting skills to Luxembourg, but also knowing how to keep them here. This requires us to develop this expertise right here, within the country. It's becoming an increasingly topical issue and one that we, together with our partners, are on top of, trying to identify concrete approaches and solutions for the future.

Luxembourg launched the SpaceResources.lu venture in 2016 and introduced a legal framework for exploring and using space resources. There has been a large number of announcements regarding the initiative, since the Luxembourg Space Agency was created last September. Is this a catalyst of choice in the strategy for economic advancement?

Clearly, when it comes to nation branding and promoting Luxembourg's image, it can only be a good thing, particularly as it's not just about the >

"These days, it's not enough to simply sell the assets that Luxembourg has as a multilingual, welcoming, and politically and fiscally stable country"

Luxembourg has a network of eight Trade & Investment Offices in addition to all embassies worldwide.



potential that look very appealing indeed,” Mr Da Cruz points out, “and we are constantly analysing the situation in order to outline a schedule and organise future initiatives that will enable us to delve even further.”

Between economic missions, ministerial working visits and other State visits, with or without political leaders, companies have ample opportunity to generate leads in foreign countries and establish initial contact with potential future clients. “In the case of missions involving ministers, or even the Hereditary Grand Duke, certain matters may be dealt with directly, on a higher political level and progress more quickly,” Mr Da Cruz explains.

Support is clearly not limited to this “physical presence” element alone; indeed, export credits are also offered by bodies such as the Office du Ducroire, for example. Then, of course, there is the data on economic intelligence, which is provided by a dedicated team at Luxinnovation and makes it possible to perform more targeted searches for potential partners in specific countries.

Whilst it is difficult to quantitatively assess these approaches to internationalisation, initial feedback has been extremely positive, “and not only where supposedly promising markets are concerned, either,” Daniel Da Cruz points out. “Last January, for example, an official mission to Senegal was organised. The delegation included representatives from lots of companies, including those operating in the construction and technology industries, and the feedback we have had has been very positive.” X

A TWO-WAY STREET

Attracting foreign companies and investors to Luxembourg is one of the key missions that fall under the “Trade & Invest” banner, but it is also important to help Luxembourg-based companies establish a presence in new markets that lie beyond the banks of the Pétrusse. With an economy that exports 85% of its goods and services, a strong international presence is almost a necessity. “The idea with this strategy is, in fact, to make it easier for companies to successfully penetrate these markets and to support them in dealing with globalisation. It is important to help Luxembourg-based players establish their position within the value chain,” says Mr Da Cruz

This being the case, establishing a close collaborative

relationship with the Chamber of Commerce is a major asset, bearing in mind that within this new promotional approach, “companies are the leading protagonists”, explains Daniel Da Cruz. “We are, of course, there to help them and see which instruments we have available when it comes to supporting them, but the private sector must take over on the ground.”

European markets – starting with the Greater Region – are obviously the most natural first step when it comes to entering local markets. Countries such as Japan, China and the United States among the more evident promising markets further afield. “That said, there are other new destinations with great

effects that the announcements have. There is also a lot of substance behind them and a lot of action being taken, which gives the country credibility in the field and represents another step towards an innovative economy. This has obviously created a strong image for Luxembourg.

Are any other sectors as advanced as this one?

The ICT field is also very advanced, though this is perhaps less obvious to the general public as it is primarily a cross-disciplinary field that affects all economic sectors. In any case, Luxembourg has a very good reputation when it comes to infrastructure and IT security, for example, not to mention its logistics sector, which has really gone from strength to strength in recent years. In fact, nearly 250,000m² of logistics space has been created in the country since 2013, representing an investment of some €250 million on the part of the companies concerned. There are also the projects under way at the Eurohub Sud site, which currently account for 150,000m² of logistics space and will employ around 800 people.

Last but not least, a great deal of effort has also been made with regards to eco-technologies and smart mobility, and I think that we're really doing well in that respect. There is, of course, still some way to go, especially when it comes to bringing together the required expertise and contacts, but it was never going to happen overnight.

Is it hard to find the right balance between the eagerness to see certain projects come to fruition and the reality on the ground, where things often progress at a slower pace?

With the government's support, lots of resources have been, and continue to be, invested in the various sectors that we have targeted and in which we believe, and a great deal of effort has been made in this respect. That said, we cannot allow ourselves to overlook these sectors when it comes to diversifying our economy. This is also, of course, perfectly in keeping with the framework of the third industrial revolution,

bringing a strong element of consistency to the whole project.

What distinguishing assets can Luxembourg promote?

It is often a matter of niche specialisations, which add real added value in certain sectors. This is a well-known fact, and complements the country's structural assets, which must also be protected, of course.

What is the main difficulty you encounter with this approach?

I think it's the challenge of creating the most comprehensive ecosystem possible with the potential to support the development of different sectors. Given the size of the country, it's not always easy to find sufficient critical mass, which brings us back to the issue of the talent we need to develop various projects.

What are the next major steps you will be taking?

The ministry is in the process of finalising sector-specific strategies with the experts from Luxinnovation. So we'll have to see to what extent these strategies can bring Luxembourg international recognition, particularly from the perspective of a data-driven economy, which is an underlying theme for all priority sectors.

Based on these strategies, we will be in a better position to attract more targeted foreign investment that is geared more towards client needs. Once companies located outside of the European Union, wherever they may be, automatically think of Luxembourg when they start looking into opening their first branch in Europe, then we can claim to have achieved our first concrete objective.

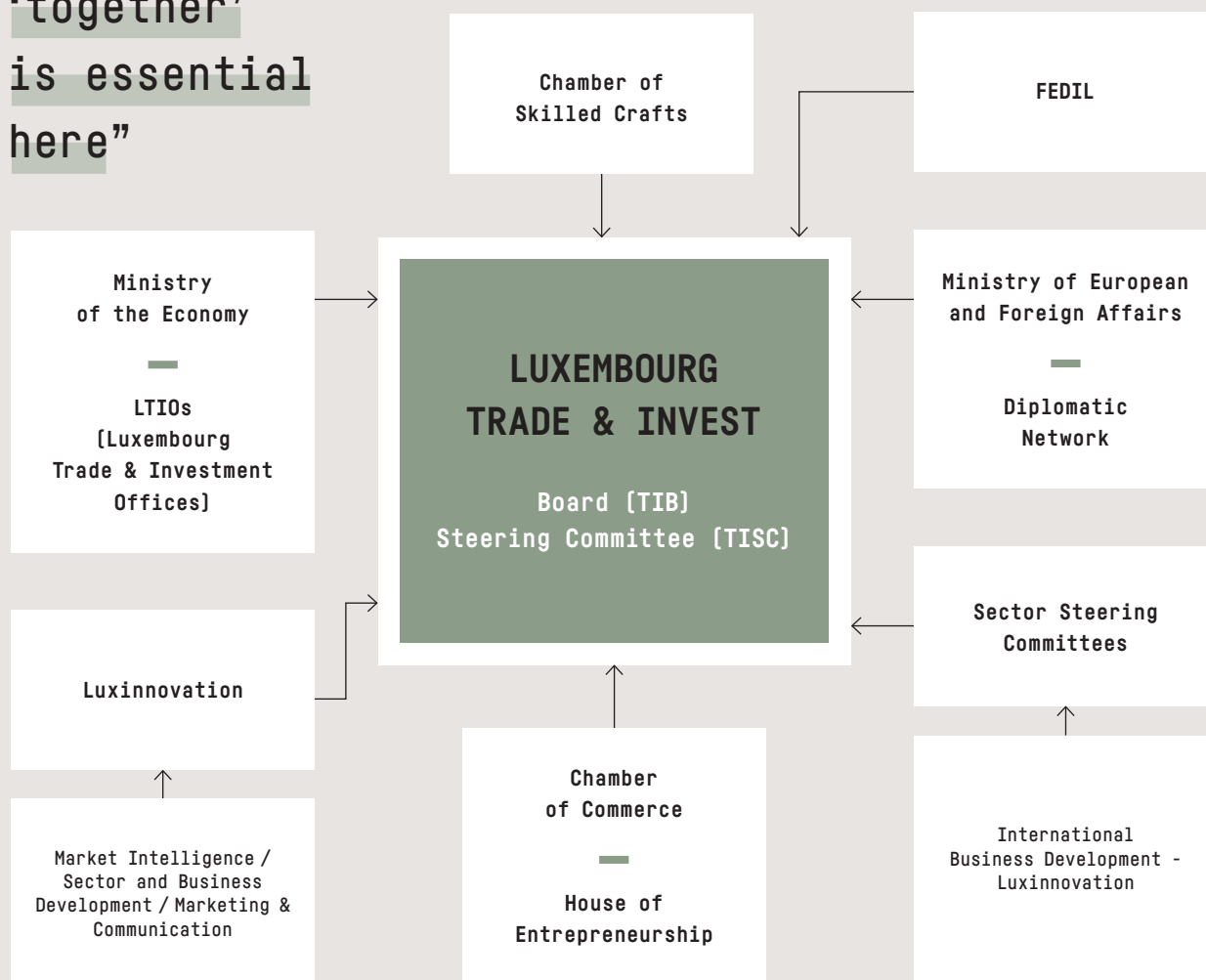
But that won't be enough – this intention then has to come to fruition...

Of course, and that's why we have to reinforce our position as a real haven for companies, and industrial ventures in particular, with high added value, and to develop this welcoming approach ➤

MANY PLAYERS, A SINGLE NETWORK

The economic promotion strategy is based on a powerful and diverse ecosystem of players – some of whom are newly established – interacting at reciprocal levels. Who are these players, and what are their duties?

“The word
‘together’
is essential
here”



in order to best meet the aims and expectations of these companies.

We now have a whole host of individuals on board that make this the perfect time to move forward with this project.

American giant Google recently purchased land in Luxembourg and may be planning to open data centres there. Is this another major asset in your promotional strategy?

Obviously this will really highlight the country's appeal, as did the arrivals of Amazon, PayPal and eBay at the time. The fact that such companies are now opening head offices here can only encourage other companies to follow suit, but this is a hugely complex and political matter and we have to let time take its course.

That said, the mere fact that Google has Luxembourg in its sights and that it has purchased land here proves that the work carried out over recent years is paying off! I'm not sure that that would have been the case five or ten years ago.

Does that mean, then, that there has been a positive change in Luxembourg's global image?

I don't know whether Luxembourg has a particular image. Generally speaking, a lot of educational work remains to be done when it comes to promoting the country abroad, and we still have to explain what Luxembourg is, before we can even think about tackling the economic aspect. The country has to be put into perspective and into context and the emphasis placed on its specific features and characteristics. It is important not to assume that those we are dealing with automatically know who we are or where we come from.

Then, once they know what we are all about, we might have a chance to build something and, of course, convey a positive image of the country. This is even more beneficial when there is some substance behind it, such as cutting-edge ICT infrastructures. Ultimately, it's about "putting Luxembourg on the map", as the saying goes.

This doesn't mean that promoting the country's economy abroad cannot, in fact, be closely linked to nation branding...

The two are, of course, intertwined, but the concept of nation branding is much broader. As I was saying before, it's a very good start if all of the players involved are conveying the same image, this gives us a strong foundation on which to build. It's still a little early to say for certain whether it has worked, but we are clearly going in the right direction.

Luxembourg also has a network of representative offices abroad. How does that work?

We actually have a network of eight Trade & Investment Offices in key markets around the world and we are working closely with all the Luxembourg embassies (see page 10). This network of 'economic embassies' works very well. These offices are located in markets that show great promise where the national economy is concerned and are primarily a very valuable source of help and support when it comes to preparing for State visits and economic missions. They not only serve as our representatives on the ground with regards to organising such events, but also do a great deal of background work by helping both companies looking to open branches in these countries and companies within these countries that are interested in establishing branches in Luxembourg.

Is this network of LTIOs going to have to expand further in the future?

Discussions are currently ongoing, of course, and it will be up to the future government to make the decisions. One thing for certain is that our priority was initially to strengthen the existing network to provide us with a series of well-established offices that we could rely on. Now that we have achieved this objective, we need to think about expanding our geographical footprint, in order to better cover those regions that show great promise or economic potential.

What is the most difficult aspect – convincing a foreign company to open a branch here or a Luxembourg company making it in a foreign market?

■ Neither of these things are easy to achieve! ➤

Companies here have the advantage of rather natural outlets into neighbouring and even other European markets, so they don't require a great deal of help in this respect. More help is required when it comes to entering markets further afield, and on other continents. A ministerial presence on economic missions, for example, can open both economic and political doors or establish contacts that might prove particularly beneficial to our companies. With regards to attracting foreign companies, whether those that are knocking on our door or those we have been actively approaching, we obviously try to establish how we can best support them and help them to find what they're looking for. The ideal scenario is to identify companies that would complement the players already operating within Luxembourg, without getting into a cherry-picking situation that would require us to say "yes" to some companies and "no" to others.

We are also helped and supported, of course, by our network of LTIOs, which also identifies investors looking to open branches in Europe and explains why Luxembourg is a worthy contender. X

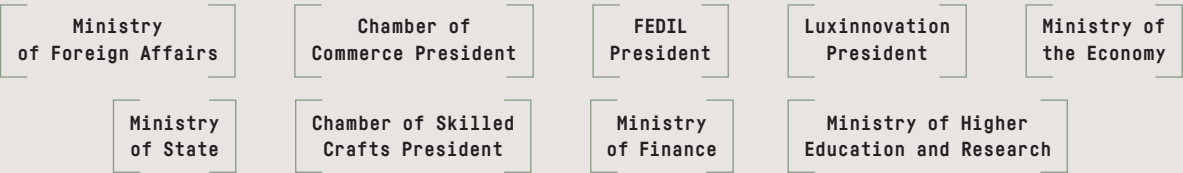
“Luxembourg has a very good reputation when it comes to infrastructure and IT security”

PROMOTION STRUCTURE

TRADE & INVESTMENT BOARD (TIB)

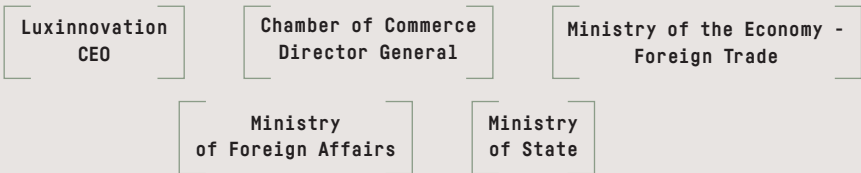
HRH Prince Guillaume, Hereditary Grand Duke [Honorary President]

Ministry of the Economy [Presidency]



TRADE & INVESTMENT STEERING COMMITTEE (TISC)

Ministry of the Economy [Presidency]



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Some discover.
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What **HAPPENED** in Luxembourg



Who are the start-ups who will represent Luxembourg in the next CES? What will the future Luxembourg airport look like? Have a look at the latest innovative news from Luxembourg.

Tourism Innovation Award – The first edition of the Tourism Innovation Award, recognising particularly innovative tourism projects, has delivered its verdict, awarding Ramborn Cider Haff, Spoticle and the Spillplaz.lu application by Bazar.

START-UPS



16 start-ups for CES 2019

After the first successful experience for the 2018 edition of the big CES show in Las Vegas last January, with eight companies chosen to represent the country, the Luxembourg start-up ecosystem will double its presence in January 2019. Between 8th and 11th January, 16 start-ups will participate in the largest international event dedicated to new technologies and innovation.

The selection was made from more than 100 applications received by the experts of Luxfactory (formerly European American Enterprise Council, EAEC). Some 900 start-ups from around the world (two-thirds from the United States and France) will participate in this event.

Within the Eureka Pavilion, specifically dedicated to start-ups, where more than 170,000 visitors are expected, the Luxembourg stand will extend to over 100m².

Two of the 16 companies selected (**Motion-S** and **CoinPlus**) were already present in 2018. The others selected for 2019 are: **Atis Network**, **Art Design Painting**, **BIM-Y**, **CarVroom**, **ClearImage**, **Crowdaa**, **Koosmik**, **LuxAI**, **Mu Design**, **MySardines**, **Scrybto**, **Skeeled**, **SYD.cloud** and **Yatta**. **X**

luxfactory.com
ces.tech

WHO SAID WHAT?

“We appreciate the atmosphere of innovative research and the spirit of cooperation in Luxembourg.”

Sejong Kim
*Secretary General,
ASEM SMEs Eco-Innovation
Center (ASEIC)*

“The Luxembourg Space Agency is an important step for the country’s future as a space leader.”

Steve Collar
President and CEO, SES

“The growing number and quality of start-ups are good indicators of the attractiveness and dynamism of our country’s economy.”

Sasha Baillie
*CEO, Luxinnovation,
about the Fit 4 Start programme*

DID YOU KNOW?

2%

This is the annual inflation rate in Luxembourg measured at the end of October 2018. Driven in particular by the rise in petroleum products (+14.7% in one year), this rate has not been higher since 2012.

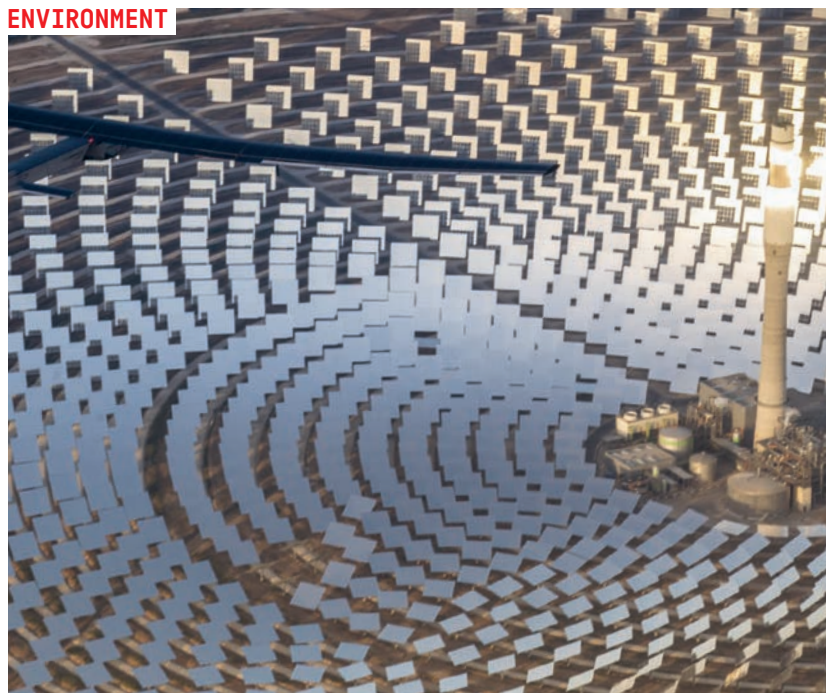
+3

This is the number of places gained by Luxembourg in the 2018-2019 edition of the *Global Competitiveness Report* of the World Economic Forum, moving from 22nd to 19th [out of 140 countries].

250,000 m²

Since 2013, this is the logistics area created in Luxembourg, corresponding to an investment of €250 million by the companies concerned.

ENVIRONMENT



Inside the Alliance

Launched in 2016 by the Solar Impulse Foundation created by the Swiss adventurer Bertrand Piccard, the World Alliance for Efficient Solutions aims to select 1,000 clean, efficient and cost-effective solutions to accelerate the transition to a carbon-neutral, sustainable economy.

The Luxembourg Ministry of Sustainable Development and Infrastructure and the Luxembourg Institute of Science and Technology (LIST) joined this tremendous adventure by initialling, in October 2018, an agreement with the Alliance to contribute to this commitment aimed at protection of the environment.

This tripartite partnership aims to accelerate the evaluation of solutions submitted to the Solar Impulse Foundation through

LIST's network of clean technology experts, and to contribute to the deployment of these solutions through the implementation of the country's environmental policy.

"This agreement confirms Luxembourg's determination to position itself as a major player in ecological innovation," said Claude Turmes, State Secretary for Sustainable Development and Infrastructure. "My ambition is to make Luxembourg a place of excellence in the field of research and investments in green technologies. This partnership is a concrete step in that direction."

A dozen other Luxembourg private players are also part of the Alliance, which brings together more than 1,300 companies and institutions worldwide. **X**

Patents
Trademarks
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IP Training courses
IP Contracts
IP Audits
Domain names
IP Strategy
IP Litigation
IP Valuation
Copyright

Winning Intellectual Property Strategies

We provide in-depth advice and service to vigorously protect our clients' rights and interests, at European and worldwide levels. Our philosophy is that IP rights are tools, which must be able to furnish a return on investment.

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WHO IS SHE?

Pascale Engel de Abreu, 38, won the Outstanding Research-Driven Innovation Award granted by the Luxembourg National Research Fund. This Luxembourgish Associate Professor in developmental psychology at the University of Luxembourg has developed "LALA – Lauter lëschteg Lauter", an early intervention programme for Luxembourg kindergartens that supports pre-literacy skills of children in multilingual Luxembourg. Dr. Engel de Abreu came back to Luxembourg in 2012 after living and working 13 years in France, UK, Bolivia, Brazil, the US and Canada. She was already awarded by the FNR in 2013 and 2014.



INFRASTRUCTURE



The emerging face of Airport City

Luxembourg's international airport will evolve in the coming years into a real "Airport City", with the creation of new facilities. This will create a real hub of activity and development.

The first of these new developments was announced last October: it is a four storey high flexible building of 15,000m² with fluid shapes (with a possible extension up to 40,000m²). It will host office space, shops, restaurants, fitness facilities, and also a kindergarten.

Called "Skypark Business Center South", this project, estimated at between 25 and 35 million euros, has an ecological orientation, with a building constructed using a wooden structure, a double insulation facade and even a green roof.

"I'm looking forward to seeing the first milestone of our Airport City becoming a reality. The Skypark Business Center South will be a reference for environmentally friendly and sustainable buildings. It helps us to align our economic and ecological goals," René Steinhaus, CEO of lux-Airport, stated.

This Skypark Business Center South was designed by the Danish architectural firm BIG (Bjarke Ingels Group) – in association with the Luxembourg architectural firm Metaform –, which is also responsible, for example, for Google's future headquarters in Mountain View (California) and one of the World Trade Center buildings in New York.

The Skypark Business Center South is scheduled for completion in 2022. **X**

Illustration by Jan Hanrion (Maison Moderne) / Photographs from BIG

US\$16 million for Job Today

The mobile-focused casual job marketplace headquartered in Luxembourg, Job Today, raised US\$16 million last September. The start-up, launched in 2014, operates in Spain and the UK. It plans to use the majority of this cash to increase its presence on the UK market.

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024

Nicolas Buck
Industry is not dead

032

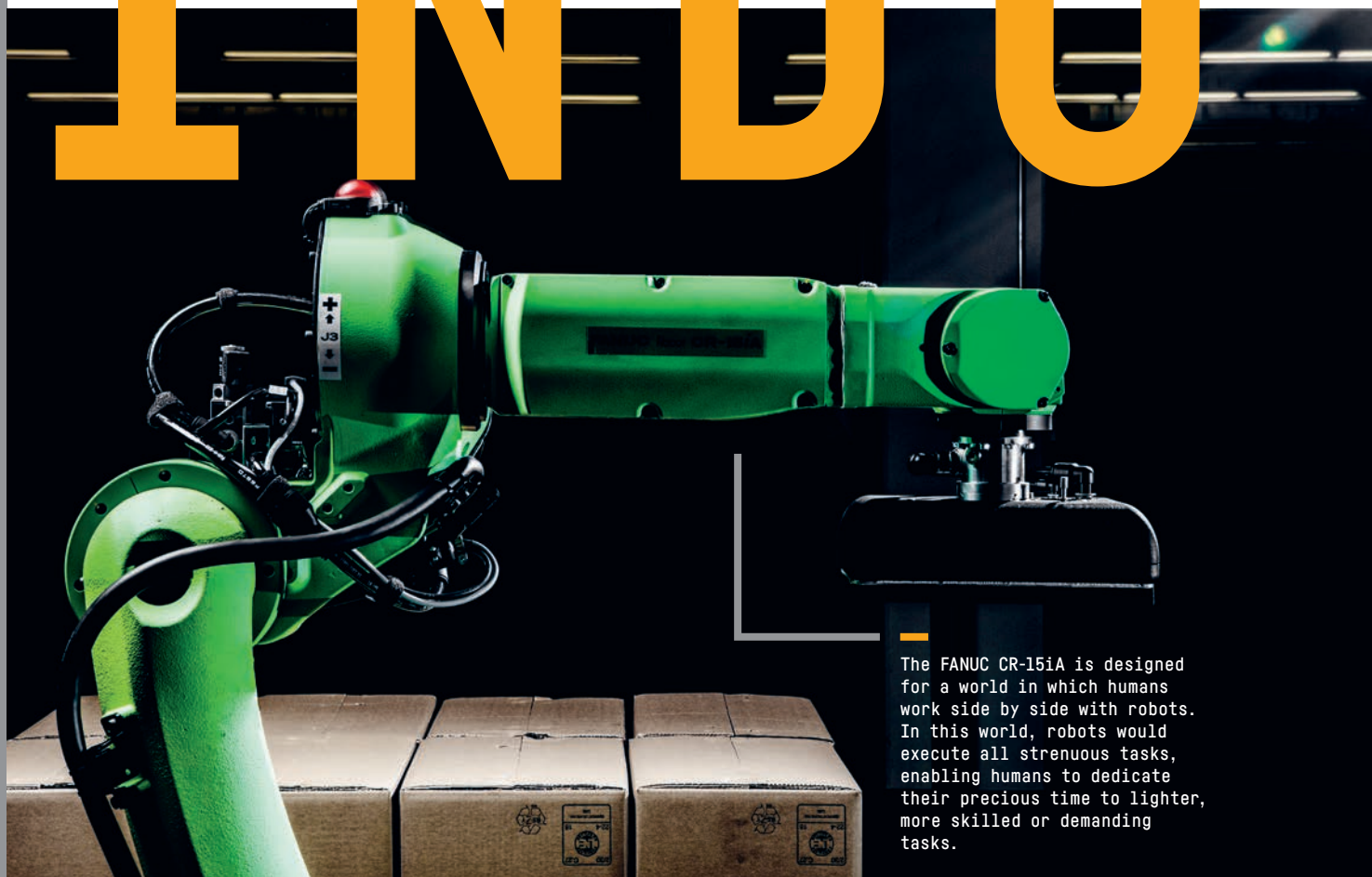
Industry 4.0
Building the smart
factories of tomorrow

038


Towards data-driven,
high-value manufacturing
solutions

The

INDU



The FANUC CR-15iA is designed for a world in which humans work side by side with robots. In this world, robots would execute all strenuous tasks, enabling humans to dedicate their precious time to lighter, more skilled or demanding tasks.



Cebi Group is a leading developer and manufacturer of components for automotive and household appliances, ventilation, electric vehicles and other industrial applications.

STORY

4.0

Digest:

There are four principles which support companies in identifying and implementing Industry 4.0: interconnection via the Internet of Things (IoT); information transparency using big data to identify key areas that can benefit from innovation and improvement; technical assistance to help make informed decisions; and finally, decentralised decision making enabling cyber-physical systems

to perform autonomously, with escalation only in exceptional cases. Industry is central to Europe's economy generating 80% of EU exports and plays a major role in driving productivity and innovation. It is therefore no surprise that a key focus of the European Commission and many governments is to support the digitalisation of the European manufacturing sector.

In this dossier, we are going to hear from local industry experts and take a look at how some of Luxembourg's leading manufacturing companies are introducing and leveraging Industry 4.0, the major benefits and how they perceive the continued development. We will also cover how two innovative start-ups are helping companies successfully adopt and implement Industry 4.0. X

Nicolas Buck

Industry is not dead

For the Chairman of the business federation FEDIL – the Voice of Luxembourg's Industry, Industry 4.0 is just another chapter in the process of evolution and development of a sector that remains strong and has a capacity to respond to political or technological shocks.

Texts by Jean-Michel Gaudron > Photograph by Patricia Pitsch [Maison Moderne]





Nicolas Buck, the Industry 4.0 concept is developing rapidly. How important is this concept for the future of the Luxembourg economy?

Nicolas Buck: Industry 4.0 should not be viewed as an end in itself. The strategy to be adopted depends on three main considerations: What? For whom? And how? We need to define what should be developed or produced when applying this approach, specify what markets and targets this is intended for and determine the optimal production methods. We can also add the “why?”, the reason why a client chooses to work in a particular way.

Industry 4.0 is a bit of a catch-all term, but it clearly expresses the now crucial importance of connectivity and the ability to produce much more quickly in response to significant fluctuations in demand from the market, which also requires companies to be highly responsive.

The digitalisation of preparation and production processes represents an evolution, more than a real revolution. It is opening up possibilities for high-quality production in Western Europe. But this digitalisation is developing alongside other more conventional innovation processes. It is up to everyone to take the concept on board and define what it means for their business.

Is this Industry 4.0 strategy difficult to implement?

This depends of course on the requirements, and it is part of an effort to collect production information. With any industrial process, whatever it may be, the clients’ specifications have an essential impact on the production put in place. Over the last 40 to 50 years, all industrial firms have spent a huge amount of time trying to optimise the take-up of information received from clients and translating all of their specifications into a production environment. We need to know how to manage information waste, information that arrives late, clients that change their minds, etc.

Clearly, the Industry 4.0 approach is a key methodology that can really help increase efficiency and reduce, for instance, an entire two-week production process to just a few days. This is not necessarily >

WHO IS HE?

Name

Nicolas Buck

Born

August 1968

From 2016

Chairman of the Luxembourg business federation FEDIL – the Voice of Luxembourg's Industry

From 2012

CEO, Sequoia

Nicolas Buck joined the family business early [Imprimerie de la Cour Victor Buck] in the 90's and quickly innovated by offering reporting services for the investment fund industry with a new company called Victor Buck Services. For this, he received the award of Entrepreneur of the Year in 2004. After selling his company to the Post Luxembourg group, he created another one, Sequoia, in 2012, [management of the regulatory documentation of investment funds]. At the origin of #StartUpNation Luxembourg, from 2014 to 2017, he was Chairman of the start-up accelerator nyuko. Since 2016, he is also Chairman of the FEDIL. X

done with just a quicker machine, but also by taking information on board more effectively.

Would you say that Luxembourg is well-positioned in terms of Industry 4.0?

We certainly have our strengths, just like other countries. We have not necessarily been pioneers, and large countries, such as Germany or France, are no doubt more advanced with their factories of the future. But with the business federation FEDIL, the Ministry of the Economy and Luxinnovation all working together, we have made major efforts. Our role is clearly to promote existing expertise that companies can benefit from. It is then up to the businesses themselves to select the service providers that they consider to be the best fit. To some extent, we are sowing seeds.

We can also see that research centres like the Luxembourg Institute of Science and Technology (LIST) or the University of Luxembourg Interdisciplinary Centre for Security, Reliability and Trust (SnT) are very involved in this area and have high-level skills that are of much interest to industry. It is clear that industrial firms will not be able to do everything by themselves. They will need consultants, public or private partnerships, etc.

Soon, Luxembourg will launch a Digital Innovation Hub (DIH), a one-stop shop helping industrial companies to become more competitive by using digital technologies. What value does it offer to businesses?

This initiative is first and foremost European. We have worked extensively with the European Commission's Directorate-General Connect to clearly redefine the DIH concept and the roles of the various stakeholders, given that many institutions, virtually everywhere in Europe, have proclaimed themselves to be DIHs.

The idea is to build up the most exhaustive map possible of the skills that exist here and in Europe, in order to enable companies to embark on their digital journey. This is a marketplace that enables a simplified approach to the offers that are available. >

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Europe is the driving force behind this platform, which is part of the much bigger digital single market initiative. Is it important to have this type of momentum at community level in addition to national initiatives?

The European market is of course still attractive. The challenge for Europe is to believe in ourselves. It is very clear that for external investors who want to establish a presence, this is the world's leading market in terms of population, purchasing power or skills. Europe has a market of 500 million people, with strong links to Africa. There is no shortage of opportunities! All within an exceptional framework that not only respects intellectual property, but also ensures fair competition. For investors, it is of course essential to be able to set up in a part of the world where they do not have to compete with firms that are being subsidised by national banks. A level playing field is very important.

What about Luxembourg? How is the country positioning itself within this environment?

Luxembourg is still the best place for doing business in Europe! The country constantly shows positive dynamics and strong growth. It offers skills, an institutional framework, political stability, predictability in terms of taxation, streamlined processes, as well as open-mindedness and much more. Setting up in Luxembourg makes it possible not only to establish a presence in Western Europe, but also more widely across Europe.

Does Luxembourg know how to effectively sell itself abroad?

A country does not sell itself. No one is selling. Instead, there are people who are buying... We need to offer choices and we need these choices to be clear. The investors arriving here want to have clear answers in relation to their investment projects. And we have always been able to give them these answers. Of course, we need to maintain this capacity to listen when we meet with new companies and then be able to say "yes, we know how to do this" or, when necessary, "unfortunately, we cannot help you with this part".

There have recently been some major announcements in Luxembourg, including among others Goodyear's

Mercury project, Husky's Factory of the Future and significant investments by Kronospan, Cebi International and Circuit Foil. Does this count in Luxembourg's favour?

These projects are of course great driving forces, because they come from international groups that are delighted to be established here. They are very well supported by the teams from the Ministry of the Economy and Luxinnovation, and the key role played by civil servants and politicians in charge of the economy up to the highest level deserves to be highlighted. The decision makers who come from abroad to continue investing are satisfied with the environment, with their access to information and with the fact that they are listened to so effectively.

What are the next major steps in the development of Industry 4.0?

Clearly, as always, continuous learning. The human aspect is vital. We need to orient schools and universities more strongly towards preparing students for technical and technological jobs. And "technology" goes hand in hand with "scientists". This is essential.

We also need to reflect on how things will evolve and, for instance, consider the tax incentives in place. In an increasingly globalised world, we can see very clearly that the majority of investments are no longer focused on simply machines, but also on the brainpower that creates the software and processes used by machines. We therefore need to look into creating incentives that take this into account.

You mentioned human resources. Should we focus on attracting talents or retaining them?

We clearly need to do both! We need to both train up talented people and encourage them to come to Luxembourg. And to attract them, we need to use good arguments. The Luxembourg Digital Skills Bridge project is an ambitious initiative. It aims to encourage businesses to anticipate their needs for skills, while promoting employee mobility in a job market that is undergoing a transformation.

The rollout of this project shows that the political sector has taken on board the full scale of the

HPC is a branch of computing that deals with scientific and engineering modelling, and simulation tasks, so demanding that calculations cannot be performed using general-purpose computers. The EuroHPC will be able to perform 1 billion billion calculations per second.

challenges that lie ahead. But the equation is still the same: develop, train, attract, retain... Keeping people also means keeping businesses.

Luxembourg is getting ready to welcome the headquarters of the EuroHPC joint undertaking in charge of supervising the development and deployment of a European network of high performance computers (HPC). What will be the impact of this decision taken by the European Commission last June?

The Industry 4.0 concept clearly has major requirements for simulation and processing power, for conducting pure research as well as for tests and production. This HPC is therefore an essential tool. Of course, we will then need to ensure that the benefits are shared on a wide scale, so that the entire ecosystem understands all the benefits and advantages it offers.

When do you think the first concrete effects can be measured?

This will no doubt take several years. Europe and the associated countries are sometimes slightly >

“The human aspect is vital”

ahead of the market, with a very pioneering approach. The economy then needs to assimilate the ideas and understand them. Alongside this, businesses' needs will evolve. Today, an infrastructure like this might not be useful for them. But tomorrow, when this will be the case, the tool will be in place and available to them.

For the past year and a half, the arrival of the US giant Google in Luxembourg has been mentioned. The company has even acquired more than 30 hectares of land in the centre of the country, but has not yet officially announced its decision to set up its future data centres here. Is this strong level of interest from such a giant positive for Luxembourg's ecosystem?

This is first and foremost a project on a very large scale. Its sheer size is interesting. And if it succeeds, this will show any potential investor that while Luxembourg is a modestly sized country, it has the skills needed for managing such a project, which includes not just making available the infrastructures, but also everything relating to energy supply and data governance. Clearly, if we are able to welcome a Google, we can welcome anyone.

Now, we must not lose sight of the fact that while data centres are of course an important part of the infrastructure, there are other elements within the ecosystem that we need to know how to develop. There are data centres everywhere in Europe and it is possible to imagine that there will, with time, be a concentration of the players operating on this market.

Are you confident about the way Industry 4.0 is going to develop in Luxembourg?

If there is one sector that is not protected by national borders and a specific regulatory framework, it is clearly industry! Through its very nature, it needs to constantly reinvent itself in relation to technological evolutions and new geographic players, as well as the various needs of clients. We should not underestimate industry's capacity to respond to shocks, whether they are political or technological.

So, industry is not dead...

Definitely not! We should not simply look at the changes over the past 20 or 30 years. Industry has been developing since the 18th century and will continue to evolve in the 21st century. The sequence of things remains unchanged: scientific progress leads to new technologies, which lead to innovation. The process will always continue, possibly in other forms. And ultimately, Industry 4.0 will be just one of many chapters, but it is the one that we are living through at the moment.

What about the human aspect? Growing digitalisation and the development of artificial intelligence are fuelling concerns that people will be replaced with machines and thousands or even more jobs will be lost. How would you assess the situation?

The human capacity to rethink production processes is unlimited. Take a car production line: while it is true that there are far fewer or indeed sometimes no people at all involved in the initial production phases, a human presence is still essential for the assembly line.

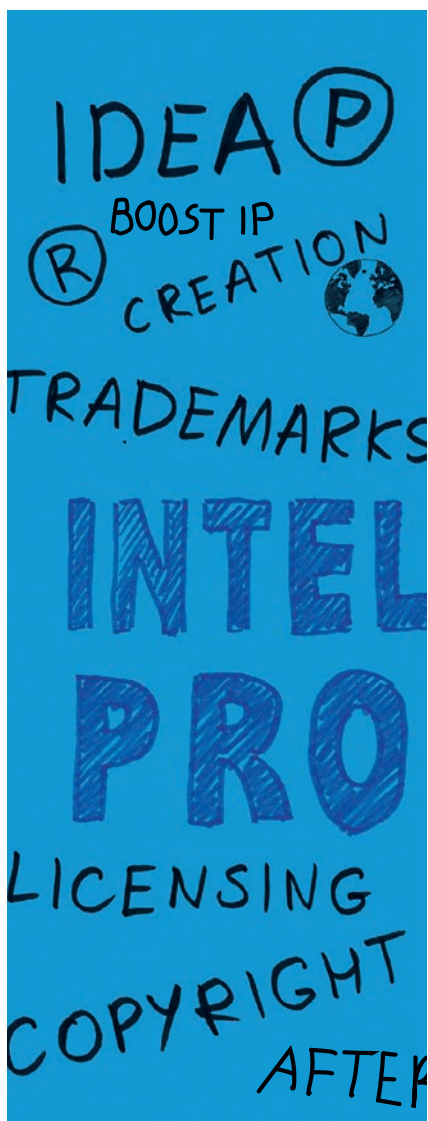
One day, we may see car plants with even fewer people. Or maybe not. What is certain is that if someone manages to achieve this, others will need to align themselves with it. But we have always managed to create more jobs than we have destroyed. ✕

FACT

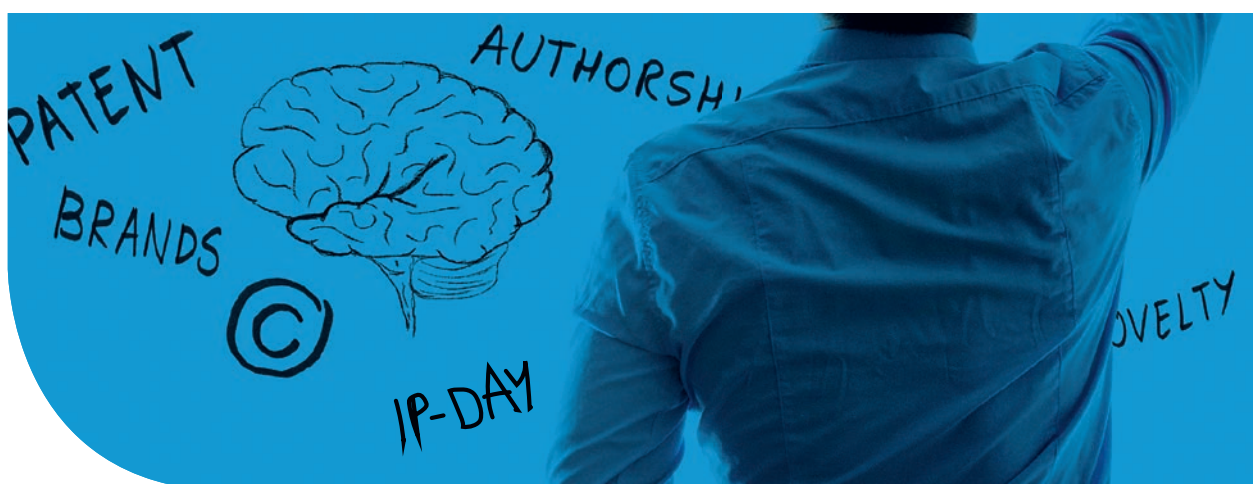
Cost reduction

The expected cost reduction in the worldwide automotive sector between 2016 and 2020 due to Industry 4.0 is estimated at US\$ 28 billion. This represents a 3.9% reduction in costs per annum across the auto industry.

Source: themarketmogul.com



INFORMATIONS
ACCOMPAGNEMENT
COACHING
FORMATIONS

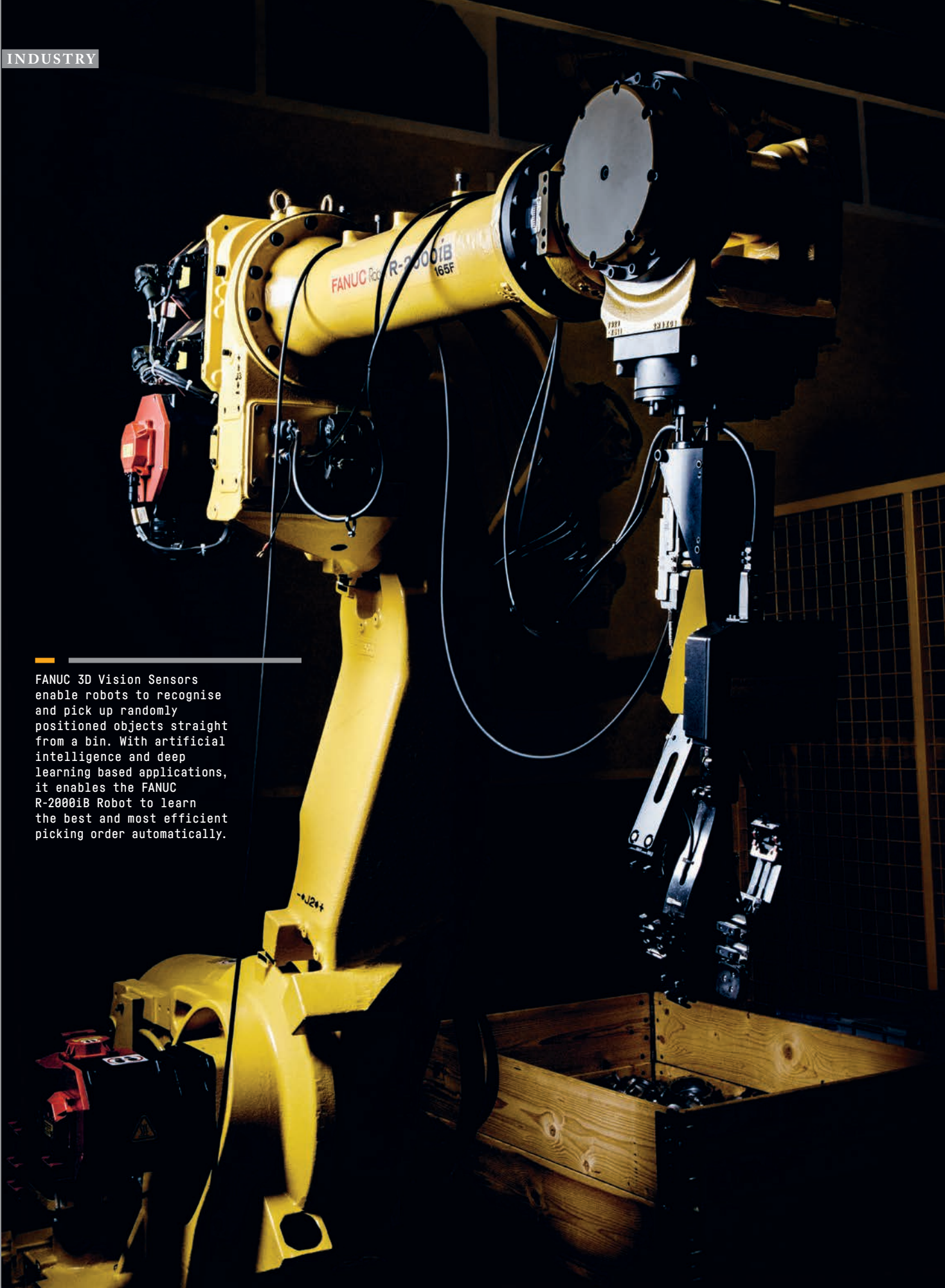


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Industry

4.0

Building the smart
factories
of tomorrow

Read how some of Luxembourg's
leading manufacturing companies are
introducing and leveraging Industry 4.0
today and how two innovative start-ups
are bringing expertise to the table
to help companies arrive and remain
at the forefront of technology.

Texts by Sue Hewitt > Photographs by Jan Hanrion [Maison Moderne]

START-UP

Wizata

Website
wizata.com

Founded in 2014, Wizata, a team of data science, metallurgy and manufacturing experts, develops AI solutions to help companies achieve the highest results within their production processes.

Jean-Philippe Hugo, CEO, understands that “the combination of data availability from IoT, AI technologies and cloud computing power was the perfect combination for an Industry 4.0 to emerge, where every person and organisation is empowered with AI to tackle unsolved problems and drive manufacturing processes towards 100% efficiency.”

Elaborating on how Wizata is helping companies leverage automation today in manufacturing and production processes, Raphaël Cayrol, Public Relations Officer, explains that “pushing the limits of production efficiency requires more than algorithms: it's the symbiosis of business expertise of field engineers with the power of AI, and the capacity of our data science specialists with industry know-how to act as an orchestrator. In practice, we help companies to onboard AI as a key actor to assist engineering in manufacturing processes and explore brand new improvement paths.”

Looking towards the future, Mr Cayrol anticipates that “intelligent systems that leverage technologies such as deep learning will get smarter by digitising, interpreting and learning from raw data, such as electromagnetic [images & videos], thermodynamic [heat distribution], mechanical waves [sound] and other signals measured by innovative sensors. This will enable AI to take into account more granular data to detect uncharted and unexplained patterns, empowering employees to make better decisions. Companies will take less time to clean and give context to this data, allowing company data science teams to experiment more efficiently and to innovate at a faster pace.” X

Three leading Luxembourg-based manufacturers and two forward-thinking start-ups share how they are harnessing latest technologies and practices to stay ahead of the game. Learn about their experience and plans for Industry 4.0.

Cebi International

Cebi Group is a leading developer and manufacturer of components for automotive and household appliances, ventilation, electric vehicles and other industrial applications, employing more than 3,000 people in 13 countries. It recently launched an ambitious Industry 4.0 project in partnership with the University of Luxembourg.

Cebi admits that the company has always invested strongly in process engineering while vertically integrating its production. Over time, it has reached a high level of automation enabling it to become a market leader in specific segments

while remaining competitive, despite strong market pressure and high labour costs in Western Europe. 86% of the turnover of Cebi Group is generated by plants in Western Europe.

According to Corporate Project Manager & Industry 4.0 Program Director Franck-Alexandre Sallebant-Bessone, “you need to leverage the potential of the proposed technologies within a scope that will generate the highest ROI, i.e. increasing automation and robotics to improve uptime and optimisation of production equipment. We chose to address the challenge of increasing the overall equipment effectiveness, eventually enabling autonomous reconfiguration of manufacturing production units while supporting predictive maintenance, thanks to big data and live analytics.”

He believes a key driver is “a capacity to make the company responsive to change. Upgrading employees' skills is an important success factor, not to be underestimated.”

“Upgrading employees' skills is an important success factor, not to be underestimated”

Franck-Alexandre Sallebant-Bessone, Cebi

“Simply collecting data is not enough. The art lies in the analysis”

Farsan Parwez, Ceratizit

Going forward, Mr Sallebant-Bessone affirms that Industry 4.0 will be “a standard in the manufacturing sector and especially in the automotive segment. AI will start to support and help the workforce in all its operations. New technologies will enable better control of resource consumption and will support the mitigation of waste and inefficiencies. This is why we believe that the education systems have to transform to provide extensive training for young and experienced people in the digital field.”

Ceratizit Group

Headquartered in Mamer, Luxembourg, Ceratizit Group is the world’s fourth-largest producer of hard metals which it transforms into wear protection and cutting tools for a wide range of different industries. Constantly innovating in the manufacturing process is something the company is focusing on.

In recent months, Ceratizit has initiated a whole series of projects to network their machines and collect project data, to increase

the efficiency of their production, improve their products and offer new services to their customers. Big data and machine learning will of course also play a role in this. However, it is still too early to go into details.

According to Farsan Parwez, Ceratizit’s PR & Content Manager, “when implementing Industry 4.0 it is crucial to rely on standards when introducing new solutions. Industry 4.0 can help the company to better understand complex interactions within their manufacturing chain that could remain largely unknown or misunderstood without the use of digital solutions.”

Mr Parwez emphasises that Ceratizit “has a very strong industrial base in Europe with numerous key players who are active worldwide and also play a leading role in the implementation of Industry 4.0 solutions. Luxembourg is already doing a lot to strengthen the Industry 4.0 sector.

Examples include FEDIL’s D4I initiative, and various LIST ➤

START-UP

DataThings

Website
datathings.com

DataThings was created in January 2017 as a spin-off of the SnT/University of Luxembourg, where its four founders worked beforehand. The co-founders are experts in software engineering, security, machine learning and artificial intelligence, and have many years of both academic as well as industrial experience in these fields under their belt.

DataThings applies state-of-the-art software engineering, machine learning and artificial intelligence solutions to help customers make operational decisions. They conduct an in-depth analysis and then develop a tailored solution in close collaboration with their clients.

According to Grégory Nain, Co-founder, benefits of Industry 4.0 are “far-reaching, e.g. cost reduction, better customer experience, improved efficiency, higher productivity and improved competitiveness. In addition, it allows companies to become more innovative.”

The team believes that Europe with its long history of high-quality engineering has an excellent foundation in Industry 4.0 but tends to be more conservative compared, for example, to the “trial and error” driven approach of the US. To stay competitive, “a reasonable balance between the two might be key.”

Looking forward, Mr Nain explains that “industrial systems and processes are entrusted with increasingly complex tasks posing tremendous challenges and opportunities for businesses at the same time. Today’s industrial systems need to become more and more intelligent necessitating bringing software engineers, experts in machine learning and domain experts together to develop suitable solutions.” ✕

(Luxembourg Institute of Science and Technology) and University of Luxembourg projects. Of course, more can be done, but Luxembourg is already on the right track.”

As to the continued development of Industry 4.0, Mr Parwez believes “the standards and technologies are now there but simply collecting the data is not enough. The art lies in the analysis and in making use of the data volume and finding the right people to do this. Not only through internal competencies but via public-private partnerships and cooperation with start-ups, crucial in order to be able to play a leading technological role.”

Goodyear

Household name Goodyear’s R&D operations for EMEA and Asia Pacific are based in Luxembourg where Goodyear currently employs some 3,350 people in R&D and manufacturing.

Engaged in numerous national and international R&D programmes, Goodyear represents today the perfect compromise between the traditional industry of yesterday and the innovative one of tomorrow.

In September 2017, the company announced the construction of a new plant in Dudelange in the south of the country dedicated to innovation in the automobile sector and code-named Mercury. The investment of USD 95 million is expected to create 70 jobs and the ultra-modern plant will produce 500,000 tyres per year, premium large size value-added tyres, normally produced in small series.

The project will be based on Industry 4.0 using latest innovative technologies.

The plant will be highly automated to produce high-performance tyres with high complexity using optimised production techniques. In partnership with the LIST, Goodyear is very much focused on data science. New business models are being developed and Goodyear believes that fast experimentation is key.

While not a lot of details are currently available, the plant is expected to build on agility to complement traditional manufacturing processes with digitisation and networking via high performance computing. A digital hub will connect people, data and processes. The ultimate goal is to deliver the right product at the right time at the right location. This involves improving the accuracy of the manufacturing processes, achieving a faster response to market demand and optimising logistic flows. X

FACTS

2.6%

The annual reduction in inventory levels expected from Industry 4.0.

USD 90 billion

By 2020, the global augmented reality market (taking operations and machinery to the next level) is predicted to reach USD 90 billion.

80%

80% of robots sold worldwide go to just five countries. USA, South Korea, Japan, Germany and China.

Sources: symantec.com / Statistica

The ultimate goal
is to deliver the
right product at
the right time at
the right location

The whole world of Intellectual Property



Client-oriented



Owner-managed



Self-funded



Global



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dennemeyer.com/services



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Towards data high-value manufacturing solutions

In a data-driven economy, data is a key resource and enabler of innovation. Luxembourg offers an excellent infrastructure and the optimal environment for companies aiming to ride the digital wave and successfully implement Industry 4.0 to retain a competitive edge on the world market.

Texts by Sue Hewitt > Illustrations by Maison Moderne

driven,



Luxembourg, fostering European collaboration and development. Together with over 15 companies across Europe, Luxembourg SMEs submitted a project proposal to the European Commission to explore the potential of AI coupled with high performance computing for predictive maintenance applications.

Industry 4.0 is well on its way to become a reality in Luxembourg. Flagship projects in the field are being implemented by major industrial groups who testify to the general willingness to innovate within Luxembourg's industry. In recent years, nearly two-thirds of private R&D expenditure came from the industrial sector.

This positive trend is underlined by the digital innovation strategy being put in place by the Luxembourg government. The country already has one of the highest performing digital broadband networks in the EU, with very low latency rates, and is ranked number 2 in the EU 2018 *Digital Transformation Scoreboard* for "connectivity". The government is investing in new high performance computing (HPC) infrastructures that will be available for use by the private sector. Recognised for its pioneering role in these fields, Luxembourg was recently

designated to host the future EuroHPC agency. Luxembourg's ICT services sector is particularly well developed and public research centres have internationally recognised expertise in secure data storage, connectivity and information security.

R&D initiatives

The government is encouraging the private and public sectors to form partnerships to bring research from the university and other public research institutions, innovative R&D start-ups and big industrial players together to work on the smart factories of tomorrow. This in the fields of artificial intelligence, advanced software engineering, machine learning, data analytics and cyber-physical systems. Support and encouragement to experiment and innovate with new advanced digital technologies, to accelerate integration into services and products, is a key focus of the Ministry of the Economy.

With this in mind, the Ministry is currently supporting digitising industry experimentation, support platforms and testbeds, both at national and European level.

Digital Innovation Hub

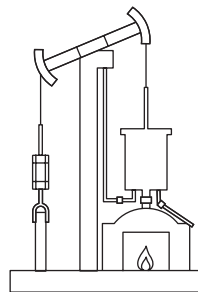
A new initiative highlighting Luxembourg's determination to ensure that all industrial companies in Luxembourg, whatever their size, can embrace the digital opportunities of the future is the Luxembourg Digital Innovation Hub, (L-DIH). Jointly set up by the Ministry of the Economy, FEDIL – the voice of Luxembourg's industry and Luxinnovation with support from the European Commission, the L-DIH is scheduled for launch in early 2019, and is aimed at stimulating the digitalisation of industry. The L-DIH will provide a platform for digital technology exchange between research organisations, institutional partners and private digital service providers and will connect to the network of the EU's other DIHs.

EVOLUTION

THE ROAD TOWARDS INDUSTRY 4.0

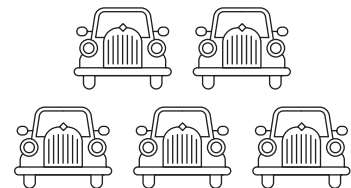
1.0

End of 18th century:
Water and steam
powered manufacturing
facilities.



2.0

Early 20th century:
Mass production,
using electricity
and assembly lines.



It will also connect with European Commission supported testing and experimentation facilities for artificial intelligence to support the uptake of this key technology by Luxembourg SMEs, providing the framework for Industry 4.0 in Luxembourg.

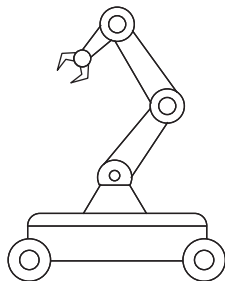
Industry 4.0 is an exciting opportunity for Luxembourg's industry to respond to the competitive need for digitalisation of its industry. "A high priority of the Luxembourg government remains to support companies to be leaders in data-driven, sustainable, high-value manufacturing solutions. We will continue to do so by strengthening existing initiatives in the areas of R&D, and government financing, by optimising the high-tech infrastructure and by co-funding R&D projects going forward," explains Mario Grotz, Director General for Research, Intellectual Property and New Technologies at the Ministry of the Economy. **X**

"A high priority of the Luxembourg Government remains to support companies to be leaders in data-driven, sustainable, high-value manufacturing solutions"

Mario Grotz, Ministry of the Economy

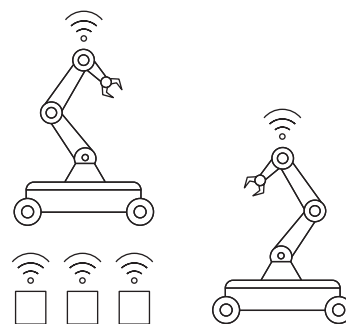
3.0

Start of 1970s:
Further automation
using electronics
and IT.



4.0

21st century:
Cyber-physical
systems.



A space agency for business

Launch date

31 January 2018

Coverage

Europe, Africa,
Middle East,
Atlantic Ocean,
Indian Ocean

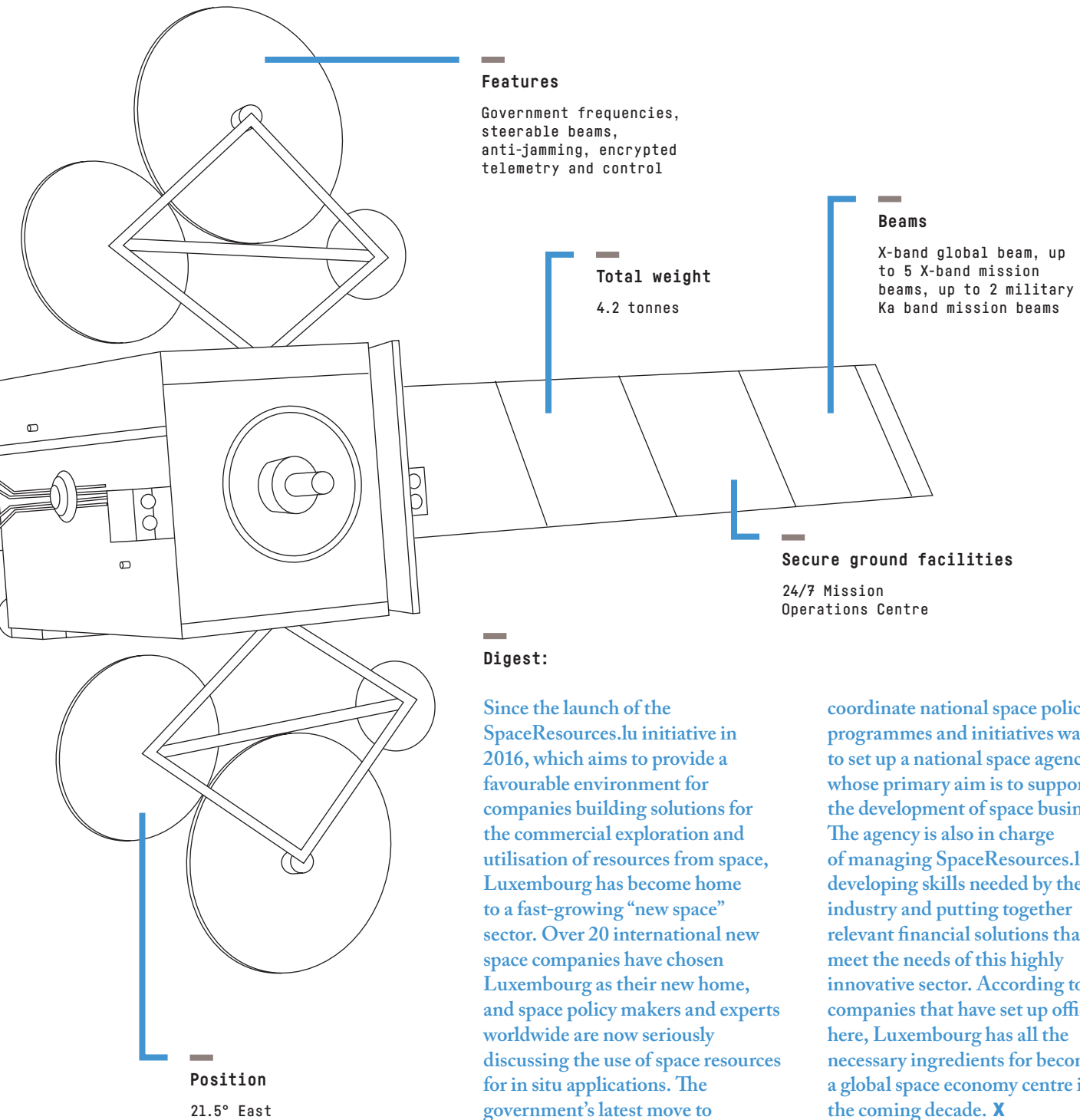
A pioneer in the future space economy, Luxembourg is expanding its efforts to create favourable conditions for space businesses. The country's new national space agency will measure its performance based on the success of industry.

Designed lifetime

Minimum 15 years

Texts by Lena Mårtensson > Photograph & Illustrations by Maison Moderne

Satellite GovSat-1



Over the past two years, Luxembourg has established itself as the European hotspot for “new space” companies engaged in the commercial exploration and exploitation of space resources. In order to support its fast expanding space community, the country launched a business-oriented space agency in September 2018. The agency will support the industry, attract new companies, develop human resources and offer innovative financial solutions.

“Luxembourg has always been courageous and tried to reinvent itself,” said Étienne Schneider, Deputy Prime Minister and Minister of the Economy, at the launch of the agency. Perhaps best known as a leading financial centre, this tiny country has over the past few decades become something of a giant in space and is also home to SES, the world’s largest satellite missions, and a very dynamic space industry. The space sector represents nearly 2% of the country’s GDP – one of the highest rates in the EU.

Being at the very forefront of realising the potential of the new, commercial space sector, the government launched the audacious SpaceResources.lu initiative in 2016 with the aim of providing a unique legal, regulatory and business environment for private companies that explore and use space resources. Luxembourg

became the first country in Europe, and the second in the world, to adopt a legal framework that secures property rights for resources harvested in space, and put in place a range of measures to meet the needs of these highly innovative companies. The success is obvious: over 20 global new space companies have already opened offices in Luxembourg and several more are on their way.

The Luxembourg Space Agency (LSA) was created to further professionalise the support offered to the space community. According to Minister Schneider, the agency will “further encourage innovation-driven space entrepreneurship and promote this country as Europe’s platform for commercial

space development and a home for cutting-edge industries.”

Driven by business

Contrary to many other space agencies, the LSA will not directly conduct research or launch its own space missions, but focus on business development and the creation of economic value and jobs. This strongly impacts the activities of the agency. “It is not enough to provide existing or new companies solely with support for R&D activities,” says its CEO, Marc Serres. “They need a place where they can find the right surrounding environment to develop their business.”

Building on their in-depth understanding of what space



GOVSAT

SECURE SATELLITE COMMUNICATIONS

GovSat launched a first satellite, GovSat-1, in January 2018. This joint venture between the Luxembourg government and SES offers highly secured satellite capacity, ideal for defence purposes.

“GovSat has unique security features, on both our space-craft and our ground segment,” explains CEO Patrick Biewer.

“The cost synergies levered through our cooperation with commercial industry enables us to provide a very competitive proposition compared to traditional military satellites.” The ground segment includes security-accredited premises and an associated secure operations centre with specialised personnel. “This state-of-the-art secured facility is a key enabler for fulfilling the security classification needs of our users,” says Claude Schanet, VP Information Security at GovSat.

“DO SPACE BUSINESS WITH A STRONG INSTITUTIONAL PARTNER”

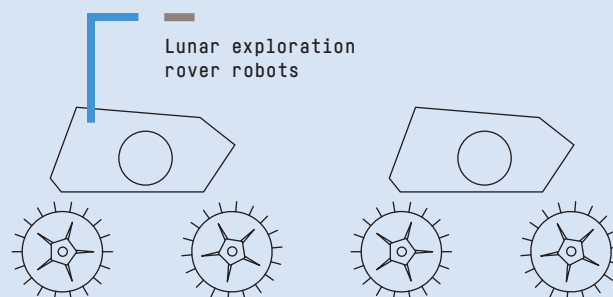
ispace

Website

ispace-inc.com

Japanese space robotics company ispace opened an office in Luxembourg in February 2017. “We were looking for a European base to expand our business development and operations,” says Managing Director Kyle Acierno. “When the SpaceResources.lu initiative was launched, we saw that the vision of the Luxembourg government was very similar to our own.”

ispace develops small, lightweight landers and rovers that will be used to explore the surface of the Moon. SpaceX will be the launch provider for its maiden voyages to the Moon, scheduled for 2020 and 2021. The Luxembourg office focuses on business development, R&D, payload development, engineering and integration. It will also be the centre for analysing data from the lunar missions. ispace collaborates with the Luxembourg Institute of Science and Technology (LIST) to develop a miniaturised mass spectrometer that will explore elemental compositions of lunar ice and regolith. Luxembourg co-funds relevant activities



through national R&D grants, research support and the programmes of the European Space Agency.

“The support provided is certainly attractive,” says Mr Acierno, “but there are two other things that I think are even more important. Firstly, the legal framework for exploiting resources harvested in space – we will not claim such resources any time soon, but it shows the strong political support – and secondly, the fact that we are able to approach this business with a partner, thanks to the relationships we have built up with the government. They have stood by our side in what can sometimes be a very political environment.”

ispace is currently setting up a “lunar yard” at its premises that will be used for perfecting the navigation and positioning of lunar vehicles. These facilities will also be open to other companies, Mr Acierno explains, adding: “We want to show the general public and the government that our presence in Luxembourg is a success story.” X

The proposal is clearly interesting for clients: GovSat counts the Belgian navy among its first clients and has already supported a number of NATO missions in the Middle East, Africa and Europe. “We offer additional services for supporting collaborative defence efforts, particularly in the context of NATO,” confirms Mr Biewer.

The company is also expanding its network of partners, both in Luxembourg and internation-

ally, in order to be able to offer end-to-end services that cover an entire value chain. GovSat has recently partnered with Telespazio France to address the needs of the French Ministry of Defence. Pooling their skills, infrastructures and solutions, the two companies have created a complete catalogue of satellite telecommunications services in various military bands. Under the contract awarded by France’s Joint Directorate for Infrastructure

Networks and Information Systems, Telespazio France, supported by GovSat, will begin supplying satellite capacity to all French military and state entities by the end of 2018.

These positive developments have allowed GovSat to grow from 12 to 19 employees. Further expansion of activities will follow in the near future for this company that has taken off successfully and is quickly heading into orbit. X



“Our main objective is to stimulate the Luxembourg economy”

3 QUESTIONS FOR

Marc Serres
CEO, Luxembourg Space Agency

The main aim of the Luxembourg Space Agency is to promote business development. How does this influence the agency's structure and expertise?

Our activities are a continuation of the work previously carried out by the Ministry of the Economy, which means that we have many years of experience working closely with industry. Our clients clearly appreciate dealing with an agency that has a deep understanding of how companies work and what doing business means. We complement our own expertise with a broad network of external partners who have specialised knowledge in a wide range of fields. This unique collaboration allows us to go much further than we could on our own.

How do you prioritise between supporting Luxembourg's existing space industry and managing the SpaceResources.lu initiative?

Both tasks are equally high on our agenda. While in the past we were mainly working to expand the capabilities of existing space companies, a significant part of our efforts today goes towards meeting the needs of newcomers brought here by SpaceResources.lu. This international dimension of bringing new companies to Luxembourg is crucial, but it does not mean that we work less with the existing community – rather on the contrary.

What results would you like to see over the coming years to consider the agency successful?

Our main objective is to stimulate the Luxembourg economy, so our results will be measured based on the performance of the companies we have helped over the years. In order to evaluate the impact of the initiatives we are taking, we will look at indicators such as the number of space companies in Luxembourg, the evolution of their turnover and of the sector's contribution to GDP, the number of people working in the field and the number of specialists with high-level space skills. The success of the Luxembourg space industry is our success. X

entrepreneurs need to succeed with their commercial ambitions, Mr Serres and his team of 12 will stimulate the development of the national space ecosystem and facilitate the process for new businesses setting up their European base here. In addition to managing the

national space research and development programme and the SpaceResources.lu initiative, the agency represents the interests of the industry at the international level and helps companies make the most of the opportunities offered by the programmes

of the European Space Agency and the European Union.

Innovative financial solutions

Access to funding is a key issue for growing space companies. Luxembourg can provide financial support to specific projects to ➤

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With offices in the US, the UK and Singapore, space data and analytics company Spire opened its European headquarters in Luxembourg at the beginning of 2018. It was the SpaceResources.lu initiative and Luxembourg's innovative vision for the new space economy that first attracted the company's interest. “Luxembourg definitely has all the ingredients for becoming a main centre for the space economy in the coming decade,” affirms CEO Peter Platzer.

Spire uses satellites to track ships, planes and weather phenomena in the most remote regions of the planet and provides high-value data analysis and forecasts to governmental and commercial clients all over the world. “Everything we do is global: our clients, our satellites and our people,” explains Mr Platzer. The fast-growing Luxembourg office – a new person is hired approximately every second week – works in a wide range of areas, including scientific research, product development and sales.



Being able to hire the most talented people in the field is crucial for the company and one of the reasons why it chose to come to Luxembourg. “For numerous reasons, in particular the difficulties of hiring international staff in the UK that might occur after Brexit, we needed to find a place that would ensure our access to the exceptionally skilled workforce that a space data and analytics company requires,” says Mr Platzer, who is hiring new staff both locally and internationally.

Spire counts the Luxembourg Future Fund among its shareholders, but Mr Platzer calls the setting up of a dedicated space fund “a very smart move”. He also welcomes the creation of the Luxembourg Space Agency as an instrument to further improve the business climate for new space companies. “If everything the government is talking about gets executed, this will probably be one of the single best places on Earth for space companies.” X

complement companies' equity and loans. Substantial assistance to academic and private sector research projects can be offered through national R&D grants, and the country's participation in the European Space Agency (ESA) opens up access to European support programmes for Luxembourg-based companies. In addition, the National Research Fund is setting up a space research programme that will fund public-private research ventures aiming to advance knowledge, attract top-level researchers and contribute to the development of the space ecosystem.

Many of the companies arriving in Luxembourg are also looking for equity funding. A dedicated space fund with a capital of €100 million is currently being set up to meet this need and canalise the high level of interest shown by private investors. The fund will invest in new space companies with innovative ideas and technologies.

Developing human resources

In order to give its clients access to a wide range of services, the LSA has built a network of national partners including, among others, the Chamber of Commerce, the Institute of Intellectual Property, the Luxembourg Group of Aeronautics and Space (GLAE), Luxinnovation, SES and the Technoport incubator. They contribute with their

specialist skills that are complementary to those of the agency.

One such field where complementary knowledge is needed, is the development of human resources. In addition to developing the current key skills and expertise of the sector, the agency aims to work with partners in the field of education to inspire both schoolchildren and young professionals to work in space. In 2019, the University of Luxembourg will launch a unique interdisciplinary Masters programme dedicated to space in order to train future experts for the space industry. This shows the country's firm determination, not only to meet the industry needs of today, but also to make sure that the sector can develop and thrive in the future. **X**

FACTS

Connectivity

Luxembourg contributes significantly to Europe's 40% share of the global satellite business, supporting thousands of highly skilled jobs and keeping billions of people connected.

R&D

Luxembourg drew up its first action plan for space R&D in 2008 and takes another step further with the SpaceResources.lu initiative.

ESA

Luxembourg is an active member of the European Space Agency (ESA) and, in particular, of ARTES, the ESA programme to develop innovative satellite communications systems and services.

“The space agency will further encourage innovation-driven space entrepreneurship and promote Luxembourg as Europe's platform for commercial space development and a home for cutting-edge industries”

Étienne Schneider, Minister of the Economy



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SpaceResources.lu

With the launch of the SpaceResources.lu initiative in February 2016, Luxembourg took centre stage in the “new space” economy consisting of companies that explore and exploit space resources on a commercial basis. *Happen* spoke to Georges Schmit, the Special Envoy of the Luxembourg government of the SpaceResources.lu initiative, about the results so far.

“My personal expectations in terms of the initiative’s achievements and recognition have been largely exceeded,” says Mr Schmit. “It has received significant attention, both in Luxembourg and internationally, and the use of space resources for in situ applications has become a legitimate topic among space policy makers, explorers and experts worldwide.”

The results are already impressive. The law defining a procedure for the authorisation and surveillance of space missions by private companies

intending to explore and/or harvest resources in space and granting them potential ownership of these resources was a first key achievement. A significant number of space-related companies are now starting to implement projects and generate economic benefits in Luxembourg.

The government is currently working on introducing international standards of space law into the national legislation, and is engaging with the United Nations and other countries to progress with clarifying the international governance for

space resources exploration and use. Luxembourg will also host the Hague Space Resources Governance International Working Group, together with the Netherlands.

So will SpaceResources.lu become a long-term success story? “Yes, if we continue to be successful in attracting significant technology and market operators, as well as top-level professionals,” answers Mr Schmit. “The development of SES has proven that this is possible. As a first mover, we can be a leading participant in the emerging in-space economy.” **X**

FACTS

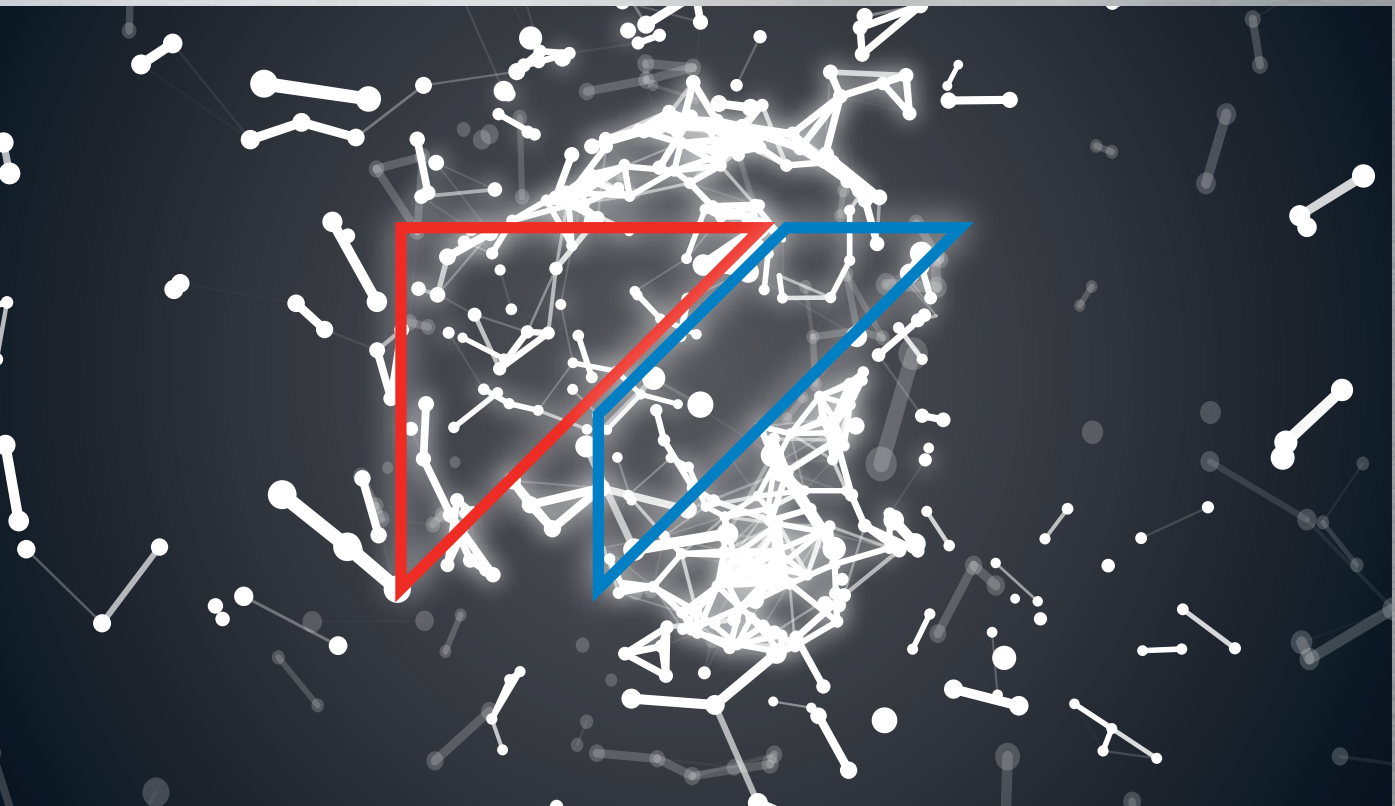
2017

On 20 July 2017, Luxembourg became the second country in the world to adopt a law on the exploration and harvesting of space resources.

6

Luxembourg has signed Memoranda of Understanding for bilateral space-related cooperation with six other countries.

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Towards a

Circular Economy Model

Photograph by Nader Ghavami



The focus and growing awareness of both politicians and the public is encouraging Luxembourg to move from a linear to a circular economy. The limitations of “extract – manufacture – consume – throw away” are becoming more and more apparent.

Texts by Marine Mombelli > Illustrations by Maison Moderne



Digest:

Ellen MacArthur Foundation in the United Kingdom, well known for its expertise in the circular economy, points out that of the 65 billion tonnes of raw materials injected into the world economy annually, only 20% are recovered from manufactured products at end of life. The European Union also imports six times more materials and raw materials than it exports. Europe, poor in natural

resources, faces increased competition for the remaining resources on international markets. Raw materials crucial to industry are imported from all over the world. Asia is an increasingly large importer, as a result of its rapidly growing middle classes. This is leading to increased consumption and, in all likelihood, less interest in exporting raw materials. European, and Luxembourg industry in particular, are at risk

from increases and fluctuations in raw material prices, shortages and even unavailability. In this dossier, we are going to hear from industry experts about how they see Luxembourg's continued transition towards a circular economy. In addition, from three organisations about the steps being taken in the areas of environmental protection and the move to a regenerative economy. **X**

For several years now, Luxembourg has been a strong advocate for a sustainable development policy in economic, social and ecological terms. This process, aimed at imagining the country as it will be tomorrow, led the Ministry of the Economy to launch a study on the current situation and assess the potential for the future development of the circular economy in Luxembourg.

Based on a roadmap, the strategy for implementing such a circular approach includes several key areas and pilot projects which can be implemented in the short to medium term. The foundations are already very good, since, according to the presentation made by the Secretary of State for the Economy, Francine Closener, the country has more than 15,000 jobs based on circular models, particularly in the steel and construction industries.

The study also showed the full impact that the rigorous implementation of a circular model would have on the economy. For Luxembourg companies, this could represent savings in procurement costs estimated at between €300 million and €1 billion per year. For Christian Tock, Director Sustainable Technologies at the Ministry of the Economy, “moving towards a circular economy is essential in order to avoid overexploitation of resources. We must help companies

to move from one business model to another, without this affecting their business. This is smart and sustainable growth.”

To reach this level of maturity, all players in the Luxembourg economic landscape are invited to create or take part in pilot projects in key sectors such as construction, ICT, finance or logistics. All actions related to ecodesign, industrial ecology, recycling, reuse, reuse and repair can be attributed to the circular economy.

All of them comply with the principles of longevity, quality, functionality and absence of waste. “Some companies have already integrated these principles well into their production, for others the process is longer,” says Dr Tock. “A paradigm shift is needed to change our economy. Bringing the sectors together and working across the board is something

we know how to do and we do it well. Cross-sectoral thinking makes a difference. The ecosystem and the driving forces are in place, but what remains is to encourage them to think and act differently.”

A new vision

A new conception of the economy is gradually emerging, that of the functional economy. In line with the circular economy, the functional economy consists of replacing the sale of goods with service or rather performances. The supplier remains the owner of the product and can benefit from the efficiency of the product, take advantage of the innovation effort made during its design and recover the materials at the end of use. This new concept helps meet the requirements of sustainable development. However, switching to this model requires a strategy, and above all, a strategic commitment. “It is too easy to point the finger at

FACTS

**€300 million to
€1 billion**

Estimated procurement savings per year with implementation of a circular model in Luxembourg.

More than 15,000 jobs

In Luxembourg based on circular models, particularly in the steel and construction industries.

“Not everything is immediately achievable, but the important thing is to start creating the required ecosystem today”

Christian Tock, Ministry of the Economy

companies that are now forced to move forward in a linear polluting model. They must, of course, be made responsible, but above all, they must be helped to profit financially from the benefits and efficiency of their products,” Dr Tock explains. “In fact, the idea of transforming products into a service is not new. What is new is the emergence of new technologies, such as robotics or the Internet of Things. This model, which was only valid for high-end products, can now be applied to more affordable products. Not everything is immediately achievable, but the important thing is to start creating the required ecosystem today.”

Luxembourg’s willingness to move to a circular model is clear.

In 2018, the circular economy was embodied in the “Climate Pact”, a programme in which all Luxembourg municipalities participate. Led by the Ministry of Sustainable Development and Infrastructure and the myenergy agency, the “Climate Pact” offers municipalities the opportunity to play an active role in the fight against climate change and to seek the support of the State. In a report published in May 2018, the Ministry announced that the investments undertaken since the beginning of the pact represented €55.2 million, a significant amount.

At the local level, projects are also progressing well, such as the conversion of the former industrial wasteland of the city of Wiltz in northern Luxembourg, proudly

presented as the future municipal “hotspot” of the circular economy. The pilot project, called “Wunne mat der Wooltz”, places particular emphasis on collaborative economics, materials passport and mobility.

With the same objective, the Fit 4 Circularity programme, managed by the Ministry of the Economy and the Luxembourg EcoInnovation Cluster of Luxinnovation, was designed to facilitate and accelerate the transition of companies to the circular economy. “The programme has provided the companies with new strategic business opportunities and also solutions to solve raw material supply issues, that they probably would not have

ESCH-SCHIFFFLANGE

THE NEW CITY OF THE FUTURE

The city of the future in Esch-Schifflange is beginning to take shape today.

As part of the national project to rehabilitate more than 60 hectares of Arcelor's brownfield sites in order to create an eco-neighbourhood, the development company Agora commissioned Luxinnovation to initiate a process to identify innovative technologies, services and products. In order to involve as many professionals and experts as possible in this approach, Luxinnovation has organised several workshops on the themes of (de-)construction (materials, modelling, circular economy), social integration (mobility, quality of life and urban agriculture) and urban metabolism (water, energy, materials and waste installation and flows). The conclusions of these exchanges will be used to draw up specifications that will support the international call for tenders which Agora should launch in mid-2019. **X**

agora.lu



Esch-Schifflange **X**

Photographs from *agora.com*



identified without its support,” says Charles-Albert Florentin, manager of the Luxembourg EcoInnovation Cluster.

Luxembourg as a test bench

This vision of a less linear economy is, moreover, in line with the strategy on the third industrial revolution, launched by the Luxembourg government in collaboration with the team of the American economist Jeremy Rifkin. Taking a participatory approach, the strategic study is based on the convergence of information and communication technologies, energy and transport within an intelligent network. The circular economy is an impor-

tant focus of this strategy, as its impact is transversal to all areas. The Strategic Monitoring Committee responsible for overseeing the implementation of the Rifkin strategy states that two-thirds of the priority measures identified have already been completed, to 80% after 18 months of work.

Nine measures were identified as priorities by the Government Council in November 2016, including the construction of a national energy internet; the implementation of a flagship project to demonstrate the socio-economic aspect of smart, sustainable, circular and zero-energy districts; the promotion of electromobility; and the launch of a programme for

emission-free personal vehicles. The country can also count on the presence of so-called “champion” companies such as Tarkett or Apateq. It also attracts smaller companies that have chosen Luxembourg to develop their activities, such as Eiravato, a young start-up that has created a platform for waste optimisation and secondary materials management. “One of Luxembourg’s strengths is that the country can be considered as a laboratory, a real test bench for all types of circular projects,” says Georges Schaaf, Head of Sector Development – CleanTech at Luxinnovation. “Thanks to its small scale, Luxembourg has a lot to offer!” X

“One of Luxembourg’s strengths is that the country can be considered as a laboratory, a real test bench for all types of circular projects”

Georges Schaaf, Luxinnovation

AMA MUNDU TECHNOLOGIES

Extracting recyclable materials from wastewater

Considering wastewater not as water loaded with pollutants but as a resource: this is the approach adopted by Ama Mundu Technologies and the philosophy behind the company's technology.

Thanks to its technology and the principle of membrane filtration, the Luxembourg company Ama Mundu is able to filter out, step by step, the various elements present in wastewater. These water samples contain a large number of organic and inorganic compounds that need to be recovered. "In the same way as sorting solid waste, we sort liquid effluents. In wastewater, there is obviously water and tailings. By cleverly separating these different elements, we can obtain fractions with immense value potential," says Vincent Popoff, the company's Deputy Director.

Ama Mundu's solution is aimed at farmers who want to adopt an economic and ecological management of their slurry. It also targets biogas producers aiming to improve the productivity of their methanisation plants by making better use of their digestates, as well as tourism professionals, real estate developers in sustainable cities and municipalities who wish to pursue an environmental approach.

The municipality of Waldbillig, in eastern Luxembourg, will be the first to use this technology: "The construction of a new wastewater treatment plant will take

several years before it becomes operational," explains Mr Popoff. "We have provided an intermediate solution: a filtration plant with a very low energy consumption that is immediately operational. It is also mobile in order to allow possible reuse."

Changing paradigms to innovate

The solution comes in the form of a very compact industrial unit. It is made exclusively of clean and recyclable materials and assembled in Luxembourg. No chemical or biological products are used for water filtration. "We have made processes evolve, >



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that's where our innovation lies, the approach is different. We deliver turnkey machines, from design to maintenance," says the Deputy Director.

Ama Mundu Technologies has been recognised with several innovation and environmental awards for its innovative and patented solution and has received co-funding from the Ministry of the Economy for its

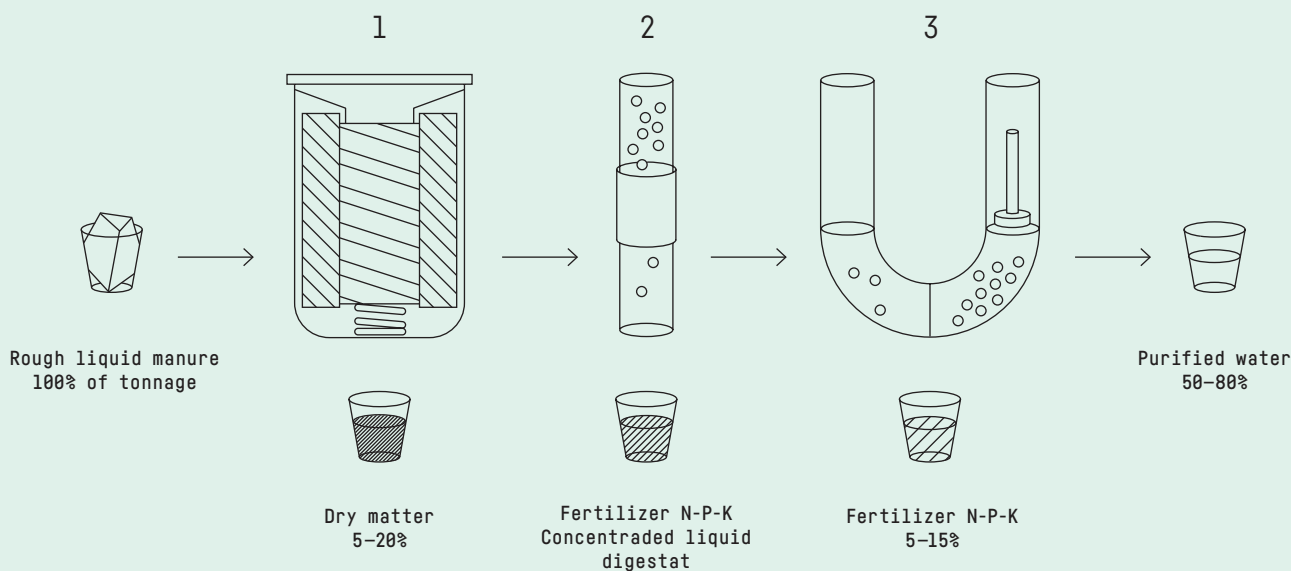
first R&D project. The company is also involved in a second research project, this time a European one: "Persephone", an Interreg project involving, over a three-year period, 13 partners from the Greater Region to discuss the development of the biogas sector. "In this context, the choice to settle in Luxembourg was really strategic for us. It is a real gateway to the European market," says Mr Popoff.

Population growth, industrialisation, urbanisation or simply current lifestyles are all threats to drinking water resources. "Wastewater reuse is not new. It is already commonplace in space or military operations," he explains. "However, as far as everyday life is concerned, current regulations do not yet allow this resource to be fully exploited. We are ahead of the regulations because the technology is ready." X

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About Boson Energy

Founded in Luxembourg in 2008, Boson Energy has offices also in Poland, Sweden and Israel. The company pursues its development in Luxembourg and its expansion in Europe through several very promising projects, which aim at meeting the highest standards of energy efficiency and environmental protection.

bosonenergy.com

4 QUESTIONS FOR

Heike Carl Zatterstrom,
Chief Communications Officer

How does Boson Energy put into practice a circular economy approach?

We believe in sustainable business with a positive impact on society. You need to earn the trust of communities by building "In My Back Yard" solutions, or you will face "Not In My Back Yard" resistance. We have developed the next generation of small-scale solutions to convert a wide range of waste into clean power, heat and cooling for direct local use.

We have uniquely efficient and affordable solutions that reduce urban stress and profoundly change the way waste is handled. Our solutions support all 17 Sustainable Development Goals and are circular because we transform waste into a minimal volume of chemically stable construction material that can be safely used for all eternity. We call it a "first mile" solution because we deal with waste right where it happens – without creating problems for future generations. We are also "Industry 4.0" with Internet of Things and data-driven process control and predictive maintenance.

In what type of projects are you involved?

We are currently building a next-generation gasification plant for wood chips and wood waste in Göttingen. Being allowed into the city centre of one of Germany's "greenest" cities shows that we are "In My Back Yard" capable. In full production, the plant will increase Stadtwerke Göttingen's green district heat production from 30 to 65%. Our first project in Israel will divert almost 200,000 tons of recycling leftovers per year from a landfill 250km away. Our first UK project will eliminate 5 million truck kilometres of waste transportation per year. Our first US project will shorten time-to-destruction of medical waste from up to 8 weeks, down to less than 24 hours. These projects are all game-changing in approach and profitable for our customer partners. They can be replicated both in these markets and globally.

What are the upcoming challenges for your company?

To scale. We are one of only 24 "new technologies" globally selected for the first round of "Environmental Technology Verification" by India's National Mission for Clean Ganga. Proving our ability to contribute to the Ganges clean-up will support our further expansion into Asia and Africa. To get there, we work intensely with niche leaders, like SAB and TMT, here in Luxembourg and our large global OEM partners.

What additional actions could Luxembourg take to help companies to turn waste into wealth?

With some 70% of the world's waste today being dumped, burnt or landfilled without any energy recovery, we are very far from the vision of a circular economy. Since China banned import of most "recycled" waste in January, it is very clear that Europe is far from that vision. We need to take the entire lifecycle footprint and cost of recycling into account. Luxembourg can continue to support product safety, health, and environment; and stimulate efficient circular solutions with further investments. We need to solve waste everywhere for our children to have a future on Earth! **X**

TAIWAN-LUXEMBOURG EXCHANGE

Accelerating the circular transition

The government of Taiwan is fully committed to the transition towards a circular economy and is encouraging various economic sectors to be part of the switch to a regenerative society.

As a consequence of its limited land space, insufficient natural resources and dense population, Taiwan has made great efforts to enhance its environmental protection over the past two decades. The results so far are excellent: the country has a general recycling rate of 58%, which is one of the highest in the world, and Taiwanese companies are increasingly aware of the need to invest in circular economy business models. Turning recycled PET into textile is common practice, with 95% of

PET bottles being transformed into valuable resources. During the 2018 FIFA World Cup, 16 teams out of 32 wore jerseys of recycled PET fabric made in Taiwan.

Regenerative economy

“Many people still have a negative image of ‘Made in Taiwan’ products, but an increasing number of producers are using circular business models,” underlines Shadow Chen, in charge of the Taiwan Circular Economy Network. The network brings together government bodies,

businesses and NGOs with the aim of facilitating the transition to a circular economy.

“Our mission is to promote the regenerative and restorative economy. We work together with the government to set up circular economy policies and integrate them into major industrial policies and programmes,” explains Ms Chen. The initiatives aimed at further exploring the opportunities provided by the circular economy are many: the government has recently launched a national “circular economy promotion plan”, the Environmental Protection Agency (EPA) has proposed a new circular economy policy framework and the city of Taipei has recently launched its “circular city roadmap”.

Luxembourg – Taiwan opportunities

Moving towards a circular economy and exchanging experiences with others is also high on the Luxembourg agenda. Ms Chen was part of the Taiwanese delegation that attended the Luxembourg Circular Economy Hotspot organised by the Ministry of the Economy and Luxinnovation in 2017. She was impressed by the determination of the Luxembourg government to adopt a circular economy, demonstrated for instance by the integration of circular aspects into public >

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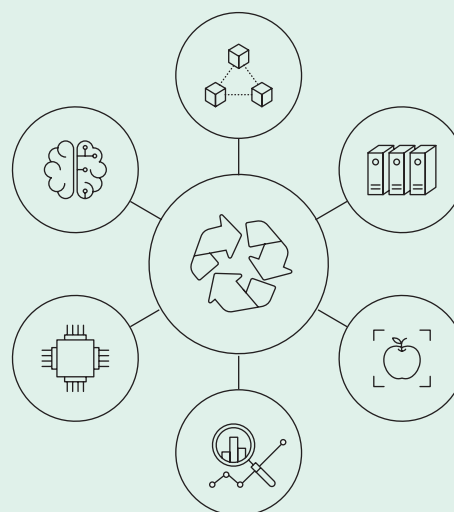
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EIRAVATO SELECTS LUXEMBOURG TO MAKE GROWTH HAPPEN

EIRAVATO

Website

eiravato.com



EIRAVATO has been admitted to the 7th edition of Luxembourg's Fit 4 Start programme and has announced Luxembourg as its new hub on mainland Europe.

The company joins the programme having recently secured €550,000 in seed funding from investors to drive global growth and the promotion of its pioneering software-based solution.

EIRAVATO uses cutting-edge technology such as artificial intelligence and big data to revolutionise the way we think of waste – to turn it into an opportunity.

Marcin Kulik, CEO for EIRAVATO, explains: "Plastic waste is one of the biggest global challenges facing the environment and companies striving to create sustainable businesses. Our platform

empowers companies to eliminate inefficiencies and discover finance-driven improvements whilst exceeding sustainability and CSR goals."

EIRAVATO sees Luxembourg as a perfect base to grow its European operation. "It is an ideal location for us as it is a true gateway to Europe. We've been impressed with the vision, commitment and support in Luxembourg, particularly the Ministry of the Economy, and their desire to take on the environmental challenge by realising the potential of the circular economy."

"The support for small companies considering setting up in Luxembourg is outstanding and we've found organisations such as the House of Entrepreneurship, Luxinnovation and Paul Wurth InCub, great to provide entry to the market," he continues. "We'd highly recommend these to any budding entrepreneurs." **X**

procurement projects and the availability of dedicated funding. "I also noticed the close collaboration between the public and private sectors in Luxembourg and the many initiatives aimed at changing private sector business models from selling products to selling services," says Ms Chen.

With global supply chains and reverse supply chains now greatly

interconnected, Ms Chen thinks that there are great opportunities for collaboration and best practice sharing between the EU and Asia, in particular Taiwan. *The Global Competitiveness Report 2018* ranks Taiwan 3rd in innovation and 4th in overall performance among Asia-Pacific countries, and according to Ms Chen, Taiwanese companies can be interesting partners for Luxembourg entities,

in particular in fields such as plastics, electronics, solar panels and construction. "We saw quite a few innovative ideas in Luxembourg in the area of circular construction," she says. "With several efforts being undertaken in Taiwan to introduce aspects such as 'the building as a material bank' and 'modular design', experience from Luxembourg can be very beneficial." **X**



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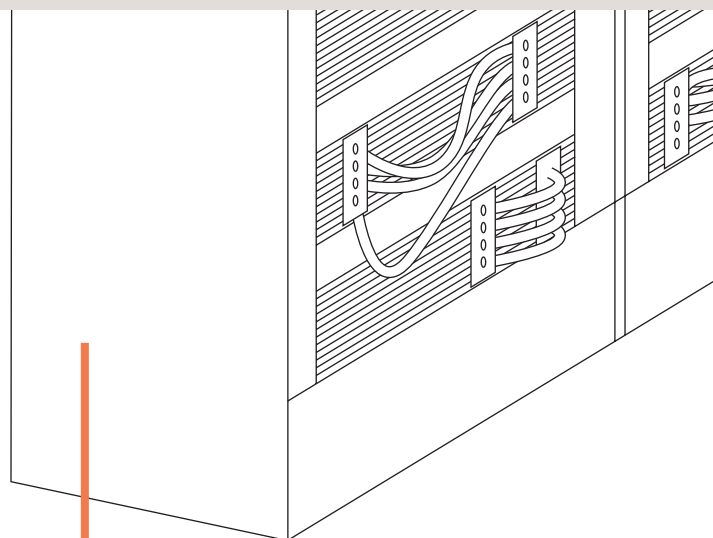
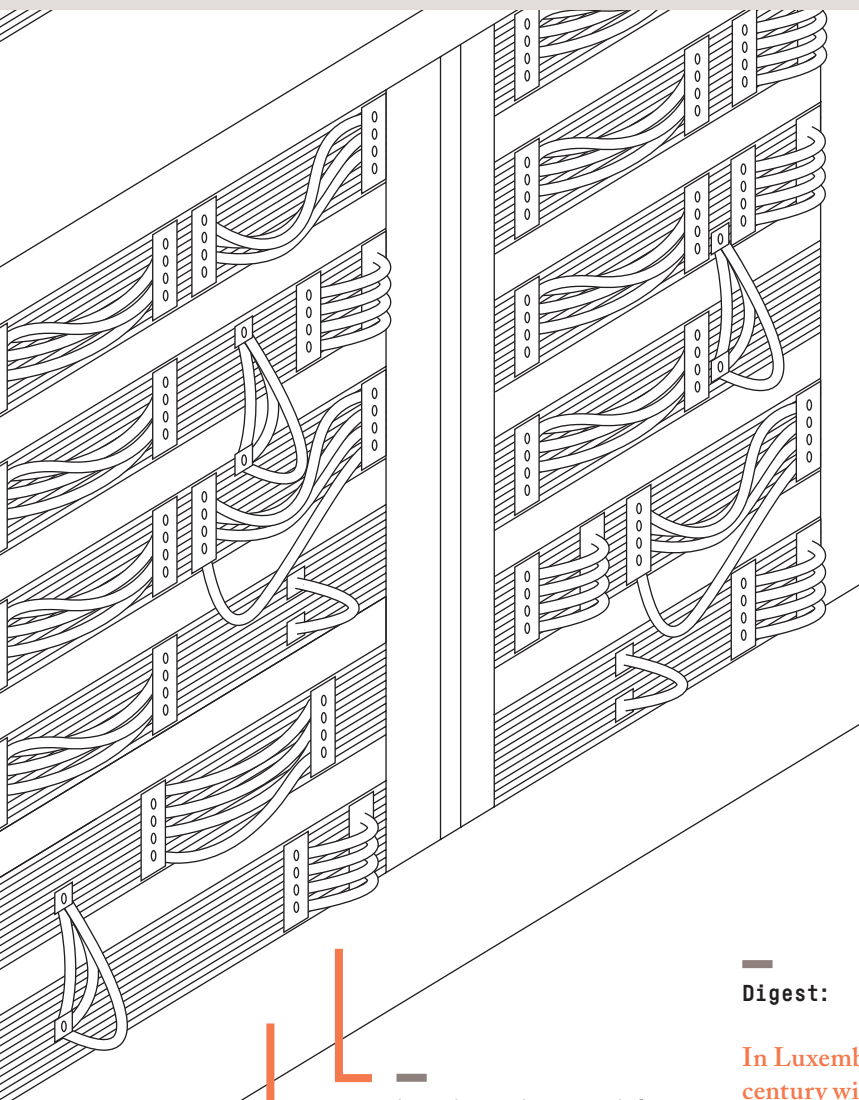
Setting the scene for digital success

Luxembourg is at the centre of the data-driven economy. Firmly committed to provide an environment where companies can thrive under this new paradigm, the country offers a finely balanced mix of elements to ensure success and security.



Luxembourg was ranked 3rd in the first edition of the European Commission's *Women in Digital Index* in 2018, proving that gender equality in the digital sphere as well as the country's digital development as a whole are areas of strength in the Grand Duchy.

Texts by Lisa Francis, Jean-Michel Gaudron, Lena Mårtensson



In the 2018 European Commission's *Digital Transformation Scoreboard*, Luxembourg gained two positions and now ranks in 2nd place (out of 28) in the Digital Infrastructure for Digital Transformation Indicator.

Digest:

Luxembourg has moved from 33rd to 8th place (out of 200 countries) according to the last *Worldwide Broadband Speed League Report* in 2018, which compares the speed of the internet connection from one country to another.

Despite an increasingly competitive landscape, Luxembourg managed to slightly improve its score in the last European Commission's *Digital Economy & Society Index (DESI)* report, in May. The country maintains its position of 5th place (out of 28).

In Luxembourg, the 21st century will obviously be digital. Information and communication technologies are the cornerstones of the national economy and a real growth vector for companies, enabling them to do better with less. With a yearly average of 7.4% in the 2009–2013 period, the growth rate of Luxembourg's ICT sector exceeds that of the national economy as a whole. In 2015, ICT specialists accounted for 4.6% of domestic employment in Luxem-

bourg, compared to an average of 3.5% in Europe. A growing community of start-ups specialises in fields such as artificial intelligence and the Internet of Things. With a top-of-the-line technological infrastructure (networks, data centres, etc.) and the implementation of a high performance computer, Luxembourg is an ideal host country not only for international ICT players, but also for any company that uses information technology as the backbone of its business. X

Our society is undergoing a digital transformation at a breathtaking pace, and data is emerging as the key resource for innovation and competitiveness. Businesses are today able to collect huge amounts of data through digitalised services and objects connected through the Internet of Things (IoT). Big data analysis makes it possible to glean information from this data in previously unimaginable ways and build completely new services and solutions, notably with the help of artificial intelligence (AI).

Luxembourg is at the forefront of the emerging data-driven economy. Data is a central resource for the most promising national sectors, such as space, clean tech, the automotive industry or health tech, and is at the heart of the move towards Industry 4.0 that is taking place in the materials and manufacturing sector. The country is also home to a dynamic and international start-up community that is strongly oriented towards digital solutions. Innovative start-ups specialise in fields such as fintech, the IoT, AI, big data treatment, cybersecurity and health tech. Luxinnovation's start-up accelerator programme Fit 4 Start attracts ICT-based start-ups from all over the world.

This thriving technical sector requires a finely balanced mix of elements to ensure success

and security. Good governance, support for research, impeccable security, advanced infrastructure and regulatory savvy are the winning mix that Luxembourg offers.

Governance

Facilitating the digitalisation of the business sector is a priority in Luxembourg, and the government actively encourages companies to experiment and innovate with new digital technologies through both national and European initiatives. One example is the cross-border digital testbed for connected and automated driving set up jointly with French and German authorities. The testbed allows companies developing the smart mobility of the future to test digital technologies in a real environment.

Research

The research-driven University of Luxembourg conducts high-level ICT-related research. While the university's Interdisciplinary Centre for Security, Reliability and Trust (SnT) conducts research in the fields of ICT and cybersecurity, the Luxembourg Centre for Systems Biomedicine (LCSB) uses highly advanced bioinformatics to analyse complex systems such as cells, organs and organisms. The Luxembourg Institute of Science and Technology (LIST) focuses on IT for innovative services with the target of transferring knowledge to

the private sector. Government grants support to companies that are undertaking R&D and innovation projects, often in collaboration with public research centres.

Security

Driven by the needs of its financial sector, Luxembourg has developed exceptionally high standards of cybersecurity that are readily available to all companies. Several governmental initiatives, including securitymadein.lu and the Cybersecurity Competence Center (C3), help businesses improve their protection against cyber threats by providing training and awareness raising for everything from threat analysis to digital forensics. The C3's unique simulation game "Room #42 – Do[n't] Panic" immerses participants in a cyberattack simulation to help them learn how to behave and take the right decisions.

FACT

4.6%

In 2015, ICT specialists accounted for 4.6% of domestic employment in Luxembourg, compared to 3.5% in Europe.

Infrastructure

A performing infrastructure is the backbone of any digital economy. Due to long-term, systematic investments in top-of-the-range infrastructure, notably Europe's most modern data centre park including 40% of all European Tier IV data centres and ultra-low-latency fibre routes to main European hubs, Luxembourg today ranks 2nd in "Connectivity" in the EU's *2018 Digital Transformation Scoreboard*. The country is now investing in high performance computing capacity and the future 5G network.

Regulations

Luxembourg has a solid track record as an early adopter of new legislation that ensures that companies can evolve in an environment of fair competition and fully exploit emerging digital opportunities. In the context of the digital economy, the ambition is to provide a regulatory environment that enables further development of trusted data-driven services. X

Luxembourg is
home to a dynamic
and international
start-up community
that is strongly
oriented towards
digital solutions

LUXROBO KOREA MAKES LUXEMBOURG ITS HOME

LuxRobo

Website

modi.luxrobo.com

Parents who are worried about their children being left behind in the quickly-evolving digital landscape can now rest easy. LuxRobo works actively to support educational projects through robotic toolkit MODI. This innovative Robotics of Things platform is taking the educational and learning landscape by storm. MODI has an elegantly simple design that allows components to be assembled very much like magnetic 'lego' pieces.

Three categories of interactive smart blocks (input, output and set-up) form 13 different modules. School kids connect and build customised robots or enable smarter electrical appliances with plug-and-play coding that is as simple as 1,2,3. "We want to give every child the chance to experience how fun and easy it is to build and code," says Mr Kim, General Manager of LuxRobo Global.

Luxembourg's agile government supports a strong start-up culture. Its international, multilingual workforce provides strong business support and connections throughout Europe, making Luxembourg a great place to work and live. Beyond the logical, business rationale, Andy Kim is the son of Korean parents who survived the Korean War. "Luxembourg was the smallest of the 16 countries to send soldiers. What better way to commemorate our eternal gratitude and our nations' intertwined histories?" smiles Mr Kim. X

FAST, EASY, ANYWHERE

SnapSwap

Website
snapswap.eu

In finance, when it comes to reliability and trustworthiness, nothing beats an AAA rating. Add ease of doing business and you have a view of what attracted SnapSwap away from Silicon Valley. SnapSwap provides a fully automated online customer onboarding solution for banks and other regulated financial services. It allows them to onboard new customers and complete KYC (Know Your Customer) processes, in full compliance with EU and international regulations, in minutes rather than days.

With over 20 years' experience in finance, cofounders Denis Kiselev, CEO, and Natalia Pavlova, CTO, focus on showcasing new solutions that will revolutionise access to financial services - both for individuals and for businesses. "It was a choice between London and Luxembourg when we decided to move to Europe," says Mr Kiselev. "Locating in the EU allowed us to offer our services to all member states - a 500 million people marketplace."

As well as its openness to new technology and methods, Luxembourg has a strong start-up ecosystem with extensive government and private support.

Small community and easy access to markets allowed SnapSwap to build partnerships with major industry players, like Mastercard and Thomson Reuters, as well as with local innovators like Apla, a Luxembourg company building the next generation of blockchain platform. X

HPC

Luxembourg: Supercomputing for Industry

Luxembourg, a forerunner in High Performance Computing (HPC), paves the way for a world-class computing environment, in close alignment with the EU.

In today's complex business environment with unpredictable competitive challenges, powerful supercomputers enable cutting-edge, secure technology. They provide the needed environment to develop scientific capability, predictive modelling and value-add for new competitive markets. High Performance Computing (HPC) capacity can boost productivity, enhance the economy and even improve life for the general population.

The United States and China are the two big masters of the game in the supercomputer area: of the

top 10 supercomputers in the world, five are based in the United States and two in China. And Europe? Clearly, the European HPC technology supply chain is still weak and the integration of European technologies into operational HPC machines remains insignificant. However, the needs expressed by scientists and industrials are growing exponentially, both in volume and in complexity. The computational power required is therefore also rising sharply and, in the absence of sufficient infrastructure, European scientists and industrials have to turn to data processing outside the EU.

In March 2017, at the initiative of Luxembourg, the European Commission finally launched the EuroHPC declaration to build and deploy a world-class High Performance Computing infrastructure that would rank among the world's top three.

In January 2018 EuroHPC, the legal and financial structure allowing the coordination of this massive project, was created, coordinated by Jean-Marie Spaus (Ministry of the Economy).

EuroHPC, headquartered in Luxembourg, will support the acquisition and interconnection of world-class supercomputers, including two systems capable of a hundred million billion (or 1,017) calculations per second and at least two petascale systems

capable of a million billion (or 1,015) calculations per second to be among the top 25 in the world ranking.

"Today in Luxembourg, it is a new page in the history of Europe that is written," said Mariya Gabriel, the European Commissioner in charge of the economy and the digital society, during the first meeting of the EuroHPC board held in Luxembourg in early November 2018.

"Europe must quickly catch up with the United States, China and even Japan. It is a strategic issue of the utmost importance," added Mario Grotz, Director General for Research, Intellectual Property and New Technologies at the Luxembourg Ministry of the Economy. **X**

FACTS

Substantial Resources

Under the next long-term EU budget for 2021-2027, the European Commission to invest €2.7 billion in projects to build up and strengthen supercomputing and data processing in Europe.

25 on board

In January 2018, the European Commission proposed to jointly invest with member states the sum of €1 billion through a new legal and funding structure: the EuroHPC Joint Undertaking. So far 25 European countries have confirmed their commitment to this ambitious project.

ERADICATING MALWARE. 24/7

ODIX

Website
odi-x.com

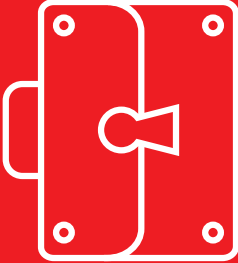
ODIX CDR (Content Disarm and Reconstruction) security software is the next generation anti-malware technology presented today as the most powerful. Whether the threat is a familiar attacker or not even yet detected, this protection platform sanitises files based on advanced True Content Disarm & Reconstruction technology.

ODIX came to Luxembourg via PwC's cybersecurity accelerator. "It was an easy decision. Luxembourg understands tech companies. It has a plethora of support and testing structures and the government is very responsive," says Oren Eytan, CEO. "That helps get projects running, and when you are on the leading edge, that's important to staying ahead of the curve. Luxembourg offers a great environment for developers and customers to help grow the business."

ODIX uses five parallel anti-virus engines and Smart TrueType to check that files match the standard structure type. Beyond just looking for specific malware markers in known viruses, trojans, worms, ransomware, etc., this seamless process removes the malware and rebuilds the file; leaving the original file content and function intact. Even unrecognised malware doesn't stand a chance. ODIX solutions are used by organisations with cloud-based or frequent file-based data exchange such as numerous financial institutions in Luxembourg. This is good news now that over 800 new malware specimens are found each hour! **X**

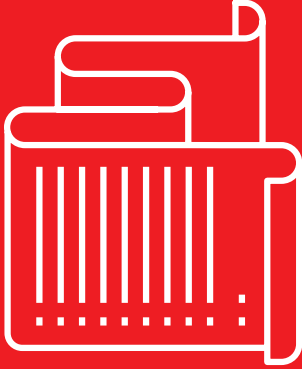
Nine FACTS about Luxembourg


Illustrations by Maison Moderne



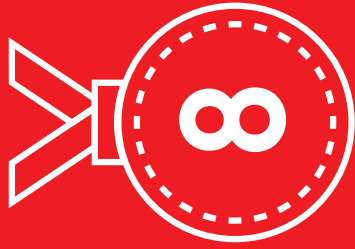
— Luxembourg is ranked the **world's best place for job security**, in part thanks to its stable economy. **X**

— Luxembourg has one of the **highest life expectancy rates** in Europe [82.4 years]. **X**



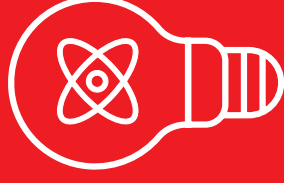
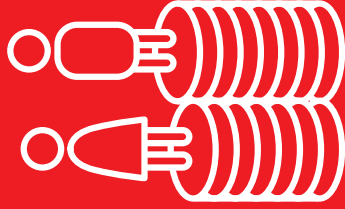


— Luxembourg City is **#9 worldwide among the most livable cities for European expats**, out of 480 cities around the world. **X**



— Luxembourg takes 8th place (out of 180 countries) in the ranking of the least corrupt countries in the world. X

— With an average gender pay gap of 5.5% between men and women, Luxembourg is #3 in the EU, which has the smallest gap worldwide. X

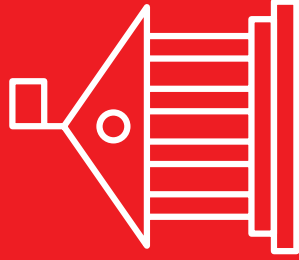


— On the 2018 *European Innovation Scoreboard*, Luxembourg is now one of the six “**Innovation Leaders**” (#2 for connectivity and digital skills and #3 for internet use). X



— With a dynamic labour market and highly competitive salaries, Luxembourg is #2 in the world for attraction of talent. X

— The University of Luxembourg ranks #12 worldwide in the *Times Higher Education [THE] Young University Rankings 2018* and is one of the most international universities in the world (more than 55% of foreign students). X



— Based on cross-border trade, investment and revenue flows, Luxembourg is the 3rd most globalised economy in the world. X

Living & Working in L U X E M B O U R G

What they have to say

Four professionals who live and work in Luxembourg share their experiences with *Happen*. Read about what they like most about working in Luxembourg, the excellent quality of life and healthy work-life balance.

Texts ^{by} Sue Hewitt > Photographs ^{by} Luxinnovation

Martina

Profession:

Financial Controller at
International Electronics
& Engineering [IEE]



"As soon as I arrived in Luxembourg, I noticed that living here is very different from living in Italy or Brazil, where I also lived for a while. I immediately felt secure and at home in this country. Working in Luxembourg is very attractive because it offers you great career opportunities and a strong economic environment. Here, you have the possibility to find a great balance between your professional and your private life. The high salaries are, of course, another great advantage and, despite the high cost of living, people still have great purchasing power. In addition, Luxembourg's nature is fantastic. There is a large choice for people who enjoy open air activities, sports or hiking for example." X

"Despite the high cost of living, people still have great purchasing power"

Joni

Profession:

Civil Engineer at
Kuhn Construction



"I felt at home here in Luxembourg from very early on, partly because there's a strong Portuguese community here. What I appreciate most about Luxembourg is its excellent quality of life; the balance between work and personal life. The fact that the country is multicultural allows us to get to know other cultures and make friends with people from other nationalities. Last but not least, its geographic location in the centre of Europe allows us to travel throughout the continent with ease and visit other locations around the country." X

Etienne

Profession:

Program Manager Tire
Intelligence at The Goodyear
Tire and Rubber Company



"What brought me here was the location and the job together. It was really the perfect combination of where I wanted to live, where I wanted my family to live and a great, stimulating job. I would recommend coming to Luxembourg for three reasons. The country itself. It's a very nice country to live in, especially if you have a family. The jobs are really interesting. The third reason, it's multicultural. That's what I enjoy." X

"Excellent quality of life"

Luisa

Profession:

Consultant Statistics &
Analytics at Capgemini Group



"I came to Luxembourg six years ago to do an internship at the European Commission. I decided to do a second master's degree at the University of Luxembourg and then stay on to work. Luxembourg offers a very interesting professional environment. I think it's the country of choice for those who want to invest in their career. It's also the right country because it offers a perfect balance with your private life, and for those who would, eventually, want to start a family. We have a very good multilingual education system. The health system is great too. It is very interesting to live here." X

Life in L U X E M B O U R G

People make places and Luxembourg is no exception. To prove it, we spoke to five foreign CEOs about how they are helping shape the country's business landscape, why it's the best place to be for innovation and why the Grand Duchy is a great place to live.

Texts by Kate Maidens > Photographs by Jan Hanrion
and Patricia Pitsch (Maison Moderne), Mike Zenari



Colette Dierick

| | |
|----------------------------|--|
| Originally from | Ghent in Belgium |
| Profession | CEO, ING Luxembourg |
| Company's main business | Multinational banking and financial services |
| Living in Luxembourg since | August 2016 |

Colette Dierick knows all about male-dominated industries: her family comes from the construction sector and she studied engineering at university. During her 30-year career at ING, she has been an outspoken advocate for more women in all industries. "I'm really interested in innovation and technology. I visited Silicon Valley and was one of the founding partners of Zembro, a Belgian start-up that helps elderly people stay connected with smart bracelets." From the stylish Mudam to the old town in the Grund, "everything is within easy reach in the city! The combination of old and modern is a trademark of Luxembourg and a reflection of its spirit: respect for the past while building the future." She believes "innovation is the key to a sustainable future. This country has demonstrated time and again its adaptability and entrepreneurial spirit." Her daughters study in Belgium, and while she enjoys living in this small yet vibrant, international community, she looks forward to family weekends back home. **X**



Kyle Acierno

| | |
|----------------------------|---------------------------|
| Originally from | Canada |
| Profession | Managing Director, ispace |
| Company's main business | Lunar exploration |
| Living in Luxembourg since | 2017 |

Lunar exploration brought Kyle Acierno to Luxembourg in his quest to develop ways at ispace to propel humanity into outer space. Thanks to the government's SpaceResources.lu initiative, it is an exciting time to be in Luxembourg's fast-growing, space mining industry. He says there are numerous political advantages unique to Luxembourg. "The government passed a law whereby companies are able to own the resources they extract in outer space – which is something we want to do in the future." He sees a huge ecosystem developing around the space industry, with inter-industry support coming from transportation, energy and manufacturing industries. "They're all interested in seeing how they can extend their businesses into space, or how they can help with R&D to make our dream a reality." From outer space, to the great outdoors... when he is not dreaming of ispace's first mission to the moon in 2020, he is off enjoying the Moselle valley and spends the summer in picturesque Esch-sur-Sûre. X





Frédéric Stiernon

| | |
|----------------------------|--|
| Originally from | Belgium, in the Gaume region |
| Profession | CEO and Founder, CarPay-Diem |
| Company's main business | Smart fuelling solution |
| Living in Luxembourg since | Still lives in the Gaume region, but has worked here for almost 22 years |

Frédéric Stiernon started out in the automotive industry, then moved to banking solutions and mobile payments. In 2016, he combined the three experiences to create CarPay-Diem, a mobile payment system for fuel. Luxembourg is an increasingly attractive place for start-ups: "With so many different incubators and accelerators launched over the past years, there's a kind of consolidation and synergy between different incubators and smaller initiatives that now became bigger projects." It's also perfect geographically ["easy to move everywhere"], and "the people running the country manage it like a company. They are open and really push the country to move on and to be the best in Europe for the development of employment." For him, "Luxembourg is synonymous with solidarity. There is such a dynamic and innovative interaction between different companies. Lots of events means you're part of a small business world, where everyone knows one another. If you need to meet someone, you're just two clicks away." X

Sébastien Danloy

| | |
|----------------------------|--|
| Originally from | Brussels, Belgium |
| Profession | Former Head, Continental Europe & Offshore and CEO, RBC Investor Services Bank |
| Company's main business | Investor and treasury services |
| Living in Luxembourg since | 1993–2001, and then from 2011 |

Sébastien Danloy first came to a “slow and bureaucratic” Luxembourg as a graduate. He left in 2001, returning a decade later for the “perfect job” as CEO at RBC. By then the country has since undergone a transformation in terms of culture (e.g. the Philharmonie in Kirchberg – he’s a fan), as well as on the industrial and social front. “Luxembourg is now much more multicultural, more open to the outside world. We have people from almost 30 nationalities working at RBC,” he says. “The ecosystem surrounding the financial industry has grown significantly. There’s a shift towards fintech and a younger generation with a fresh outlook is helping support the financial industry.” RBC has a social responsibility towards the city’s future. “Every year, we organise the RBC Race for the Kids raising funds to support the Red Cross and Kannerhaus Jean.” A fan of restaurants that have been awarded Michelin stars, he enjoys that Luxembourg has the highest concentration of such restaurants per capita in the world. Will he stay for good? “I left once, I won’t make the same mistake again.” **X**





Pierre Barreau

| | |
|----------------------------|--------------------------|
| Originally from | Paris, France |
| Profession | CEO and Co-founder, Aiva |
| Company's main business | AI music composition |
| Living in Luxembourg since | 1.5 years |

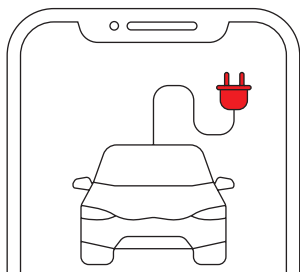
After studying computing science at LCL in London, Pierre Barreau left in search of better opportunities in Luxembourg. His company Aiva, which uses artificial intelligence to create personalised music, soon landed a spot at Luxinnovation's Fit 4 Start acceleration programme. He hopes that Aiva will help "change and diversify the image of Luxembourg, moving away from being known as the financial centre of Europe, to being a tech-friendly place." What advantages does Luxembourg offer compared to London? "It's a no-brainer, it's the mindset of the people. Open-mindedness is required for innovation. And the people here are very receptive to new technology projects coming from Luxembourg." He continues: "The quality of life here is very good. The maximum commute time for all our employees is 15 minutes, and all over Luxembourg, it's green. You can get out of the city so quickly, go for a run or a hike." These are just some of the many advantages convincing talents that this is a great place to live. "And with people comes innovation." X

It happened **1st** in Luxembourg

Luxembourg is a land of innovation. Small in size, big in dynamism, the country is a hidden gem and host to world premieres. Here are some examples of what happened in 2018.

Texts by Jean-Michel Gaudron > Illustrations by Maison Moderne

April 2018



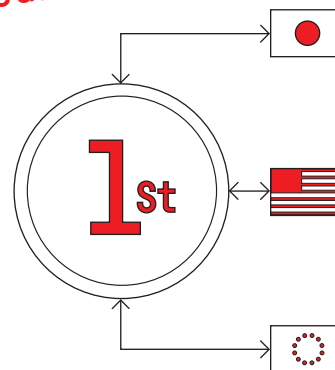
UFODrive, car rental of the future

At Findel airport, UFODrive launched its world premiere: a mobile application to easily and quickly rent a 100% electric car from a premium range (Tesla, Jaguar, etc.). A 100% digital customer experience awarded Startup of the Year at the Luxembourg Mobility Awards 2018. **X**

Bitflyer, cross-border bitcoin

The Japanese company Bitflyer, hosted in the Luxembourg House of Fintech, has become the first bitcoin platform to be licensed to operate on three continents: Japan, the USA, and now Europe. The company claims to be the world's largest bitcoin exchange platform (in volume). **X**

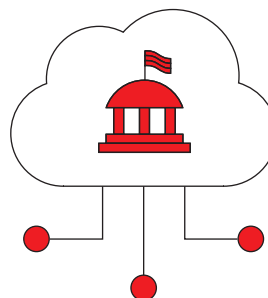
January 2018



A "Data Embassy" for Estonia

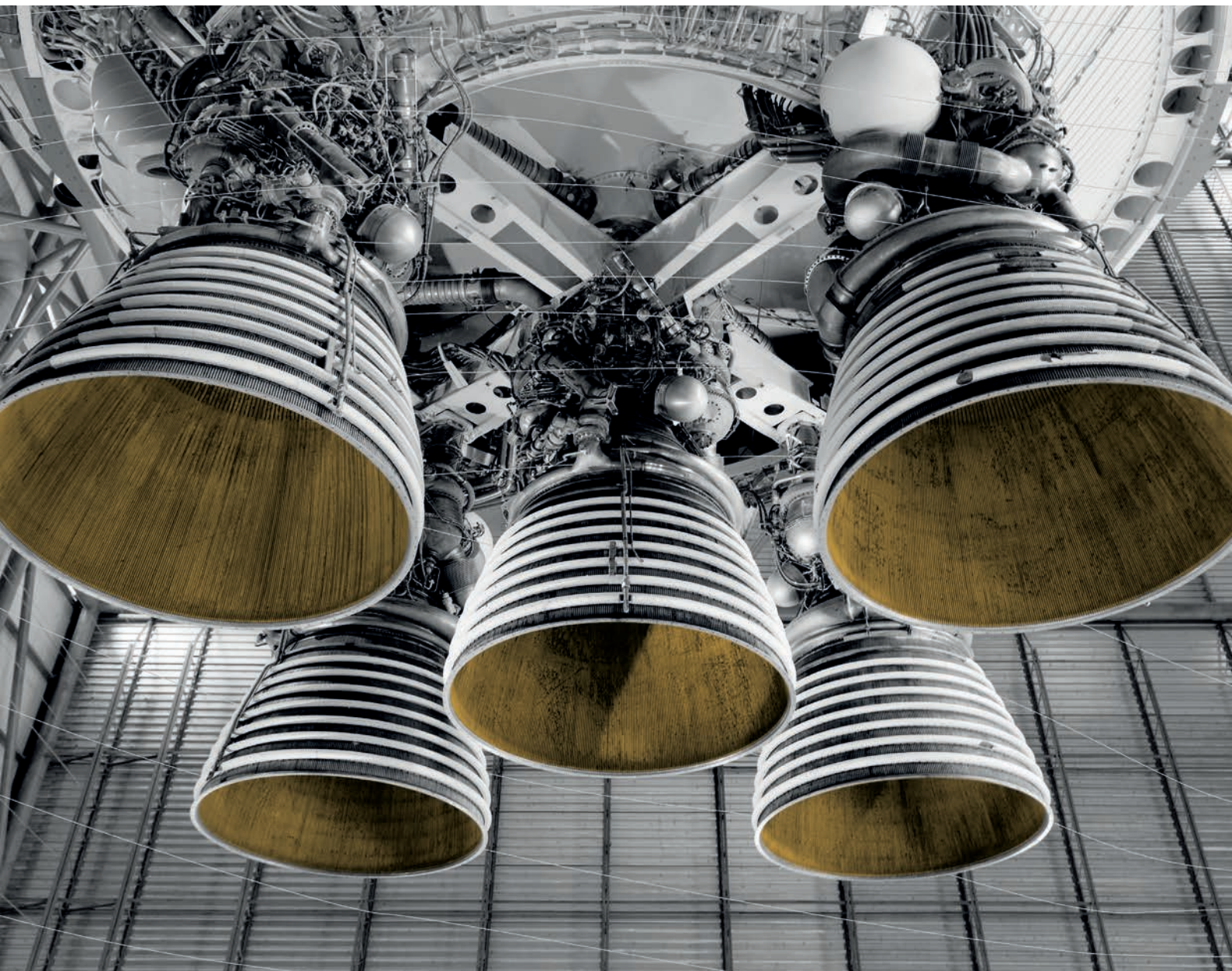
Estonia and Luxembourg innovate together! The former has chosen the latter to establish the world's first data embassy: a data centre with the same privileges and immunity as a traditional embassy, which hosts sensitive data that the Baltic state wants to protect. "In a digital world, we have to put overboard old concepts of national borders," says Gilles Feith, the head of the Luxembourg government's IT activities. Data hosting is a speciality in the Grand Duchy: a quarter of the Tier IV data centres (the highest level of security and availability) in Europe are in Luxembourg. "Luxembourg has been a very good partner. In essence, we are creating a new precedent in terms of international law and practice, a kind of innovation," explained Siim Sikkut, the Estonian government's ICT Policy Adviser. **X**

April 2018



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