SCHWEIZERISCHE NATIONALBANK
BANQUE NATIONALE SUISSE
BANCA NAZIONALE SVIZZERA
BANCA NAZIUNALA SVIZRA
SWISS NATIONAL BANK

Speech

Embargo
28 March 2019, 6.00 pm

The evolution of payment systems in the digital age: A central bank perspective

Money Market Event

Andréa M. Maechler and Thomas Moser

Member of the Governing Board / Alternate Member of the Governing Board*
Swiss National Bank
Zurich, 28 March 2019
© Swiss National Bank, Zurich, 2019 (speech given in German)

* The speakers would like to thank Dirk Faltin, Mico Loretan and Andreas Wehrli for their support in drafting this speech. They also thank Giuseppe D'Alelio, Lukas Hauri, Sébastien Kraenzlin and Nicolas Stoffels as well as SNB Language Services.

Ladies and Gentlemen

Welcome to the Swiss National Bank's biannual Money Market Event. Tonight, we have chosen to focus on a subject that is becoming increasingly topical in light of developments in digitalisation: payment systems. This is a fascinating field, not just for the private sector, but also for central banks, as payment systems and monetary policy are closely interconnected.

The SNB's monetary policy is designed to ensure price stability, which in turn maintains confidence in the value of our currency. At our quarterly assessment last week, we decided to leave our expansionary monetary policy stance unchanged. For the year 2019, we expect growth of around 1.5% in Switzerland, compared to 2.5% growth in 2018. The inflation forecast has been revised downwards. We now expect an inflation rate of 0.3% for 2019. The Swiss franc is still highly valued and the situation on the foreign exchange market remains fragile. In this environment, both the negative interest rate and the SNB's willingness to intervene in the foreign exchange market as necessary remain essential. These measures allow us to ensure price stability – and thus fulfil our mandate in the interests of the country as a whole.

Facilitating and securing the operation of cashless payment systems is part of the SNB's mandate. And for good reason: A smoothly functioning payment system is critically important to the performance of an economy. Payments connect buyers and sellers; borrowers and lenders. The ability to make payments securely and irrevocably is fundamental to sustaining confidence in the financial system.

Digitalisation and the proliferation of mobile internet services are changing the way we pay for things. New applications and technologies promise ever faster, easier and cheaper payment options via smartphone, tablet or smartwatch. The entire payments ecosystem is set to undergo profound change as a result.

My colleague Thomas Moser and I will take a more detailed look at how innovation is shaping developments in the payments arena. We will focus in particular on the challenges such innovation presents to central banks.

In the past, payment innovations have often been driven by the private sector. Facilitating – and especially securing – the operation of payment systems has long been a fundamental task of many central banks, however. It is thus essential that all the various stakeholders maintain a constructive dialogue. In this spirit, once we have finished our presentation, we will be hearing the views of a panel of experts representing fintech, banking, infrastructure provision and the SNB.

To run efficiently, an economy needs functioning payment systems

Payment systems play an important part in enabling economies to function smoothly. Allow me to illustrate this point with a brief anecdote taken from a book entitled 'Across Africa' by British explorer Verney Lovett Cameron. Cameron crossed equatorial Africa in 1875, and was the first European to do so. At one stage on his travels, he needed some boats. He managed to

find a boat owner, but the owner demanded to be paid in ivory, which Cameron did not have. However, word reached him that there was a person in the vicinity who sold ivory. There was just one hitch: this person would only accept cotton cloth as payment, which Cameron did not have either. Eventually, Cameron came across somebody who owned cotton cloth that he was happy to part with in exchange for wire. Mercifully, Cameron had brought some wire with him. So he gave this man the required quantity of wire, took the cotton cloth, used this to pay for the ivory, and – finally – bought the boats in exchange for said ivory.[1]

This story brings home just how high the transaction costs of an exchange can be. If Cameron had not needed the boats so urgently, the transaction would presumably never have come to pass. What was missing was a generally accepted means of exchange, i.e. money.

Cost efficiency as a driver of innovation

Let us conduct a brief thought experiment. Imagine for a moment that the boat owner had accepted gold as payment, and that Cameron had had some with him. The payment process would have been good deal easier and faster, which would have benefited both parties to the transaction. Having said that, the transaction would still not have been entirely free of costs and risks. After all, who would have been able to guarantee via-à-vis the boat owner that the gold was genuine and of the desired purity? In addition, gold is heavy and involves transport costs, and the risk of loss due to accident or theft (especially when travelling) is considerable.

The desire for cost efficiency and security has always been a major driver of innovation in the realm of payments. Way back in the 7th century BCE, the Lydian kings began issuing small, standardised gold coins and stamping them with royal emblems. By embossing the coins in this way, the kings could guarantee both the weight and purity of the gold coins they issued.[2] In my first slide – a highly simplified depiction of the history of money – this is the initial phase: the transition from privately owned gold to gold coins guaranteed by the state. This was a milestone in the evolution of trade and prosperity.

Later on, merchants invented payment instruments, including promissory notes and cheques; and, in the 17th century, the first privately issued banknotes emerged in Europe.[3] These innovations significantly reduced the transport costs involved in making payments and simultaneously improved security. On my slide, this is the second phase: the transition from coins with intrinsic value to promissory notes, cheques and privately issued banknotes.

[1] As reproduced in Rudolf Richter (1990), *Geldtheorie – Vorlesung auf der Grundlage der Allgemeinen Gleichgewichtstheorie und der Institutionenökonomik*, Berlin, pp. 120 et seq.

[2] Specifically: electrum, a naturally occurring alloy of gold and silver.

[3] The existence of paper money in China dates back to the 10th century. In Europe, the first banknotes were issued in 1661 in Stockholm. In Switzerland, the first banknote was put into circulation in Berne in 1826.

Central banks play a fundamental role in payment systems

Now, it is important to remember that neither the promissory notes nor the cheques – nor even the banknotes – of this era were actual money, but merely a claim on money. Such instruments could not be used to settle payment obligations with finality. There was always a risk that the borrower would not have enough precious metal to honour the payment obligation on the due date. The use of payment promises in trade thus entailed substantial credit and liquidity risk. These risks could undermine confidence in payment instruments, bringing trade to a standstill.

And this, ladies and gentlemen, is where central banks enter the equation. Central banks can reduce payment-related risks very effectively. By establishing security and confidence, they contribute decisively to the efficiency of the payment system.

Today, money changes hands mainly via transfers or direct debits, with payments being booked directly to the commercial banks' accounts at the central bank. Settling in electronic central bank money is equivalent to settling in cash; it is final and irrevocable. This approach reduces credit risk and inspires confidence – both in the payment system and in money itself. On the slide, this is the third phase: the transition from private promises to pay to central bank money – in other words, to today's banknotes and the electronic sight deposits that commercial banks hold with their central bank.

RTGS systems – a milestone in the evolution of cashless payments

Let us now turn to Switzerland. For many years, the postal cheque service of Swiss Post was at the heart of the cashless payment system. This area only began to become attractive for banks as well from the middle of the 20th century. Around this time, so-called 'bank clearing' – Switzerland's first interbank payment system – came into existence. This was an important step in the development of the cashless payment system. However, the predominantly manual nature of the system made it cumbersome. It could take up to four days to execute a payment, making efficient liquidity management virtually impossible for the participating banks.

Furthermore, in the 'bank clearing' system, payments were settled on a net basis. In other words, incoming and outgoing payments were offset against each other, with only the net difference being transferred between banks at the end of the settlement period. In order to facilitate banks' liquidity management, the SNB allowed them to temporarily overdraw their accounts before the end of the settlement period. This delayed settlement created credit risk for the SNB.

These shortcomings prompted banks to seek new solutions. In 1987, a new payment system known as 'Swiss Interbank Clearing' (or SIC, for short), entered service. In SIC, payments in Swiss francs are settled between banks in real time and on a gross basis. This type of arrangement is referred to as RTGS. Each payment is settled individually via the sight deposit accounts at the central bank, provided that sufficient funds are available on these accounts.

The advent of RTGS systems was a major milestone in the quest for efficient and secure cashless payments. It is no surprise, then, that RTGS systems have become the standard payment settlement mechanism in recent decades, with more than 100 central banks worldwide now operating them.[4]

The SIC system exhibits some specifically Swiss characteristics, not least the close partnership that exists between the banks and the SNB. SIC is owned by the Swiss banks but it is operated by SIX Interbank Clearing Ltd on behalf, and subject to the oversight, of the SNB.

Another unique feature of Switzerland's SIC system is that, unlike most RTGS systems, it is not used exclusively to process interbank payments,[5] but also to settle retail payments – the exchange of payments on behalf of households, corporations and public bodies – individually and on a gross basis. Experience with the SIC system has shown that the combination of interbank payments and retail payments is beneficial. First, economies of scale can bring down transaction costs significantly. Second, the fact that retail payments are also settled in central bank money increases security. Moreover, SIC participants can optimise their liquidity management and reduce technical interfaces, since they can use a single system for all of their Swiss franc payments.

The transition from net settlement with electronic money to the RTGS system is the last phase in the evolution of payment systems shown on the slide.

SIC has proved itself to be an adaptable, secure and cost-effective system. Since the 1980s, payment requirements and the demands placed on payment systems have risen relentlessly. For one thing, the volume of transactions has increased hugely, especially in the retail sector.[6] Equally, new payment instruments, such as e-banking, have emerged over the years.[7] More recently, the ISO 20022 standard was introduced as a basis for the national and international harmonisation of retail payments, and SIC's operating hours were extended to allow same-day settlement of retail payments.

New challenges in the digital age

Ladies and gentlemen, digitalisation is bringing a whole new set of changes to payment systems. What implications will these changes have for the entire payments ecosystem? And what further adjustments will the cashless payment system have to undergo if it is to remain efficient and secure in the future?

---

[4] Allsopp, Peter et al. (2009), The evolution of real-time gross settlement – access, liquidity and credit, and pricing, *The World Bank Financial Infrastructure Series – Payment Systems Policy and Research*, February 2009.

[5] Interbank payments comprise payments relating to FX operations or money and capital market transactions, but also large-value payments transacted by the non-bank sector.

[6] PostFinance's decision in 2016 to settle all of its domestic payments via SIC in future has also significantly increased the volume of retail payments in the SIC system.

[7] The recent SNB survey on payment methods shows that cash continues to play an important role in payments in Switzerland. However, a large proportion of payments by households is now conducted via credit card, and above all via debit card. Swiss National Bank (2018), *Survey on payment methods 2017 – Survey on payment behaviour and the use of cash in Switzerland*.

Before turning to these important questions, I should emphasise that I will not be talking about cryptocurrencies such as Bitcoin or Ether.[8] The question I will focus on today is: how is digitalisation changing payment systems?

One important finding is that the changes being wrought by digitalisation are affecting the entire payments ecosystem. Just as the cogs and wheels of a watch all mesh together, the changes unfolding in specific sectors are not occurring in isolation; they are interrelated, as the slide shows.

What is driving these fundamental changes? The initial impulse for transformation often comes from new technical possibilities such as smartphones and tablets, Big Data applications or artificial intelligence. These technologies are opening up new payment services for end clients (e.g. Twint) and new business models for companies. The mantra here is invariably faster, easier, cheaper. At the same time, technology is lowering barriers to entry for new players in the market for payment services, such as fintech companies. And finally, the payments infrastructure and regulatory framework play an important role, in terms of both securing the payment system and ensuring fair competition – which in turn should permit further innovation in the future.

These changes are presenting major challenges for all stakeholders in the payments ecosystem (cf. slide 3). I would like to discuss four of these in greater detail. First, the central role of the client interface; second, the disaggregation (or 'unbundling') of value chains; third, digital ledger technology (DLT); and fourth, cyber risks.

The first challenge concerns client contact and client data. For established providers of cashless payment services, such as the banks, the payment interface has long been an important client touchpoint. In the digital age, non-banks, such as large internet platforms and online retailers, can leverage payment data to target their clients with personalised products. As digitalisation progresses, the quantity and value of such client data are increasing.

Established providers of payment services are having to confront the fact that competition at the client interface and competition for client data is intensifying. In the digital age, the wide network of branches which traditionally gave banks' a competitive edge no longer provides that advantage. Developments in China show how quickly banks can lose their client interface to non-banks in the payments arena: Within a few short years, the online marketplace Alibaba and the news app WeChat have managed to capture more than 90% of the rapidly expanding mobile payments segment.[9]

The growing focus on the client interface and client data also represents a challenge for central banks. Gross misuse of data and a lack of reliability could seriously erode trust in payment systems – and ultimately in money itself. Even with the new technologies and

[8] I covered this topic at our Money Market Event a year ago. I stand by the point I made then – namely, that cryptocurrencies are more like speculative investment instruments than stable payment methods.

[9] Financial Stability Board (2019), *Fintech and market structure in financial services: Market developments and potential financial stability implications*, FSB White Paper, 14 February.

possibilities coming on stream, payment transactions must continue to function and be secure. For payment systems to remain future-proof, in-depth discussions between the main stakeholders in the Swiss financial centre are therefore essential.

The second challenge thrown up by digitalisation is the unbundling of the value chain. In the past, the value chain – from payment initiation, through authorisation and clearing to complaints processing – was largely concentrated in the hands of a single entity. Thanks to technical innovations, however, payment service providers are now unbundling and reconfiguring the value chain. For instance, they are taking the products of specialised providers – e.g. relating to FX transactions, payment guarantees or 'mobile wallets' – and combining them.

Established providers of payment services are having to adapt to this unbundling. They are having to cooperate with new players, invest in their value chains and simultaneously satisfy demand for ever faster and easier payment methods.

The central banks, too, face a challenge: they need to develop the core payment infrastructure in such a way that the unbundling of the value chain can be successfully navigated – without new risks being created.

As a result, we are seeing many central banks adapting their RTGS systems. For example, retail payments are increasingly being settled via RTGS systems (something which for a long time was unique to Switzerland), longer operating times are being introduced and settlement times are being shortened. These are major international trends, and we in Switzerland will have to think about how we wish to position ourselves.

There is also the question of how to integrate the new players – the fintechs – into the payments infrastructure. In the next slide, the payments ecosystem in our two-tier financial system is presented in a simplified form. On the first level, via the RTGS (blue field), the central bank enables financial institutions to settle payments using secure systems and electronic central bank money. On the second level (green field), the financial institutions enable retail payments.

When it comes to integrating new players, there are currently two models: first, indirect access via the banks. This 'open access' approach, shown on the left-hand side of the slide under 'Model 1' (client –> fintech –> bank), is the one adopted by the EU. The new Payment Services Directive (PSD2) requires EU banks to grant fintechs access to bank accounts. The second option involves granting fintechs direct access to core payment systems. This 'direct access' approach is shown on the right-hand side of the slide under 'Model 2' (fintech –> RTGS). Switzerland has chosen this approach.

As the SNB announced at the beginning of this year, it will grant fintech companies access to the SIC system and to SNB sight deposit accounts, provided they have a fintech licence and their business model makes them significant participants in the area of payment transactions. The advantage of the direct access model is that it also allows retail payments made using

payment solutions from new providers to be settled efficiently and securely in central bank money. This change creates a level playing field within the SIC system for existing and new providers – ensuring that the Swiss franc payment system remains efficient, secure and future-proof.

The third challenge concerns the possible application of DLT to payment transactions. Switzerland, in particular, has witnessed the establishment of a fintech ecosystem in recent years, and we are a leading fintech hub.

For central banks, DLT raises at least two fundamental questions. First, could it end up replacing current core infrastructure, such as RTGS? Various central banks have been experimenting with this idea, in close collaboration with private stakeholders. The results have yet to demonstrate that DLT is superior to a modern RTGS. Yet, in other areas of core infrastructure, such as securities settlement, it is entirely plausible that DLT-based systems could take hold.

The second question is: How should existing systems based on conventional technology and new DLT-based systems interoperate? Should central banks or private sector players establish this link? Specifically, in this context: should central banks offer a digital token for certain DLT applications – such as securities settlement? Here, too, while a number of experiments are underway, there are currently no examples of such tokens having become established. Furthermore, private sector providers can themselves put their money in DLT systems by 'tokenising' it (e.g. in the form of 'stable coins').[10]

As you can see, ladies and gentlemen, there are a lot of questions still to be answered, and they will require careful analysis. Innovation is important, but it must not come at the expense of stability or confidence in existing payment systems.

The fourth challenge relates to the downside of digitalisation: cyber risks. Cashless payments are a particularly attractive target for cyber attacks. A lot is at stake for central banks in this regard too, as a loss of confidence in the payment system could ultimately undermine confidence in money.

Tackling such risks may open up new business opportunities. Achieving significantly greater resilience to cyber risks could give Switzerland an important competitive edge in the future. In particular, it might be worth investing in a new, robust and secure data communications infrastructure. Promising solutions are currently being developed right here on our own doorstep. For example, a team from ETH Zurich has created SCION, a new internet architecture which enhances the security and reliability of internet communications considerably. This technology could form the basis of a secure Swiss finance network. For the

[10] While such tokens would be backed by an official currency like the Swiss franc, they represent a claim on a given private sector provider, not on the central bank.

Swiss payments ecosystem in particular, this would allow secure and flexible communication between participants.

To meet these four challenges and prepare for the digital future, the Swiss financial centre needs to engage in an open dialogue on strategic options. It is important that we reach consensus on what a robust, attractive and future-proof payment system in Switzerland should look like. Which digital challenges can the interested parties manage on their own? And where might shared solutions be beneficial for all concerned? Ultimately, we have a common goal: to maintain confidence in our currency. Against this backdrop, an efficient and secure payment system will be as critical as ever in the years ahead.

Conclusion

Ladies and gentlemen, the SNB has a mandate to facilitate and secure the operation of cashless payment systems. It fulfils this task by acting as commissioning party for the SIC system, and guiding the latter's ongoing development in conjunction with the banks. In so doing, it creates the conditions at the infrastructure level for efficient, secure and future-proof Swiss franc payments.

The SNB acts in the interests of all stakeholders in cashless payment systems in Swiss francs. To this end, we are engaged in active dialogue with both banks and non-banks. This evening, we have given you the perspective of the central bank, however it is important to hear other perspectives, too. So I am particularly looking forward to our panel discussion. The noted economist and author Jürg Müller will act as moderator.

After the discussion, our panellists, Thomas Moser and I will be happy to take questions from the audience. I hope we can all continue these conversations during the drinks reception.

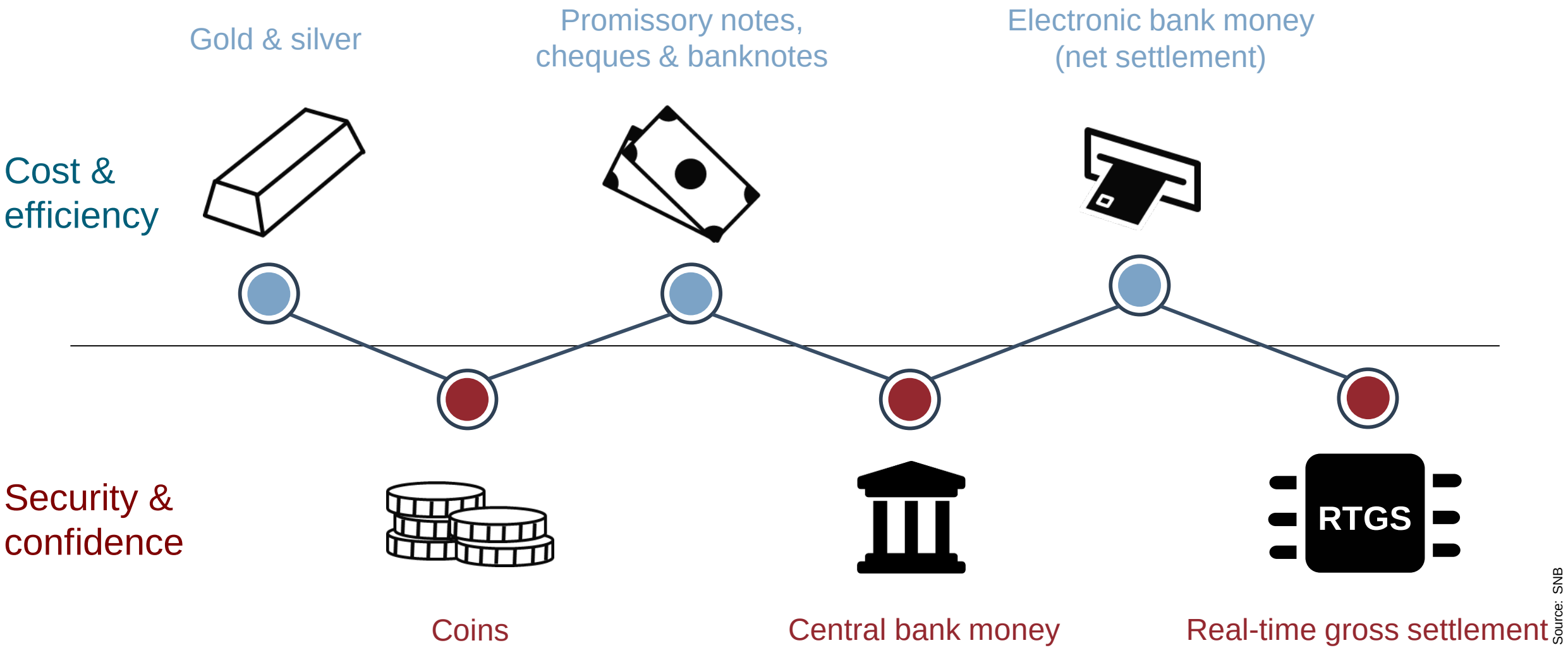
The evolution of payment systems in the digital age: a central bank perspective

Andréa M. Maechler, Member of the Governing Board
Thomas Moser, Alternate Member of the Governing Board

Zurich, 28 March 2019

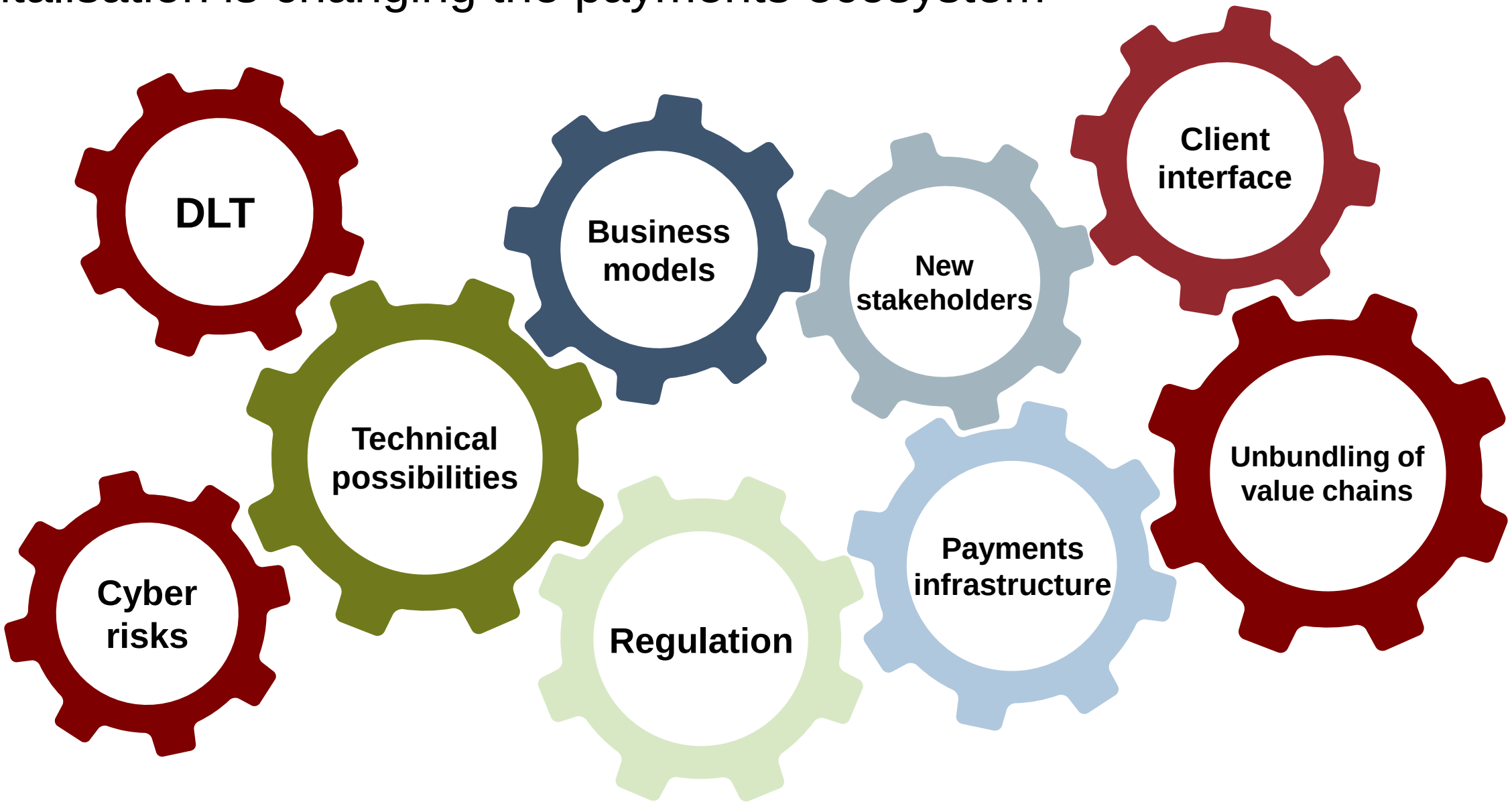
SCHWEIZERISCHE NATIONALBANK
BANQUE NATIONALE SUISSE
BANCA NAZIONALE SVIZZERA
BANCA NAZIUNALA SVIZRA
SWISS NATIONAL BANK

Innovations in payment systems: between efficiency and security



Source: SNB

Digitalisation is changing the payments ecosystem



Source: SNB

Four challenges of the digital age

Client interface

Focus on client contact and client data

Value chain

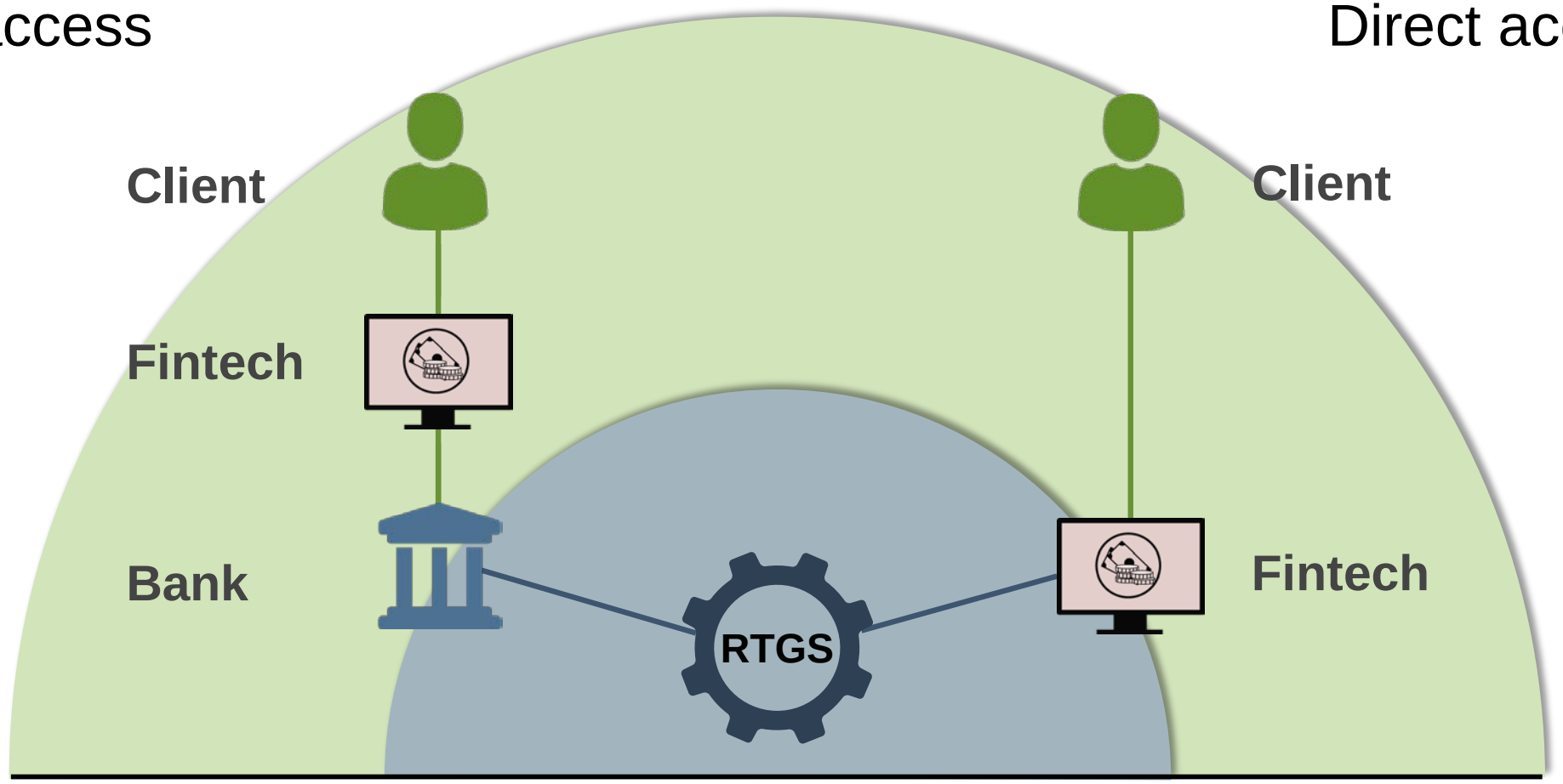
Development of core infrastructure

Source: SNB

Two models for integrating new stakeholders into the payments ecosystem

Model 1:
Open access

Model 2:
Direct access



Source: SNB

Four challenges of the digital age

Client interface

Focus on client contact and client data

Value chain

Development of core infrastructure

DLT

Interoperability with DLT

Cyber risks

Security of data communication

Source: SNB

Thank you for your attention

© Swiss National Bank

SCHWEIZERISCHE NATIONALBANK
BANQUE NATIONALE SUISSE
BANCA NAZIONALE SVIZZERA
BANCA NAZIUNALA SVIZRA
SWISS NATIONAL BANK