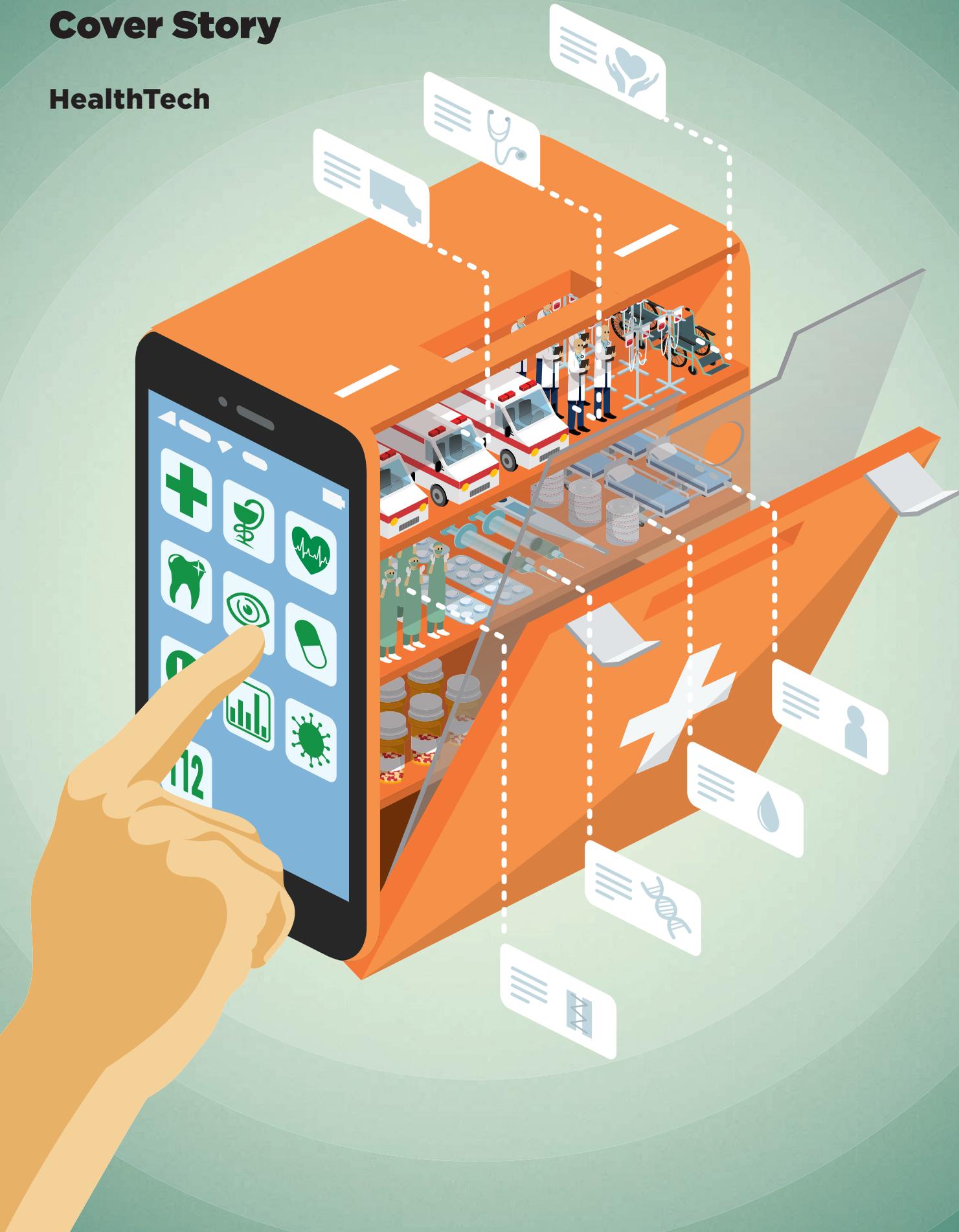# Cover Story

HealthTech

Gold mine or Pandora's box?

TEXT Stéphane Étienne / Hypallages

With gems like B Medical Systems, Fast Track Diagnostics, Flen Health and many others, Luxembourg is well on its way to winning its gamble to become a world leader in the health technology sector. The motivations are not just economic. Like most European countries, Luxembourg is faced with an aging population, the spread of chronic diseases and a lack of infrastructure and medical personnel. In this regard, health technologies, more commonly referred to as healthtech, hold great promise, even if there are many questions raised about how they should be deployed in the service of both health professionals and patients.

——— In the past ten years, Luxembourg has made significant investments in order to become a leading destination for capital and talent in healthtech, a promising and rapidly developing sector. Today, it has many world-renowned research institutes such as the National Health Laboratory (LNS), the Luxembourg Centre for Systems Biomedicine (LCSB) at the University of Luxembourg, the Luxembourg Institute of Health (LIH) and the Integrated Biobank of Luxembourg (IBBL), the Personalised Medicine Consortium (PMC) and the Laboratory of Molecular and Cellular Biology of Cancer (LBMCC).

To accelerate innovations in healthcare, the country has also stepped up initiatives aimed at fostering collaboration between the public and private sectors. This is how the Luxembourg HealthTech Cluster was created (see the Interview with its manager, Jean-Philippe Arié). Managed by Luxinnovation, the national agency for the promotion of innovation, it brings together companies and academic centres to build collaboration favouring the emergence of innovations from which patients and healthcare professionals can benefit and identify business opportunities. It also supports international players wanting to start businesses in Luxembourg or to initiate collaborations with Luxembourg entities. The House of BioHealth, a collaboration between the Ministry of the Economy, private investors and the ZARE[1] intercommunal syndicate, hosts public research laboratories and companies active in the field of biotechnologies, information technologies, and communication and environmental technologies. It is installing a 350m^2 incubator exclusively dedicated to startups active in health technologies.

In April 2021, a further step was taken with the launch of a first call for projects by the Minister of the Economy, Franz Fayot, in partnership with the National Research Fund (FNR) in the field of health technologies. The objective of this joint call was to create a culture of collaborative research between Luxembourg companies, public research organisations, hospitals and healthcare organisations. To facilitate the emergence of projects and support the process of preparing joint projects, a platform - *www.research-collaboration.lu* - was set up on which all private and public actors could submit their project ideas before the deadline of 30 June 2021. Each pre-application had to come from a consortium comprised of at least one company and one research organisation, which could be either a medical or care organisation. The authors of the selected projects were then invited to submit a complete file for financial assistance before 15 October 2021. The results will be communicated as early as January 2022 and projects can start a month later.

A very fragmented market

We can see that Luxembourg has spared no effort to ensure that healthtech becomes a vital component in the economy and a factor differentiating the country from international competition. But what exactly are we talking about? What does the term healthtech include? What are its challenges? What will be its impact on healthcare professionals and patients?

Healthtech brings together innovative companies active in three main sectors: biotechnology, medical technology and digital health.

Biotechnology (or Biotech) brings together all the solutions combining life sciences and technologies from various other disciplines such as physics, chemistry or computer science. There is not one, but several biotechnologies depending on the areas covered: green biotechnologies for agriculture and agri-food, white biotechnologies for the industrial synthesis of biofuels and polymers, yellow biotechnologies for soil remediation and water treatment and red biotechnologies for the manufacture of medicines. The latter are increasingly used in all

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1. Intercommunal syndicate for the creation, development, promotion and operation of a regional economic activity zone in Ehlerange.

'Artificial intelligence will help to prevent and treat many diseases, but it will not be a silver bullet on its own.'

therapeutic areas, particularly in oncology, infectious diseases and the central nervous system.

Medical technology (or MedTech) covers a wide range of products and healthcare treatments used to treat, save or improve the lives of patients suffering from all kinds of pathologies. It encompasses both very simple tools (syringes, dressings, wheelchairs, pregnancy tests, hearing or orthopaedic prostheses, etc.) as well as much more sophisticated ones (MRI, artificial respirators, in vitro diagnostic tests, artificial organs, surgical robots, etc.). Today, more than 500,000 medical technology products are used in hospitals, care facilities or in homes around the world.

Digital health (or e-health) refers to all the means and services related to health that use the latest information and communication technologies. Connected medical devices such as telehealth (preventive and care procedures performed remotely), telemedicine (medical procedures performed remotely by a doctor), applications for smartphones or connected objects related to health and electronic health record systems are all part of it.

Unlike other innovative sectors which have been almost swallowed up by the famous 'GAFAM' (Google, Apple, Facebook, Amazon, Microsoft), healthtech has not developed around networks, platforms or marketplaces always pushing for greater concentration. It has remained a very fragmented market. Everyone has their chance to become a

champion, provided they have unique expertise and access to capital allowing them to develop their innovation up to a more or less advanced stage of clinical validation. Several thousand companies around the world are thus engaged in a constant race for innovation. In the Grand Duchy, according to the latest sectoral mapping published on the Luxembourg HealthTech Cluster website[2], 136 companies, whose primary market is healthcare in Luxembourg, employ nearly 1,880 people.

The COVID effect

Although healthtech has played a leading role in the healthcare sector for several years, the present COVID crisis has given it a real boost and has underlined both its capacity for innovation and its societal impact. This was brought to light by the messenger RNA technology developed by the German startup BioNTech and used in the manufacture of Pfizer's vaccine against COVID-19. Rather than administering an attenuated or inactivated infectious agent or some of its proteins, the messenger RNA vaccine contains instructions from which the patient's own body will manufacture the treatment. The advantage of this method, which comes down to making code, is that it quickly produces a prototype that is easy to produce, since the patient's body does most of the work. In addition to COVID-19, messenger RNA could prove to be very effective in individualised treatments such as cancer, where each patient would receive a tailor-made product corresponding to their tumour.

The pandemic has also shown that it is possible to practice medicine in a different way thanks to online appointment booking and teleconsultation – the recent rise of Doctena, a Luxembourg startup, is the best example of this – monitoring the elderly remotely or the follow-up of certain patients at home. Health monitoring applications and connected objects for healthcare (Internet of Medical Things or IoMT) have also experienced exponential development, whether for monitoring heart rate, blood pressure, or respiratory data or insulin in diabetic patients.

Artificial intelligence, a major player in the medicine of the future

And this is only the beginning. The substantial changes are yet to come. According to specialists, the revolution in the biomedical sector will require the future merging of artificial intelligence and massive amounts of health data.

Until recently, medical practice relied on the methodical collection and analysis of clinical data, i.e., objective information observed during clinical trials of a drug or medical device, performed on patients in a hospital environment. The digitalisation of medical records combined with the increase in available computational capacity has paved the way for the exploration of real-life data by algorithms. Unlike clinical data, real-life data describes the use of a

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2. *www.luxinnovation.lu/healthtech-mapping*

Yannick Oswald
Partner at Mangrove
Capital Partners

'Entrepreneurs in healthtech are rarely doctors'

In 2015, Mangrove Capital Partners was one of the first venture capital firms to invest in healthcare technologies. What made you interested in this sector at a time when it was not popular with investors?

Each year, we reflect on the major trends of the future. In general, there are two main factors that influence our decision on whether or not to invest in a particular sector. The business, if it is going to be disruptive, must have a significant impact on people's daily lives, and the technology must be mature enough to be able to introduce this disruption. To inform our considerations, we do a lot of research, read reports and meet people who are involved in innovation.

So, for example, in the case of health technologies, we did not talk to doctors or companies that are leaders in their market. Most of the time, they are not interested in innovation. In 2015, thanks to our research and our various discussions, we realised that it was the right time to invest. Artificial intelligence in particular had reached a degree of maturity such that it could produce algorithms that could radically change a world as complex as healthcare. Yet this field faces enormous problems that are far from being resolved. It was this combination of a need for significant change and technologies capable of responding to it that prompted us to take a chance on healthtech. And we do not regret taking this risk. We have already invested in six startups – we will continue to do so in the coming years – and they are repaying us well.

What criteria do you rely on when investing in a healthtech project? Do you ever make mistakes?

Not every project we invest in works. The art of our business is to ensure that a sufficient proportion of the investments are profitable. To do this, we spend a lot of time analysing a project. What added value does it bring? Is all the information provided by the entrepreneur verifiable and correct? A relationship of trust must also be established between the entrepreneur and us. It is not really their personality that will be the decisive factor, but rather a desire to give the project their all, their passion, and an ability to tell a story that can convince all audiences, whether they are future collaborators, investors, or clients.

treatment or a medical device in an uncontrolled environment, i.e., the daily life of the patient throughout their treatment journey. By nature, it is very heterogeneous, and the quantity is almost infinite. It includes clinical data from the medical file as well as information of an administrative nature (treatments and procedures covered by social security) and data from connected objects or generated by online activities (Internet searches, visits to medical appointment platforms, patient social networks or online drug sales sites, etc.).

The use of this reservoir of data by artificial intelligence offers many perspectives. Soon it will be possible to predict the development of a disease, estimate the probabilities of a drug's success in different target populations, offer more personalised treatments, and support various public health interventions such as disease surveillance, epidemic outbreak response and management of healthcare systems.

Artificial intelligence projects are also being developed in Luxembourg. For example, 'Deep Medicine'. This startup plans to

01. 02. 03. 04. Healthtech brings together innovative companies active in three main sectors: biotechnology, medical technology and digital health. These cover many fields ranging from technologies derived from other disciplines such as physics and chemistry, to e-health, and from simple healthcare products such as syringes and dressings to complex items like MRI and surgical robots.

Coming soon: robots replacing doctors?

Will the medicine of tomorrow be entirely made up of robots and artificial intelligence? Nothing is less sure. Certainly, medical software managed to sow discord in 2018 in the United Kingdom by being more effective in dealing with a set of questions usually offered to medical students. But does this mean that robots will one day be able to perform surgeries without the help of a practitioner? For many medical robotics specialists, the answer is 'no'. Robots will be able to perform movements with a precision that humans cannot achieve, but they will never be able to make critical decisions. However, the way of treating and operating will change. Medicine will always have a human element, but it will be more predictive and preventive.

'The current health crisis has shown that it is possible to practice medicine differently.'
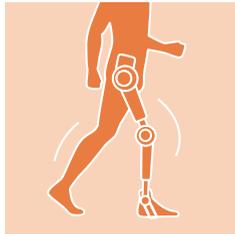
The augmented human or just an illusion of invulnerability

For years, scientists, research labs and powerful companies like Google, NASA and MIT have been working on innovative technologies that will someday turn humans into sophisticated 'human-machines'. Augmented with prostheses and implants, they will be endowed with tenfold intellectual, physical and physiological capacities and free from disease, old age and even death. But if the dividing line between man and machine becomes so blurry, can we still speak of a human being? Would the human species still exist if it freed itself from its vulnerability and finitude? Without the fear of death and the possibility of making a mistake, can we still have a taste for life? To even pose these questions is, ultimately, to answer them.

launch early diagnoses of neurodegenerative diseases on the market by the first quarter of 2023. Powered by artificial intelligence, these will make it possible to detect pathologies such as Alzheimer's disease, Parkinson's disease, or multiple sclerosis long before - between 15 and 20 years - the onset of the first symptoms.

Antibiotic resistance, more deadly than cancer by 2050

Having said that, we cannot fall into blissful optimism either. The use of 'smart data' may advance knowledge and help prevent and treat many diseases such as cancer, but it will not be a silver bullet on its own. In addition, new therapeutic challenges will emerge for which we do not have sufficient experience and reference points to develop intelligence. Thus, for many ecosystem observers and public health researchers, the coronavirus epidemic is only the emerging part of a much larger phenomenon: a succession of pandemics and other large-scale health emergencies caused by a collision between human and natural habitats. The emergence of these new viruses is believed to be due in large part to the destruction of biodiversity by humankind. By disrupting ecosystems and ridding viruses of their natural hosts, we unwittingly accelerate the passage of pathogens from animals to

humans. According to the US Centers for Disease Control and Prevention (CDC), nearly three-quarters of new or emerging diseases come from animals.

New viruses of animal origin are not the only major threat to our health, bacteria are too. Before the current health crisis hit, the United Nations, international institutions, and experts had already warned of the growing resistance of bacteria to antibiotics. The rise of these 'superbugs', fuelled by the misuse of antimicrobials, would constitute a time bomb for global health. With the increasing ineffectiveness of crucial drugs, more frequent illnesses, such as respiratory tract infections, urinary tract infections, or sexually transmitted infections, are becoming difficult to treat. If nothing is done to stop the phenomenon, drug-resistant diseases could be responsible for 10 million deaths per year by 2050. In other words, antimicrobial resistance may become, in the more or less long term, more fatal than cancer.

Health data, a highly coveted resource

There are also ethical problems, starting with the issue of health data. Certainly, many patients are ready to take a more active part in their healthcare journey, mainly via medical monitoring applications, and

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Patrick Kersten
Founder of
MediNation.lu

'The relationship between doctors and patients will change profoundly'

What is the objective of *MediNation.lu*?

We created this recruitment platform dedicated to health and social careers in Luxembourg to meet a need. Finding staff is not easy. In addition, the offer was scattered and not always online. It was difficult, if not impossible, for candidates to see the big picture. However, it should be noted that the sector, with its some 50,000 professionals, employs as many people as the financial sector.

Why is it so complicated to recruit medical and social staff in Luxembourg?

Many positions will soon be vacant. In the next 10 to 15 years, half of the country's doctors will have retired, and the next generation has not yet arrived. One in three graduates does not come back to work in Luxembourg after completing their studies, for several reasons. One of them is that many do not see the opportunities in the Grand Duchy due to lack of visibility. It is to fill this gap that we launched *MediNation.lu*. There are also structural reasons. So, for example, in the field of personal care, nearly 25% of the staff will retire within a decade, with a significant wave of departures within five to six years. The home care network has only existed for about thirty years in Luxembourg. Lots of hiring took place at that time and the age curve has not evened out yet.

As the former CEO of Doctena, a medical appointment platform, do you think that the digitalisation of health will be easily accepted by professionals in the sector?

By definition, healthcare professionals are not innovation driven. When you go to your doctor, you do not want him to suggest a new treatment, but a proven drug. Changing attitudes takes time and investment, especially when it comes to large structures such as hospitals.
Digitalisation, in particular the massive amounts of data generated by connected objects, is also changing the relationship between patient and doctor. The former is ready to collect their health data and share it with the latter, but the latter is not prepared at all. How can the practitioner interpret real-life data from a non-medical environment? We must set up the means and structures to deal with this change in thinking. In this regard, I think Luxembourg has an important role to play.

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to share their health data with the medical profession. This is notably the principle of the shared care record set up by the Luxembourg government in January 2020. This electronic health record, free and completely secure, allows all essential patient data to be brought together in one place: medical consultation reports, results of x-ray analyses and examinations, prescribed medication, information on blood group and allergies, etc. The file is fed by the patient via a personal profile space (on www.esante.lu) and the various health professionals authorised to access it. For several years now, new platforms have also emerged on the Internet that allow patients with chronic diseases to share their experiences. Through these exchanges, they learn, advise and support each other but in doing so, they are disrupting the traditional conventions concerning health information. It is no longer only a vertical process – from doctor to patient – but also horizontal – from patient to patient.

The concern is that health data is not only of interest to the public sector or to the patients themselves. It is also highly coveted by a growing number of private players who offer an increasing amount of services and applications, but do not always care about the moral issues. This is particularly the case with an American company that offers facial

05. The revolution in the biomedical sector will require the future merging of artificial intelligence with massive amounts of health data.

06. Today, many applications show that it is possible to practice medicine differently.

Françoise Liners
Director of Health
Technologies at the
Ministry of the Economy

'Our ecosystem is young, but has many strengths'

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What are the pillars on which the Ministry of the Economy relies to accelerate the development of the health technology sector?

There are three. The first concerns the accommodation and hosting infrastructures for companies in the sector, such as the House of BioHealth, which has just been completed by a bio-incubator of 350 m^2 of equipped laboratories allowing startups to start their R&D activities directly there. The second includes research and development assistance tools promoting public-private partnerships and links to health professionals. Finally, the third, and most recent, relates to medical regulatory support, which is aimed, in collaboration with experts from the Department of Health, at preparing companies to meet the new regulations governing the placing on the European market of their health products such as medical devices, digital health tools and in vitro diagnostic devices.

What is the potential of healthtech in terms of jobs and income for Luxembourg?

It is huge. Health issues remain permanent in all societies and the recent pandemic is just a reminder of this. To meet these challenges, the fields of medicine, research and business must come together around common projects. This is what the Ministry of the Economy wanted to promote by launching last April, in collaboration with the FNR and Luxinnovation, the first call for public-private partnership (PPP) projects focused on digital health technologies. Hospitals have needs that can be met by companies present in Luxembourg and active in health technologies and whose solutions can be validated at the clinical level by these hospitals in collaboration with public research actors. Innovative digital health technologies will thus be able to gain faster access to the market, which will ultimately be facilitated by reimbursement by the national health fund, as is the case in Germany for certain digital applications.

This initiative contributes to the anchoring of innovative international startups in Luxembourg thanks to Fit4Start HealthTech. This acceleration programme, which is in its fourth year, aims to increase the critical mass of entrepreneurial projects capable of contributing to the growth of the sector in Luxembourg. Note that many vacancies are currently open.

'Everything that is the very essence of the caregiver's role could disappear if they give up their freedom in the face of algorithms.'

07. Early diagnoses of neurodegenerative diseases, supported by artificial intelligence, will soon make it possible to detect pathologies such as Alzheimer's disease, Parkinson's disease or multiple sclerosis long before the onset of the first symptoms.

08. Health robots and algorithms may diagnose, but they have neither awareness, emotion, nor pain. Could the very essence itself of the caregiver's job disappear?

09. 10. The use of data from artificial intelligence, virtual reality, connected objects, or generated by online activities (Internet searches, visits to medical appointment platforms, patient social networks, or online drug sales sites, etc.) opens up many possible perspectives.

recognition technology making it possible to know the life expectancy of an individual from a simple selfie and to decide whether or not they are eligible for life insurance!

In Europe, health data is particularly well protected thanks to the recent implementation of the GDPR (General Data Protection Regulation). The treatment of data is, in principle, prohibited, unless it is necessary for medical purposes or for reasons of public interest in the field of public health. Private companies may also use data on the condition that they have received the express consent of the user for one or more specific purposes. Clearly, it is in everyone's interest to weigh the pros and cons before agreeing to the use of their health data.

There are also issues of availability, confidentiality and security inherent in all data, whether related to healthcare or not. We have lost count of the number of hospitals, pharmaceutical industrial sites, and medical organisations that have been victims of

computer attacks, especially since the onset of the COVID crisis.

The very definition of health data is debated. What are the reference points for defining something as health data? The boundaries are relatively blurry. For example, if an app only records the number of steps taken during a walk, this is not strictly speaking considered health data unless the person is in a rehabilitation phase. In this case, the number of steps may indicate to an attending physician that the person is listening to advice about walking. On the other hand, if the same application cross-references the same number of steps with the user's heart rate, this is, in principle, considered to be health data since information about their physical condition can be deduced from it.

The same vagueness surrounds data protection. How to promote access to data and knowledge while preserving anonymity? Individuals often generate unique traces, and it is possible to reconstruct a person's identity by crossing several pieces of data. Achieving perfect anonymisation is impossible, and not desirable either, as it would come at the expense of data accuracy. This is a dilemma that society will have to resolve eventually, as it will gain in importance in the future with the increasingly frequent analysis of big health data by artificial intelligence for public health reasons or for research.

When algorithms play doctor

Ethical questions are not just about data. Algorithms, which are at the heart of artificial intelligence, are also singled out. Admittedly, European Regulation EU 2017/745 relating to medical devices, which includes artificial intelligence tools, and has been applicable in Luxembourg since 26 May 2021, places obligations on manufacturers before they are able to market their products. In particular, they must clearly explain how their products work and provide all the data to document their effectiveness and safety. But zero risk does not exist and many point to the lack of neutrality and design biases of algorithms, which can reflect the value judgments or prejudices of the designers. For example, an algorithm used by many physicians in the United States has been shown to take African Americans less into consideration than white people in terms of accessing programmes designed to improve the care of patients with complex medical needs.

Others insist that algorithms contribute to a certain dispossession of medical knowledge and decision-making. How far should doctors respect the verdict of medical software rather than listening to their own judgment? Is there no danger when a doctor applies the conclusions of a system that they do not fully understand and which they cannot then explain to a patient? Will they still be ready to accept any responsibility if they rely entirely on a decision made by the algorithm? If, unfortunately, the algorithm gets it wrong and makes a decision that results in the death of the patient, who is responsible? The doctor, the algorithm, or its designer?

Another question is the lack of humanity of algorithms. 'You are going to die, but I have run out of battery!', quips the French gastroenterologist Henri Duboc in his eponymous novel[3], denouncing the absurdity of certain healthtech products. Algorithms diagnose, but have no consciousness, emotion, or pain. They do not feel anything and cannot make listening, the quality of presence, gaze and speech prevail. In short, everything that is the very essence of the caregiver's role could disappear if they give up their freedom in the face of algorithms: decoding health problems in an intelligible

3. 'Vous allez mourir mais je n'ai plus de batterie', Henri Duboc, 2018

When healthtech has bad blood ...

Everything is not always rosy in the world of healthtech. There are many failures, and there is also lots of fraud. The most famous was perpetrated by Elizabeth Holmes, a young American who, in 2003, created Theranos. The startup had reportedly developed an automated blood analysis method requiring only a pinprick of the finger. Success was immediate as investors jostled to participate and the company was valued at billions of dollars. In 2015, an investigative journalist lifted the veil off the dangerousness of the company and the incompetence of its leaders. In fact, Theranos was using the devices of its competitors. The case was brought to justice and the trial began on 31 August 2021. A film, based on a book about the investigation, will be released in 2022: Bad Blood.


The cyberchondriac, the connected imaginary patient

By dint of covering ourselves with connected objects and digital applications, as if permanently measuring ourselves will result in absolute security, are we not in danger of becoming cyberchondriacs in the long term? This new form of hypochondria is not so new. It was first noted by American physician Donald Capra in 1999 and has grown with the Internet and the vast profusion of health data. Generally devoid of any critical thinking, the cyberchondriac mines the Web for information to fuel their anxieties. Today, cyberchondria has taken a new turn: it is no longer just the slightest suspicious symptom that will trigger an alert, but a simple variation in daily measurements made by activity tracking technologies.

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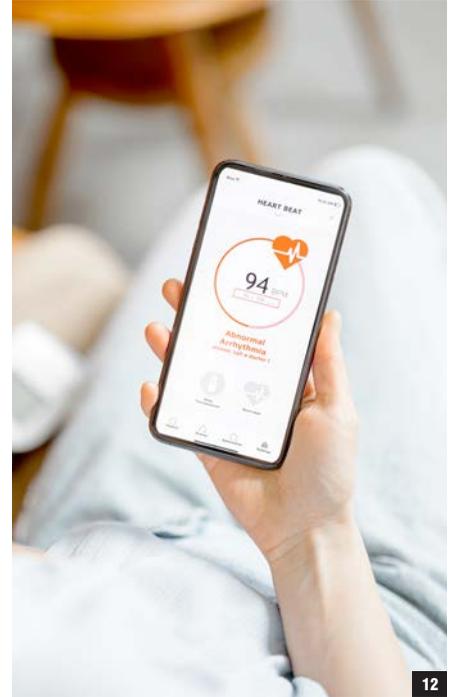
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way for the patient and their relatives, making announcements tactfully, modulating care and treatment plans according to the patient's experience, emotions and reaction to their environment.

Health professions and systems at the dawn of a reinvention

Developing digital tools is therefore not enough. It is also necessary for health professionals to have the digital skills necessary to use them and identify the risks that arise from their use. Specific initial and continuing training must accompany their roll-out. The courses must also evolve, either by adapting them or by developing new ones more related to the professions that will emerge in the years to come (healthcare data scientist, tele-surgeon, organ printer, health data moderator, specialists for ethical questions related to genetic programming, etc.).

Health systems must also reinvent themselves. In February 2020 Luxembourg's government launched the '*Gesondheetsdësch*' (health desk), a participatory and structured exchange around the challenges that the Luxembourg health system is currently facing. Under the leadership of the Minister of Health, Paulette Lenert, and Minister of Social Security, Romain Schneider, key players in the health sector have come together to define the main avenues for development.

In the end, six working groups centralised the main ideas for improving patient care. One of them is dedicated to the use of modern technologies in the field of health. In particular, it explores the investments required and the digital solutions to be developed to make the healthcare system more efficient and patient centred.

The cornerstone of this digital transformation will be the 'shared care file' – the DSP (*dossier de soins partagé*), managed by the eSanté agency. Its mission is to set up a national strategy for the collection and management of health data, the final objective being to set up a centralised health database. P4 medicine (personalised, preventive, predictive and participatory) will be another pillar. Among the 19 concrete projects selected is, in fact, the implementation of a 'vision of the patient journey of the future', in other words, more individualised care for the patient. The pilot project for the care of patients suffering from long COVID is a first example. Another project for the care of diabetics is also envisaged. A centralised response must make it possible to guide patients in a targeted manner towards an individualised care plan.

As paradoxical as it may seem, Luxembourg has relied heavily on healthtech as a source of economic diversification, but without ever really taking advantage of it to enhance its own healthcare system. This is now in the

'Developing digital tools is not enough. It is also necessary for health professionals to be able to use them and identify the risks arising from their use.'

process of being achieved. There is indeed an urgent need to put in place a system that will prevent possible illnesses, including chronic diseases, even before the age of 60. According to Eurostat, the statistical office of the European Union, the average healthy age in Luxembourg was 62.6 years in 2019, while the European average was 64.6. On the other hand, for the same year, life expectancy, all sexes combined, was 82.7 in the Grand Duchy against 81.3 for the European average. In other words, the people in Luxembourg live a little longer than in most other European countries, but with a quarter of their lives in poorer health… ▬

11. 12. For several years, new platforms have emerged on the Internet that allow patients with chronic illnesses to share their experiences. Through these exchanges, they learn, advise, and support each other. In doing so, they are disrupting the traditional conventions concerning health information. It is no longer only a vertical process - from doctor to patient - but also horizontal - from patient to patient.

13. Virtual health data must not only face the challenges of availability, confidentiality, and security inherent in all data -whether related to healthcare or not - but also vunerability to hacking.
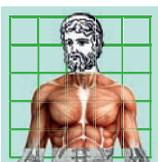
Healthtech in Luxembourg
Find our detachable poster at the end of the magazine.

Kris Bober
CEO of Clear Image AI

'Healthtech startups need more support'

Can you briefly introduce Clear Image AI to us?
We specialise in visual recognition and interpretation based on artificial intelligence. We are currently launching Home Care Guardian that aims to assist the elderly or sick in their daily lives. Cameras fitted with stereoscopic lenses making it possible to see in 3D are placed in the most frequented rooms. Using our technology, they are able to recognise emergency situations such as an abnormal rise or fall in temperature, irregular heartbeat, spasms or a fall followed by immobilisation. The advantage of our solution, the first of its kind on the market, is that it respects privacy. Nothing is recorded. In the event of a problem, our system contacts the mobile phones of family members or the medical team.

Developing a product like yours requires significant capital. Did you have a lot of difficulty finding the funds?
Luxembourg is a small country and there are no major companies here with which we could establish solid partnerships. That is why we have been forced to seek funds and partnerships elsewhere, sometimes even outside of Europe. The pandemic has not helped us either. We even came close to bankruptcy in December 2020. To develop products like ours, it is essential to be surrounded by very competent people and that comes at a cost. Our team of 9 represents an annual amount of between EUR 350,000 and 400,000 and it took almost three years to develop the technology used in Home Care Guardian. In addition, as we are not yet generating any income, we have not been able to obtain Covid-19 financial assistance from the Luxembourg government.

Based on your experience, what advice would you give to someone who would like to start a project in healthtech?
When you want to market a product or service that does not yet exist, having a good business plan is not enough. From the start, or even before you start to develop your project, you must have sufficient financial resources and already established partners. They need to be familiar with healthtech already and able to help you enter the field more easily or they need to be well-known in another field and, if they do not belong to the sector, want to diversify their investments.