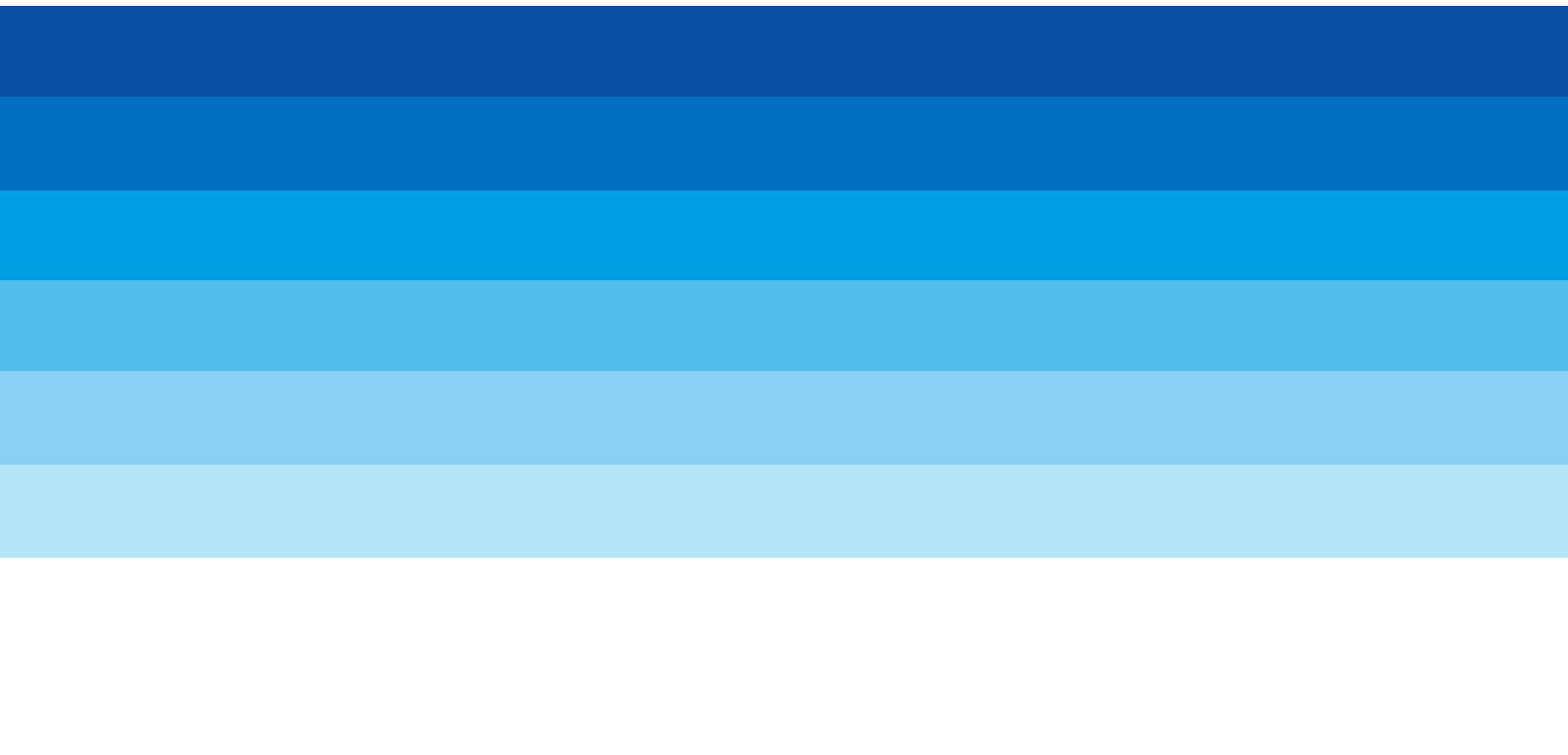


# Digital Economy Outlook

October 2015

Financial Inclusion Unit

- **Smart contracts: the ultimate automation of trust?** Smart contracts could become a transformational wave in banking
  - **Data for financial inclusion in the digital era:** How can technology help in extracting more data for financial inclusion goals?
  - **Trial and error to achieve universal financial inclusion?** Rigorous evaluation techniques are key to achieving financial inclusion goals
  - **Internet adoption:** At far higher speed than other durable technological goods
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## Summary

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### Smart contracts: the ultimate automation of trust?

**Smart contracts could become a transformational wave in banking.** A theoretical concept developed in 1994, the materialisation of contracts capable of enforcing themselves, is now facilitated by blockchain technologies. The ability of these smart contracts to alter the way in which many traditional processes are performed, in every industry, is potentially immense. However, standardisation and wider adoption of the blockchain is needed to turn this potential into reality.

### Data for financial inclusion in the digital era

**How can technology help in extracting more data for financial inclusion goals?** A definition of financial inclusion is far from straightforward, but a consensus is developing. However, knowing what happens inside and how to implement it is still more complicated. One of the problems business, researchers and policy makers face when talking about the topic is the lack of data. In the era of digital transformation this should not be a problem. But actually it still is.

### Trial and error to achieve universal financial inclusion?

**Rigorous evaluation techniques are key to achieving financial inclusion goals.** There is a big challenge for researchers and service providers to design and test financial services and programmes that help households to manage their finances efficiently. Although financial access is growing exponentially thanks to digital innovations, the use of financial services remains low. Understanding the behaviour of individuals through rigorous evaluation techniques is key to achieving financial inclusion goals.

### Internet adoption

**At far higher speed than other durable technological goods.** Internet adoption has taken place in most markets at a far higher speed than has been observed for other durable technological goods such as radio or television (Rangaswamy & Gupta, 1999).

### Payment services and financial inclusion

**A mutually beneficial relationship.** As the first financial services to be offered to the unbanked population, payments play a key role in enhancing financial inclusion. At the same time, financial inclusion, by increasing the number of cashless payments, positively affects the overall efficiency of a country's payment systems, due to economies of scale and network externalities. After an in-depth examination of the links between payments and financial inclusion, the Bank for International Settlements (BIS) and the World Bank Group have identified a set of critical enablers and catalytic pillars that are important for enabling access to, and usage of, payment services by the unbanked population.

# 1 Smart contracts: the ultimate automation of trust?

## Smart contracts could become a transformational wave in banking

A theoretical concept developed in 1994, the materialisation of contracts capable of enforcing themselves, is now facilitated by blockchain technologies. The ability of smart contracts to alter the way in which many traditional processes are performed is potentially immense. However, standardisation and wider adoption of the blockchain is needed to turn this potential into reality.

### What are smart contracts?

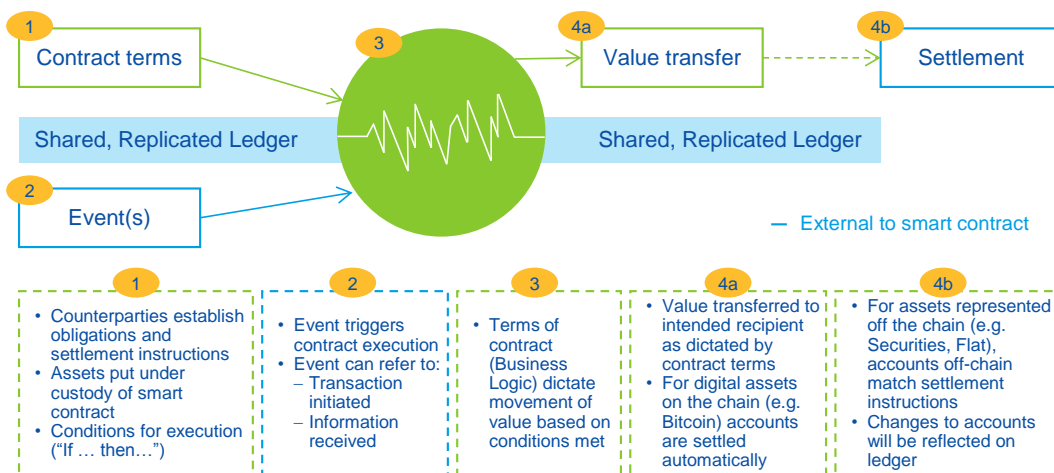
The term, *smart contract*, refers to any contract capable of automatically enforcing itself, without a third party between individual participants. Smart contracts are written as computer programs rather than in legal language on a printed document. The program can define strict rules and consequences in the same way that a traditional legal document would, but unlike a traditional contract it can also take information as an input, process it through the rules set out in the contract, and take any actions required of it as a result.

The concept was defined in 1994 by cryptographer Nick Szabo, but in practice remained unrealised because the technological infrastructure needed to support it did not yet exist. Nowadays, the advent of crypto protocols and the blockchain is changing that, and as a result the idea is seeing a revival.

In brief, smart contracts are modular, repeatable and autonomous scripts, usually running on a blockchain, which represent unilateral promises to provide a determinate computation. These scripts are stored in the blockchain at a particular address, which is determined when the contracts are deployed to the blockchain. When an event prescribed in the contract happens, a transaction is sent to that address and the distributed virtual machine executes the script's operation codes (or *clauses*), using the data sent with the transaction.

Smart contracts can be coded to reflect any kind of data-driven business logic: from actions as simple as voting for a post in a forum, to the more complex such as loan collateralisation and futures contracts, and to the highly complex such as repayment prioritisation on a structured note. A flow chart for applying business logic with smart contracts would be the following:

Figure 1.1  
Applying business logic with smart contracts



Source: BBVA Research

### Smart contracts: use cases in financial services

While there have been hundreds of proposed use cases for smart contracts, some of the most (directly or indirectly) relevant to financial institutions would include:

- **Loans** could be stored as smart contracts in the blockchain, together with the collateral ownership information. If the borrower misses a payment, the smart contract could automatically revoke the digital keys that grant his access to the collateral.
- **Inheritances** could be automated by setting the allocation of assets after death. It might be as simple as moving an adjustable slider that determines who gets how much. Once the smart contract can verify the triggering condition — in this case, death — the contract goes into effect and assets are divided up.
- **Escrow.** Smart contracts can easily be set up as escrow accounts that monitor an exchange between two parties. The buyer of some goods or services would transfer the payment to the contract account. The contract would monitor external services (i.e. GPS tracking) and, when ownership has been transferred from the seller to the buyer, the contract would automatically release the funds to the seller..
- **Cryptocurrency wallet controls.** Wallets controlled by contracts could include many different types of complex controls, from daily withdrawal limits to granting and revoking access for specific entities. A generalisation of this will lead to the notion of **programmable money**, a type of money which can be set up to be spent only on certain kinds of assets, in a geographical area, between two dates, etc.
- **Capital Markets.** Securities based on payments and rights that are executed according to predefined rules can be written as smart contracts. There are already experiments for the issuance of *smart bonds* and the management of private stock markets. Contracts that monitor the performance of digital or non-digital assets can also be used as futures, forwards, swaps and options.

### Smart contract issues

Implementation of smart contracts is far from easy, due to relevant issues related to their definition:

- **“Real world” enforcement.** Smart contracts are simply software and as such they can “enforce” or, better, administer the state of the data to which they have access on the blockchain. Yet, beyond that, they have little reach. For the foreseeable future, they will not be enforceable in any court and few parties will be able to rely on smart contracts alone to structure all of the terms of a commercial transaction.
- **Flexibility.** Smart contracts seem to assume that parties can determine all aspects of the negotiations at the onset of their transaction. But in the real world, contracts often end up being imprecise, because what happens after parties reach an agreement is often unpredictable. Smart contracts should have mechanisms to allow parties to amend their agreements when mutually desired.
- **Adoption.** The most significant benefits of smart contract adoption come when numerous commercial entities begin to automate their interactions, by using smart contracts and a blockchain that is purpose-built for multi-party interaction. Given that only a limited number of individuals currently have the technical proficiency to develop and deploy smart contract systems, this is a real challenge.
- **Liability.** Smart contracts could pose an important challenge for regulators because they allow the creation of decentralised automated versions of P2P services like Uber or Airbnb, connecting people and handling payments without the need for a company in the middle. Regulators would be left with nothing to target, because there is no legal entity behind it.

### Bottom line

The main purpose of smart contracts is to enable people to do business with strangers, usually over the internet, without the need for a trusted intermediary. The idea is that software can automate much of the process, allowing the enforcement of contractual promises without human involvement. The blockchain assures that everybody is seeing the same thing without one side having to trust the other side to be honest, because anything that is in the blockchain is unforgeable. This may sound like we won't need lawyers anymore. But smart contracts are an evolution of the legal system, not its replacement. The role of lawyers might shift from adjudicating individual contracts to producing smart contract templates on a competitive market. Contract selling points would be their quality, how customizable they are, and their ease of use. In the long term, we could see the surge of organized smart contract marketplaces that, in turn, would be fully managed through smart contracts, thus closing the circle.

## 2 Data for financial inclusion in the digital era

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### How can technology help in extracting more data for financial inclusion goals?

**A definition of financial inclusion is far from straightforward, but a consensus is developing. However, knowing what happens inside and how to implement it is still more complicated. One of the problems business, researchers and policy makers face when talking about the topic is the lack of data. In the era of digital transformation this should not be a problem. But actually it still is.**

#### Financial inclusion and the problem of lack of data

The most comprehensive definition of financial inclusion focuses on increasing people's participation in the financial system through increased usage of financial services through more financial channels, fewer structural barriers – such as cost, bureaucratic procedures, long distances and limited trust in the financial system - that inhibit financial intermediation; all without compromising on financial sustainability.

However, when trying to move from the conceptual framework to more practical issues, things become more difficult. Problems include: how to diagnose the current status of financial inclusion; how to access details of more vulnerable citizens; how to define appropriate policies, and how to evaluate policy if data are scarce or even unavailable? There are enormous data limitations at both global and country levels, and from both the demand and supply sides, in analysing financial inclusion, which seems strange in the current era of digital transformation.

#### Why is obtaining the necessary data still difficult in the digital era?

General speaking, data from the financial system for analysing issues on financial inclusion are scarce or incomplete. From the supply side, most of the publicly available financial data are those historically required from the financial authority which normally deals with macro and financial stability issues but not with financial inclusion perspective. There are also other reasons that make it difficult for traditional financial institutions to provide the information in a way to enable us to answer most of the questions that we might have regarding financial inclusion. One of the main inhibiting elements is the way in which databases have been assembled over time since they are frequently the consequence of mergers with and acquisitions of different financial institutions, with dissimilar data processing schemes, technological hardware and software, which have not been really completely integrated and synchronised. This “spaghetti architecture”, which has consequences for the efficiency of banking functionality, also has a correlation in how data is managed. As a consequence of the inflexibility of these databases, many banks are unable to make available data about how many banking accounts per customers they have, and provide instead only the gross number of banking accounts, knowing that an individual could well have several. The same problems arise with other important information, such as financial transaction channels and the usage of the accounts.

From the demand side, some countries have made interesting and determined efforts, by implementing detailed surveys in order to extract information at the individual level. These micro data have been very useful in answering specific questions related to financial inclusion. However, from a global perspective, there is a long way to go in getting access to adequate information. It is important to note the effort being made by some international institutions such as the World Bank, which has developed the Global Findex, the most comprehensive survey dealing with financial inclusion. The survey could be improved, of course, with more questions being asked and more people being interviewed, but these surveys tend to be very expensive and the currently available database is probably the best that can be obtained with limited funding.

Finally, there is the problem of the informal sector, those people who are mostly unbanked and whose financial status and information is unknown. The paradox here is that most of the financial inclusion regulations and policy designs are aimed at this particular group and yet it is difficult to have clear knowledge and an ex-ante diagnosis. The most interesting approach in dealing with this issue has been to implement specific surveys, such as in Mexico (ENIF survey) to know how the informal workers save and get access to financial services, which is normally through informal networking. But again, these are just isolated efforts within the global picture.

### But certainly the digital transformation will help

The current situation of data availability for analysing financial inclusion inhibits analysis and decision-making. There are key questions that could be answered if, for instance, we could count with data such as the use of informal financial services; networks and preferences in the informal finance, the proximity to financial infrastructure such as branches, ATMs, POS and banking correspondents; usage patterns of savings; cost of financial transactions; motivations for financial usage; financial literacy; and, quality measures such as detailed information of services currently available to the bottom of the pyramid.

However, the digital era should gradually help to overcome all these limitations. The speed at which historical data is being digitised - largely due to internet penetration, the extensive use of mobile devices and GIS technologies - and how this information is processed thanks to Big Data analysis will provide information about how banked and unbanked people actually organise and make use of their finances.

There are interesting cases developing of non-banking digital firms which are offering services to unbanked individuals, by making use of digital platforms, and which already getting information about how their customers save, how they get loans and, more interestingly, about their credit risk. This innovation is already pushing traditional banks to get involved in digital transformation. Although some big banks have been successfully applying this process, it is clearly a path that others will be forced to follow. As a consequence, collection of the data for financial inclusion could become easier, and then made more freely available for complex analysis.



### 3 Trial and error to achieve universal financial inclusion?

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#### Rigorous evaluation techniques are key to achieving financial inclusion goals

**There is a big challenge for researchers and service providers to design and test financial services and programmes that help households to manage their finances efficiently. Although financial access is growing exponentially thanks to digital innovations, the use of financial services remains low. Understanding the behaviour of individuals through rigorous evaluation techniques is key to achieving financial inclusion goals.**

#### Innovation for scaling inclusive digital finance

Two billion adults around the world are unbanked. Without access to safe and affordable financial services that meet their daily needs, many low-income households have difficulty managing their money. Across developing and advanced economies alike, low-income households need effective and affordable tools to save and borrow money, make and receive payments, and manage risk. In recent years, access to financial services has increased thanks to the expansion of digital finance and the efforts of service providers and governments to reach the unbanked. However, although innovations in digital finance have increased access to financial services, take-up remains lower than expected. More work is needed to design and test digital product innovations to encourage use and promote healthy financial behaviour.

This process involves identifying problems that can be approached through researching and working to diagnose the underlying causes. The results of evaluations are used to refine the policy and ask new questions. However, evaluation is often complicated and conditioned by the data and methodology. To ensure whether the tools available to low-income people are effective in helping them manage and grow their money is not straightforward. It is important to seek out the small changes that emerge from the data rather than looking at the aggregate impact on income that may appear lagged.

#### The role of randomized control trials

The practice of taking methods from medicine and applying them to the social sciences has caused a revolution in development economics. Randomized controlled trials (RCTs) give policymakers and service providers better information to use in their decision-making. RCTs are considered the gold standard of impact evaluation design, because of the rigorous methodology behind them that allows researchers to isolate the effects of a programme from other factors. As in medical trials, researchers assign participants at random to different study groups. One group receives an intervention (treatment group) and another group serves as the comparison (control group).

Measuring the effectiveness of programmes and policies involves conducting rigorous evaluations of the programmes and testing new ideas. In addition, replication processes are an essential step on the path to scaling up effective programmes. Once an intervention has proved to be effective in one context, it is necessary to test whether it works in different contexts.

There is an increasing number of researchers and practitioners using RCTs to address outstanding questions on how to design and scale innovations to bring affordable and effective financial services within the reach of previously unbanked and under-served clients.

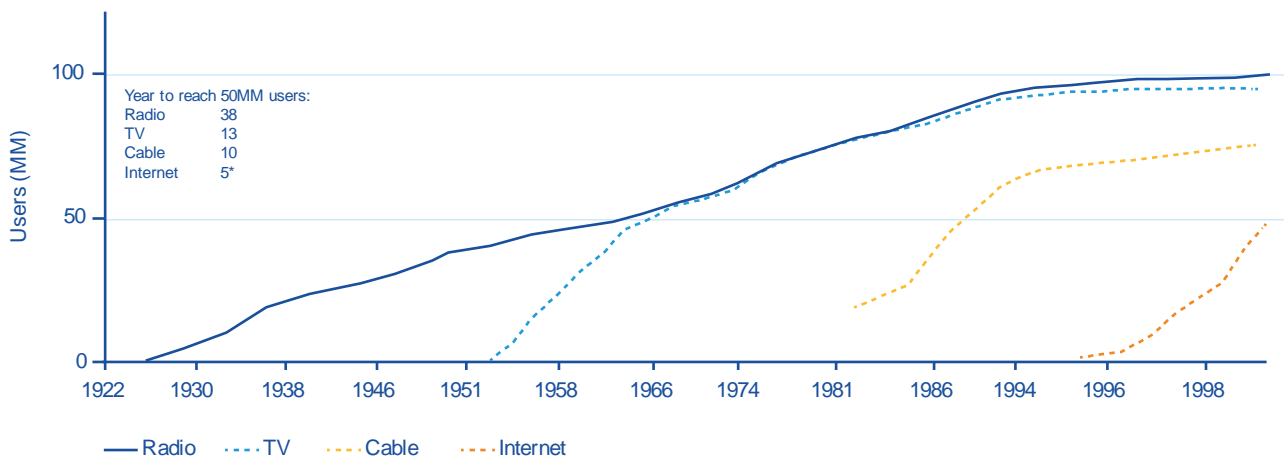
At institutional level, Innovation for Poverty Action's (IPA) is a good example. They rely on RCTs to identify effective solutions to promote healthy financial behavior and share the results, to inform the work of financial service providers and governments around the world.

## 4 Internet adoption

### At far higher speed than other durable technological goods

Internet adoption has taken place in most markets at a far higher speed than has been observed for other durable technological goods such as radio or television (Rangaswamy & Gupta, 1999)<sup>1</sup>.

Figure 4.1  
Evolution of the number of users of different technologies



Source: Morgan Stanley Dean Witter Technology Research

The explanation for this behaviour lies with a combined set of factors that have exerted a positive influence. On the one hand, the typical characteristics of digital products help them to spread quickly. On the other hand, the sort of individuals involved and the general framework of the market in question are additional factors that are likely to account for these dynamics.

With respect to product characteristics, the internet is the platform required to consume many other digital products. Moreover, it serves both social and leisure activities and also as a work tool. At the same time, using the internet and the array of different digital products and services that are marketed through it enables such products to be acquired more cheaply than buying via traditional channels, given the low cost of marketing them. It also allows the features of goods and services to be compared rapidly and easily. Digital products are straightforward to imitate and propagating them is almost instant. This means that, for the product to enjoy success, it must be spread as fast as possible because the competition can remove its novelty value in the blink of an eye. Such a lively market and the stiff competition observed in it are conducive to the life cycle of products like these becoming shorter and shorter, which serves to incentivise the whole process of innovation and hasten their adoption (Scott Morton, 2006)<sup>2</sup>.

As regards the sort of individual involved, as Rogers (1983) says, innovative people, who are the first to adopt a new technology, correlate very closely with their educational level and social status<sup>3</sup>. There are several reasons that are likely to explain this correlation. On the one hand, innovators notice the gain to be had from an innovation before imitators do, but on the other they have to bear the risk of the innovation not being as successful as they had bargained for. Therefore, it is those with more means (i.e. those with a

1: Rangaswamy, A. & Gupta S. (1999), "Innovation Adoption and Diffusion in the Digital Environment: Some Research Opportunities" eBusiness Research Center Working paper 02-1999. School of Information Sciences and Penn State Smeal.  
2: Scott Morton, F., (2006), "Consumer Benefit from Use of the Internet", in: A. B. Jaffe, J. Lerner & S. Stern (eds.), *Innovation Policy and the Economy*, Volume 6, NBER, MIT Press.  
3: Rogers, E. M., (1983), *Diffusion of Innovations*. The Free Press, a Division of Macmillan Publishing Co., pp 241-259, New York.

higher educational level) who can more easily afford to risk adopting a new technology. Finally, the nature of new technologies is such that more technical ability is required to use them, which is easier to find among the more highly educated. To conclude, both age and educational level are defining elements of the ability of both individuals and a country generally to innovate. The improvement in the overall global level of education should therefore partly account for internet's faster adoption.

Looking at the market aspects, innovation depends on a variety of factors, including: i) whether the decision to adopt is collective, taken by individuals or by a central authority; ii) the communication channels used to acquire information about an innovation, whether this means the mass media or interpersonal contact; iii) the nature of the social system in which potential adopters move, its norms and degree of interconnection, and iv) the extent of change agents' promotional efforts (advertisers, development agencies, etc.). The huge amount of freedom offered by internet usage and the fact that there are hardly any or no barriers at all to entry are also likely reasons for such swift adoption when it comes to the internet and other technologies of a digital nature.

## 5 Payment services and financial inclusion

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### A mutually beneficial relationship

**As the first financial services to be offered to the unbanked population, payments play a key role in enhancing financial inclusion. At the same time, financial inclusion, by increasing the number of cashless payments, positively affects the overall efficiency of a country's payment systems, due to economies of scale and network externalities. After an in-depth examination of the links between payments and financial inclusion, the Bank for International Settlements (BIS) and the World Bank Group have identified a set of critical enablers and catalytic pillars that are important for enabling access to, and usage of, payment services by the unbanked population.**

### The virtuous circle

Payment services (i.e. transaction accounts and payment instruments) are a critical part of the financial system. They are not only the most frequently used services - conditioning customer experience and engagement - but also the gateway for providing other financial products such as credit, savings and insurance. From a financial inclusion perspective, payments are the primary daily need of unbanked individuals, that can be satisfied by formal financial service providers. Therefore, efforts to offer efficient, safe, widely accessible and customer-friendly payment services play a key role in promoting financial inclusion. At the same time, increasing the number of transaction accounts and payments carried out by a country's payment systems positively affects the overall efficiency of these systems, due to economies of scale and network externalities. There is thus a virtuous circle between improving payment systems and enhancing financial inclusion.

However, as financial inclusion is the situation in which all working-age adults have effective access to the set of financial services that meet their needs, using a transaction account and their associated payment instruments is in most cases just an initial step in becoming fully financially included. Hence, there is a relevant distinction, from a financial inclusion perspective, between transaction accounts provided by deposit-taking institutions, giving access to a broader range of financial services (savings, credit, insurance, etc.), and those provided by other Payment Service Providers (PSPs), such as e-money accounts, with more limited functionalities. Still, these basic transaction accounts help individuals in getting used to formal financial services and represent a first step towards financial inclusion.

The links between payments and financial inclusion have recently been examined in depth in a consultative report – open for comments until 7 December – jointly prepared by the Committee on Payments and Market Infrastructures (CPMI) of the Bank for International Settlements (BIS) and the World Bank Group<sup>4</sup>. The report identifies three foundations (critical enablers) and four catalytic pillars that are important for enabling access to, and usage of, payment services by the financially excluded. These seven elements – and the corresponding guiding principles raised in the report – are the following:

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4: The consultative report is available at: <http://www.bis.org/cpmi/publ/d133.pdf>

## Critical enablers

1. **Commitment** from both the public and the private sectors to broaden financial inclusion is explicit, strong and sustained over time. National strategies should include measurable milestones.
2. The **regulatory framework** underpins financial inclusion by effectively addressing all relevant risks and by protecting consumers, while at the same time fostering innovation and competition.
3. **Financial and ICT infrastructures** are robust, safe, efficient and widely accessible, being effective for the provision of transaction accounts services and broader financial services.

## Catalytic pillars

1. The payment service offerings effectively meet a broad range of **transaction needs** of the unbanked segment.
2. The usefulness of transaction accounts is augmented by a broad network of **access points** that also achieves wide geographical coverage, and by offering a variety of interoperable access channels.
3. Individuals gain knowledge, through **financial literacy initiatives**, of the benefits of adopting transaction accounts, how to use those accounts effectively, and how to access other financial services.
4. Large-volume and **recurrent payment streams**, such as government benefits, employer payrolls or remittances, are leveraged to advance financial inclusion objectives.

## Digital news



### EC launches consultations as part of the Digital Single Market Strategy

The European Commission has launched a public debate with four consultations, open until late December 2015, dealing with different issues as part of the **DSM strategy**: i) **geo-blocking**, ii) **platforms, online intermediaries, data, cloud computing and the collaborative economy**, (iii) **standards for the DSM**, and iv) **modernising VAT for cross-border e-commerce**.



### EU Court of Justice declared Commission's US Safe Harbour decision invalid

The European Court of Justice (ECJ) has recently ruled that the transatlantic Safe Harbour agreement, which facilitated the transfer of personal data from the EU to the US, is invalid. According to the **ECJ's judgment**, national supervisory authorities may, even where the Commission has adopted a decision finding that a third country affords an adequate level of protection of personal data, examine whether the transfer of a person's data to the third country complies with the requirements of EU legislation on the protection of that data



### US: progress on Virtual Currency Regulation



The **Conference of State Bank Supervisors (CSBS)** has published a Model Regulatory Framework for Virtual Currency Activities in order to license and supervise agents operating in the virtual currency ecosystem. On the other hand, the **Commodity Futures Trading Commission (CFTC)** has declared Bitcoin and other virtual currencies to be commodities covered by the Commodity Exchange Act.



### EC on the Green Paper on Retail Financial Services and Insurance

The European Commission has released the **roadmap** for the forthcoming Green Paper on Retail Financial Services and Insurance. The European Commission aims to overcome the existing EU market fragmentation for retail financial services. The forthcoming "Green Paper" will gather information from all relevant stakeholders and propose regulatory or market-led measures to address the identified barriers to cross-border activity.



### Weighing-up of Requirements for a US Faster Payment System

The Faster Payments Task Force is soliciting broad stakeholder input on the current draft of the **Faster Payments Effectiveness Criteria** with a survey available until October 2016. The effectiveness criteria are a framework to assess alternative solutions for faster payments. It will also have value as a description of stakeholder needs that the market can use to guide faster payments innovation. The effectiveness criteria are grouped into a set of six categories: Ubiquity, Efficiency, Safety and Security, Speed (Fast), Legal and Governance.

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