

RED

The Magazine
from SIX

Focus
**Taking the
Future into
Account**
The Successor to
the Payment Slip
Page 12

SDX – a SIX Company
**SIX Is Building
the Digital
Exchange**
Page 4

Artificial Intelligence
**Meeting
of Minds:
Hemispheres
Apart?**
Page 30

Fighting Cybercrime

Guardian of the Cyberspace

Security analyst Evrim has
everything under control at the SIX
Security Operations Center.

Page 22

The Digital Securities Ecosystem

Fully integrated digital asset trading, settlement and custody. From a regulated infrastructure provider.

www.sixdx.com

Solutions for the future. Now.

12

Focus

How Switzerland Does Its Bill-Paying

Payment systems change over time, by becoming more secure for instance, but they also change a country's culture and economic value creation. eBill, the successor to the electronic bill in Switzerland, is no exception.

4

Impulse Interview: SIX Digital Exchange

Thomas Zeeb, Head Securities & Exchanges at SIX, on the digital securities exchange SDX

10

Caught in the Act

Marco Menotti, Head Banking Services at SIX, at Zurich's Paradeplatz

18

Sideshow

Financial backing for players of American football

20

How Does ...

... a reference interest rate originate?

22

Fighting Cybercrime

Security analyst Evrim at the SIX Security Operations Center

27

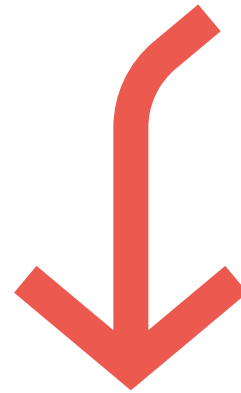
A New Way to Issue Bonds

Deal Pool, a centralized electronic platform

30

Future Talk: Artificial Intelligence

Data scientist meets neuroscientist



Takeaway

The Magazine in 30 Seconds

Page

4

SDX – a SIX Company

SIX is developing the world's first fully integrated platform for trading, settlement, and custody of digital assets in a secure and regulated environment. As the operator of the Swiss stock exchange and an established provider of post-trade services, SIX is well positioned to build the bridge between existing and new infrastructure.

Page

22

Cyber Security

SIX has been running Switzerland's first cognitive Security Operations Center since 2018 to optimally protect its network. The service is also available to banks and insurance companies. Small and midsize enterprises particularly benefit, gaining the kind of cyber security solution that otherwise only large banks can afford to develop and maintain.

Page

27

Deal Pool

With Deal Pool, SIX is automating the issuing of new bonds in Switzerland across a centralized electronic platform. Deal Pool makes misunderstandings a thing of the past and enables banks to benefit from greater efficiency and traceability.

Thomas Zeeb

As Head Securities & Exchanges at SIX and a member of the Executive Board, Thomas Zeeb is responsible for all of Switzerland's stock exchange capabilities. This includes listing and trading services as well as all post-trade services with clearing, custody, and securities finance. In addition to this Exchange Services remit, Thomas Zeeb is also the driving force behind the newly launched SIX Digital Exchange (SDX). He is accountable for the vision, scope, and delivery of what has been referred to as the future of exchanges. Prior to SIX, Thomas Zeeb held a number of positions in New York, London and Luxembourg for Bank of New York and Clearstream Banking respectively. The Canadian national speaks fluent German and is passionate about all things that represent excellence – particularly in the realm of client service.



The Securities Exchange of the Future

Impulse Interview: SIX Digital Exchange SIX has announced that it is developing a fully integrated trading, settlement, and custody platform for digital assets. Thomas Zeeb, Head Securities & Exchanges at SIX, explains how SIX Digital Exchange (SDX) is building a bridge between existing and new infrastructure.

Interview **Matthias Bill**

In 1995, Switzerland's stock exchange became the world's first securities exchange to introduce electronic trading. Now SIX has founded a company called SDX – a digital securities exchange. Electronic, digital: What's the difference?

Thomas Zeeb It is not so much the terms electronic and digital that constitute the difference. The word electronic, for example, in electronic trading really only refers to the act of trading. What comes after that is clearing, settlement, and custody – all parts of the Swiss value chain. SDX, in contrast, executes all of those steps simultaneously. That's the big difference. Millions of francs that are tied up today as collateral will be freed as we execute a genuine, instant, transfer of title to property. Distributed ledger technology makes that possible. In other words, we're building the world's first end-to-end trading, settlement, and custody platform for tokenized assets that will operate in a regulated environment.

Tokenized assets? What does that mean exactly?

Tokenized assets are a form of digital assets that can be traded on SDX. There are almost no limitations to the types ➤

of assets that can be tokenized. The realm of conceivable tokenized assets includes digital currencies and securities, and perhaps someday even non-bankable assets such as paintings and real estate. But the first assets that we would like to tokenize as part of a minimum viable product (MVP), an early version of SDX, are securities that are already traded today on our exchange. We plan to take that step in mid-2019.

What advantages does this bring?

Tokenization brings significant advantages, especially for our clients, in creating new products for their clients. Anyone who lacks a lavish budget but would nonetheless like to diversify the portfolio gets options beyond mutual funds. A token can be almost infinitely fractionalized. I could then, for instance, get a fraction of a share – 0.00173 Nestlé, for example. Cryptocurrencies have already made us familiar with this principle. Imagine the services that banks could offer their clients in the future. Tokenization will give all assets a new digital quality. They will become intelligent in a way because we'll be able to do almost anything with them via smart contracts.

Will SDX also host initial coin offerings, ICOs?

SDX will offer digital IPOs. But whether or when we start to use the respective technology depends on a number of different factors including a regulatory infrastructure that exploits the potential of digitalization.

The lack of such a regulatory infrastructure, of course, is exactly why cryptocurrencies don't always enjoy the best reputation and why ICOs have come under fire on occasion.

It's a serious issue because there are currently no controls in place. All the more important is a transparent, straightforward process. In the future we must be able, for instance, to verify that the actual asset underlying the digital asset is not of criminal origin. If we can do that, institutional investors, for example, will be among the first to want to take advantage of such offerings.

The same goes for ICOs, which currently proceed in a decentralized and unregulated manner and thus give rise to a large number of fraud cases. What we're striving for is a white ICO. Starting in spring of next year, we will meet with banks and the Swiss regulator

“
The competition
in the form
of digital currency
exchanges
has it tougher
than we do.
”

SDX – a SIX Company

The Digital Exchange Is Coming

SIX is building the world's first fully integrated platform for trading, settlement, and custody of digital assets in a secure and regulated environment. SDX is a stand-alone company that is locally separated and has a proprietary infrastructure. As such it will enable us to build the service autonomously in a controlled manner, combining the existing with the new wherever it makes sense to do so. Over time, our clients will have the opportunity to select the offering that best suits them.



→ More information: six.swiss/digitalexchange

FINMA to swap ideas on how ICO services from our side might look. We need to define standards, perhaps not as high as those for a traditional IPO, but not much lower either.

Speaking of standards, how mature are the regulations for a platform like SDX?

The regulations are just starting to take shape, which is an advantage for us. Part of the regulatory regime will probably develop continuously with the buildup of SDX. Our ICO services, for example, will set a precedent. Given the experience and status of SIX as an operator in a regulated environment, we are working closely with FINMA to define the needs for the future.

That sounds like a key element to success.

It is indeed. The competition in the form of digital currency exchanges has it tougher than we do. Our path going from traditional to digital asset classes is a more credible one than their path transitioning from an unregulated to a regulated structure. And again, on top of that, there's our unique starting position as an established supplier of end-to-end trading, settlement, and custody services all under one roof. We are well-positioned to build the bridge between existing and new infrastructure. We find ourselves presented with a tremendous first-mover opportunity to capitalize on, and further strengthen, the brand value of SIX as well as Switzerland's brand value. SDX has the potential to position Switzerland at the center of the global financial industry's digital future. ■■■

Lexicon

Digital currency exchanges are trading venues solely for cryptocurrencies, mostly operated by unregulated brokers.

SDX sees itself as a digital exchange that integrates trading, settlement, and custody of any digital asset.

A **distributed ledger** gives everyone the same view of ledger entries. The decentralized architecture replaces intermediaries.

SDX will use a permission-based distributed ledger, which means that access and certain processes will require authorization from SDX.

An **initial coin offering (ICO)** is a digital IPO or project funding through the sale of tokens.

SDX will be capable of hosting ICOs in the future. An initial step toward that capability is the establishment of ICO services in collaboration with banks and FINMA.

A **minimum viable product (MVP)**, unlike a prototype, already features the core functions of the final product.

SDX, in an MVP version, will activate trading of tokenized securities in mid-2019.

Trading of **non-bankable assets** such as paintings, real estate, and the like is not accommodated by today's financial system.

SDX will technologically be capable of tokenizing non-bankable assets, thus rendering them tradable.

A **smart contract** emulates the logic of a contract in programming code.

SDX will allow the use of any type of smart contract and will thus provide an entirely new ecosystem for Switzerland's financial center.

Tokenization will make any asset – including existing securities and non-bankable assets – digitally tradable.

SDX, in an initial step, will tokenize existing securities.



The Picture From September through November 2018, over a hundred employees at SIX spent a day volunteering, like here in Switzerland's Jurapark nature sanctuary. The SIX Social Days, which were launched in Switzerland in 2011, have since been expanded into a Europe-wide commitment. Employees at the office locations of SIX in Zurich, Olten, Luxembourg, London, and Paris joined in this year with enthusiasm.

The Quote

“I am impressed by how Switzerland continues to create an innovative ecosystem for its financial center.”

Ivan McKee, Scottish Minister for Trade, Investment and Innovation, while visiting the F10 FinTech Incubator & Accelerator and SIX in October 2018

The Head / The Count



Janine Hofer-Wittwer

Senior Product Manager, SIX

CHF
5.9
trillion

How rewarding is an investment once taxes are deducted? TaxCube from SIX will soon provide the answer. With its help, banks can incorporate tax elements into their investment advice to clients, thus enabling them to invest even more intelligently. The potential is enormous: In Switzerland alone, total assets invested in securities amount to approximately 5.9 trillion francs. TaxCube is the brainchild of Senior Product Manager Janine Hofer-Wittwer, who recognized an unmet need for such a service through discussions with clients and her previous work at a large bank. Under the InnoHub innovation program within SIX, she has guided TaxCube from the brainstorm phase to impending market readiness. Now she has room for new ideas, as the turnkey service will be part of the comprehensive tax-handling product offering from SIX headed by Jürg Stalder.

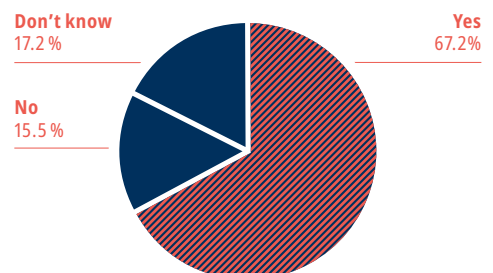
The Insight

Tax Data in the Spotlight

“There is scope for improving efficiencies in the way we manage tax administration challenges.” Two-thirds of the respondents to financial institutions survey commissioned by SIX agree with this statement (see chart below). This may hardly come as a surprise since the scale and scope of regulations such as FATCA, IRS 871(m), and CRS have pushed tax data into the spotlight. The complexity of country-specific legislation turns out to be the biggest concern (55.1%), followed by the general management of tax data (38.5%). Financial institutions recognize the need to fundamentally revamp their processes. The survey also discloses the resources they are thinking of employing to do that. Around 30% of the respondents added resources in accounting or compliance departments, for instance. For 40%, the changing tax regulation has strengthened the business case for automating processes and centralizing information on tax data across the organization. The majority of them additionally describe their processes as still being “manually intensive” (31%) or “partly streamlined and automated, but with a need for manual intervention” (36.2%). The good news is that market needs aren’t the only things changing – services are as well, like the customized data offerings from SIX, for example.



→ Read the entire survey findings in the white paper from SIX:
six.swiss/tax-automation



Two-thirds of the survey respondents think that there is scope for improving efficiencies in the way they manage tax administration challenges.

Caught in the Act

Paradeplatz
Zurich, Switzerland

19 September 2018
11:15 am

20°C
Humidity 70%
Sunny and clear

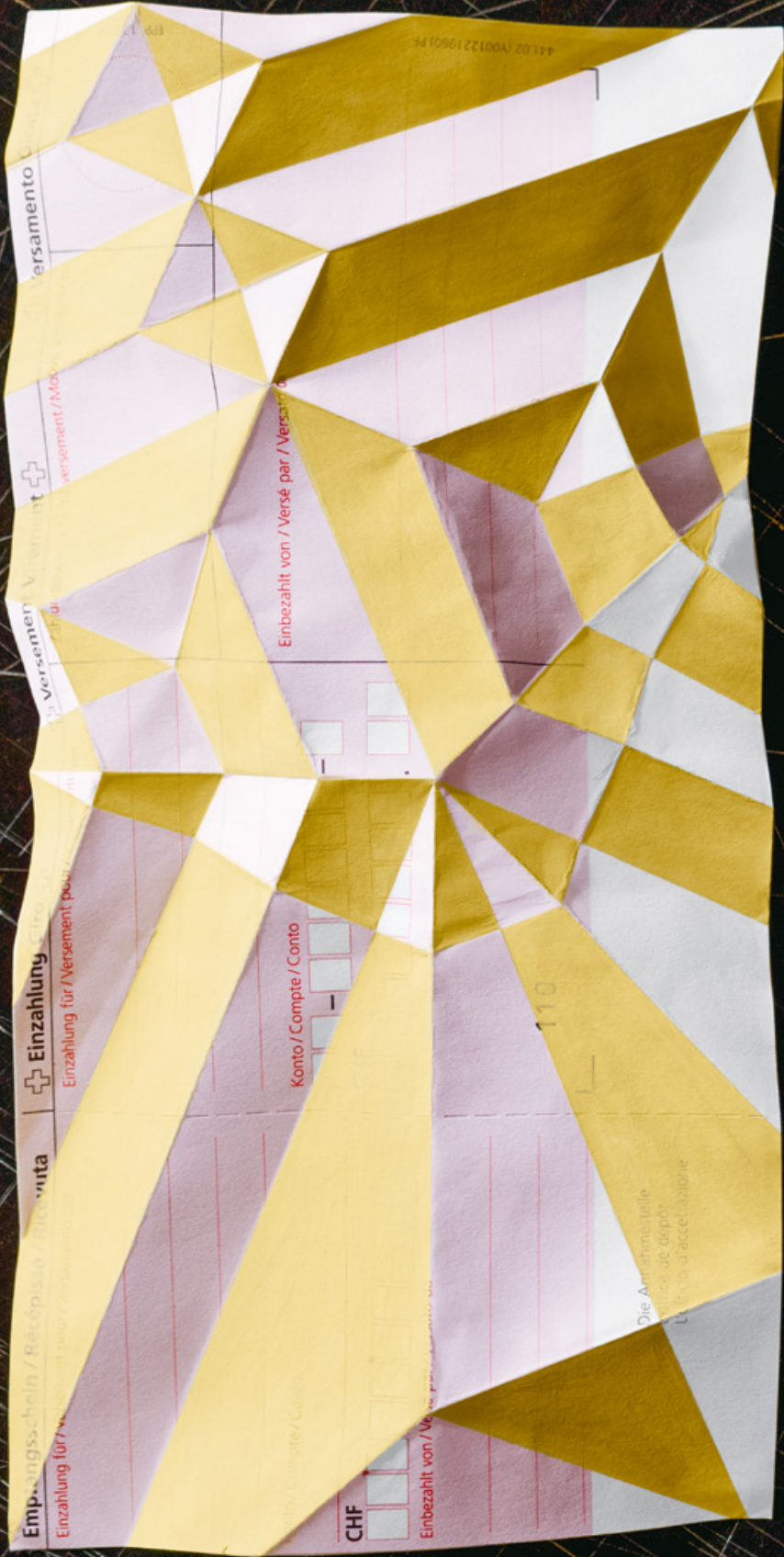
Marco Menotti
Head Banking Services, SIX



Bumping into Marco Menotti at Zurich's Paradeplatz – the headquarters address of a number of banks – doesn't surprise us at all. The Head Banking Services at SIX is currently having a lot of discussions with clients. It is important to him to impart his view of Switzerland's payment transaction processing landscape to them. What he sees is an ecosystem that is greater than the sum of its parts.

The TWINT payment app, eBill electronic billing, and other payment modalities belong to that ecosystem, just as well as automated teller machines and interbank payments via SIC and euroSIC. But none of these will be stand-alone systems for much longer. Technological and regulatory dynamics in particular make it imperative to exploit synergies and to develop overarching innovations for the entire ecosystem, and ultimately for banks.





Empfangsschein / Récépissé / Ricevuta

Einbezahlung für / Versement pour / Versamento per

Einbezahlung von / Versé par / Versato da

Einbezahlung

Konto / Compte / Conto

CHF

Einbezahlte von / Versé par / Versato da

Die Annahmestelle
für die deponierten
Gelder ist die Kasse der
Kantonsschule

110

Einbezahlte von / Versé par / Versato da

Einbezahlung für / Versement pour / Versamento per

Einbezahlung

441.02 (V001221990175)

Electronic Billing

Payments: Past, Present, and Prospective

From the ancient Greeks to eBill: The way in which bills get paid is a reflection of a society's culture. And the payment system chosen plays an important role in economic value creation. Security and trustworthiness are the necessary prerequisites.

Text **Simon Brunner**

There's a scene in the *Iliad* where Glaucus and Diomedes exchange their armor. Homer, the epic poem's author, remarks that Glaucus must have been robbed of his wits: Whereas Glaucus's golden armor was said to be worth 100 oxen, Diomedes was said to have paid a "vulgar price" of just nine oxen for his humble bronze armor.

Scholars of ancient history have differing interpretations of this minor scene on the periphery of the Trojan War, where Glaucus and Diomedes faced each other as enemies. Some view the exchange of armor as a gesture of homage because the grandfathers of the protagonists were friends after all. Others construe it as one of history's first documented fraud attempt. Under this interpretation, Diomedes feigns the friendship ritual to get his clutches on the precious armor. But whatever the true motive was, for the jurisconsults of ancient Rome the unequal swap exemplarily demonstrated the need for money as a medium of exchange, for only that way can

accurate price formation take place in the trade of goods, they believed.

This anecdote reveals three things that are still true even in today's payment transaction regimes: Payment systems have a lot to do with culture, they have to be secure and trustworthy, and they have an impact on economic value creation – and eBill is no exception. Banks in Switzerland will migrate from e-bill to eBill by the end of 2018, ushering in a new era in payment transaction processing (see box on page 17).

1. Payment systems have a lot to do with culture.

Homer calculated the value of armor in oxen. Later cultures paid in shells, grain, oil, salt, and, of course, precious metals. The choice of medium of exchange in each case was largely shaped by local factors: What was available, storable and practical? In the 17th century, societies in Europe slowly transitioned from barter to paper for reasons of efficiency (see point 3). And to this day, culture continues to play a big role in the way we pay bills.





→ The payment slip as Switzerland knows it will be replaced by the QR bill in mid-2020. And eBill already makes paperless payment transactions possible today. What will you do with your no-longer-needed payment slips? Here's how to fold an origami dove, for instance: six.swiss/origami-dove

Fast-forward now to 2016. Companies in the USA were still settling half of their payments by check. Why? This question was discussed in a US banking forum. The explanation garnering the most agreement was: "Because the recipient doesn't need a bank account. Because it doesn't incur fees. Because it works even when electronic systems break down."

It appears difficult to persuade people to adopt something new, particularly in sensitive money matters.

France and the UK also are traditional pay-by-check countries. People in Portugal prefer to make their payments through special "Multibanco" ATMs. In many African countries, "cash only" has been the rule for centuries. But that now turns out to be an advantage: Since there is no other established payment system besides cash, it is possible to skip straight to very advanced mobile payment solutions, which are only slowly gaining traction even in industrialized nations.

Switzerland, like Germany and the Netherlands, ranks among the world's "giro" countries, where payment transfers from one bank account to another enjoy a high level of accep-

tance. But there are differences also within this group. Whereas Germany established the Reichsbank giro system back in 1876, banks in Switzerland fought into the 20th century against the proposed project to set up a joint consolidated clearing house needed to transfer remittances from one financial institution to another.

The moment of opportunity was seized by the Swiss postal service. Called PTT (Swiss Post, Telephone and Telegraph Company) at the time, in 1906 it launched its Postcheck system, which quickly caught on thanks to the many PTT offices throughout Switzerland. It wasn't until 1949 that banks followed suit with their own system, the precursor to today's Swiss Interbank Clearing payment system. Even later, in 1971, banks came to an agreement on introducing a standardized bank giro slip with a machine-readable code line.

The postal service wielded a formative influence over the payment processing system in Switzerland, marking a prominent exception in international comparison. For decades, the PTT payment slip remained a synonym for payments and was even taught in school. Its color changed over the course of its history – from green to red and from blue to orange – to accommodate scanners.

Banks also used payment slips and provided them to their clients even though the system actually was impractical: In order to pay bills, for a long time customers still first had to physically withdraw money from the bank and carry it to the post office.

In April 1997, Credit Suisse launched Switzerland's first online banking portal. Although this didn't eradicate the printed payment slip, it could be inputted electronically with the requisite hardware. From that moment on, payments could be made directly from one's home or office.

Advantage eBill

"With eBill, we are now completely closing the paperless circle in Switzerland," says Marco Menotti, Head Banking Services at SIX. "Billers and invoice recipients can now settle payments with receipts entirely digitally."

In accordance with the mandate of SIX to operate a competitive infrastructure for Switzerland's financial industry, all banks have access to this service and can integrate it into their online banking systems. This particularly facilitates smaller financial institutions because it enables them to provide a new service without having to bear the full development costs themselves. eBill originates directly from Switzerland's payment culture and is a logical refinement of the historically rooted giro system.

The payment slip will live on as well – as the QR bill, which will replace current payment slips from mid-2020 onward, and will address a target group that still prefers an efficient paper-based payment solution. People who do not use online banking can continue to do their bill-paying at the post office counter or by mail. The integrated QR code on the bill can be scanned, however. It contains all of the data needed to complete a payment. The QR bill thus builds an important bridge between paper-based and digital culture and can mark an intermediate step for some on the way to adopting eBill.

Diomedes, Americans trust checks even though safer and more practical payment solutions have since come into existence.

The history of the signature illustrates how much the concept of security has changed over the years. For centuries, a signature was considered sufficient proof of security, and we still use it today to authorize payments by credit card, for example. Signatures are widely accepted and seldom questioned. If we were to question them, we would quickly realize how inefficient and unsafe they are. Verification of signatures always entails a margin of latitude, and it's literally child's play to forge a signature: If your daughter or son wants to play hooky from school, she or he usually knows exactly how to sign the attendance book. The signature is becoming less and less important as other safer and more efficient forms of authorization – PIN, fingerprint, face recognition, etc. – are taking its place.

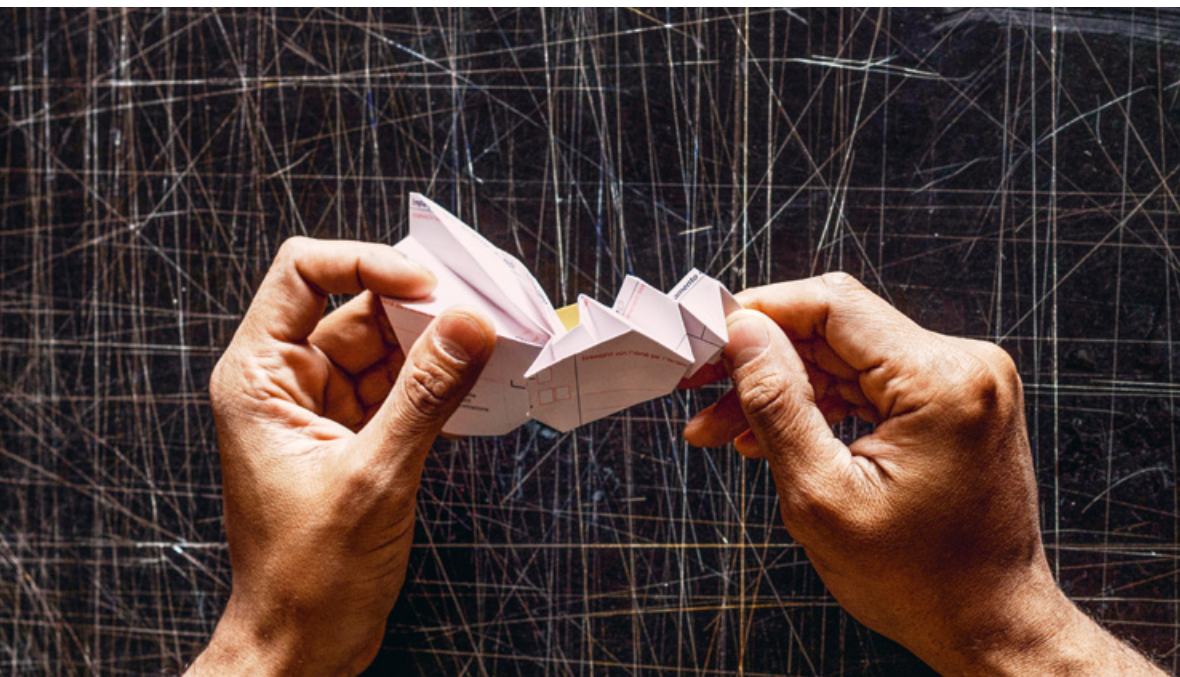
It takes very convincing arguments to establish new trust. How was a 19th-century businessman persuaded to embrace the idea of trading his gold for a piece of paper? Just how superior was the banknote solution to the precious-metal solution that he agreed to engage in something so risky and unfamiliar?

2. Payment systems must be secure and trustworthy.

Diomedes maybe swindled Glaucus out of his precious armor by invoking their families' bond of friendship. He thus exploited Glaucus's trust in him. Trust is the key to acceptance for any payment system. Just as Glaucus trusted

Advantage eBill

There are a number of reasons why eBill provides a security advantage over the existing paper-based solution: eBill renders time-consuming, error-prone typing of reference numbers, bill amounts, and account details into online banking



systems unnecessary, giving people – the leading source of error – fewer possibilities to make mistakes. Also, eBill is the safest way to receive digital invoices. All of the billers participating in the system have been vetted. Furthermore, eBill is as secure and reliable as online banking itself, making it more dependable than sending invoices and payment orders by mail.

3. Payment systems have an impact on economic value creation.

Bartering is inefficient and makes it impossible for a wider economic area to come into being. Even the simple question of how to make change for the purchase of two oxen is practically unanswerable under the barter system. In the Middle Ages, it took up to a year to transport a bill of exchange – a kind of check

bearing instructions to pay a certain sum to the order of a specifically named person – from Kraków, Poland, to Avignon, France.

“Efficient payment processing is a cornerstone of economic advancement,” Fritz Klein and Guido Palazzo write in the preface to their book *Kulturgeschichte des Geldflusses* (Money Flow – A Cultural History). What they mean by that quickly gains clarity through another glance at history. In 1826, the Caisse de dépôt of the City of Bern issued the first banknote in Switzerland. The introduction of this paper-based payment system enormously simplified commerce. But as so often happens with innovations, it took some time for the added value creation to optimally take effect. The number of banks in Switzerland that issued banknotes rapidly swelled to 53. It wasn’t until toward the turn of the 20th century that Switzerland’s federal government was granted the monopoly right to issue banknotes.

The mode of making payments in Switzerland continued to lack efficiency well into the 20th century both for customers – who had to withdraw money, take it to the post office and fill out complicated payment order forms – and for financial institutions. In the 1950s, “simplified international payment transactions” were introduced, though “simple” sounds a little ironic from today’s perspective. Each payment order form set consisted of eight duplicates. Despite the high-grade paper employed, the stack of sheets was so thick that it was hard to make a carbon copy that was legible down to the last page. Banks risked getting buried under an avalanche of paper.

Advantage eBill

The average Swiss household receives 11 invoices per month, and each act of paying a bill requires around three minutes of work – from opening the envelope and logging onto the online banking portal to entering the payment and finally archiving the invoice. Three minutes per bill times 11 invoices per month works out to the family bookkeeper having to spend around 6.6 hours on paying bills over a full year. Or take another example: setting up a direct debit. It’s a tedious process because the customer has to fill out a complicated form and has to coordinate the communication with the bank and the biller as well.

With eBill, the invoice now arrives directly in the customer’s personal online banking mailbox and can be paid in a matter of seconds



Origami Artist Siphon Mabona

The eBill and the QR bill are sending the Swiss payment slip into retirement. Origami artist Siphon Mabona has his own idea about what could happen with them afterwards, as the sequence of photos shows. At the age of five, he folded his first paper airplane, and when he turned 20 he began to create his own original designs. Along that road he discovered origami. Since then, his achievements in that art have included his involvement in *Origami in the Pursuit of Perfection*, the award-winning short film by sporting goods maker Asics Corp. And he has exhibited his creations in museums and galleries around the world. Siphon Mabona currently lives and works in Lucerne, Switzerland.



→ More information:
mabonaorigami.com



with just a click. Moreover, automatic payment to selected billers can be authorized up to a self-determined maximum amount. That makes it very easy for customers to set up a standing authorization, which also provides more functions than the somewhat rigid and outmoded direct debit.

But eBill enhances efficiency beyond just for customers. On average, it costs a biller around five francs to generate, print, package, and send an invoice. That expense vanishes with eBill, and what's more, the bill arrives even faster than before. Earlier receipt of payment is thus virtually assured, so to speak. Added value therefore increases. ■

E-bill Becomes eBill

Digitally into the Future

Online banking is routine today for most of us, and many people have grown accustomed to executing their financial transactions from the comfort of home on their computers. Some companies are saving postage and protecting our environment by sending invoices by e-mail. But there's an even more convenient and securer way to do invoicing in Switzerland: with eBill. The eBill solution sends electronic invoices directly to your online banking portal, where you verify them and authorize payment. With a few mouse clicks you have everything under control, all with the highest level of online banking security.

This definitively makes the tedious and time-consuming double-checking and inputting of account and invoice numbers a thing of the past. No wonder more than a million customers and a multitude of renowned companies have already opted for the simplicity, security, and speed of eBill.



→ More information: ebill.ch



Down! Set! Hut!

More and more teams and athletes: American football is enjoying increasing popularity in Europe. SIX is supporting a team in this growing sports market through a one-time financial contribution to the AFC Lumberjacks based in Chur. "The contribution from SIX helps us achieve our goal," says Fabio Montigel, Specialist Listing at SIX, who plays cornerback for the Lumberjacks. "Our opponents are pretty good and they're tough as can be, just like American football is. But we're training hard to advance to Switzerland's B league."



→ More information: lumberjacks.ch



KRAFT
FLATTENBELÄGE

SIX

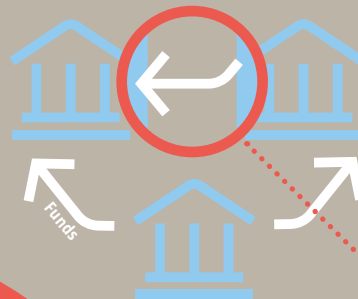
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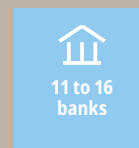
How Does a Reference Interest Rate Originate?

Reference interest rates are important, and not just for monetary policy. Financial contracts for loans, savings deposits, and mortgages also make use of them, as do many derivatives and exchange-traded funds. However, the controversial standard – LIBOR – will be discontinued in 2021. An alternative to that standard has already existed in Switzerland since 2009. It is called SARON, is calculated by SIX, and offers many advantages.

Unsecured Money Market in London

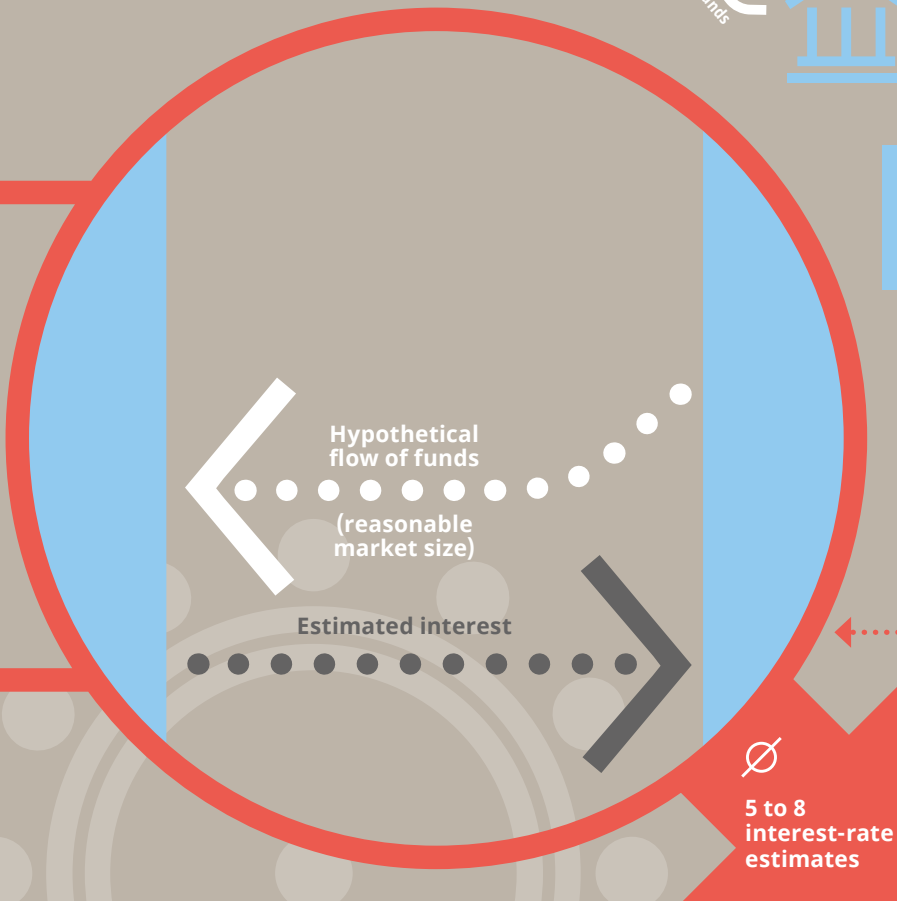


The LIBOR reference rate reflects the **unsecured money market** (short-term credit funding) in London. “Funding against credit-worthiness” is the rule here (no collateral required).



A group of **11 to 16 panel banks** is involved in setting LIBOR.

The panel banks answer the question of what interest rate they could borrow funds at if they ask for an **interbank offer** in a reasonable market size. Illicit collusion between some of those panel banks caused the LIBOR scandal in 2011.



The **estimates** submitted by the panel banks flow into the calculation of LIBOR. **Between 5 and 8** interest rates are used, depending on the number of banks involved. The 3 to 4 highest and lowest interest rates are discarded.

LIBOR

London Interbank Offered Rate



Calculated once a day



Published once a day



Available in five currencies (CHF, EUR, GBP, JPY, USD)

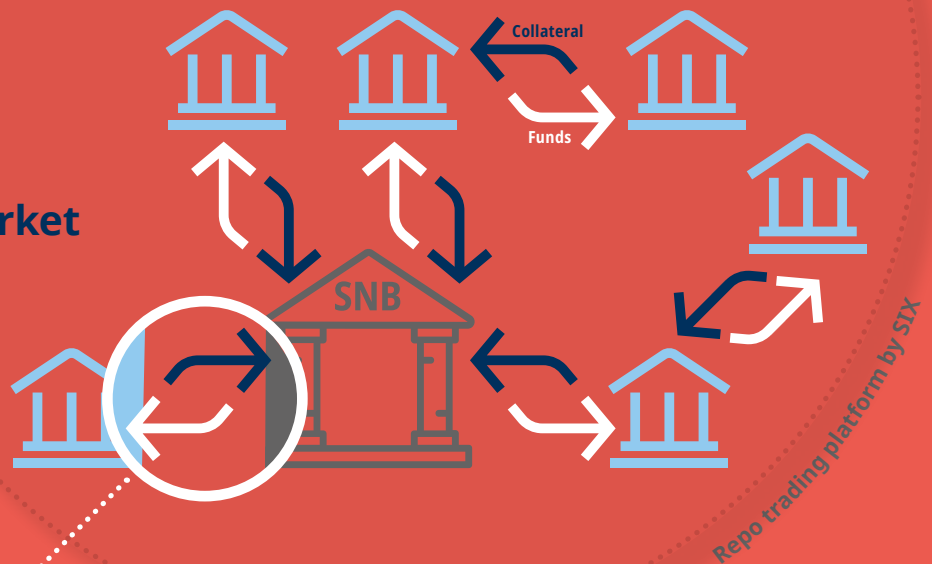
Secured Money Market in Switzerland

SIX operates the fully automated trading platform for the **secured money market** (short-term credit funding) in Switzerland. The SARON reference rate reflects this repo market. "Funding against collateral" is the rule here.

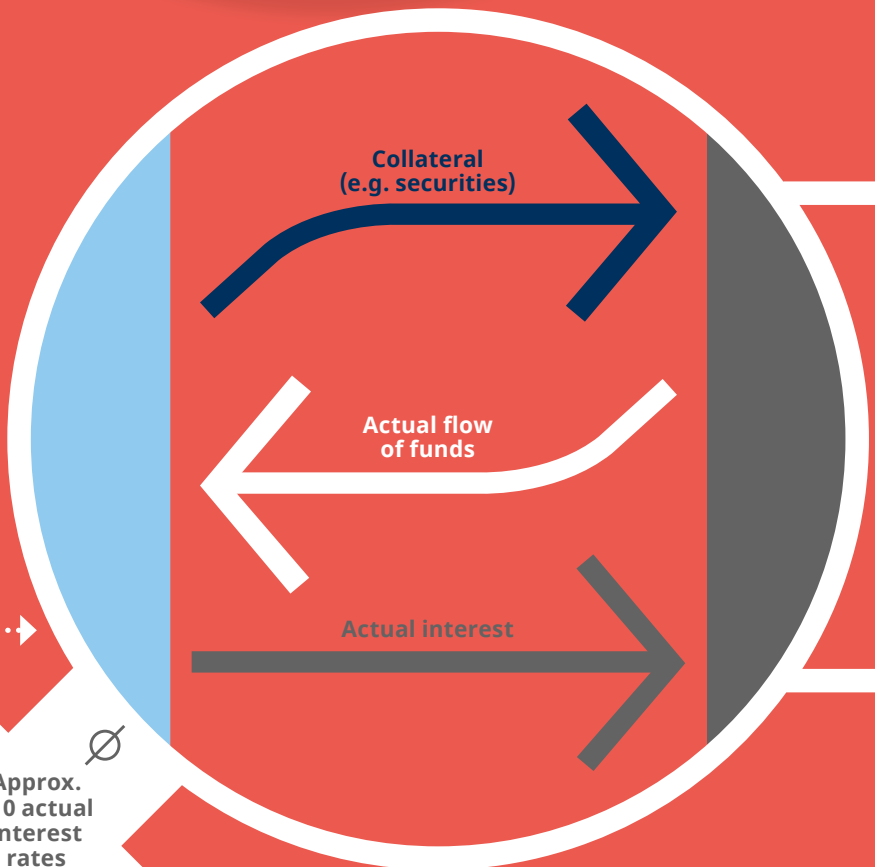
Some **160 banks and insurance companies** take part in the Swiss repo market, including the Swiss National Bank (SNB), which uses it to supply Switzerland's economy with liquidity.

Banks receive funds from the SNB by depositing securities as collateral. They pledge to buy back those securities at a later date and **pay interest**. Banks also borrow money from each other using this principle (secured interbank market).

Actual **concluded transactions and quotes** flow into the calculation of SARON. That's **approximately 110 interest rates** per day on an annual average.



160 banks & insurance companies



Approx.
110 actual
interest
rates

SARON

Swiss Average Rate Overnight



Calculated/published every ten minutes



Fixing conducted three times a day (closing rate: 6:00 pm)



Available in one currency (CHF)

Bits rather than Bullets

Fighting Cybercrime Data has become a popular target of theft, particularly in the financial sector.

From her post in the Security Operations Center of SIX, security analyst Evrim fights on the front lines to thwart digital raids.

Text **Hrvoje Tkalcec**

The signal column on the right above her desk suddenly lights up, flashing red. A piercing alarm sounds. Evrim stays calm. A glance at the four monitor screens facing her shows no security-related incident. She can resume the briefing with her colleague from the night shift, whom she is relieving. Were there incidents that he had to analyze? What trends should she continue to keep an eye on? Were there perhaps even actual cyberattacks? Everything was quiet, is the response. There were no particular incidents at the Security Operations Center (SOC) of SIX.

But what about the alarm just now? Every day the SOC surveils up to two billion access requests to the IT infrastructure operated by SIX that interconnects the players in Switzerland's financial sector. That infrastructure is accessed 30,000 times per second during peak moments. "All acts of accessing this network potentially pose a security issue," Evrim explains. Very few of them trip an alarm, though, and even fewer of them actually constitute a danger. "But I have to check into them nonetheless." That's her job as a security analyst. Evrim monitors the networks operated by SIX and those operated by clients (see box on page 25) in real time and instantly reacts if a suspicion hardens.

Individual access events say little, though, as correlations first emerge in the aggregate. That's why the security analysts in the SOC

The Security Operations Center of SIX surveils up to two billion network accesses per day.

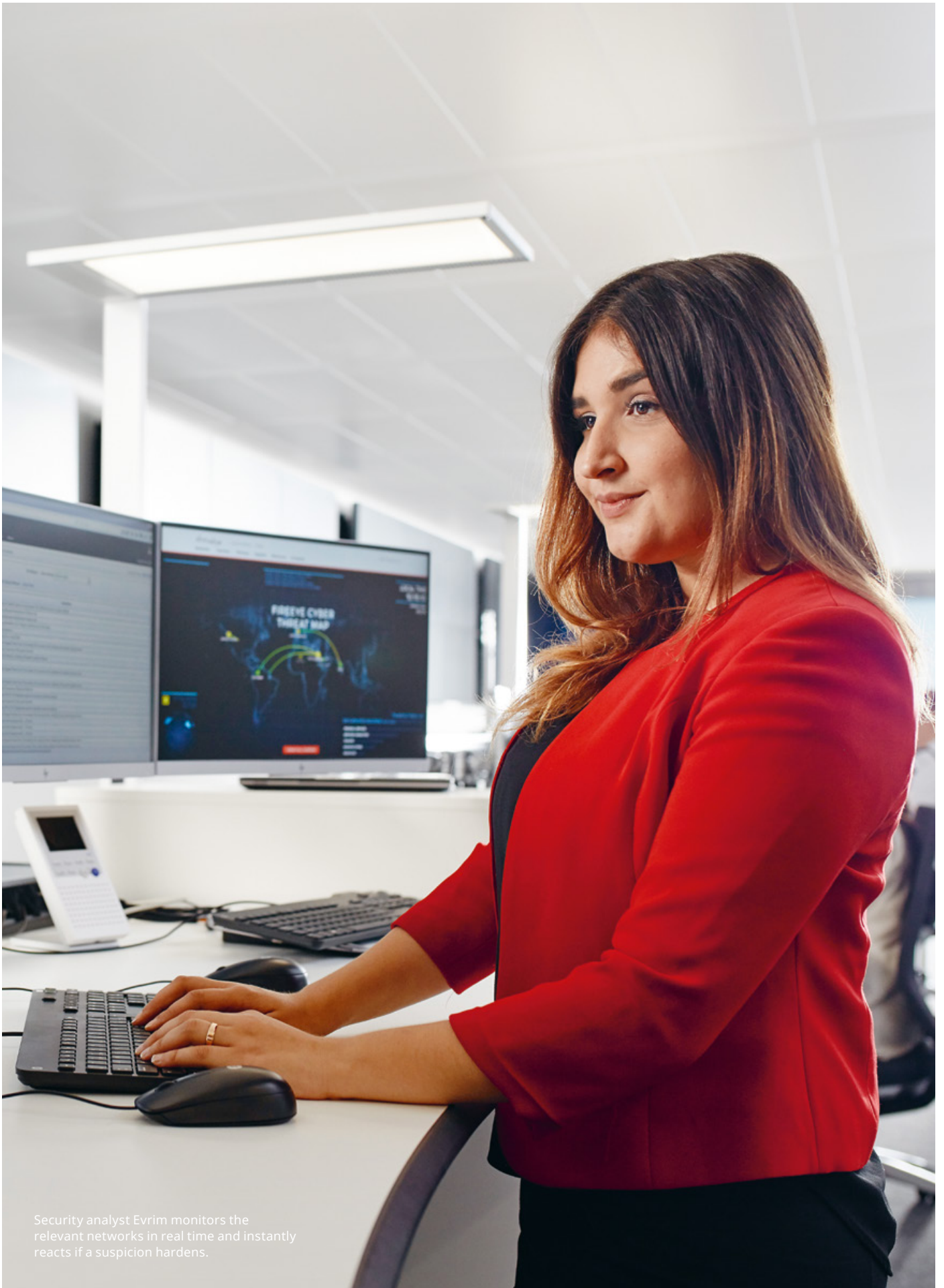


get assistance in establishing such correlations from a variety of sources, including IBM Watson. The analytics software graphically depicts network access activity, making even the hidden visible. Cognitive computing enables IBM Watson to continually learn and to import knowledge from other sources.

In the meantime, Evrim has finished the briefing with her colleague. She starts to scroll through her e-mail inbox. Part of her job is to answer a steady influx of queries about security matters from other departments and teams at SIX. While she does that, she nevertheless always maintains an overview of all network activity, also thanks to the SOC's multiple giant four-square-meter wall screens. It takes time to answer the e-mails, but it's a very worthwhile task. "Sensitizing our colleagues to cyber security facilitates our work here in the SOC. Every phishing e-mail that doesn't get opened means one less alarm to deal with."

Industrialization of Cybercrime

As if her statement needed corroboration, the surveillance system chimes up again. And this time, a phishing attempt has indeed occurred. Evrim analyzes the incident and rates it as a threat. A colleague evidently was lured by a fake e-mail message to a malicious website and unwittingly picked up malware there. The response unfolds lightning-quick. Going by the book, Evrim immediately notifies her internal contacts and informs them of all the ➤

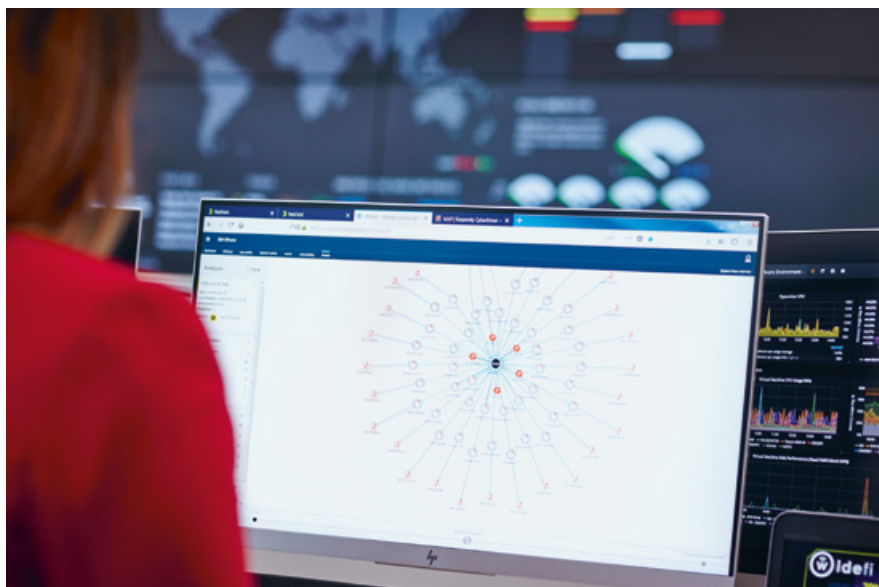


Security analyst Evrim monitors the relevant networks in real time and instantly reacts if a suspicion hardens.



**“I like to compare
the Security
Operations Center
of SIX to a
police station –
an ultramodern
police station.”**

The security analysts at the Security Operations Center of SIX get assistance from IBM Watson. The analytics software graphically depicts network access activity and thus makes even the hidden visible. Cognitive computing enables IBM Watson to continually learn.





Security Operations Center as a Service

Cyber Security for Your Enterprise

SIX has been running Switzerland's first cognitive Security Operations Center (SOC) since 2018 to optimally protect the IT network operated for the country's financial industry. SIX also provides this service to banks and insurance companies. To detect security issues and attacks, the SOC logs, correlates, and analyzes security incidents. If a suspicion is confirmed, security analysts like Evrim (see main article) draw up a recommended course of action and immediately alert your incident response team. Particularly your small or midsize enterprise benefits, giving you the kind of cyber security solution that otherwise only large banks can afford to develop and maintain.

SIX, as the operator of Swiss Exchange, is committed to maximum security. The SOC accordingly meets the highest standards:

- SIX installs, operates, and maintains the system needed to run the service on-site on your premises.
- Your data stays with you in-house. Only security incidents are passed on to SIX, but that data, too, never leaves Switzerland.
- SIX continually harmonizes the service with Switzerland's latest financial regulations, freeing your enterprise from this work and expense.
- You can use our service modularly and thus precisely control your costs. Optimize your organization's resources by having us take on the heaviest burden of your cyber security operations.



→ More information:
six.swiss/cybersecurity

details. The experts on containing and removing malware threats are reachable, and they likewise take immediate responsive action. The communication channels function flawlessly. The phishing attempt is thwarted.

"The attacks are becoming ever more sophisticated and their frequency is continually increasing," Evrim says, attributing this to the growing industrialization of cybercrime. "A cybercriminal used to have to manage the entire production chain on his own. In the case of a phishing attack, he had to compose the e-mail himself and make it look credible, and had to send it himself. He not only needed addresses to do that, but also the requisite software. And then he also had to build the website that he wanted to lure his victims to. Today he just buys all of that as a complete package easily and inexpensively. With money laundering perhaps even included."

The words she uses make it clear: The job of security analyst also requires a flair for criminology. "I like to compare the SOC to a police station – an ultramodern police station. We, too, hunt down crooks, but crooks who shoot bits instead of bullets." Evrim has never attended a police academy, though. She is a trained computer scientist with specialization as a systems engineer and holds an additional certification in cyber security. She is currently pursuing a bachelor's degree in application development.

No Such Thing As Absolute Security

Evrin and her colleagues in the SOC are not battling alone against cybercriminals. The threat analyses of SIX draw on information from an entire network that continually delivers updates on present dangers. "That way we are constantly learning very quickly. Nevertheless, there is no such thing as absolute security," Evrim notes matter-of-factly. "We can gird ourselves against a lot of threats, but it's impossible to completely apprehend every one of them before they surface." If it were possible, that would probably be too boring for the inner detective in Evrim. "As long as everything functions according to plan in the end, it's sometimes nice to have a little action," Evrim admits as she looks forward almost with glee to the next alarm. But this day triggers no further alarms. Everything stays quiet through the end of her workday. Now it's her turn to brief her colleague taking over the next shift, because the SOC never sleeps. ■■■

RED

THE MAGAZINE FROM SIX

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How Deal Pool modernizes bond issuance in Switzerland



EFFICIENT
Automated workflow



STANDARDIZED
Structured format from a single source



SECURE
Fewer communication errors and better traceability



SIMPLE
Centralized electronic service for banks and investors



FAIR
The same information for everyone at the same time



FREE OF CHARGE
Free access for investors

It's Time to Hang Up

A New Way to Issue Bonds For decades it has required a lot of manual labor to issue bonds, involving tasks ranging from phoning through a list of contacts to typing in the orders. SIX is now ready to automate the bond issuing process with its innovative centralized electronic platform called Deal Pool.

Text **Matthias Bill**

Did you ever play the telephone game as a child? The first child in the line whispers a sentence into the ear of the second child, who in turn passes the sentence on to the third child, and so on. The last child in the line says the sentence that was whispered into his or her ear out loud. By then, “snacks” has become “snakes” and “play” has become “pray,” and much laughter ensues. It’s less amusing when misunderstandings arise in a financial transaction. Such mix-ups can get expensive. One person says “fifteen” and the other hears “fifty.” That can happen in bond issuance today. When banks inform their clients about new bond issues, take their orders, or allocate bonds, their employees reach for the telephone the way they did decades ago. One of the few alternatives is Bloomberg Chat. There is no risk of hearing incorrectly with that communication tool, but mistakes occur nonetheless. There are risks wherever data has to be entered into a system manually, and those risks don’t get smaller when the workload per employee is increasing due to cost cutting.

Banks and Investors Benefit

With Deal Pool, SIX automates the issuing of new bonds in Switzerland across a centralized electronic platform. Deal Pool makes misunderstandings a thing of the past and enables banks to benefit from greater efficiency and traceability. Banks can retrace the entire interaction with investors, and this way can more easily ensure compliance with regulations and internal guidelines. But Deal Pool also benefits investors because not

even the fastest bank employee is capable of simultaneously informing all of his or her contacts of a new bond issue. Smaller-scale investors in particular are disadvantaged by this today because they don’t learn about new bond issues simultaneously with large investors. With Deal Pool, all potential investors receive the information at the same time and in the same format via e-mail or Bloomberg Message. This is because with Deal Pool, SIX has created a standardized source for all financial data (issuer, term to maturity, etc.). This not only reduces the load for banks of having to make multiple data entries, but also lays the groundwork for listings on the exchange. ■



→ Deal Pool is endorsed by all of the major syndicate banks in Switzerland. Institutional investors can now sign up for free to use this service from SIX: six.swiss/deal-pool

Innovation at SIX

Start Up and Be Back

Deal Pool arose out of an unmet need on the part of banks that prompted three employees at SIX to spend six months developing the service as a startup in the F10 FinTech Incubator & Accelerator. Deal Pool has since been integrated into the structure of SIX and is being used by banks as a turnkey service.



→ SIX is the originator and co-founder of F10. More information: six.swiss/f10-fintech

The List



Hot Streaks

4×

From 2001 through 2004, **Britney Spears** was the world's most googled woman each year and was even the most googled search term in 2003 and 2004.

5×

Roger Federer won the Wimbledon Men's Singles Championship tennis title for five consecutive years from 2003 through 2007 and duplicated that winning streak at the US Open from 2004 through 2008.

6×

At the US television industry's Emmy awards, **Julia Louis-Dreyfus** took home the trophy for Outstanding Lead Actress in a Comedy Series for six straight years from 2012 through 2017 for her role in *Veep*.

7×

Melbourne, Australia topped the Economist Intelligence Unit's Global Liveability Index rankings every year from 2011 through 2017. In 2018, the crown of "most liveable city" migrated from down under to Vienna, Austria.

8×

Aretha Franklin received the Grammy Award for Best Female R&B Vocal Performance for eight straight years from 1968 through 1975.

9×

The Inside Market Data/Inside Reference Data Awards have recognized **SIX** as the Best Corporate Actions Provider for nine consecutive years from 2010 through 2018. This year SIX has also reaped a fistful of additional awards for its financial data services, including accolades as Overall Service Provider of the Year (FTF News Technology Innovation Awards), Best Data Provider (Sell-Side Technology Awards), and Best Market Data System (Systems in the City Awards).

The Statistic

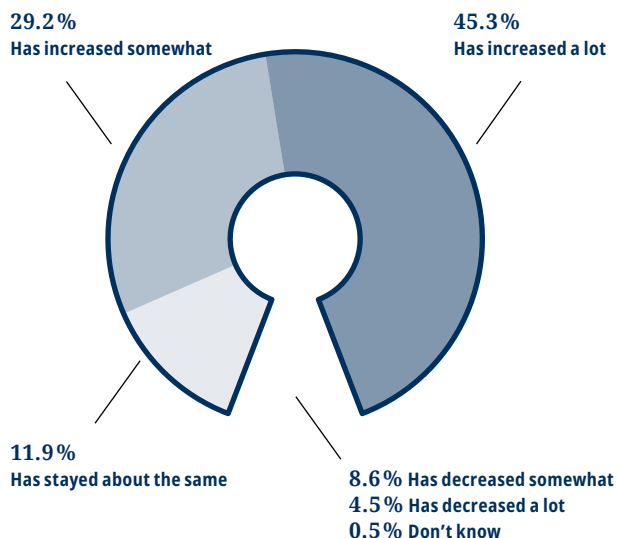
Open Corporate Doors for Open-Source Software

The Swiss Open-Source Study clearly reveals that the importance of open-source software (OSS) continues to broaden 20 years after its advent. Three-quarters of the survey respondents said that the relevance of OSS for their businesses has increased (see chart below). Android operating systems, for instance, are in widespread use, and all major companies utilize OSS. Open standards, knowledge-sharing with communities, cost savings, and greater independence and security are the main reasons why. OSS eliminates licensing costs and reliance on a single supplier. SIX, too, is successfully deploying OSS, not least for the purpose of enhancing its attractiveness as an employer to recruit the best software developers.



→ SIX participates in the Swiss Open-Source Study, which swissICT and CH Open have been publishing every third year since 2003. More information and the complete study: oss-studie.ch (in German only)

Relevance of Open-Source Software for Your Company over the Last Three Years



The Glossary

CVC

The CVC (card validation code), sometimes also called CVV (card validation value), is known by everyone as a security feature on credit cards. The CVC usually consists of three digits printed on the back of a credit card adjacent to the signature box. In a different context, CVC is an acronym for corporate venture capital. Under this form of funding, startup enterprises receive equity capital from established companies. In 2018 SIX founded the fund SIX FinTech Ventures to promote innovative fintech startups in Switzerland. It is endowed with CVC amounting to CHF 50 million. The first two startups that it is benefiting are vestr and Shift Cryptosecurity. The former aims to revolutionize investments in mutual funds, and the latter has developed a hardware wallet for cryptocurrencies.



→ More information: six.swiss/fintech-ventures



The Find

What Is That?



This cylindrical object is neither a space satellite nor an automobile exhaust muffler. It's actually a camera or, more precisely, the very camera used for the world's first stock exchange telecast. Introduced by Telekurs, a precursor company to SIX, in collaboration with Autophon, a manufacturer of telecommunications equipment, this camera broadcasted live from the floor of the Zurich stock exchange from 1961 onward. It filmed securities prices that a stenographer seated right on the trading floor ring continually recorded on a list, enabling offices adjacent to the trading ring as well as bank branches and subscribers throughout the city of Zurich to receive televised information on around 90 different securities in real time. This early innovation from the pages of the history of SIX is on permanent exhibit today at the Swiss finance museum. Employees at SIX recently rediscovered the camera in a closet.



→ Banking nation Switzerland's first and only finance museum explains the origins of the economic system and the role of stock exchanges through a multimedia exhibition. More information: six.swiss/finanzmuseum

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Pascal Kaufmann
wants to understand the principle
of human intelligence.

Jeremy Callner
sees parallels between
man and machine.

“Intelligence Means Learning from Small Data”

Future Talk: Artificial Intelligence Algorithms and machine learning are automating business processes in more and more sectors. Will our computers soon become robots that are more intelligent than people? Jeremy Callner, Head Data Scientist at SIX, and neuroscientist Pascal Kaufmann have made up their minds about it.

Interview **Matthias Bill**

We're standing here together in the Gewerbemuseum (Museum of Industry) in Winterthur in the midst of the “Hello, Robot.” exhibition. Will robots soon enable us to find more time to visit museums?

Pascal Kaufmann I hope so. Because there really would be more fascinating things than work for us humans to do, such as visiting a museum for instance. But it will still take a while for that to happen in hands-on professions, in all professions that involve a lot of fine-motor manual labor, such as nursing for example. It will happen faster in knowledge- and rule-based professions. Many tasks performed by the human brain today could be taken over by robots and algorithms.

Algorithms, artificial intelligence, machine learning, deep learning – can you two untangle the terminology confusion a bit?

Jeremy Callner I'll start with machine learning. People often do a lot of fantasizing about this term along the lines of science fiction novels and Hollywood films. We could avert exaggerated expectations and even fears, though, if we called machine learning what it really is: automatic parameter calibration.

K I think you need to explain that.

C As a physicist, I conceptualize the brain as receiving an input through sensory perception, experiences, etc., and effectuating an output that manifests itself by me moving, gripping something, etc. I fundamentally believe we can model that mathematically. A model has parameters. Machine learning means that for each of those parameters there is an algorithm, a kind of instruction manual on how the system processes new information – how it should sort it, for instance. The “learning” part of machine learning, if we even want to call it that, is limited to the algorithm that the programmer predefined. Deep learning, a special type of machine learning, requires somewhat less rigid algorithmic presets because it employs neural networks.

K The image of an input-output machine is what instinctively comes to mind. It corresponds with what we know from the computers that shape our everyday technological lives. But this image doesn't necessarily bring us closer to the understanding we seek. A few centuries ago, people believed that the brain was composed of tiny cogwheels and coil springs simply because clocks





Pascal Kaufmann

Neuroscientist Pascal Kaufmann is the co-founder of the Switzerland-based company Starmind, which is headquartered in Küsnacht and has offices in Frankfurt and New York. In over 100 countries, employees of large companies use the Starmind network based on self-learning algorithms to tap into each other's knowledge via a "corporate brain." The graduate of the Swiss Federal Institute of Technology in Zurich researched the interface between living brains and robots at the Northwestern University in Chicago. Through the Mindfire Foundation (see box on page 34), Pascal Kaufmann is attempting to do nothing less than crack the brain code.

Dr. Jeremy Callner

The Head Data Scientist at SIX Jeremy Callner guides the company's efforts to harness vast amounts of existing data to create services of great benefit to clients. In Gregor Kalberer's team he also examines artificial intelligence. The US-born data scientist studied physics at the University of Illinois at Chicago and earned his PhD at the European Organization for Nuclear Research (CERN) in Geneva. He was on the scene in 2012 when CERN, with its Large Hadron Collider, experimentally verified the existence of the Higgs boson. Jeremy Callner also holds a bachelor's degree in jazz saxophone from Roosevelt University in Chicago.

defined our everyday technological lives back then. In all likelihood, though, the brain actually isn't an input-output machine because we humans constantly alter the input. I can't grab a glass of water without continually manipulating the input in countless different ways. So, machine learning and thus also deep learning are purely statistical processes, in my opinion, and are not what I would consider intelligence.

Views undoubtedly diverge the most over the term "artificial intelligence."

C One definition I like starts with machine learning as I described it. On top of that, there's an added ability to simulate something and to thus formulate predictions and, lastly, to make a decision based on all that. I think that's very similar to the way humans learn. Aside from being a physicist, I'm also a musician, so I know from firsthand experience how important it is to practice the right sequence of notes in a melody. If I repeatedly play it incorrectly, that forms memory traces in the brain. On the stage, under the spotlight, in front of an audience, I'm guaranteed to play the wrong note because it has become etched in my mind.

K The theory of neural networks that you mentioned in the context of deep learning is arguably the best theory that we have at present to explain that. We neuroscientists say: "What fires together, wires together." Neurons that fire at the same time in reaction to something form preferential connections with each other in the brain.

C And that's exactly what we're able to model. In "my" automatic parameter calibration, the parameters would be the connections between neurons. For example, there are methods by which we can teach a computer to recognize a cat. We work backwards from the image of a cat to individual pixels. The more images we input, the better we can calibrate the parameters and the stronger the connection is between the artificial neurons.

K But how successful are we really at recreating the structure of the human brain in a computer? To me, the brain still possesses something magical. Neither better statistics nor faster computers enhance the quality of artificial intelligence, in my opinion. I also don't place much stock in Big Data. Do I really need 300 million images of cats to be capable beyond a doubt of telling them apart from cows? Intelligence to me means to

a far greater extent learning from Small Data. A toddler sees a cat once and knows what a cat is for the rest of his life. Don't get me wrong, I'm unshakably confident that we'll be able one day to create artificial intelligence on par with the human mind. After all, research groups around the world, like the Swiss Mindfire Foundation (see box on page 34), are attempting to crack the brain code.

"I fundamentally believe that we can model the brain mathematically."

Jeremy Callner

Why is that worth pursuing? Do I need to understand the brain in its entirety to create smart applications?

K We have to specify more precisely what we're talking about here. Even though automation and the quest for artificial intelligence are often conflated, there's a difference between them. Humans have always sought automation. Back in ancient times, Archimedes' screw made it easier for people to pump water. Today we automate by digitizing – thanks to machine learning, Big Data, etc. That occasionally has yielded some spectacular results. But we don't have to crack the brain code to be able to automate. I'm trying to do it for other reasons. I want to understand, for instance, how humans plan, sometimes even beyond their own life spans. I don't have to understand human biology to do that, by the way. Loosely ➤

along the lines of Leonardo da Vinci, I don't want to replicate a bird, I want to build a flying machine. I'm interested in the principle of human intelligence.

C Which brings us back to the definition of artificial intelligence. I have a somewhat different view in the context of automation, perhaps also because I work for SIX. When we, for example, develop a service designed to automatically detect anomalies in market data, that definitely requires a certain form of intelligence. The result is a correspondingly large efficiency gain. JACOB, short for Jacob's Automated Compliance Bot, is another example. In the past – before machine learning, Big Data, and today's computing power existed – we would never have been capable of creating such a tool. JACOB helps compliance specialists at SIX, and will soon be helping our clients, the banks, to more efficiently keep track of regulatory changes in thousands of documents. So, to that extent, enthusiasm for artificial intelligence in a broad sense definitely has its justification.

K I think we can agree that there is of course intelligence embedded in such a service – human intelligence.

“We don't have to crack the brain code to be able to automate.”

Pascal Kaufmann

Starmind's technology utilizes this as well to make the know-how of employees in large companies more accessible organization-wide. But at root, isn't it the stored intelligence of the programmer that we mean whenever we talk about artificial intelligence? A service with a “life of its own,” particularly one from an operator of infrastructure for the financial market, arguably wouldn't be tenable.

C I agree. And that's also why terms like “machine learning” and “self-learning” are not just inaccurate, but even dangerous. As I said tongue-in-cheek, that's why I prefer to speak of automatic parameter calibration.

K Speaking of autonomy, I would like to add something important. Once we have cracked the brain code and have replicated it in an algorithm, we won't leave it purely to statistics and thus to its own devices. We will embed it in some kind of value system because genuine intelligence is always goal-oriented. And we set the goal. Artificial intelligence should play on the human team, not on the robots' side.

C I'm all in favor of that. In the meantime, let's allow machines to work for us as intelligently as currently possible. ■

Mindfire

A Quest to Decipher the Brain Code

The Mindfire Foundation, a Swiss non-profit organization, focuses on understanding the basic principles of human intelligence and utilizing them to develop human-like artificial intelligence to be put to use for social-impact and sustainability purposes. To answer the unsolved questions, Mindfire founder and president Pascal Kaufmann will launch a series of missions, each one bringing together 100 international talents from a wide array of subject areas. The contributions and discoveries made by the individual mission participants are to be stored in a distributed ledger, the underlying technology behind blockchain. If Mindfire actually cracks the brain code one day, the distributed ledger will enable a perfect reconstruction of the chain of thought and will safeguard intellectual property rights. Mindfire's maiden mission took place in Davos, Switzerland in May 2018.

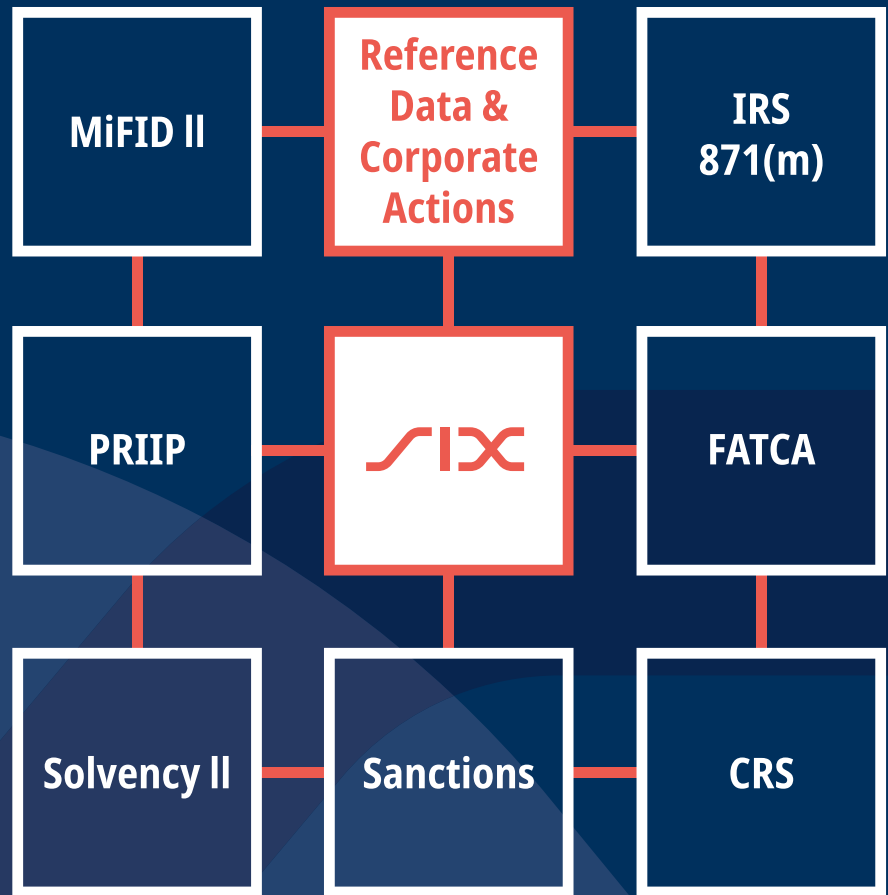


→ More information: mindfire.global

The exhibition “Hello, Robot.” is on a world tour. The next chance to see it will begin on 22 January 2019, at the MAAT in Lisbon. The current exhibition at the Gewerbemuseum in Winterthur is devoted to surveying the food of the future. It runs until 28 April 2019.



→ More information: gewerbemuseum.ch



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