

# Scope

## Disruption. The opportunity.

Blockchain, AI, and co. are  
revolutionizing the financial sector

01/2019

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### **Innovative capacity – the key to the future**

Urs Rohner on  
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Digital health and edutainment  
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# The only constant is change

## Michel Degen

Head of Asset Management  
Switzerland & EMEA



In the past, Switzerland has been able to count on pioneers and entrepreneurs who displayed courage, vision, and assertiveness. These have included personalities such as Charles Brown, Walter Boveri, and Fritz Hoffmann-La Roche. We also owe a debt of gratitude to Alfred Escher, not least for his role as the driving force behind the Gotthard Tunnel, opened in 1882, and the foundation of both Schweizerische Kreditanstalt (now Credit Suisse) and the Federal Polytechnic Institute (ETH) Zurich.

Pioneering achievements in the past are no guarantee of a successful future, however. Although our “pole position” is hugely promising in an increasingly globalized world, we in Switzerland are often no better than mid-ranking in terms of our productivity. A 2018 study by Deloitte and BAK Economics showed that while universities are producing a host of talented individuals in the field of innovative digital technologies, problems arise when it comes to commercializing this knowledge.

Asset Management also has a role to play here. New technologies, and digitalization in particular, are creating enormous challenges for many of the parties involved. Periods of structural change call for greater courage and resolve – “standing still means falling behind.” I firmly believe that by adopting a proactive approach, and in particular by reconciling theory and practice, we will be excellently placed to continue to play a leading role as a financial center going forward.

That is why, for example, Asset Management has joined forces with first-class universities in Switzerland. We have a partnership with the Center for Innovative Finance (CIF) at the University of Basel. Together with the Institute of Robotics and Intelligent Systems (IRIS) at ETH Zurich, we support applied research in robotics. You can gain some exciting insights into this world in the interview with Professor Roland Siegwart.

Digitalization and disruptive technologies are changing our world, creating entirely new areas of application and unimagined growth potential. The key for investors now is to keep pace with this change without losing touch with reality. This edition of Scope offers guidance on how to achieve this, highlighting the issues that smart investors need to bear in mind in this digital and disruptive era.

Happy reading!

A handwritten signature in dark ink, appearing to read 'M. Degen', written in a cursive style.

Michel Degen

Digitalization is forcing managers to scrutinize their business models. Artificial intelligence, distributed ledger technologies, quantum computing, and robotics are developments that any forward-looking company has to come to terms with. There is no single appropriate course of action, however. All options have to be assessed on the basis of sector-specific criteria. Above all, this is not a time for rash decisions. Reflecting on one's own strengths and the ability to adapt quickly to changing client needs remain key success factors.

# Disruptive challenges



The Scope interview:  
Urs Rohner, Chairman of  
the Board of Directors of  
Credit Suisse Group

A combination of personal interaction  
and efficiently digitized services is the  
key success factor for the future.

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Shape the future of  
asset management

The Zurich-based i.AM Innovation Lab  
seeks to maintain the cutting edge of  
the industry and also to develop tools  
that can help the sector drive and shape  
today's blistering pace of change.

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Blockchain is driving  
decentralization

Blockchain allows databases to be  
kept together and be managed according  
to common rules. Any changes that  
breach the rules are immediately identified  
as invalid by the other participants  
and ignored.

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# Embracing the Future.

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At SIMAG, we are proud of our roots as a ETH Zurich Spin-off. Our unique investment capabilities derive from more than a quarter-century of research into systematically detecting patterns and inefficiencies in financial markets. We employ the most advanced artificial intelligence technology to extract signals from noisy financial data. This is how we design cutting-edge quantitative investment solutions. Our array of investment offerings includes bespoke equity solutions primarily for institutional investors, advisory on financial market signals, and a suite of mutual funds that apply our signature investment process to an ESG compliant universe.

# “The key to Credit Suisse’s future is innovative capacity.”

## Interview with Urs Rohner

Chairman of the Board of Directors of  
Credit Suisse Group



Only those who perceive innovation as an integral part of their business model will be in a position to survive in today's global competitive landscape. According to Urs Rohner, Chairman of the Board of Directors of Credit Suisse Group, a combination of personal interaction and efficiently digitized services is the key success factor for the future. With the entrepreneurial DNA of its founder, Alfred Escher, Credit Suisse is well equipped for the future. This necessarily entails a rigorous focus on client needs, as well as being open to technological innovation.

**Mr. Rohner, the current edition of Scope is devoted to innovative clout.**

**How important does the Board of Directors consider “innovation” to be?**

*Urs Rohner:* Innovative capacity is the key to Credit Suisse's success going forward. Digitization, increasingly complex national and international regulations, and changes in client behavior all demand that we not only react to but also anticipate new trends and developments. Our Board of Directors also plays a part in supporting and promoting innovation across the company. The Board members are from different sectors and regions and have a wealth of both economic and scientific experience covering different aspects of innovation. In addition, our interdisciplinary Innovation and Technology Committee regularly convenes with management representatives and with internal experts to discuss cross-industry trends and important internal initiatives. This also includes regular reports on the activities of our innovation hub in Silicon Valley, Credit Suisse Labs. Promoting innovative projects and integrating new technological developments into our business processes are both very high on the Board of Directors' agenda. As for me personally, I have been actively engaged in these topics for many years, which have also been a source of inspiration.

**How heavily has Switzerland's financial sector been impacted by disruption?**

We need to keep disruption distinct from incremental innovation. Many fintech firms set out not only to innovate but also to fundamentally transform processes in the financial sector. New market actors such as peer-to-peer lending companies are a fitting example of this. What our analyses show, however, is that the complex sets of rules and regulations, coupled with the requisite wide-ranging specialist expertise, make it inherently difficult for newcomers to become profitable and established long-term players. Consequently, fintech firms often form partnerships or are taken over by established financial service providers. But what it ultimately comes down to for the Swiss financial sector is the need for framework conditions that promote innovation and technological development in the banking sector while also securing and strengthening Switzerland's competitiveness in the international arena.

**What does this mean for Credit Suisse?**

Our business model is founded on the trust our clients place in us. Even digital natives still want to discuss and receive competent advice on many financial matters on a personal, one-on-one basis. At the same time, though, it is equally clear that digitization also enhances the efficiency of our operations and gives us the opportunity to expand them. Nowadays it's commonplace to conduct banking business from anywhere in the world at any time. In the end, a personalized, one-on-one approach and efficient digitized service are two sides of the same coin.

**How are asset management and banking in general impacted by technologies such as artificial intelligence, distributed ledger technology, quantum computing and robotics?**

The deployment of new technologies – along with proficiency in their use – is of key importance to the continued positive development and growth of asset management and the Bank as a whole. We must be able to build up the requisite knowledge in these technological areas and apply it across all our divisions. For one thing, we believe in the potential of distributed ledger technology, where we are involved in multiple projects. Artificial intelligence is yet another example, where we have defined various application areas already and have implemented solutions.

Due to the nature of our industry, however, we equally need to exercise a certain amount of caution and vigilance when it comes to using new technologies. Protecting our clients' data is our top priority.

**“Tokenization” seems to be the universal buzzword nowadays. How do you evaluate the effects of this trend on banking in general and asset management in particular?**

It is indisputable that tokenization opens up a broad range of opportunities and may contribute to the creation of a more efficient and secure overall system. Credit Suisse has set up a Distributed Ledger Technology Committee devoted precisely to this topic. The Committee examines and promotes the application areas and scalability of these technologies throughout the Bank.

“For one thing, we believe in the potential of distributed ledger technology, where we are involved in multiple projects. Artificial intelligence is yet another example, where we have defined various application areas already and have implemented solutions.”



**Where can you draw parallels to other sectors, such as the pharmaceutical industry, having served on the Board of Directors of GlaxoSmithKline since 2015?**

Digitization and the incredible speed at which technologies are being developed indeed present a challenge to all companies and industries worldwide. In the healthcare sector, smart healthcare is one of today's most rapidly growing markets. As in the financial sector, innovative technologies are key to reducing costs and improving access to services and medical care in the healthcare sector. Plus, digitization, and big data analytics in particular, is dramatically speeding up the development process for new drugs. Banks and pharmaceutical companies alike operate in a heavily regulated environment, in which they also have to comply with international standards. So the challenges are similar, even if the general conditions in these industries are completely different.

**How important are close relationships with scientific partners like the one Credit Suisse Asset Management maintains with ETH Zurich in robotics or with the Center for Innovative Finance (CIF) at the University of Basel?**

Cooperative undertakings between universities and companies have proven to be successful globally and are becoming increasingly important, including in Switzerland. Cooperation endeavors are important inasmuch as state institutions have limited resources for investments that entail business risks. This underscores the need for partnerships, such as the one between Credit Suisse Asset Management and ETH Zurich and the University of Basel respectively. In this setting we not only provide financial resources but in our capacity as a bank also act as enabler, sparring partner, and interface between science and investors.

“In this setting we not only provide financial resources but in our capacity as a bank also act as enabler, sparring partner, and interface between science and investors.”

**Will the focus on new client needs be driven first and foremost by technology?**

Client needs are heterogeneous. The use of technology is one of many tools for meeting these needs. The younger generation – the millennials – puts a greater emphasis on sustainable investment, for example, which fulfills a purpose while serving society at large. As a forward-looking company, we have to address these needs and integrate them into our strategy so we can also inspire the next generation to be enthusiastic about our Bank – both as clients and as employees.

**In a recent NZZ<sup>1</sup> interview, American author and professor Ian Bremmer expressed his deep concerns that Industry 4.0<sup>2</sup> might divide populations and “radically isolate and alienate” large segments. Do you share this concern?**

I wouldn't exactly speak of isolation and alienation. However, it is essential that the younger generation in particular know their way around new technologies. The consequences of Industry 4.0 are the subject of an international discourse, not only among opinion leaders from economy, politics, and science but also among regulators. I don't believe that reforming our existing processes and institutions will be enough. What we need instead is a common understanding of what exactly the digital transformation involves and the effects it will cause. It's the only way for us to become better at anticipating opportunities and risks.

**Alfred Escher, the founder of Credit Suisse, was not only a thought-leader but also a doer. Would he have a chance of bringing his ideas to life in a time such as ours, dominated as it is by regulation?**

Given his visionary mindset, creative will, entrepreneurial spirit, and sheer perseverance, I am convinced that he would be able to set a lot in motion, even today. With regard to safeguarding Switzerland's prosperity, he would likely concur with the call for more research funding. He would certainly also give thought to a sustainable restructuring of our social security systems and would be keen to harness the economic potential that lies in the more active representation of women in key positions in politics and business. Still, these plans and projects would clearly be more difficult to put into practice today as the political conditions that prevailed in the mid-19th century favored quick decision-making on the part of strong personalities like Alfred Escher.

<sup>1</sup> *Neue Zürcher Zeitung*

<sup>2</sup> *Digitization of industrial production*

**What is your vision for Credit Suisse?**

It is my responsibility to position Credit Suisse for continued long-term success in a world undergoing fundamental and permanent change. This is no trivial undertaking during times of geopolitical uncertainty and – in the case of the financial industry – increasing regulatory density. It is incumbent on us to pool and deploy our resources the right way. Our strategy consequently builds on our core strengths: our position as a leading asset manager, our high level of investment banking expertise, and our strong presence in the Swiss home market.

Based on these three pillars, our strategy will continue to secure our leading position in the financial industry going forward. Our clients will be able to rely on us to invest in the best people and technological solutions in our commitment to continue providing outstanding service.

**Will Credit Suisse still thrive as a major bank 30 years from now?**

I am convinced that it will. As our Bank has demonstrated in the past, it is able to adapt to a continuously changing environment. Founded in 1856, our Bank has successfully overcome a lot of challenges in the intervening years. We can count on this also being the case in the future as Credit Suisse has a corporate DNA that can adapt to changes. However, we must never lose sight of the fact that our clients are our *raison d'être*. That is why we must place them at the heart of what we do – not only in word but also in deed, winning them over with our entrepreneurial spirit while providing them with the best service possible within the legal and regulatory framework.

**Urs Rohner**

Urs Rohner has been Chairman of the Board of Directors of Credit Suisse Group AG since 2011. He was Vice-Chair of the Board from 2009 to 2011, after having served as a member of the Executive Board between 2004 and 2009 as Chief Operating Officer and Group General Counsel. Prior to joining Credit Suisse, he was Chairman of the Executive Board and CEO of ProSiebenSat.1 Media AG, and before he was Partner at Lenz & Staehelin and an attorney with Sullivan & Cromwell. Urs Rohner also sits on the Board of Directors of GlaxoSmithKline plc. In addition, he serves as a member on the boards of various Swiss and international business associations.

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# Accelerate innovation. Shape the future of asset management.

## Panoramic view instead of tunnel vision

Although the future could not be predicted with the periscope hats worn by the two men at the British Industries Fair in 1937, the hats did give their owners a better view of the fair grounds. The i.AM Innovation Lab is pursuing a similar objective. It is preparing asset managers for disruptive technologies and the far-reaching upheaval they will bring. The Lab was created as an independent entity that serves the entire asset management industry.



Asset management requires global and sustainable thinking and looks to the future like few other sectors; it is fertile ground for new ideas, methods and technologies. The Zurich-based i.AM Innovation Lab seeks to maintain the cutting edge of the industry and also to develop tools that can help the sector drive and shape today's blistering pace of change.

### **Claudio Schneider**

CEO i.AM Innovation Lab  
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Like many sectors in the current economic environment, asset management is confronted with a constant gale-force wind of disruptive technologies. This is a challenge no matter how you look at it, but it is also an incredible opportunity. For some time, many players in the sector have been searching for a way to grasp this opportunity that enables them to retain control and to preserve the traditions of client focus and institutional stability, which remain key components of current and future success. Failing to find a pre-existing structure in the market that could strike this balance, the decision was taken to forge a new framework – the i.AM Innovation Lab, of which Credit Suisse Asset Management is a co-founder.

### **The i.AM Innovation Lab**

The Lab's overall remit is to think ahead for investors and asset managers, to create better investment products and shape the future business model of the industry. To this end, it was expressly founded as an entity independent of specific asset management firms with the purpose of serving the entire asset management industry. The Lab must be agile, flexible, and bold to fulfill this frankly ambitious mission.

The mission:

- Turn ideas into projects and accelerate innovation
- Make investing a meaningful, easy, seamless, and enjoyable experience
- Maintain a close relationship with research hubs and the overall ecosystem of financial innovation
- Deliver PoCs (proof of concept) and MVPs (minimum viable product) that can be further developed into integrated solutions
- Provide an open platform to speed-test ideas and learn from (client) feedback

The last point is crucial. In our experience, the slow pace of dialogue between market participants is a critical impediment to innovation. If done correctly, such feedback loops actually can accelerate the adoption of new and improved solutions. Think of the technology industry's long tradition of beta-testing. The parallels are not perfect, of course. Testing an imperfect solution in the market may not be an option in many areas of asset management. But accelerating the development process and creating space for proof-of-concept demonstrations vis-à-vis clients and under market conditions are nevertheless central concerns of the i.AM Innovation Lab.

## Process

Hence successful innovation is a process that requires open, collaborative networks and that is based on shared knowledge. In its essence, innovation involves executing great ideas that create value. The different tasks of this process – namely ideation, ensuring value creation, and execution – can only happen as joint efforts in a community.

The i.AM Innovation Lab has systematized its approach in order to connect academia – i.e. research – with a start-up's energy and mentality. The three pillars that allow us to do this are as follows: (see illustration “Three pillars of innovation”).

## Academic collaboration

The i.AM Innovation Lab puts great emphasis on those technologies that promise to have the most profound impact on the asset management sector and the wider economy. One example is artificial intelligence (AI) and robotics. The Lab collaborates closely with Switzerland's leading universities, sponsoring professorships and engaging in other activities to shape the practical advances of these technologies in asset management.

Robotics and AI are the driving technologies behind the automation of large parts of the global economy. AI-based asset management advice is already a reality and provides many investors with a first step into the world of asset management. This advice will only get better, more granular and more individualized as the technology advances. As a sector, we must be at the forefront of this development in order to make sure that the needs and wants of the clientele remain front and center, and also to remain relevant to today's clients. Incidentally, this technology also represents a robust secular growth trend and, as such, is an interesting investment option above and beyond the immediate impact on the business of asset management.

## Three pillars of innovation

- Engage with academic ecosystem and thought leaders (relevant technology and market trends, active players/start-ups)
- Use university capabilities as extended workbench and for talent acquisition
- Support specific professorships in setting topics for theses and studies
- Run workshops and events

# Academia

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- Deliver and test MVPs and POCs
- Evaluate and test new business models (e.g. as start-up)
- Coach innovation initiatives
- Develop and run tech solutions (e.g. white-label solutions)
- Support internal and external communication

# Action

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- Identify digital growth initiatives for asset managers
- Create new solutions by matching the most promising fintech products to asset manager needs
- Look for new revenue models
- Advise asset management industry players on digital transformation
- Provide investment advisory services for digitalization topics

# Advisory

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### **A global first in decentralized orders**

As AI makes inroads into the business, new ways of storing, distributing, and updating information become possible. One important aspect is the decentralization of transaction and fund information, making the system as a whole both more efficient and more secure.

A pioneer in this technology, FundsDLT is an international platform connecting transfer agent (TA) activities, payment systems, and investors. Using distributed ledger technology and smart contracts, FundsDLT aims to dramatically improve efficiency in the fund transaction processing.

In a global first, on December 12, 2018, we successfully completed a fund order via the FundsDLT blockchain. The placement of a transaction, cash reservation at the customer's bank, confirmation by the trading agent and share and cash booking were processed. Real money was invested in a Green Bond and a regional equity fund managed by Credit Suisse. The participants involved were Banco Best from Portugal, FundsDLT/Fundsquare of the Luxembourg Stock Exchange, Credit Suisse Luxembourg S.A. as TA, and Credit Suisse Asset Management Zurich as project coordinator.

This successful transaction may well have been one small click for an asset manager, but a giant leap for the asset management industry.

### **Keep looking ahead**

The Innovation Lab is asset management's answer to the accelerated world we inhabit. It was founded after our realization that there was no systematic, sector-wide framework for dealing with the challenges – and seizing the opportunities – of the rapid change that is engulfing our business and the wider economy. As an independent entity, we have great freedom to explore and develop solutions that will be offered to interested firms across the globe.

The goal of the i.AM Innovation Lab is to keep looking ahead, to find and develop new opportunities and new technologies, and to put them to work for our sector and, ultimately, our clients. Credit Suisse Asset Management is a co-founder and partner.

# “Robots and humans can make a good team.”

## Expert interview

Professor Roland Siegwart, Professor of Autonomous Systems at ETH Zurich (*right*), and Filippo Rima, Head of Equities at Credit Suisse Asset Management



When it comes to solving highly structured problems, robots are often already better than humans. To take the example of agriculture, robots can continuously monitor parcels of land to ensure the optimal use of water, fertilizers, or pesticides. Many businesses that have mastered these and similar technologies provide measurable added value and therefore make attractive investment propositions. However, robots are not up to tackling complex workflows or interacting with humans just yet.

**Professor Siegwart, how has Switzerland managed to develop into a global melting pot in the field of robotics?**

*Roland Siegwart:* Robotics is a systems technology that combines precision engineering, sensors, actuators, and intelligence in a complex machine. The Swiss economy and Swiss research have a long tradition in all these areas – a tradition on which the universities' research laboratories have been able to build. By recruiting professors and staff in robotics at ETH Zurich and École polytechnique fédérale de Lausanne (EPFL), and thanks to various flagship programs such as NCCR Robotics, NCCR Digital Fabrication and Wyss Zurich, a melting pot for outstanding robotics research, technology transfer, and start-ups has developed that is unmatched anywhere in the world.

**Competition keeps business on its toes – does this also apply to the universities involved in robotics research?**

*Roland Siegwart:* Academics are ambitious and love competition. Like top sportsmen and women, they always want to take first place and be the best. This boosts the ability to innovate. That said, they also enjoy close working relationships with each other. In ETH and EPFL, Switzerland not only has two of the leading universities in the world, but also two institutions with some of the best international networks.

**Which universities or researchers do you work with most closely?**

*Roland Siegwart:* I'm in very close contact with all the main robotics researchers, and more than 20 nationalities are represented in my laboratory. We work especially closely with MIT, the University of Sydney, Caltech, and the CSIRO in Brisbane, for example. As part of European projects, we cooperate with the University of Freiburg, the University of Naples, RWTH Aachen University, the EPFL, and many more. We are involved in various research projects with companies such as ABB, Microsoft, Huawei, and Intel.

**Credit Suisse Asset Management has endowed a chair in robotics at ETH Zurich. How important are partnerships like this?**

*Roland Siegwart:* These partnerships are really important. The support of Credit Suisse enables us to build on ETH's position as one of the world's leading universities in the field of robotics.

*Filippo Rima:* More than 160 years ago, ETH and what was then Schweizerische Kreditanstalt (now Credit Suisse) were established at more or less the same time to build the Gotthard tunnel. In the same vein, we also need partnerships today so that we can press ahead with forward-looking technological developments such as robotics. We are proud to be helping the university to build on its leading position.

**What are the benefits of the partnership for you, Mr. Rima?**

*Filippo Rima:* It creates an ideal basis for the ongoing exchange of expertise and gives us access to research projects or spin-offs in need of funding. Investments in spin-offs can be of particular interest to our Asset Management arm. I'm thinking of equity funds that invest in specific themes such as global automation here, an area in which robotics plays a key role.

# The lab:

The Autonomous Systems Lab (ASL) was founded by Roland Siegwart in 1996 at EPFL and it has been part of the Institute of Robotics and Intelligent Systems (IRIS) at ETH Zurich since 2006. The mission is to create robots and intelligent systems that are able to autonomously operate in complex and diverse environments.



**We might say that robots have grown up within industry. How is the industrial robots segment doing, Mr. Rima?**

*Filippo Rima:* According to data from the International Federation of Robotics, more than 380,000 industrial robots were sold in 2017. The market also looks set to see double-digit growth over the next few years, contributing to the competitiveness of whole sectors of the economy. However, industrial robots are reaching their technological limits. The industrial robots of today can't cope once production workflows become less structured and products are switched quickly. They're unable to learn new process steps themselves or autonomously adapt to new situations.

**What are the implications of this, Professor Siegwart?**

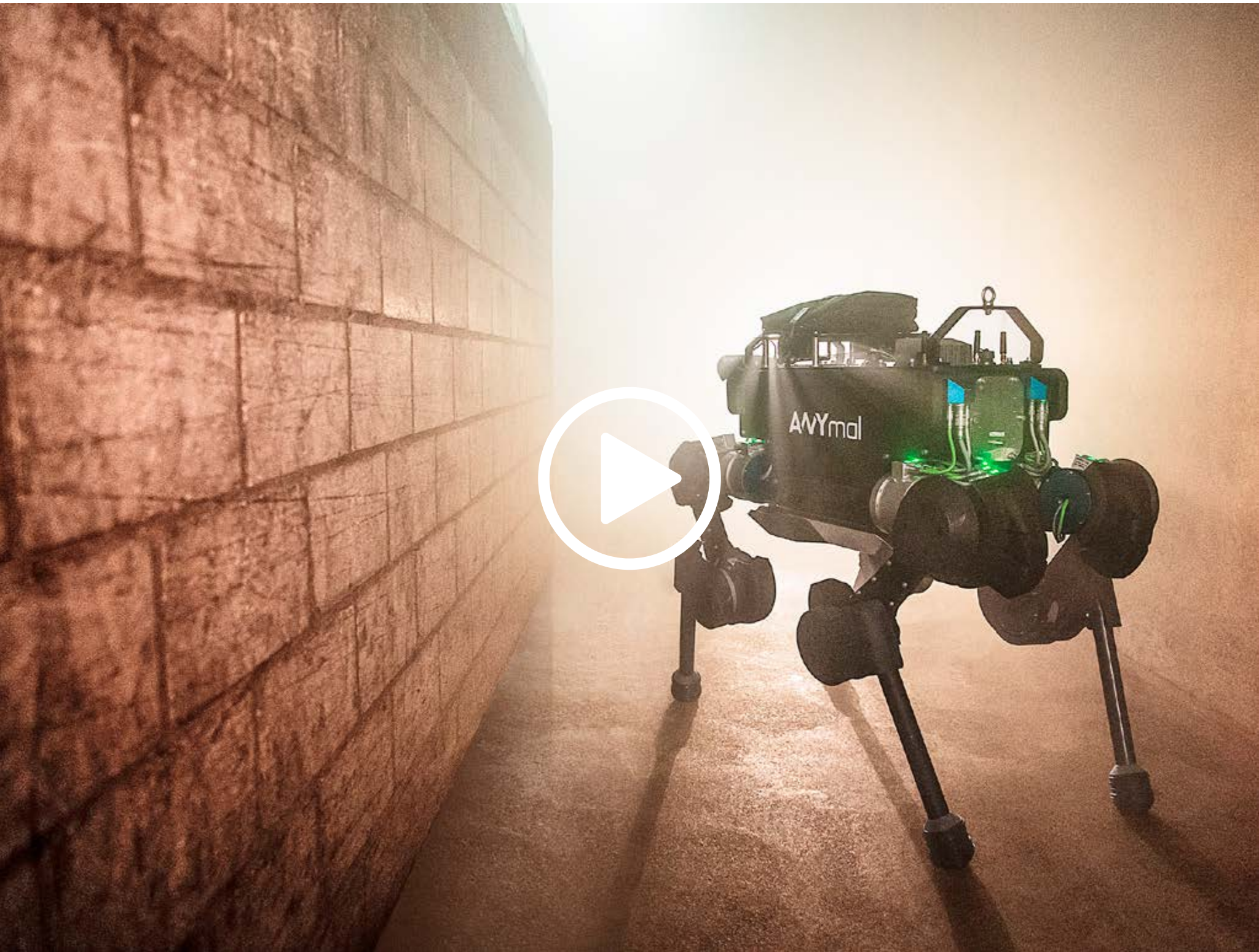
*Roland Siegwart:* Robots need to become more flexible and "intelligent" for them to be able to adapt to new circumstances. They are increasingly being equipped with cameras and other sensors to enable them to analyze situations and react accordingly. As a result, robots can also be used to automate small batch sizes and take on laborious tasks otherwise performed by humans. But this step is highly complex, and many challenges still need to be overcome in this area.

**Are robots that perform services still in their infancy?**

*Roland Siegwart:* That's one way of putting it, yes. We all know it's robots that build our cars, but have you ever seen a robot that can repair your vehicle?

For the next generation of industrial robots – and also for service robots – we need new technologies that permit all-round perception and analysis of the environment alongside tactile interaction. Tasks that often appear simple to human beings like clearing the table after a meal are still inconceivable for robots today, and will remain so in the next few years. On the other hand, robots working on production lines can place parts with submillimeter accuracy, something which is beyond us humans without the necessary assistance. So the future belongs to collaborative robots. Human beings will take care of more interesting work for which the focus is on understanding, creativity, tactile ability, and interactivity, while robots will carry out repetitive tasks that require precision and the ability to do things over and over again.

“Our partnership with the ETH gives us access to research projects or spin-offs in need of funding. Investments in spin-offs can be of particular interest to our Asset Management arm.”



### **Anymal the model canine**

Four-legged robots like the ones created by the young ETH spin-off company Anybotics are clearly superior to wheeled models, as they can navigate rough terrain and climb stairs. The robotic dog, which weighs about 30 kg, can be used to take measurements on oil rigs, conduct land surveys, and in rescue operations. Anymal can also act as an obedient companion on walks and small excursions.  
[anybotics.com](https://anybotics.com)

**What skills will service robots learn over the next few years?**

*Roland Siegwart:* The first requirement for service robots is reliable and robust navigation. This means that robots need to be able to independently draw up maps of their environment, locate themselves within it and move around purposefully but collision-free. A great deal of progress has been made in this area in the last few years. Robots can now create maps using cameras and lasers and then move relatively reliably. The key thing now is to make these technologies fit for industrial and day-to-day use over the coming three to five years so that they can be deployed in driverless vehicles, cleaning robots, or drones.

**Mr. Rima, why are robots of interest to investors?**

*Filippo Rima:* As the cost of technologies used in automated systems is falling continuously, robots are increasingly being used in areas of everyday life.

Robots are being encountered more and more often in shops, restaurants, and offices. Not only that, automation has now entered the realm of hospitals and government offices as well as cars, trains, and aircraft, not to mention our homes. From the investor's perspective, the increased use of robots in industry and the growth in automation in many other areas of the economy are creating long-term investment opportunities. In a world in which global growth is broadly in decline, investors are becoming more and more interested in areas exhibiting structural growth.

**As an investor, how can I identify the right companies?**

*Filippo Rima:* It's not easy to identify businesses with the highest growth potential, especially as this market is developing very dynamically. Because many specialist companies are not listed and can be unforthcoming in providing information, it can be very hard for "normal" investors to find the best opportunities. On top of this, products are becoming ever more complex, which means that considerable expertise and experience are required to evaluate them. Funds managed by specialists are at a clear advantage over individual investors in this area.

“In the near future, robots will help to make agriculture far more sustainable as resources like water or fertilizers will be used to best effect and pesticides will be administered in precise doses.”

**What factors are limiting the rapid spread of deep learning robots?**

*Roland Siegwart:* “Deep learning” usually refers to learning algorithms that roughly replicate our current understanding of the brain, though obviously to a very limited extent. Non-linear functions such as the region represented by a street or a field are learned using a neural network and a great many training examples. Significant progress has been made in recent years in relation to one-dimensional problems such as analyzing medical image data. Computers can now identify tumors in images more reliably than their human counterparts.

**And how are things looking in the area of multidimensional problems?**

*Roland Siegwart:* Multidimensional learning of complex inter-relationships requires millions of training examples and greater computing power to the order of several dimensions. Deep learning as it is understood today is not capable of this. In its current form it still needs a defined objective. It's very difficult to provide this type of definition for complex workflows. Present-day deep learning algorithms are not yet much more than programs that enable large data streams to be optimized and analyzed. For example, deep learning makes it possible to identify cancerous tumors (output) based on images (input). Computers are better at this than people as they can access and process large volumes of data much more quickly. But the abilities of artificial intelligence (AI) are still very limited as things stand. It's therefore a very bold claim to extrapolate AI systems that solve structured and narrowly defined problems to robotic systems expected to tackle the highly complex, multimodal problems we encounter in our everyday lives.

# ETH Zurich: chair in robotics

With the goal of supporting applied research in robotics and boosting dialog between academia and the financial sector, Credit Suisse Asset Management funds an additional professorship at the Institute of Robotics and Intelligent Systems (IRIS). The institute currently comprises eight independent labs focusing on very different research topics, which range from microscopically small robot components for biomedicine to robot-assisted rehabilitation therapy and autonomous drones.



**Prof. Dr. Roland Siegwart**

Roland Siegwart (born in 1959) has been Full Professor of Autonomous Systems at ETH Zurich since July 2006 and is a founding co-director of Wyss Zurich. From January 2010 to December 2014 he was Vice President Research and Corporate Relations on the executive board of ETH Zurich. He is a member of the boards of directors of various companies, including Komax and NZZ. Roland Siegwart was awarded his degree in mechanical engineering in 1983 and his doctoral degree from ETH Zurich in 1989. He established a spin-off company, spent ten years as a professor at EPFL (1996–2006), and held visiting positions at Stanford University and NASA's Ames Research Center. Roland Siegwart's research interests focus on the design and control of intelligent robot systems operating in complex and highly dynamic environments. He is a co-founder of various start-up companies.

**Filippo Rima**

Filippo Rima is Managing Director of the International Wealth Management division in Zurich. He is Head of Equities within Asset Management. Filippo Rima was awarded his degree in civil engineering from ETH Zurich in 1996 and his degree in accounting and finance from the University of St. Gallen in 1998.

**If we fail to make great progress in agriculture and the logistics of distribution, large parts of the world's population will continue to suffer undernutrition and malnutrition. How can robots contribute to resolving this problem?**

*Roland Siegwart:* There's great potential for robots to be deployed in agriculture. Robots can continuously monitor fields and intervene immediately if, for example, more water or fertilizer is required or pests need to be removed. In the near future, this will help to make agriculture far more sustainable as resources like water or fertilizers will be used to best effect and pesticides will be administered in precise doses. We expect a fraction of the pesticide volumes used today to achieve the same effect, and it should be possible to do much of the work involved in combating pests "mechanically." At present, around 30% of food is lost before it even leaves the field, while another 30% is lost during distribution and storage.

**It has been proved that robots can learn from human beings. But can humans learn from robots?**

*Roland Siegwart:* There are not many lessons people can learn from robots in their everyday lives just now. But people can aim to develop an optimal working relationship with them, as robot and human skills can complement each other. Robots don't get tired, they can carry out highly precise movements, and they can carry heavy loads. Human beings are unbeatable when it comes to analyzing complex systems, interacting with other people, and generating new ideas.

*Filippo Rima (laughs):* I've come to the conclusion that we can certainly learn something from robots. Discipline, hard work, precision, and the ability to work under pressure are all virtues that we as people could do with a little more of.

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# Best practice live

The structural forces that are driving change are opening up entirely new investment opportunities. Against the dynamic global backdrop, these opportunities are by no means easy to identify and structure. Credit Suisse Asset Management has therefore defined four drivers of change and developed thematic funds covering the relevant areas of investment focus: robotics, protection and security, digital health, and infrastructure. A strict best practice approach is adopted to selecting individual securities, as the case study below illustrates.<sup>1</sup>

<sup>1</sup> The best practice case study was presented at the flagship ETH Conference in the Robotikhalle at ETH Zurich on December 4, 2018. Credit Suisse Asset Management was the main supporter of the conference.





## Networking

- Potential of the internet
- Content is king

## Productivity

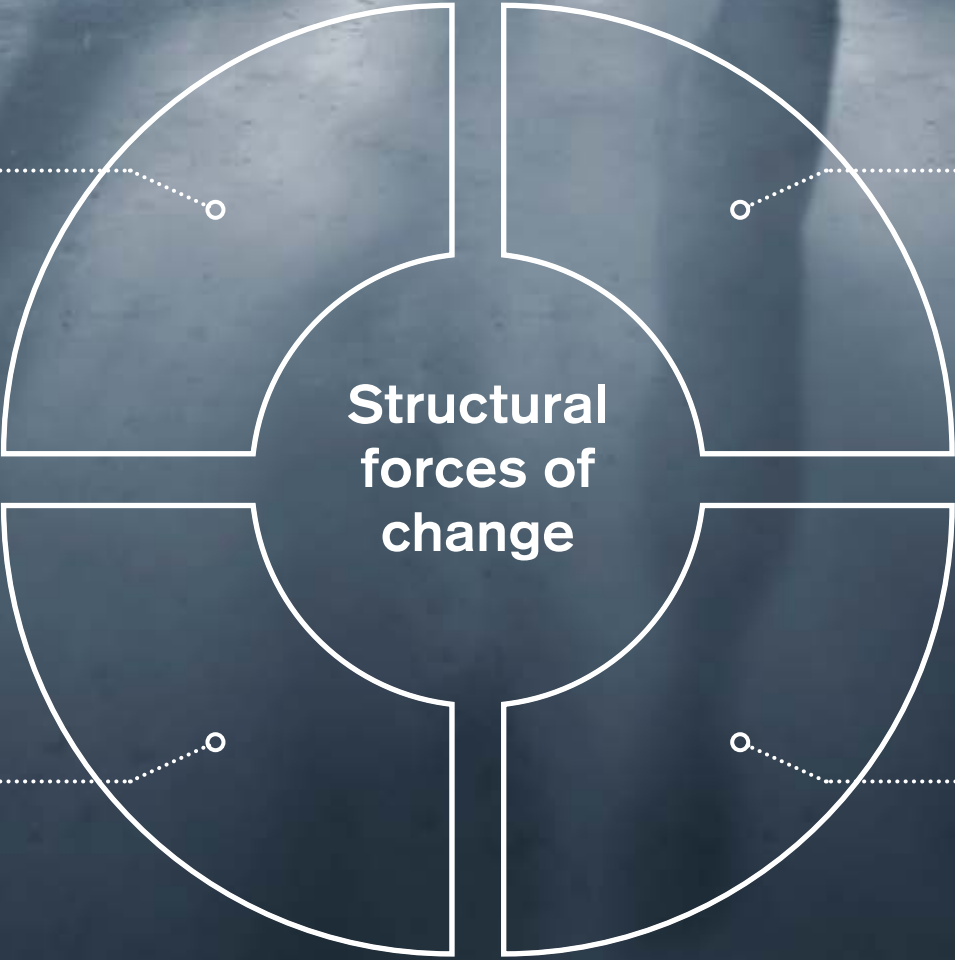
- Data “big bang”
- Automation

## Globalization

- New energies
- Infrastructure

## Demographics

- Aging population
- Healthy lifestyles







# The new secret weapon

## Simba Gill

CEO, Evelo Biosciences, Inc.  
[Simba@evelobio.com](mailto:Simba@evelobio.com)

Monoclonal microbials may offer new treatment possibilities for patients at all stages of disease with effective, safe, convenient, and reasonably priced medicines. Evelo's product candidates have the potential to become a new, unconventional weapon against inflammation, cancer, autoimmune diseases, and more.

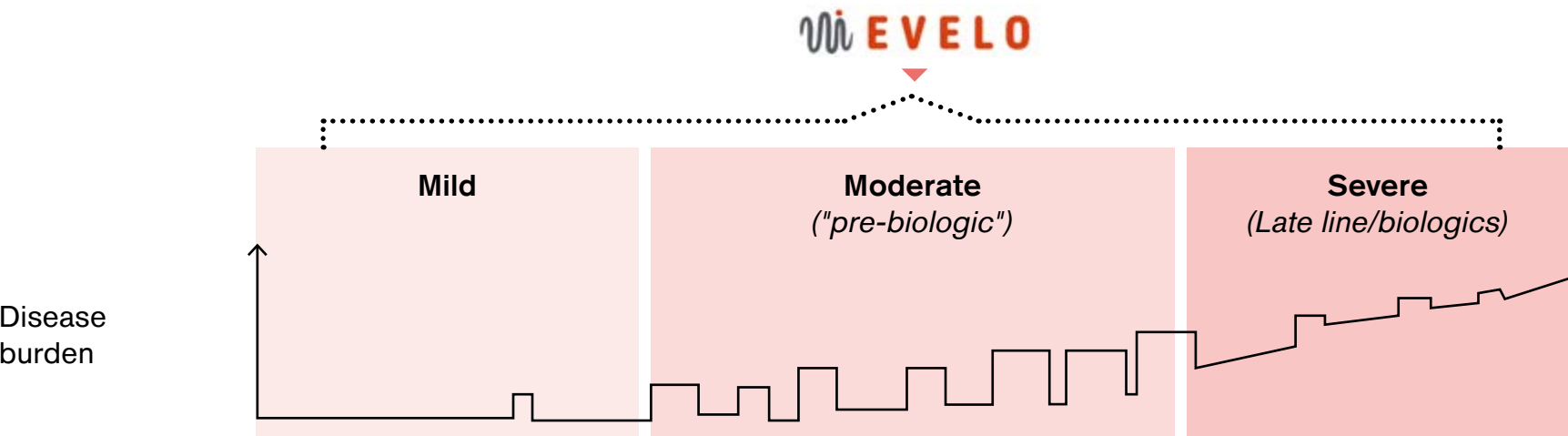
“We are all in a disease state”, says Simba Gill, President, Chief Executive Officer and member of the board of directors of Evelo Biosciences, Inc. since it was founded in 2015.

Modern medicines have had important positive impacts for the treatment of many diseases. “If you are over 50, there is at least a 50 percent chance that you are taking a medication today, probably for treatment of diabetes, heart disease, or blood pressure.” However, these treatments are limited by inconvenient administration, significant side effects, and high costs. In practice, this means that we treat patients today at later stages of disease. Simba Gill and his team at Evelo have uncovered biology which has the potential to dramatically improve healthcare by treating everybody at earlier stages of disease progression, ultimately even from the day of birth.

“Our goal is to create and develop a new class of therapies that have the potential to transform the treatment of a broad range of diseases by focusing on the gut-body network”, says the President and CEO of Evelo. Evelo, headquartered in Cambridge, MA, is a clinical-stage biotechnology company developing monoclonal microbials, a new modality of medicines developed to act on the gut-body network. Evelo’s product candidates are orally delivered, single strains of microbes, selected for defined pharmacological properties. They are intended to modulate systemic immunology and biology by engaging sensory immune cells in the small intestine that link the small intestine to the rest of the body. Evelo believes that monoclonal microbials have the potential to be broadly applicable across many diseases including inflammation, cancer, and autoimmune diseases.

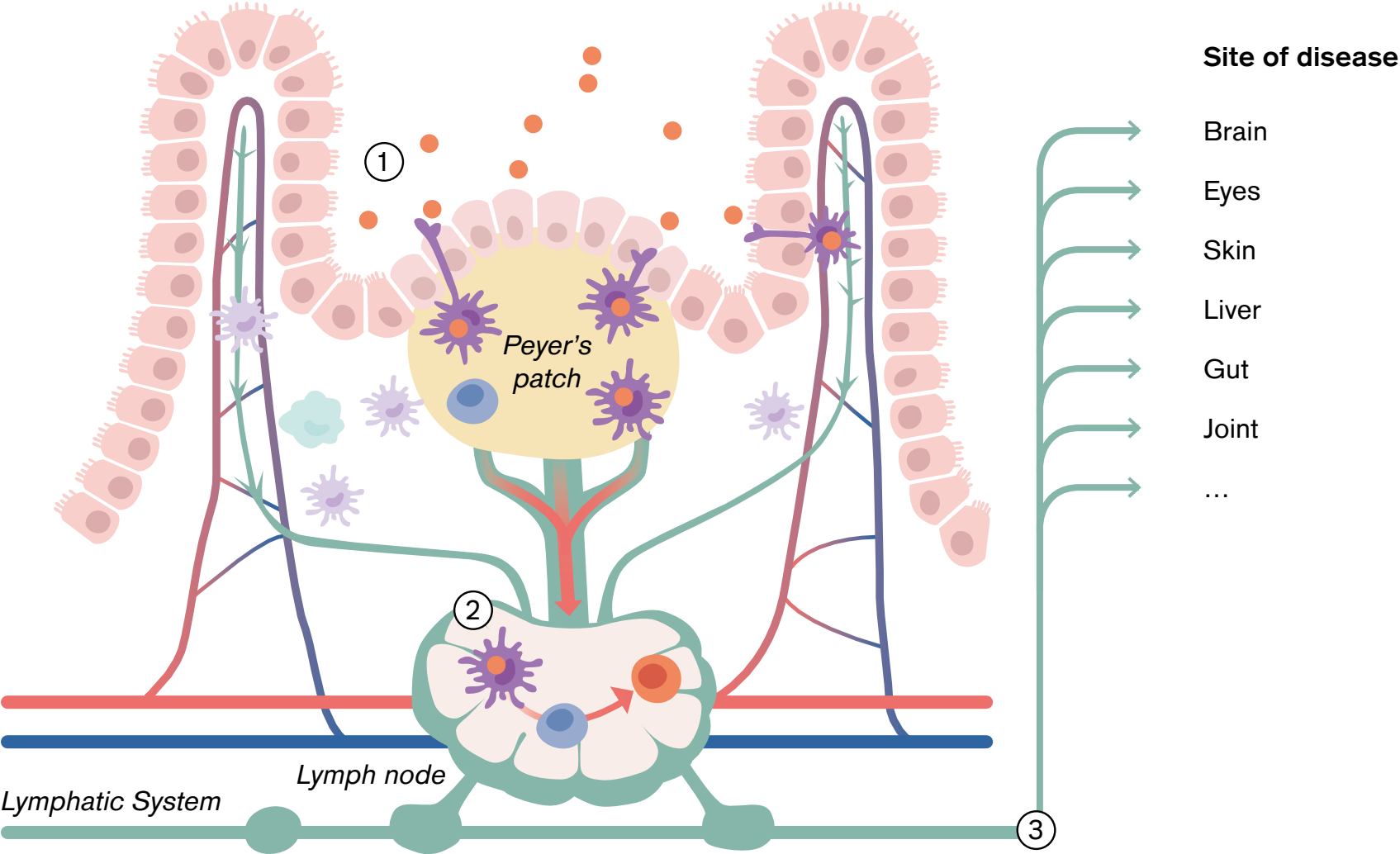
# Addressing all stages of diseases

Evelo’s product candidates have the potential to address all stages of diseases. Monoclonal microbials are expected to be widely available for the treatment of all stages of most major chronic diseases and cancer. This contrasts with current biotech medicines, which are generally a luxury for late-stage diseases.



Source: Evelo Biosciences, Inc., 2018

# Monoclonal microbial three-step process



- Monoclonal microbial
  - Macrophage
  - Dendritic cell
  - T-cell
  - Microbial conditioned T-cell
- ① Sampling of microbes in the small intestine and conditioning of macrophages and dendritic cells
  - ② Activation of T-cells by dendritic cells and macrophages in the lymph node
  - ③ Migration of activated T-cells throughout the body



As Simba Gill explains: “Our therapies are based on our growing understanding of the central role of the small intestine in modulating immune activity throughout the body and the important role of microbes as key modulators of the gut-body network.”

Key elements of Evelo's strategy are

- to realize the full potential of the gut-body network to create an expansive and diversified product portfolio;
- to develop best-in-class therapies to improve outcomes across various stages of disease;
- to generate early clinical readouts with biomarker-driven validation to efficiently advance our product candidates;
- to industrialize monoclonal microbials in order to advance and scale the platform

### **Integrated platform**

Evelo has developed an integrated platform designed to identify individual strains of microbes capable of modulating the immune system. The process development and formulation capabilities of the platform develop selected microbes into clinical product candidates. The development of monoclonal microbials has the potential to be more efficient than those of other therapeutic modalities including cell therapies, monoclonal antibodies, and small molecules. The reason is that monoclonal microbials do not require the lengthy target validation and compound optimization that is typical of conventional drug discovery. The efficiency of the platform has, in a relatively short period of time, allowed Evelo to produce three product candidates for a range of inflammatory diseases and cancer.

Currently Evelo has three product candidates, EDP1066 and EDP1815 for the treatment of inflammatory diseases, and EDP1503 for the treatment of cancer, for which ten clinical readouts are expected during 2019 and 2020. Evelo is also advancing additional candidates through preclinical development in other disease areas, including metabolic and neuroinflammatory diseases.



#### **Simba Gill**

Simba Gill has served as President, Chief Executive Officer, and member of the board of directors of Evelo Biosciences, Inc. since it was founded in 2015. He has founded and/or held lead roles in pioneering companies in the fields of antibodies, stem cells, directed molecular evolution, gene therapy, and immunodiagnostics. Earlier in his career, Simba Gill was an entrepreneur in residence and partner at TPG Capital, a major private equity investor. Simba Gill has an MBA from INSEAD, and for his PhD he focused on developing humanized antibodies to treat cancer. This work was done at King's College London in collaboration with Celltech.





# Unlimited potential

Christian Schmid

Senior Portfolio Manager

There are few things in this world that humanity can never have enough of. Health and education are two of them. Now, digitalization is bringing about profound change in these areas, with growing trends such as digital health and edutainment. Patients and students are gaining access to faster and better results, and generally at a lower cost than in the past. For investors this digital revolution promises new growth trends and fresh opportunities to make long-term, sustainable investments and diversify their portfolios.

At the highest levels, both education and healthcare are dominated by institutions that boast traditions stretching back hundreds of years. Their physical manifestations still dominate the urban landscape and have often helped to shape the history and culture of the cities in which they are based. It is also common for them to have close organizational ties, and they are frequently driven by a similar spirit. As you will have gathered, we are referring to hospitals and universities.

### **Old institutions facing new challenges**

Naturally, these two institutions do not cover the whole spectrum in their respective sectors. Education also depends on schools as well as occupational and adult education centers, for example. Within healthcare, the pharmaceutical industry and health insurance funds have as much of a role to play as hospitals. That said, universities and hospitals are symptomatic of the strengths and weaknesses of existing structures. They also make ideal test beds for identifying digital solutions and disruptions.

Social change and the tech revolution are exerting pressure on multiple fronts. Lifelong continuing professional development, which has become indispensable partly because of technological progress, calls the model of “education first, then work” into question. Rising life expectancy and other demographic trends are weighing on hospitals. Research findings are calling for new and complex procedures. Meanwhile, seamless communication facilitated by telemedicine and robotics is making state-of-the-art medical care available anywhere. Furthermore, both institutions are caught between the opportunities arising from accelerating progress and the relentless escalation of costs. The chart below shows that costs have been rising continuously for 40 years and have therefore become a structural issue. This situation no longer looks sustainable within the scope of the traditional structures.

### *What is edutainment?*

---

Edutainment is a portmanteau word combining education and entertainment and refers to programs that blend learning and fun in a multimedia environment. In the broadest sense of the word, edutainment covers a wide array of enjoyable and educational offerings in the spheres of culture and leisure, such as interactive museums or multimedia installations, exhibits, and events. In the strictest sense of the term, edutainment refers to special concepts within digital learning that aim to impart knowledge through play and fun, such as TV programs, computer and video games, or other multimedia software systems.



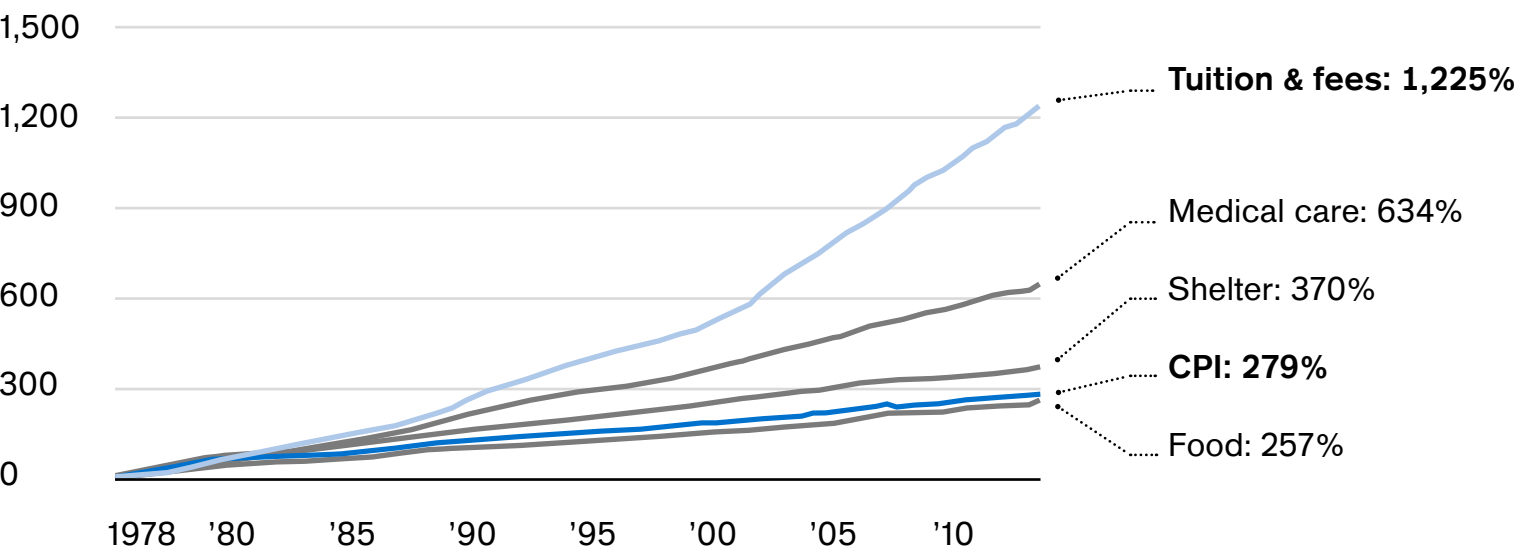
**Digital technology enabling novel approaches**

This is where technological solutions come in. Digitalization is making a major contribution toward boosting efficiency within healthcare. Stays in hospital are becoming shorter, existing procedures are getting quicker, and diagnoses are now more precise, while new procedures and drugs are leading to better outcomes. More and more people are obtaining direct access to specialist medical services. In many cases telemedicine eliminates the need for doctors to be physically present or patients to come into hospital, leading to broader coverage, especially in areas with poor service provision. A growing number of hospitals and healthcare organizations are seizing these opportunities. The very low level of penetration at present creates huge potential for growth.

It is a similar story in education. In the past, geographical or time-related constraints – and in many cases also financial barriers – have prevented countless people with a hunger for knowledge from accessing education.

**Education costs have grown faster than the rest of the economy**

Percentage increase in consumer prices since the first quarter of 1978



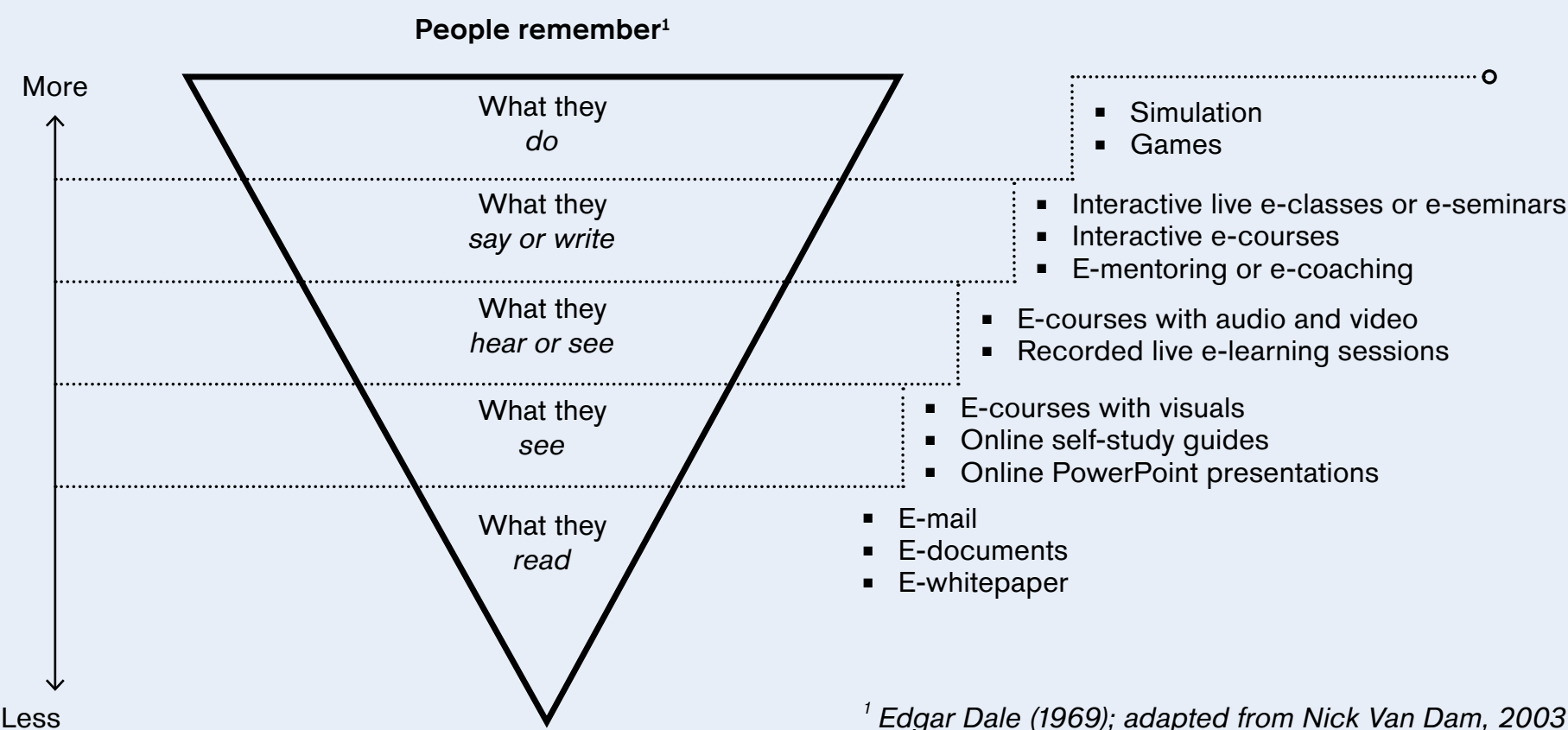
Source: Bureau of Labor Statistics, 2015

New technologies allow people to learn anywhere and at any time. And we are talking about much more than a simple digital upgrade to stuffy old distance learning courses. Combining findings from educational theory with the opportunities offered by modern technology is producing new forms of learning based on the real strengths of the human mind. As the graphic on smart learning below shows, learning efficiency increases the more the senses are involved. While only little of what is read is actually retained, the effect of traditional lecturing from the front of the auditorium is an improvement. But if learners are actively engaged, the process becomes significantly more effective.

When these insights from educational theory are implemented systematically, this is referred to as gamifying the learning process. The idea is simple. The logic of a computer game, involving a progression through levels, a sophisticated incentive and reward system, and a clear goal structure, is applied to the content to be learned. Not only does this method promote retention of the material, learning can also be seamlessly integrated into modern life. So why not squeeze in a couple of Spanish modules on the train home from work? How about getting to the next level of that engineering course over the weekend? None of this is a problem nowadays.

# Smart learning

Why does “gamification” improve the learning process?  
The more a learner’s senses are engaged, the greater the learning effect.

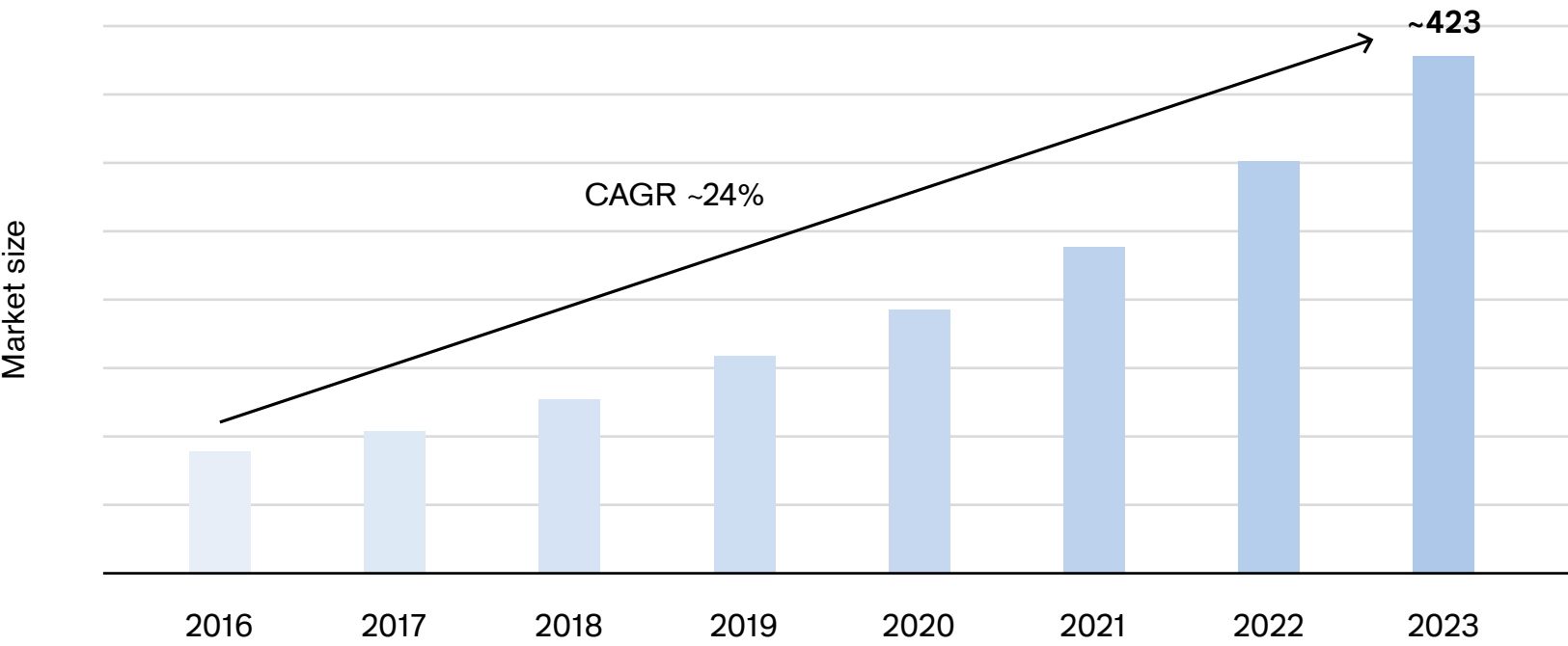


<sup>1</sup> Edgar Dale (1969); adapted from Nick Van Dam, 2003



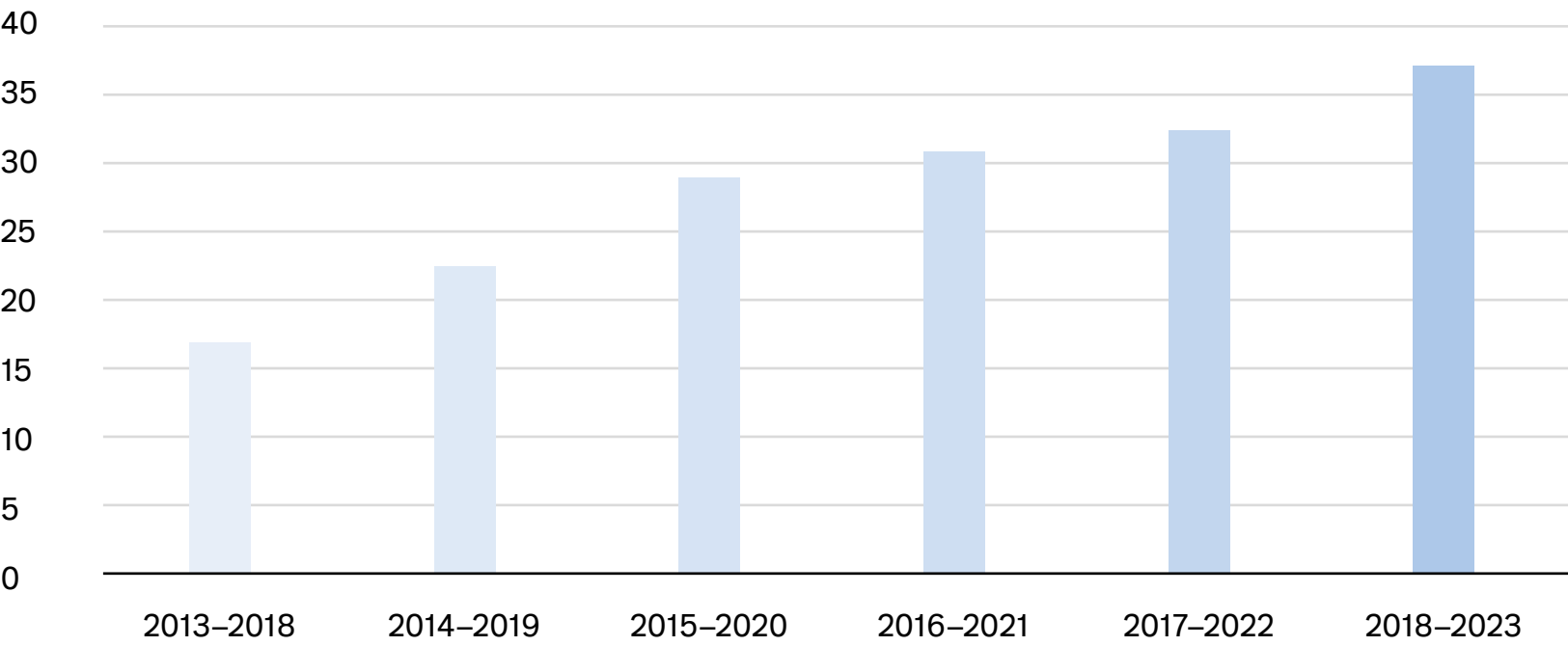
## Online education market<sup>1</sup>

Growth potential and market size (in USD bn)



## Global game-based learning market<sup>2</sup>

Five year CAGR projections revised upwards since 2013 (in percent)



<sup>1</sup> Online Education Market 2017 – Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2023; MarketersMedia  
<sup>2</sup> The 2018–2023 Global Game-based Learning Market; Metaari, 2018



# Investable trends

Edutainment, which is the term used for these new methods in the context of education, and upgrading the technical infrastructure in the healthcare space, are ideal candidates for our thematic approach to equity investment. Why is this? We consider specific criteria when putting together our range of themes:

- A clear and, to some extent, discrete trend that permits focused exposure
- Promising long-term potential – it should be more than a technological flash in the pan. Instead, we are looking for a structural trend that is rooted in deep-seated social or demographic developments (see graphic: “Global game-based learning market”).
- If possible, it should be a recent trend that will reward investors with a bonus for being early adopters. Growth rates are often highest at the beginning. This currently applies to digital health, for example (see graphic: “Online education market”).
- A certain level of breadth and depth in the market. We pursue a pure-play approach. This means we only invest in companies that generate a significant share of their revenues from the relevant technologies/products. As a result, we predominantly invest in firms that are largely unknown to the mass investor market and are part of the small and mid cap segments.

At Credit Suisse Asset Management, the thematic equities topics build on each other and reflect an outlook on the world rooted in the ongoing integration of new technologies into our everyday lives. Moreover, we see demographic trends and the ascent of broad population groups into the global middle class as a fundamental and enduring driver of economic and social development. Affinity with technology and the young investor generation’s strong emphasis on sustainability are also key factors. This produces a robust network of issues that we are addressing from different angles in our thematic funds. Furthermore, investments in themes make sense from various perspectives. They can serve as an attractive addition to a broad-based portfolio of equities, offering both diversification and performance potential. Or they can be used as standalone investments that are made out of conviction.

Whatever role they play in a portfolio, digital health and edutainment will help to get the balance right. These topics are fresh, the markets are ready, and these requirements will be a firm feature in the society of the future.



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# ENGEL & VÖLKERS

# Digital revolution in asset management

The low interest rate environment, the trend toward low-cost passive investments, and disruptive technologies are creating upheaval in asset managers' traditional value chain. Asset management finds itself in the middle of a root-and-branch transition.

**Lorenz Arnet**

CEO, Asset Management Platform Switzerland  
[Lorenz.Arnet@SFAMA.CH](mailto:Lorenz.Arnet@SFAMA.CH)

Asset management, which involves developing and managing investment solutions for institutional clients, is undergoing a sweeping transition. The days are now gone of high, recurring investment returns leading to satisfied investors, allowing providers to rake in generous fee income without much need for innovation. As well as the low interest rate environment and the trend toward low-cost passive investments, another key factor is helping to accelerate this shift: disruptive technologies that are increasingly calling asset managers' traditional value chain into question. Artificial intelligence, distributed ledger technology, quantum computing, and robotics – these are some of the buzzwords on everyone's lips. But do these technologies really offer opportunities to reshape the value chain?

Nowadays the value chain for an asset management product – an investment fund, for example – essentially comprises three elements: *1. the core functions of asset management*, where returns are generated. These include research, suitable asset allocation, the selection of individual financial instruments, optimal execution, and professional risk management. *2. Administration*, which covers aspects such as structuring the product, custody of the financial instruments, and other operational functions. *3. Distribution*, which gets the product to clients via marketing and sales efforts while offering clients a good standard of service. New technologies are creating exciting opportunities for asset managers across all parts of the value chain.

### **Hand in hand with intelligent machines**

Deploying artificial intelligence is a promising approach in the core area of asset management, which involves making investment decisions with the aim of generating attractive returns. In future, the key factors in delivering above-average investment outcomes will involve processing bigger and bigger volumes of data in real time. Machine learning will then take the models of anticipated market movements based on these data above and beyond the original model design. For its part, quantum computing may simplify and accelerate the processing of extremely large data sets. We can assume that in future intelligent machines will take care of a large proportion of market and financial analysis.

The days are now gone of high, recurring investment returns leading to satisfied investors, allowing providers to rake in generous fee income without much need for innovation.



**Administration facing a wave of tokenization**

As far as administration is concerned, on a medium-term horizon distributed ledger technology (DLT) and smart contracts could almost completely revolutionize the middle and back office infrastructure within asset management as we know it today. In principle, all activities related to registering, executing, and booking transactions can be replaced by blockchain technology. Assets can be transferred without intermediaries, while DLT infrastructure can make clearing and settlement processes cheaper and more efficient. The tokenization of traditional financial instruments, which is being driven by various market players, will likely act as a catalyst for this trend. However, there are still question marks over the scalability of these new technologies, which are not yet trusted to process the huge volumes of data securely and reliably enough. Regulatory issues and the high cost of replacing the current infrastructure are also hampering developments.

**Rapidly growing acceptance of robo advisors**

Ultimately, the third part of the value chain – the distribution of asset management products – will also undergo extensive changes over the next few years as a result of digitalization. The focus will be on asset managers' desire to get closer to end investors (from B2B to B2C) with a view to offering them a better client experience. There are numerous indications that in future investors will be putting together their portfolios with just a few clicks or swipes on an e-commerce platform. Investors will also be given an easy, user-friendly, and low-cost way to trade financial products, irrespective of where they hold their bank account. Looking ahead, platforms like this could provide asset managers with the entire infrastructure, either offering low-cost solutions in the fields of compliance, reporting, and administration, or completely removing the need for asset managers to deal with these aspects at all. This would enable managers to concentrate on their core function of generating attractive returns. Asset managers who actually add value would receive far greater exposure and distribution power at minimal cost, while their underperforming peers would be at a disadvantage. Robo advisors and fund platforms are already benefiting from growing popularity even today. While these innovations are still predominantly being used by relationship or asset managers and relatively rarely by end investors, there are clear signs of fast-growing acceptance for these new technologies.

**Swiss asset managers in a good position**

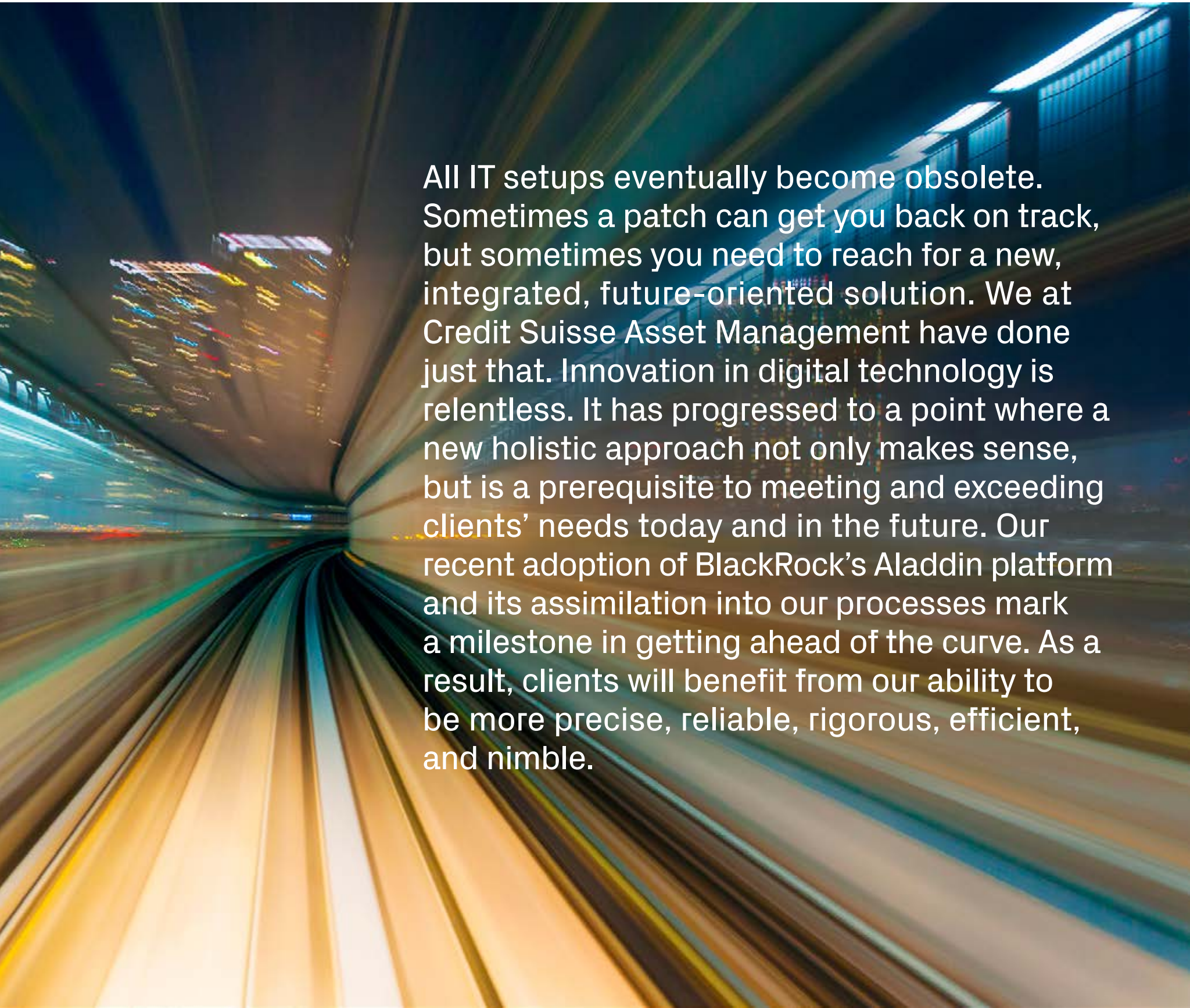
This transition represents a major opportunity for the Swiss asset management industry in particular. With its solid financial center, culture of innovation, and first-class infrastructure, Switzerland is ideally placed to position itself as a forward-looking technological leader in the asset management space. Thanks in part to the country's renowned technical universities and other higher education institutions, numerous technology firms are already based in Switzerland. The excellent research links between universities and the industry is a significant factor in this regard. With its Crypto Valley, Switzerland is also home to one of the world's leading centers for blockchain.

The digital revolution in asset management will chiefly benefit clients, who will also see costs fall, which has to be a good thing. If asset managers seize the opportunity they will benefit, as will Switzerland by establishing itself as an innovative base for asset management.

# The Asset Management Platform Switzerland

The Asset Management Platform's vision is to make Switzerland a leading center for the industry. It aims to become an established institutional platform for developing the asset management segment, stimulating ideas, providing information, and acting as a partner in regulatory and policy dialog. It will build on the common ground shared by all those involved in asset management in Switzerland. The priorities of the Asset Management Platform Switzerland include fostering innovation and new technologies to make the Alpine state a preferred production base for the asset management industry of tomorrow.

# Staying ahead.



All IT setups eventually become obsolete. Sometimes a patch can get you back on track, but sometimes you need to reach for a new, integrated, future-oriented solution. We at Credit Suisse Asset Management have done just that. Innovation in digital technology is relentless. It has progressed to a point where a new holistic approach not only makes sense, but is a prerequisite to meeting and exceeding clients' needs today and in the future. Our recent adoption of BlackRock's Aladdin platform and its assimilation into our processes mark a milestone in getting ahead of the curve. As a result, clients will benefit from our ability to be more precise, reliable, rigorous, efficient, and nimble.



“Aladdin does not make investment decisions. Rather, it provides its users with the information and transparency they need to make decisions themselves.”

**Interview with Rob Goldstein**

Chief Operating Officer & Global Head of  
BlackRock Solutions





“Today, Aladdin is the definitive investment platform combining sophisticated risk analytics, exposure, and performance analyses with comprehensive portfolio management, trading, compliance, and operational tools.”

### **What is Aladdin?**

*Rob Goldstein:* Aladdin is a technology platform for managing the complexities that come with investing large pools of capital. At its core, Aladdin is the operating system that asset managers like BlackRock, and now Credit Suisse Asset Management, can use to run their businesses more efficiently. Other users of Aladdin might be, for example, insurance companies or large pension funds.

Aladdin was first built to manage BlackRock’s business, and we continue to be the largest user of Aladdin today, given our USD 5.98 tn in assets under management. What we offer clients is the same risk analytics, portfolio analysis and intellectual capital that we at BlackRock use to manage investments day-to-day. In other words, we eat our own cooking.

Today, Aladdin is the definitive investment platform combining sophisticated risk analytics, exposure, and performance analyses with comprehensive portfolio management, trading, compliance, and operational tools. Because Aladdin is a single, unified platform, it not only provides increased transparency and scale to investment managers, it also gives clients the ability to phase out older, fragmented technology and investment systems. As we define Aladdin, it is important to understand what Aladdin is not. Aladdin does not make investment decisions. Rather, it provides its users with the information and transparency they need to make decisions themselves.

Over the past few years, we have been undertaking a new effort to extend Aladdin’s institutional capabilities to the wealth management industry by giving financial advisors access to the same risk and portfolio management capabilities used by the world’s most sophisticated investors. Aladdin Wealth, as we call it, provides a clearer understanding of portfolio risks to advisors and their clients and empowers advisors to scale their practice through a variety of tools.

### **Why is it called Aladdin?**

The name Aladdin was coined in 1999 by our first client, Freddie Mac, as part of an internal naming competition. It stands for Asset Liability and Debt Derivative Investment Network.

“Traditional enterprise technology is changing to reflect these new trends as expectations change around what technology should look and feel like. To deliver on these heightened expectations, enterprise technology must become indistinguishable from consumer technology.”

**On the one hand, we are living through an age of unprecedented technological change. On the other hand, asset management is a centuries-old industry with its own traditions and business models. How are innovation and the tech revolution affecting the asset management industry?**

Regardless of the industry, every business must become a technology company or risk getting left behind. As technology transforms industries, from payment systems to ride sharing, expectations of the digital experience have significantly increased. Rapid changes in technology have already started to transform asset management, including the exponential growth of data collection, the rise of artificial intelligence, advances in computing power, and consumers' greater interaction with technology for daily tasks.

Traditional enterprise technology is changing to reflect these new trends as expectations change around what technology should look and feel like. To deliver on these heightened expectations, enterprise technology must become indistinguishable from consumer technology. The way we like to describe our thinking in this regard is “business to human,” or B2H. Everything we build, every tool and app, needs to be viewed through this lens.

**Many of today's brightest minds are drawn to the dynamism of tech. How is the asset management industry faring in the global competition for talent?**

You may have heard Larry Fink, BlackRock's CEO, talk recently about purpose. We very much believe that to prosper over time, companies must show how they are making a positive contribution to society. Employees are a key reason for this. Attracting and retaining the best talent increasingly requires a clear expression of what you stand for.

Millennials, for example, who today represent 35% of the workforce, have new expectations of the companies they work for, buy from, and invest in. Recent studies show that millennials believe that the primary purpose of business should be to improve society. The implications of this are only growing as millennials take on increasingly senior positions in their places of work, be that in business, government, or elsewhere.

“Aladdin is not only a platform, it’s a network – a network of over 200 clients that benefit from the collective intelligence of the broader Aladdin ecosystem.”

Today’s technology talent are seeking careers that give them the greatest opportunity to affect change and to help solve really hard problems. In finance you can do both, which is one of the main reasons why a quarter of BlackRock employees work in technology-related roles, and we expect that trend to accelerate in the future. It’s difficult to imagine a challenge more universal or more pervasive than helping people achieve the financial means to send their kids to school, tend to their health, live comfortably, save for retirement, and pursue their ambitions.

### **How does Aladdin address the pressure within the industry to innovate?**

Aladdin is not only a platform, it’s a network – a network of over 200 clients that benefit from the collective intelligence of the broader Aladdin ecosystem. We are constantly innovating and adding features based on the strong feedback loop we have with our users.

As an example, last year we launched Aladdin Developer, which opened our platform to both BlackRock engineers and tech-savvy client users by enabling them to build their own applications on top of our platform through application programming interfaces (APIs). Many asset managers now want the flexibility of building their own customized algorithms or trading strategies and have built up the technical know-how to do so.

By opening Aladdin in this way, we can usher in a new wave of technology tools for the asset management industry, built on the Aladdin foundation that BlackRock has spent the past 30 years developing.

### **What’s next for Aladdin on the BRS side and for the Aladdin community?**

We are focused on continuing to activate the Aladdin community by further opening the platform and unlocking additional network effects to accelerate innovation and growth for our clients.

We are also focused on expanding Aladdin’s capabilities to build deeper relationships with clients and open up new markets. This includes further growth in multi-asset, equities, and alternatives, and broadening our offering into other parts of the investment process, such as accounting and data management.

We are also working to equip our clients with the capabilities and agility to self-serve by retooling our data factory and delivery model. Clients nowadays expect to be able to do more themselves, and we're pivoting our business in that direction every day.

And finally, with the global wealth management industry in a period of rapid transformation, we are partnering with wealth managers to enhance their value proposition, create rigor and scale in their investment process, and grow their businesses through our Aladdin Wealth offering.

**How has the technological revolution affected your thinking and career? What does innovation mean for you personally and how does it influence your decisions?**

Innovation is not just another buzzword; it's a mindset and one of our core principles at BlackRock. It's in the DNA of everything we do – from the way we develop and distribute products, to how and where we run our business, to the technologies we build for our clients.

Our job as a firm is to be constantly innovating – to anticipate and reposition our firm in advance of the changes that our clients will face over time. Throughout our history, we have not been afraid to take bold action to strategically grow our business and evolve who we are.

Just as technology developed in 2008 was not adequate in 2018, and the technology of 2018 will be inadequate in 2028, we must constantly challenge ourselves to evaluate every input, every line of code, and every piece of data. The world is changing, and we have to build a rigorous culture of questioning our assumptions in order to change with it.

**Rob Goldstein**

Rob Goldstein is BlackRock's COO and heads its BlackRock Solutions business. In his 20-plus years at the firm, he has been instrumental in developing many of its foundational processes and capabilities. He has been named to Institutional Investor's "Tech 50" list of top technology entrepreneurs in the financial services industry for the past five years.





# Blockchain

Blockchain enables the ownership of virtual property to be determined beyond doubt, as well as allowing ownership rights to be freely traded. The technology eliminates the need for a central ledger. The Center for Innovative Finance (CIF) at the University of Basel is investigating how these technologies are affecting business and society. The research unit is supported by Credit Suisse Asset Management, which has endowed a professorship in Distributed Ledger Technology (Blockchain)/Fintech.

### **Professor Fabian Schär**

Managing director and professor at the  
Center for Innovative Finance (CIF), University of Basel  
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Security, efficiency, and reliability – these have always been the criteria on which payment and transactions systems are judged. To become established, a new system has to offer an improvement in at least one of these dimensions. Cash was better than bartering because those involved in trading no longer needed both parties to have exactly what the other required. Credit or debit cards are often more efficient than cash as payments are processed electronically, removing any geographical restrictions on handing over payment. Not only that, if a credit/debit card is mislaid balances are not automatically lost, which is a major advantage over cash. The same is true of bank transfers, which have now become the norm – especially for large amounts.

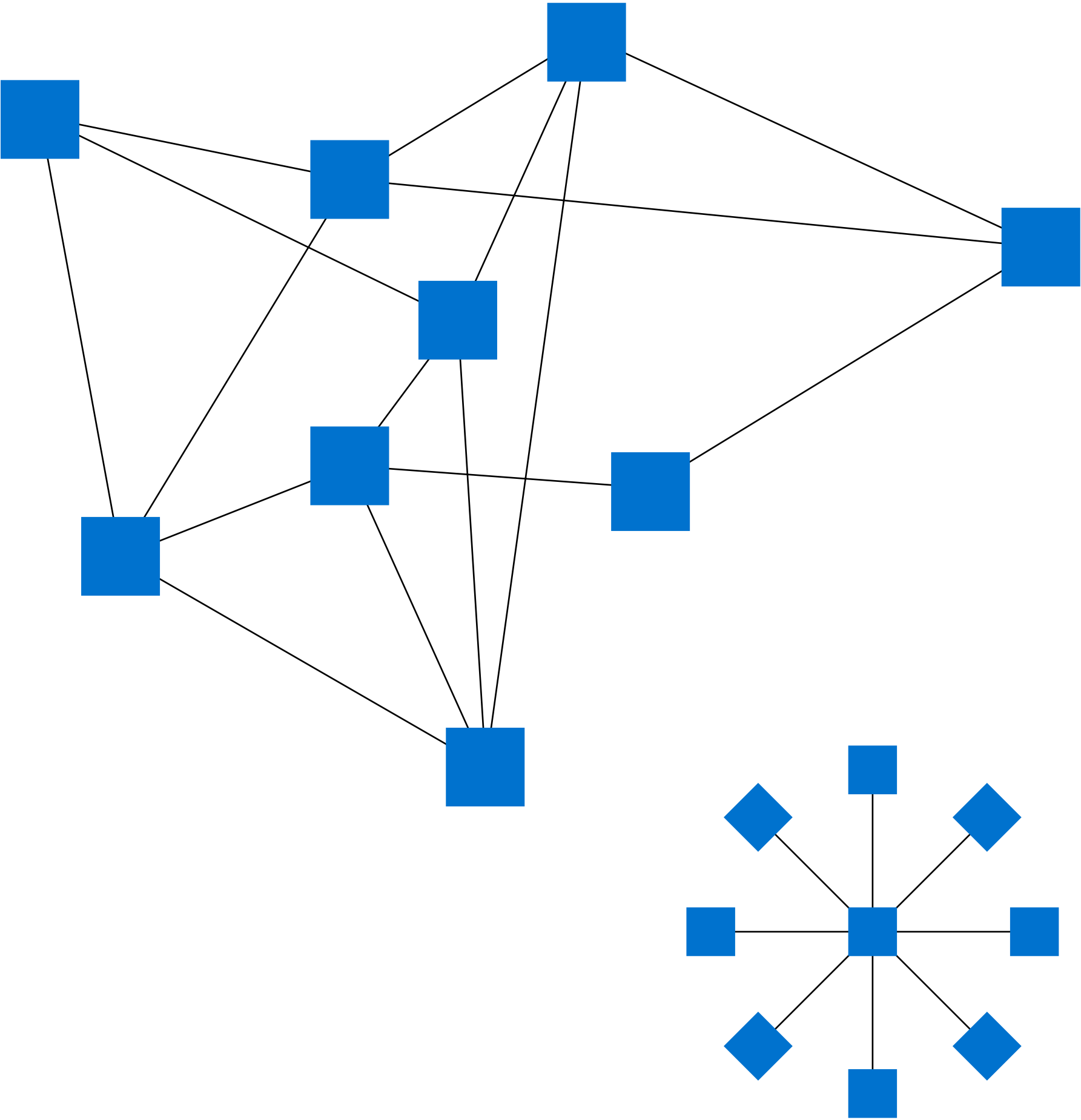
But however efficient these electronic payment systems are, they all share one key drawback. Every transaction has to be processed centrally to prevent double spends – situations in which a person tries to spend the same electronic money more than once. This issue does not arise with physical means of payment such as cash, as every coin and note only exists once and the unit of value is transferred to its new owner along with the physical currency. In contrast, electronic data can be copied countless times. To take one example, imagine a money file that you could send as an email attachment. Like Word or music files, any number of copies of the money file could be created and sent to different people. It would be possible to replicate money at will, therefore making it

worthless. But if there is a central database, electronic account balances belonging to the persons involved in transactions can be amended unequivocally, preventing people from spending more than they actually own or their limits permit.

At this point I should stress that centralized databases are highly efficient. As things stand there is no truly decentralized system that can deliver comparable speed or efficiency. However, the very efficiency of these centralized systems depends on a huge level of trust. If someone has exclusive control of the database and the power to make decisions affecting its current status, they have to be trustworthy. Otherwise, major problems may arise. If someone controls the database, this person could – in theory – seize credit balances, censor transactions, or completely exclude specific persons. Happily, in Switzerland scenarios like this are not an issue and seem far-fetched. But we should be aware that such incidents are not without historical precedent in some places. Furthermore, attacks can also be perpetrated by third parties, and centralized databases create a vulnerable point in an overall system, otherwise known as a single point of failure. If an attacker succeeds in disabling a central node in the system, this can have far-reaching consequences.

This is precisely where blockchain comes in. The technology enables management of a database to be shared. In public networks, any participant can hold a copy of this ledger and independently verify the accuracy of all the entries in it. A sophisticated system of incentives means it is in the interest of all participants to manage their own database in accordance with the shared rules. This ensures consistency across the various ledgers, creating a consensus as to which transactions are valid. If a person makes changes to their own copy of the database that breach the rules, this version can immediately be identified as invalid by the other network participants and therefore ignored. As none of the network participants have a privileged role and the data can be stored anywhere, there is none of the cluster risk inherent in centralized systems. All participants are replaceable, and network connections can adapt dynamically if individual participants leave.

Interestingly, the components of blockchain technology have existed for many years. Decentralized peer-to-peer networks are by no means a novelty. This is also true of public key cryptography and the hash functions that are used to verify transactions and reach consensus. What is new, however, is the way in which these technological components have been connected and combined into an overall system. These connections are what have enabled virtual assets to be held independently, with all the upsides and downsides this entails.



**Decentralized network**

Decentralized networks are considerably more robust than centralized networks (*see small illustration*) as they are based on multiple paths and none of the nodes have a systemically important role. *Figure based on Berentsen and Schär, 2017*



**Great power comes with great responsibility**

There is a fine line between the benefits and drawbacks of this new technology. If people have custody of their own units of value, they have complete autonomy over what they do with their assets. Assets can be transferred directly from A to B without any need for a chain involving multiple intermediaries – 24/7 and generally within a few minutes. This compares favorably with systems that only operate during office hours and do not deliver the funds until two days later in many cases.

Yet this autonomy also entails great responsibility. If someone's private key is lost or falls into the hands of a third party, the crypto-assets will be irrevocably lost. As a result, many people decide to store their cryptoassets with providers of custody services, contradicting the spirit of public blockchains in general.

The fact that blockchain gives holders of cryptoassets a choice is undoubtedly positive. They are free to choose whether to make use of these custodial services or hold the cryptoassets themselves. These virtual units of value have therefore broken new ground. As a result, this technology may be useful in the specific context of the debate over the systemic importance of individual corporations.

# Center for Innovative Finance



The Center for Innovative Finance (CIF) research unit at the University of Basel focuses on research into practice-centered issues in the fields of fintech, digital banking, and innovative finance. Its work concentrates on the academic analysis and practical implementation of blockchain projects alongside innovative funding and financial solutions. In its research activities the CIF ascribes great importance to comprehensive, interdisciplinary analysis. Professors Aleksander Berentsen, Heinz Zimmermann, Pascal Gantenbein, and Fabian Schär (pictured) are responsible for the academic leadership of the center. Fabian Schär is the managing director. His professorship in Distributed Ledger Technology (Blockchain)/Fintech is endowed by Credit Suisse Asset Management. He is also a member of the Board of the Swiss Blockchain Federation, a taskforce of the Swiss Federal Council. His research focuses on the interdisciplinary analysis of smart contracts, asset tokenization, and potential applications of the blockchain technology. Fabian Schär has co-authored numerous publications including the bestselling German-language book *Bitcoin, Blockchain und Kryptoassets*. The book is currently being translated into English and will be published by MIT Press.

## **Blockchain – the investor perspective**

Blockchains can also be used for other purposes. For example, companies can issue tokens, units of cryptoassets that represent securities. Just imagine you hold your securities yourself in your personal crypto wallet. Dividends and interest payments are distributed automatically. As far as trading is concerned, you can choose from a large number of exchange platforms, some of which are themselves completely decentralized and based on autonomous smart contracts. Any voting rights are linked to the token and can be exercised – quickly and securely, of course – using an electronic signature.

Unlike cryptocurrencies, these tokens are subject to issuer risk. Nonetheless, these cryptoassets can also benefit greatly from decentralization when it comes to transfers and custody. From an economic perspective, the option of decentralized, autonomous management is very welcome and makes systems more robust.

Furthermore, tokenization covers far more than conventional securities. To take one example, imagine that a museum creates 1,000,000 tokens representing partial ownership of a painting. This would give investors the chance to acquire tiny shares in a wide variety of assets, enabling them to diversify their portfolios to a previously unimaginable degree. The museum could use the funds raised to purchase additional works of art. A similar approach is conceivable for solar power plants, a football club, or indeed more or less any asset. Even though many of these visions would require legislation to be amended, I would go as far as to say that we are no longer very far away from a future in which many new asset classes will be created and tokenized.

Nevertheless, I should sound a note of caution at this point. Blockchain is frequently portrayed as some sort of universal remedy, and the technology is being used for all manner of purposes for which it is completely unsuitable. This is very unfortunate and sometimes leads to frustration with the technology when people finally realize that they should not have used blockchain in this particular context. Yet these projects should not obscure the fact that there are certainly useful blockchain applications. The technology has huge potential as long as it is deployed correctly. To sum up, we can say that the variety of ways in which blockchain can be used is being substantially overestimated. At the same time, the effect that blockchain can have on the areas in which it can be deployed successfully is being significantly underestimated.

# The transformative business potential of AI, IoT, and DLT – more than just a hollow promise?

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### **Digital revolution for industrial growth**

The fourth industrial revolution has begun, and industry is actively searching for opportunities to deploy disruptive technologies, specifically artificial intelligence (AI), the Internet of Things (IoT), and distributed ledger technology (DLT), of which blockchain is one example. It is doing so with good reason. According to a 2018 report from McKinsey & Co., profitable growth in industrial sectors is stagnant. The report suggests that a successful digital transformation across the entire industrial sector could yield returns of up to USD 2 tn for shareholders.<sup>1</sup>

Experiments and initiatives with these technologies are already well underway. But with the current digital revolution mirroring the dot-com bubble of the 1990s so closely, business leaders should approach AI, IoT, and DLT more circumspectly, carefully evaluating how these technologies can create sustained value while considering their social and environmental impact.

<sup>1</sup> <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-trillion-dollar-opportunity-for-the-industrial-sector>

### **Reasons for pause**

Technological breakthroughs in AI will increase the amount and types of work performed by machines, potentially enabling them to work more in areas where human strengths such as creativity or compassion are predominant success factors. But breakthroughs in AI could also drastically exacerbate inequality by eliminating jobs for workers. Similarly, IoT technology will continue to alter the value proposition of consumer and industrial goods, and it will have implications for consumption patterns and privacy concerns. Finally, the wild volatility of the cryptocurrency boom and the incredible hype surrounding it, most closely mirroring the dot-com boom, have caused DLT to be approached with trepidation.

### **Evaluating real potential**

The question then for business leaders is how to navigate the promises of emerging technologies. MIT Sloan Business School professor Michael Casey and Wall Street Journal reporter Paul Vigna, who have co-authored two seminal books on DLT, offer a valuable perspective on the hype surrounding cryptocurrencies:

The crypto bubble, like the dot-com bubble, is creating the infrastructure that will enable the technologies of the future to be built. But there's also a key difference. This time, the money being raised isn't underwriting physical infrastructure but social infrastructure. It's creating incentives to form global networks... It is the foundation upon which the decentralized economy of the future will be built.<sup>2</sup>

The value of a period like the dot-com or crypto boom is that foundations for the widespread use of technology can be laid. A valuable starting point then for confronting the possibilities of AI, IoT, and DLT is to consider what we want the future of our businesses to look like and to envisage the lasting impacts that we want these technologies to have on business operations.

### **In search of an enduring impact**

But how do you separate fact from fiction? One young company that has been working with these three technologies is Modum. We at Modum have been striving since 2016 to put a valuable, regulatory-driven solution in our customers' hands. Looking across industry sectors at both start-up companies with new offerings and established enterprises with new initiatives, we have noticed that true success stories involving these technologies are few and far between. A piecemeal approach to deploying technology is consistently what holds these projects back.

<sup>2</sup> <https://www.technologyreview.com/s/610781/in-blockchain-we-trust>





### No fear of AI, IoT, or DLT

Disruptive technologies such as artificial intelligence (AI), the Internet of Things (IoT) and distributed ledger technology (DLT) require a big-picture vision and a systematic approach. This is just what Modum in Zurich has specialized in. The company was founded in 2016 by entrepreneurs with experience in the technology sector and pharmaceutical production.



Speaking very broadly, IoT's greatest value typically comes from creating a "digital twin" of a physical item within a digital ecosystem. AI's strong suit is enabling root-cause analysis and predictions to drive automated decision-making. DLT's advantage is enabling secure synchronization of information in a single transaction with no intermediary. When combined, the potential transformational value of these technologies in the industry comes from their ability to optimize and automate. The resulting new approaches to business and the fundamental shifts in operational practices will remain long after these technologies have matured and the hype cycles have ended.

### **Where it's already happening**

Transformational shifts are complicated. In terms of leveraging the potential of AI, IoT, and DLT, integrated and globalized business units can only move as fast as their slowest counterpart. However, the supply chain is an early access point for these technologies to make a transformational impact: from tokenized assets and serialization processes to establishing provenance and proof of origin, and to autonomous parcels and predictive routing.

Modum began by developing a pharma-certified IoT data logger that can collect temperature data points from within a package while in transit and store them in a blockchain. This solution helps distributors of pharmaceutical products meet GDP (good distribution practice) regulations for medicinal products. The breadth of our supply chain monitoring solutions has since expanded to serve quality-sensitive supply chains in other sectors.

We are now developing additional automation and optimization solutions that further the potential of AI, IoT, and DLT to transform enterprise supply chains. Smart contracts can be utilized to initiate business processes or financial transactions without any manual intervention between independent parties in a supply chain. Processes such as the redelivery of goods, release of payments, or insurance settlements can then be automated. We are also using machine learning and predictive models to expose inefficiencies in distribution channels and to optimize packaging for sensitive goods. Smart contract automation and machine learning optimization both capitalize on the data that our loggers collect in the field, creating a feedback loop for continuous improvement.

Swiss Post, Switzerland's national postal carrier, has been working with Modum to integrate monitoring, automation, and optimization solutions to meet the needs of their clients in the healthcare sector and to streamline its own operations. Using collected data and predictive models, we are supporting Swiss Post to develop a smart solution for sensitive goods that increases delivery efficiency and protects consumers. The success of this collaboration earned Modum and Swiss Post a 2018 Innovation Award from PostEurop, the association of European public postal operators.

## For the benefit of everyone

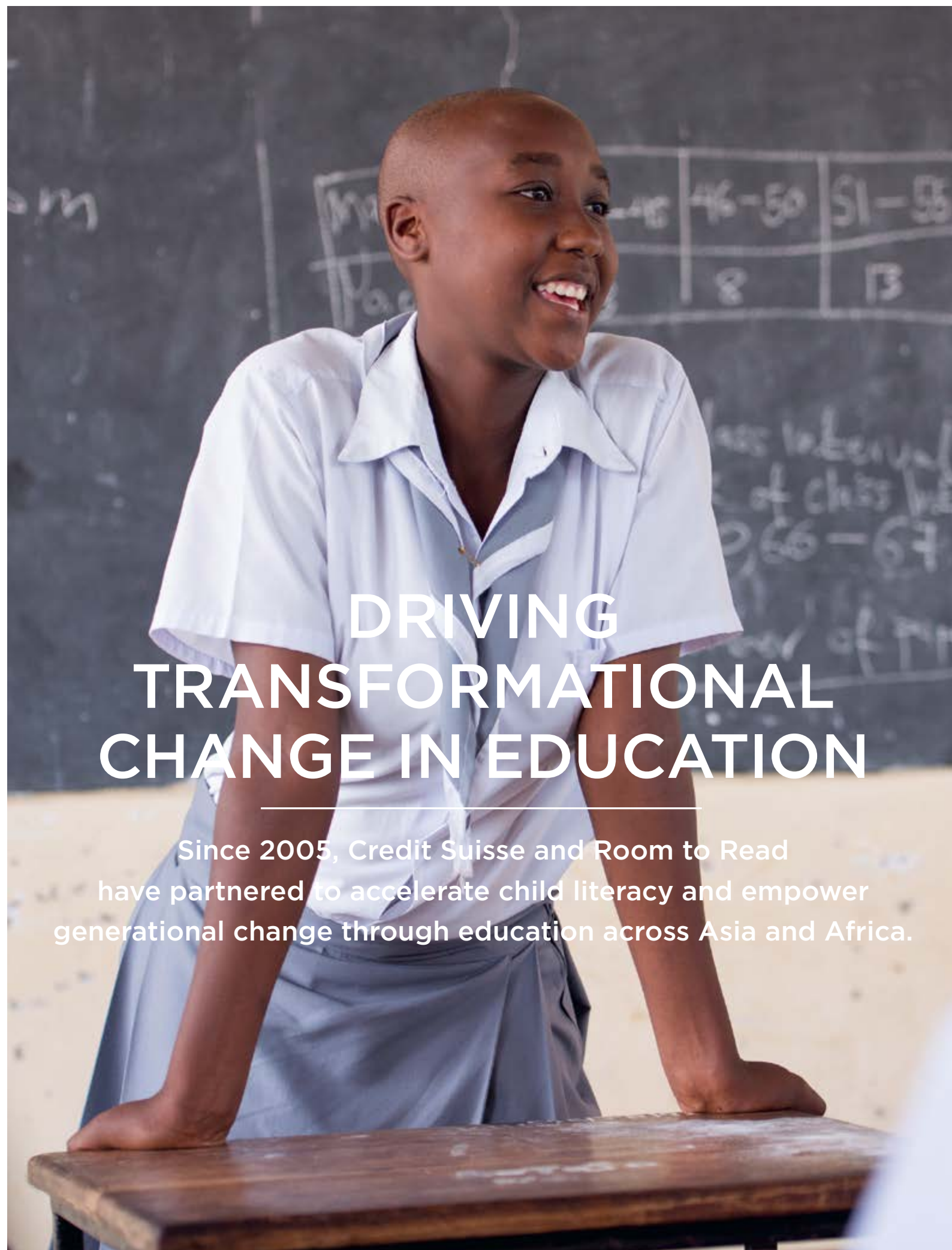
We at Modum believe in a holistic approach to transformation aimed at connecting the goals and sources of business value with the technologies that will help to achieve them. It is through the value chain that we can ignite transformative approaches by using today's technologies to automate and optimize. We can create new connections and collaborations that will open enduring opportunities for AI, IoT, and DLT.

The supply chain is a fantastic entry point for these technologies. It can begin to unlock the revenue gains and margin expansions that industry is relying on the digital revolution to deliver. Moreover, supply chain transformation using these technologies means cheaper and safer distribution by reducing the involvement of middlemen and lowering barriers to entry so that local suppliers can form new networks within a globalized supply chain. These networks can be inclusive to new businesses – in emerging economies, for example – and to new end users. The supply chain thus is an ideal place to start deploying AI, IoT, and DLT technologies to enable the fourth industrial revolution to usher in the next wave of growth through more efficient and productive business operations. And what's more – innovative companies like Modum are already on the journey to realize the promise of these technologies in real world applications.

## Everything under control

In pharmaceutical logistics, the required temperatures must be strictly adhered to along the entire supply chain. Modum has developed a block-chain-based monitoring system (MODsense) for this purpose. MODsense records and documents temperatures throughout the entire delivery phase all the way to the final recipient, for example a medical practice. The desired temperature range is monitored based on pre-defined requirements by a small data logger (see image), which is enclosed in the package.





# DRIVING TRANSFORMATIONAL CHANGE IN EDUCATION

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# Capital without values:



just money.



Burkhard Varnholt discusses the profound impact of the technological revolution, as well as the tremendous potential unleashed by our power of imagination.

### **Burkhard Varnholt**

Chief Investment Officer (CIO) Switzerland  
at Credit Suisse, Deputy Global CIO  
and Vice-Chairman of the Investment  
Committee of Credit Suisse

Capital in and of itself has no value. Only when capital is paired with the power of imagination does it evolve into a value-creating medium. The power of imagination is precisely what makes the difference (see “*Society 5.0 – the Imagination Society*”). Johannes Gutenberg demonstrated the power of imagination when in the 1450s he invented the printing press with movable type. Alfred Escher harnessed this power when he developed his plan for the world’s longest railway tunnel (through the Gotthard Pass) – and wasted no time completing the mammoth construction project. Similarly, the founding of the ETH and the “Schweizerische Kreditanstalt” (forerunner of today’s Credit Suisse) were also products of Escher’s imagination and sheer persistence. It is impossible to convey in a few sentences what Gutenberg and Escher unleashed with their pioneering achievements. But in a nutshell, Gutenberg’s printing press not only made it easier to replicate texts, it also challenged religious institutions’ monopoly on thought and opinion in Europe. Gutenberg ushered in the European Renaissance and spawned the beginning of a humanist society. Escher clearly recognized the potential of a country that, in many respects, was a developing European nation in the mid-nineteenth century. Mass poverty, widespread hunger, and infant mortality were part of everyday life. The formation of the modern federal state and a progressive constitution led to the rise of the Swiss Confederation in 1848, marking a fundamentally new point of departure. Escher had laid the foundations for Switzerland’s transformation from a European poorhouse to one of the world’s richest and most advanced countries. He seized the opportunities and turned them into a competitive advantage for the Swiss people.

### **Linear logic is frequently misleading**

We can – and must – learn from the past. Still, we need to keep a watchful eye on our cerebral automatisms. When problems arise in our everyday life, we tend to recall similar incidents from our past and deduce a corresponding response for the future. Unfortunately, the linear logic of our brains leads to a response mechanism whereby historical developments are simply extrapolated into the future. Linear logic is often misleading. Disruptive changes, which are becoming increasingly prevalent in today's world, are too much of a stretch for our linear way of thinking. It is imperative that we learn to cope with developments and innovations whose explosive power of disruption is able to turn entire social structures, corporate strategies, and business models upside down.

The Thematic Flagship ETH Conference offered a memorable taste of the potential for disruptive research and development. It was held by Credit Suisse Asset Management in the ETH Zurich robotics hall in December 2018. There was plenty to marvel at – from mind-reading electric physiotherapists and intelligent traffic management through to payment transactions of the future. Does Industry 4.0 mean we are in the throes of a revolution comparable to the 19th century industrial revolution? Judging by the ETH event, we can answer this question with a resounding “Yes”.

### **Intelligent agriculture in the fight against undernutrition**

Agriculture is also seeing the growing use of digitally networked technologies with virtually countless automation options. On the one hand, robots and drones perform repetitive tasks such as sowing, harvesting, and packing; on the other, they help to reduce resource consumption. Intelligent sensors and microchips produced by successful Swiss technology start-up Miromico, for example, help to lower water consumption by up to 50%. Its technology is literally sunk into the ground and linked to automatic irrigation systems.



### **An artist named Algorithm**

Disruptive technologies don't stop short of art. Christie's recently auctioned off the first painting programmed by an algorithm. It belongs to a series of portraits of the fictional Belamy family. The one depicted here is Le Comte de Belamy. The learning and training material included 15,000 portraits from the 14th to the 20th centuries. The paintings are signed at the bottom right and the signature consists of the excerpt of the algorithm with which the painting was created.

Blue River Technology, part of agricultural machinery group John Deere since 2017, is the developer of “See & Spray,” a technology that is based on computer vision, robotics, and artificial intelligence, and that records every single crop plant during tillage. The system differentiates between seed plants and weeds, automatically regulating the individual need for crop protection agents. The robotic nozzles are precision-directed at weeds while leaving plants unharmed. No herbicides are applied to weed-free zones (in contrast to today’s practice of wide-area spraying).

The alarming statistics on global undernutrition and famine trends drive home both the importance and the urgency of agricultural innovation. The most frequent causes of undernutrition are armed conflict and climatic shocks such as droughts and floods. But unless we see a surge in agricultural productivity, it will be impossible to achieve “Zero Hunger” – the second of the United Nation’s 17 sustainable development goals, which aims to double agricultural productivity and incomes of small-scale food producers by the year 2030. The Food and Agricultural Organization (FAO) estimates that, in Asia Pacific alone, 486 million people are undernourished.

### **Robots – welcome partners in the care sector**

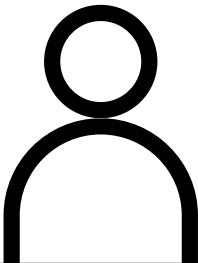
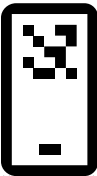
High hopes are being pinned on new technology in the healthcare sector. Physiotherapy robots are controlled by neuronal activity, i.e. via their owners’ or users’ thoughts. Robots empower paraplegics to guide their paralyzed limbs via a neuronal interface to the brain. Alongside start-ups, global corporations such as Google, Amazon, and Apple have also entered the healthcare business – or rather: the disease business – and are intelligently marketing the wealth of data they have been collecting. The opportunities? Coupled with medical software and corresponding databases, these internet giants are able to provide around-the-clock assistance across the world to physicians and patients – cardiovascular and diabetes patients, for example – and in many cases are faster, cheaper, and ever better. At the same time, where opportunity beckons, risk also lurks – in this instance in the misuse of data and information.

Robots certainly have their work cut out for them – from home delivery services and kitchen work through to elderly care. This is particularly the case in high-wage countries and aging societies, i.e. in Europe, Japan, and China. Robotics company F&P Robotics, whose Swiss roots date back many years, recently won the Innovation Award at the Shanghai Innovation Fair for its collaborative robots, which are deployed in elderly care and in physiotherapy. The volume of robots the Zurich-based company exports to China has been rapidly increasing ever since.

# Society 5.0 – the Imagination Society

Keidanren, the Japan Business Federation, has examined the potential outcomes of the digital transformation. Whereas a higher standard of living is the anticipated upside, there are negative consequences as well, including repercussions for the labor market, mounting disparities in prosperity, and the increasingly asynchronous distribution of information. Keidanren identified a need for action on this front, stating that “We must consider what kind of society we wish to create rather than trying to foresee the kind of society it will be.”

Keidanren has developed the Imagination Society (or Society 5.0) in its search for “an ideal concept of the next society,” which combines digital transformation with problem-solving skills and value creation derived from the power of imagination and the creativity of diverse communities.



~ **Society 1.0**  
Hunting society



~ **Society 2.0**  
Agrarian society



~ **Society 3.0**  
Industrial society

~ **Society 4.0**  
Information society

**Society 5.0 ~**  
Imagination Society

<i>Scale efficiency:</i>	Liberation from efficiency	<b>Solving problems and creating value</b>	“A society where value is created”
<i>Uniform:</i>	Liberation from suppression of individuality	<b>Diversity</b>	“A society where anyone can exercise diverse abilities”
<i>Concentration:</i>	Liberation from disparity	<b>Decentralization</b>	“A society in which anyone can get opportunities anytime, anywhere”
<i>Vulnerability:</i>	Liberation from anxiety	<b>Resilience</b>	“A society where people can live and pursue challenges in security”
<i>High environmental impact/ mass consumption of resources:</i>	Liberation from resource and environmental constraints	<b>Sustainability and harmony with nature</b>	“A society where humankind lives in harmony with nature”

Source: Keidanren (Japan Business Federation), published in Our Shared Digital Future, Insight Report World Economic Forum (WEF), December 2018

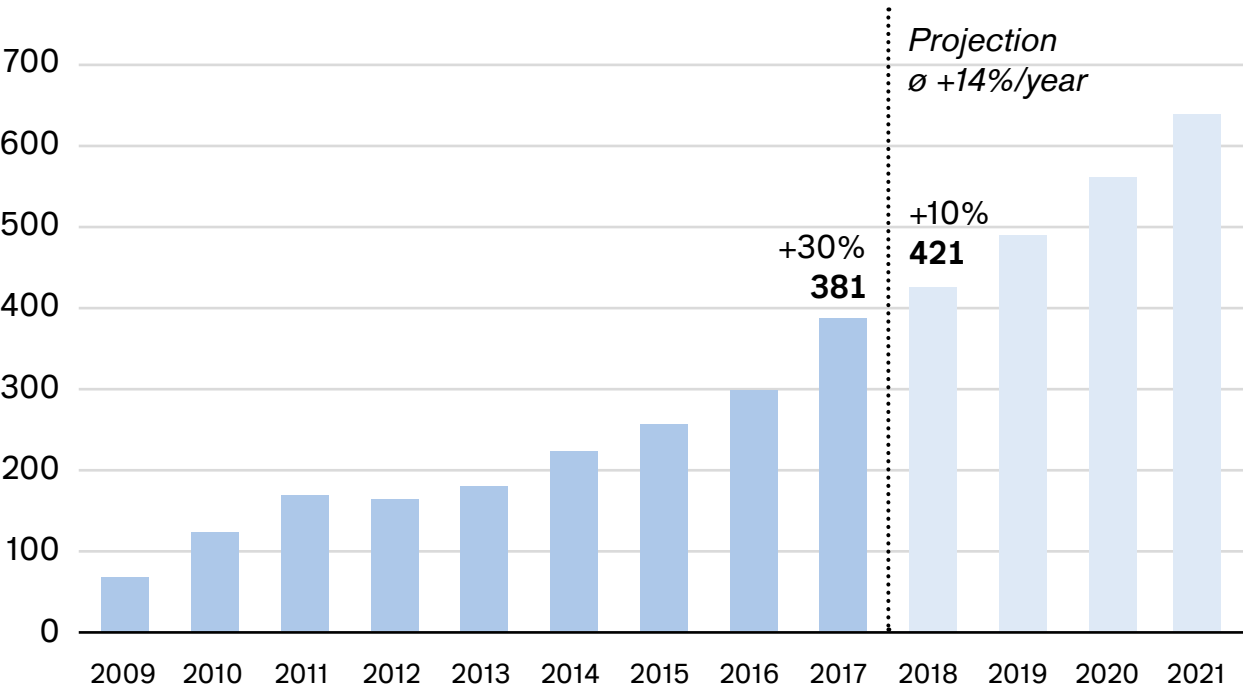
Redeployment of jobs

And what will happen to jobs rendered obsolete by advancing automation? The dynamism of the market in industrial robots (see *graphic: “Vibrant robot market”*) could lead people to assume that this will trigger mass unemployment. History suggests the opposite. Industrialization created new jobs and income streams, boosting public health and stoking growth. This benefited all sections of society, albeit not always to the same extent. Consulting firm Deloitte estimates that some 270,000 net new jobs will be created by 2025 via the digitalization and automation of the Swiss economy.<sup>1</sup> Jobs will then need to be cut in agriculture, repetitive unskilled and office work, and equipment and machinery operation. But the prospects look attractive for IT specialists, technicians, and certain academic professions, particularly where a combination of technical know-how and social or organizational skills is required.

<sup>1</sup> *Structural change creates jobs – How automation will impact employment in Switzerland, Deloitte AG, 2016*

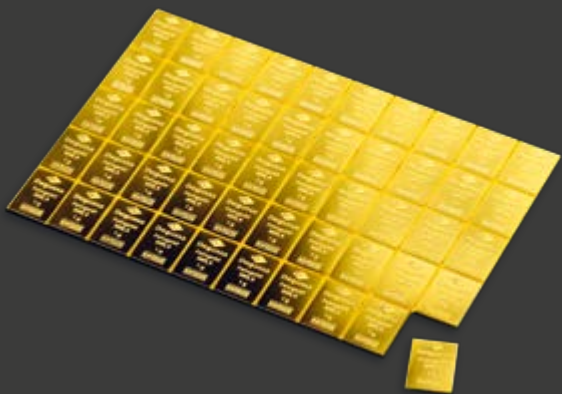
Vibrant robot market

Worldwide annual sales of industrial robots 2009–2017 and forecasts for 2018–2021 (in thousands)



Source: International Federation of Robotics, 2018





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