Benchmarking Talent for a Sustainable Future

Enhanced Competency Framework on Fintech (ECF-Fintech)

Module 11 – Regtech

Chapter 7: Smart Banking, Smart Regtech

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Adjunct Professor

HKUST Business School

Module Overview

- **Objectives**
  - The module aims to make learners understand the global Regtech trends and applications in virtual identity and digital authentication management, data and cyber security, financial crime investigation, IT audit and regulatory compliance.
- **Credit: 30 (300 Learning Hours)**
  - Training Hours: 21 Hours
  - Exam Hours: 3 Hours
  - Self-study Hours: 276 Hours

Module Intended Learning Outcomes

- Develop robust knowledge of Regtech best practices, Regtech solutions and its effective applications
- Apply business knowledge to identify, manage, and maintain the best practices on risk management and regulatory compliance.
- Develop a deep understanding of the development processes of Regtech solutions (i.e. development, validation, implementation and governance).
- Demonstrate proficiency in Regtech related technology concepts and principles to be able to select the appropriate technology solution provider and apply technology knowledge for business integration, risk management and regulatory compliance.

Module Outline

- Chapter 1: Legislative Framework and Regulatory Technology (Regtech) Overview
- Chapter 2: Data, Financial Intelligence, and Customer Protection
- Chapter 3: Disruptive Changes in Banking, Finance and Regulations
- Chapter 4: Regtech Case Analysis I
- Chapter 5: Regtech Case Analysis II
- Chapter 6: Banking Strategy: Crossroad Regtech 1.0 or Regtech 2.0
- **Chapter 7: Smart Banking, Smart Regtech**

Smart Banking, Smart Regtech

Chapter 7

Chapter Intended Learning Outcome

- Upon completion of this chapter, learner will be able to:
  - Understand Regtech 2.0 and FPS (Faster Payment System)
  - Initiate and manage Regtech 2.0 projects to meet the glocal evolving Fintech landscape

Chapter Outline

7.1 Faster Payment System (FPS) and Regtech 2.0

7.2 Case Analysis – Lending Club

7.3 CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

7.4 Smart Contracts

7.5 Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

7.6 Standards-based technology Architecture for Regtech

7.7 Future Banking and Regtech Strategy

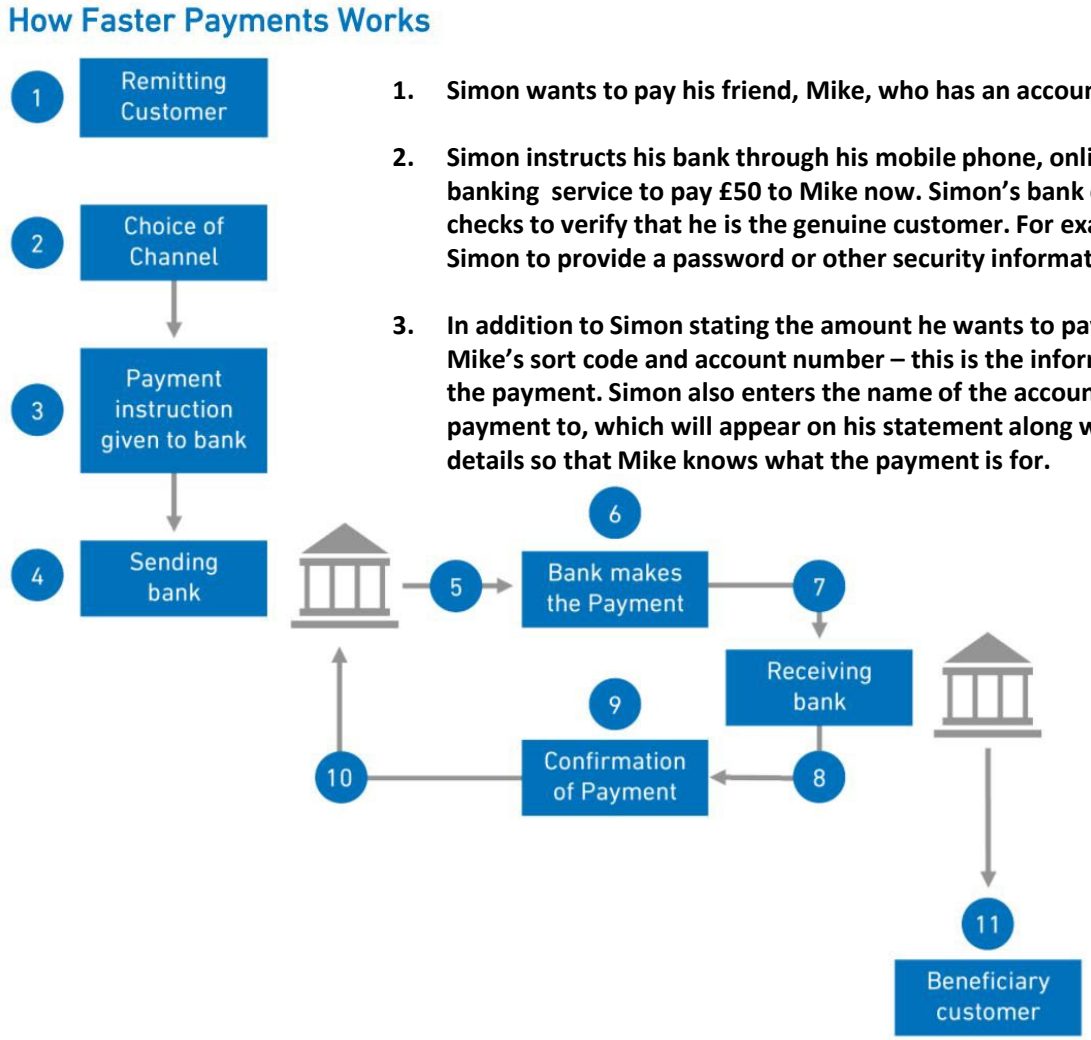
7.1 Faster Payment System (FPS) & Regtech 2.0

7.1 Faster Payment System (FPS) & Regtech 2.0

- **FPS (UK)**
  1. UK bank initiative launched in 2008.
  2. The founding UK banks became the initial shareholder of the Faster Payments Scheme Limited in 2011.
  3. It enables mobile, Internet, telephone and standing order payments to move quickly and securely.
  4. Virtually, all Internet and telephone banking payments in the UK are now proceed via Faster Payments.
  5. Seventeen banks and building societies are Participants of the scheme, and over 400 other financial institutions are able to offer the service, making Faster Payments available to more than 52 million current account holders in the UK.
  6. Transfer limit up to £250,000.

7.1 Faster Payment System (FPS) & Regtech 2.0

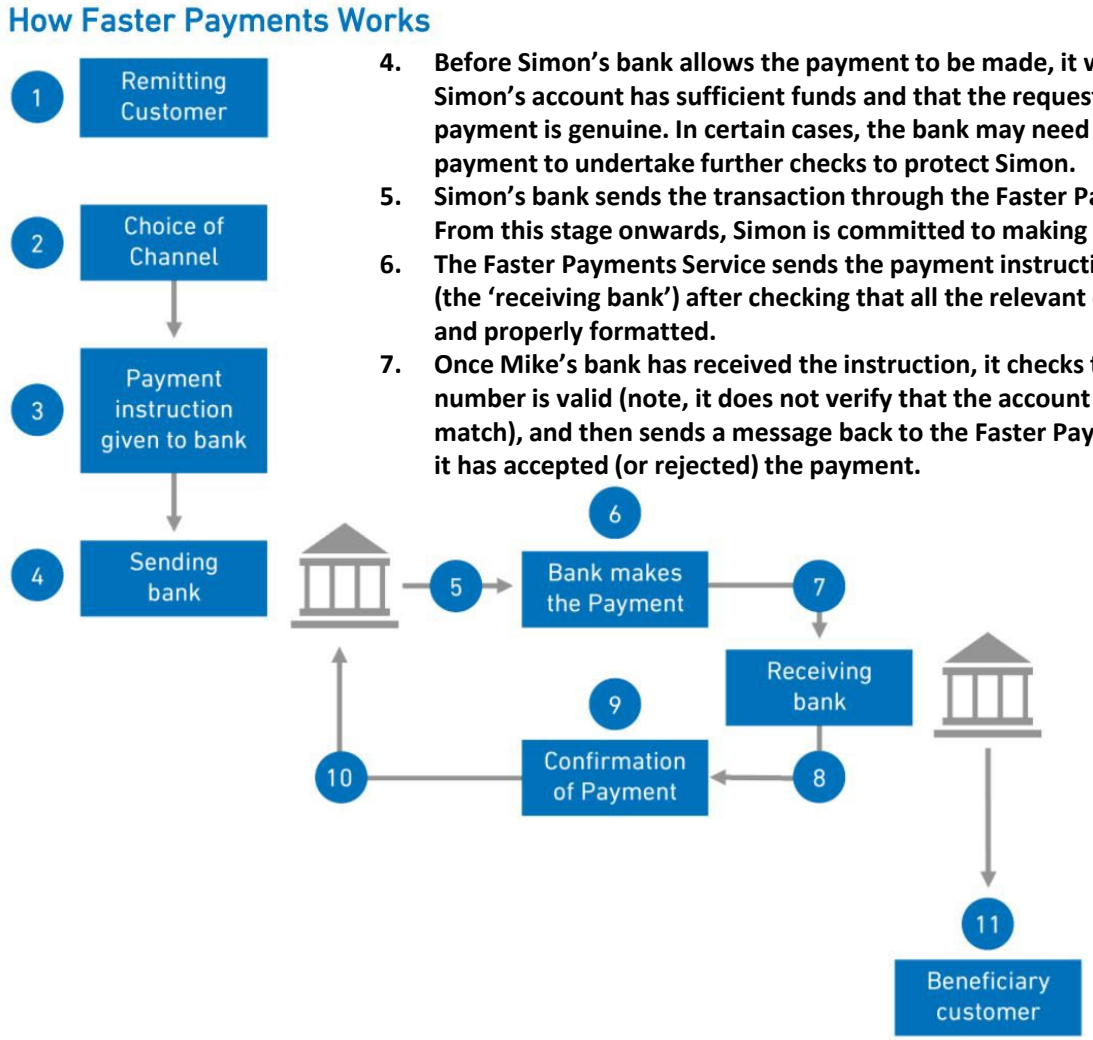
- **FPS (UK)**



1. **Simon wants to pay his friend, Mike, who has an account with different bank.**
2. **Simon instructs his bank through his mobile phone, online or telephone banking service to pay £50 to Mike now. Simon's bank carries out its normal checks to verify that he is the genuine customer. For example, they may ask Simon to provide a password or other security information.**
3. **In addition to Simon stating the amount he wants to pay, he also provides Mike's sort code and account number – this is the information used to address the payment. Simon also enters the name of the account he wants to send the payment to, which will appear on his statement along with any reference details so that Mike knows what the payment is for.**

7.1 Faster Payment System (FPS) & Regtech 2.0

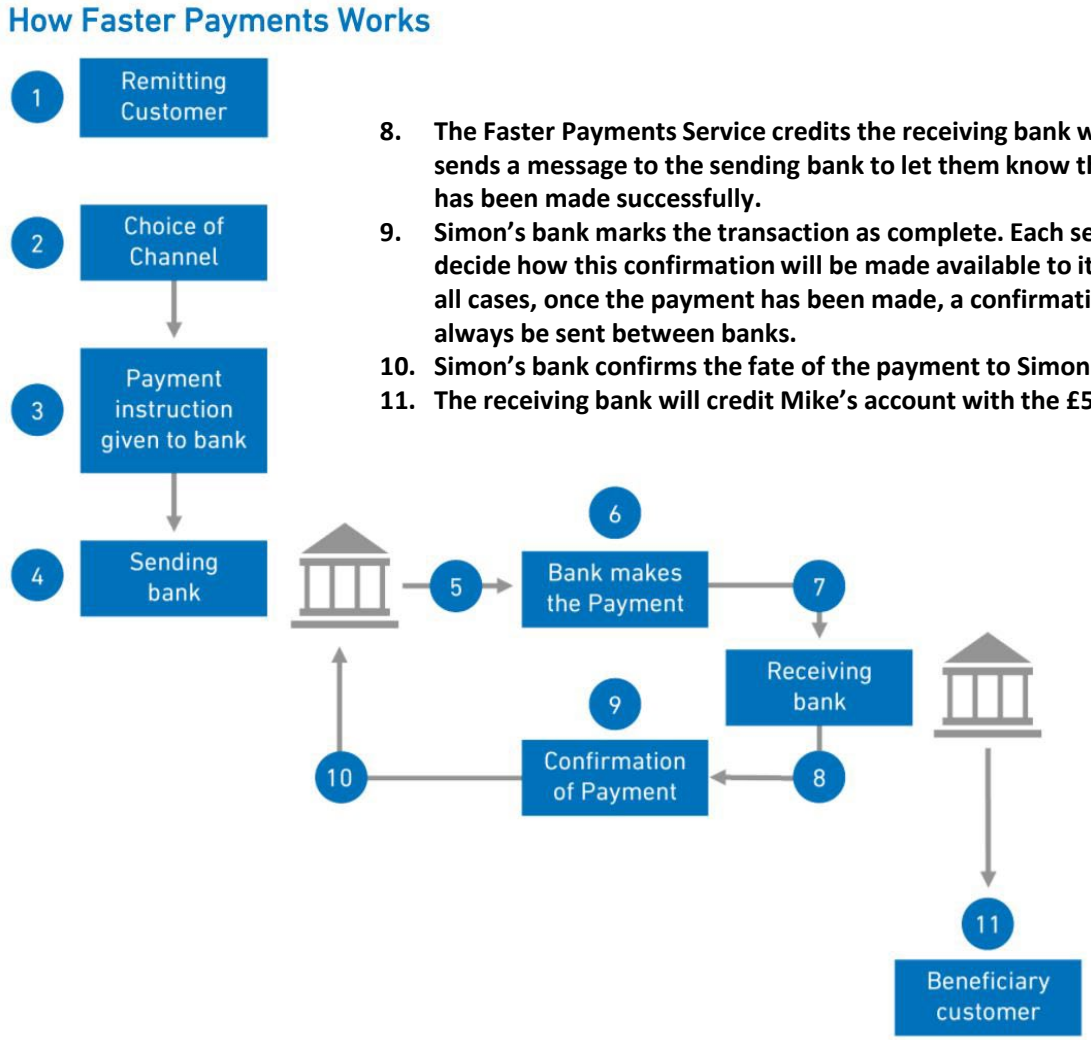
- **FPS (UK)**



4. **Before Simon's bank allows the payment to be made, it will check that Simon's account has sufficient funds and that the request to make a payment is genuine. In certain cases, the bank may need to hold the payment to undertake further checks to protect Simon.**
5. **Simon's bank sends the transaction through the Faster Payments Service. From this stage onwards, Simon is committed to making the payment.**
6. **The Faster Payments Service sends the payment instruction to Mike's bank (the 'receiving bank') after checking that all the relevant details are included and properly formatted.**
7. **Once Mike's bank has received the instruction, it checks that the account number is valid (note, it does not verify that the account name and number match), and then sends a message back to the Faster Payments Service that it has accepted (or rejected) the payment.**

7.1 Faster Payment System (FPS) & Regtech 2.0

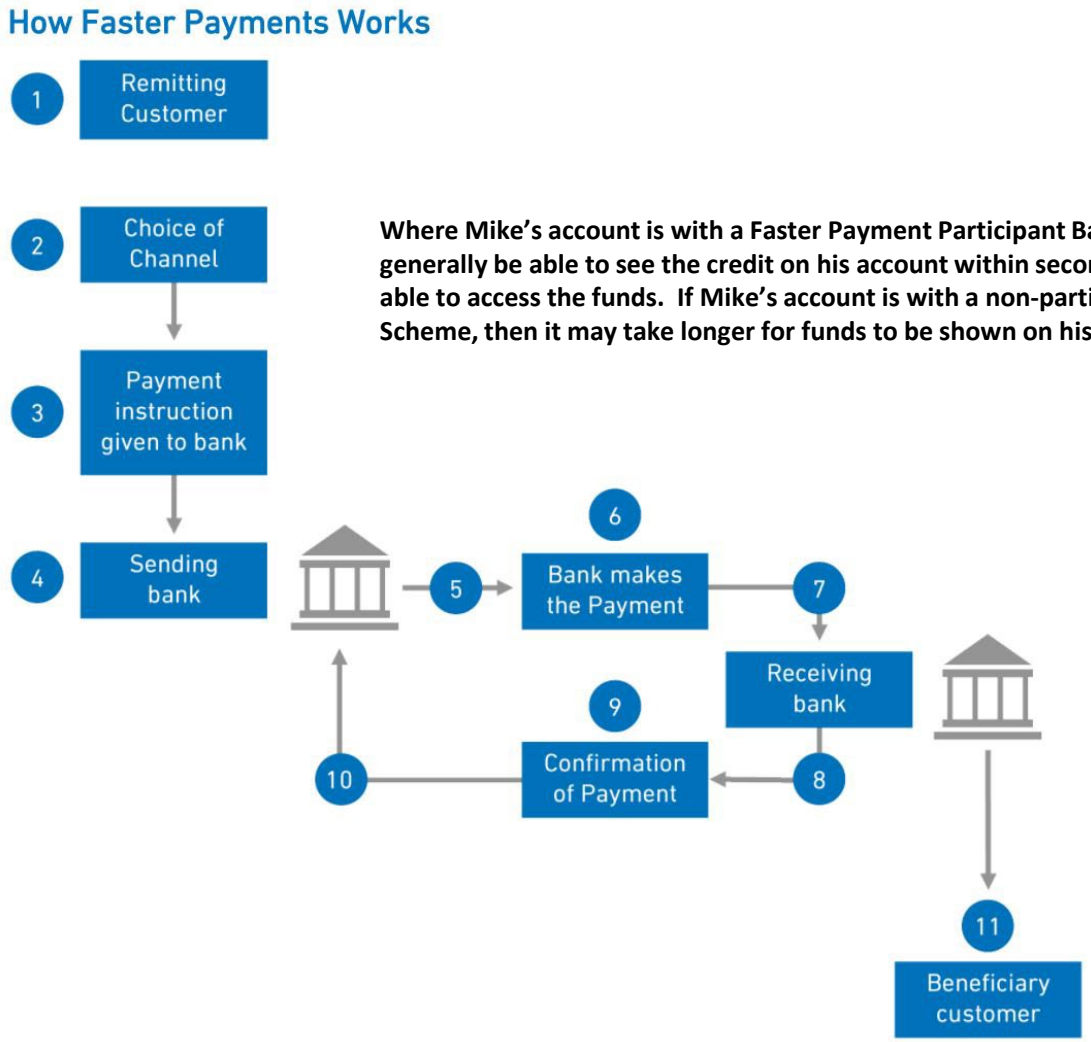
- **FPS (UK)**



8. **The Faster Payments Service credits the receiving bank with the funds and sends a message to the sending bank to let them know that the transaction has been made successfully.**
9. **Simon's bank marks the transaction as complete. Each sending bank will decide how this confirmation will be made available to its own customer. In all cases, once the payment has been made, a confirmation message will always be sent between banks.**
10. **Simon's bank confirms the fate of the payment to Simon.**
11. **The receiving bank will credit Mike's account with the £50 sent by Simon**

7.1 Faster Payment System (FPS) & Regtech 2.0

- **FPS (UK)**



Where Mike's account is with a Faster Payment Participant Bank, he should generally be able to see the credit on his account within seconds and also be able to access the funds. If Mike's account is with a non-participant of the Scheme, then it may take longer for funds to be shown on his account.

7.1 Faster Payment System (FPS) & Regtech 2.0

- **FPS (UK)**
  - UK Financial Market Infrastructure ('FMI'):-
    1. An FMI should allow for fair and open access to its services, including by direct and indirect participants and other FMIs.
    2. An FMI's participation requirements should be justified in terms of the safety and efficiency of the FMI and commensurate with the FMI's specific risk. Subject to maintaining acceptable risk control standards, an FMI should endeavour to set requirements that have the least-restrictive impact on access.
    3. An FMI should monitor compliance with its participation requirements.

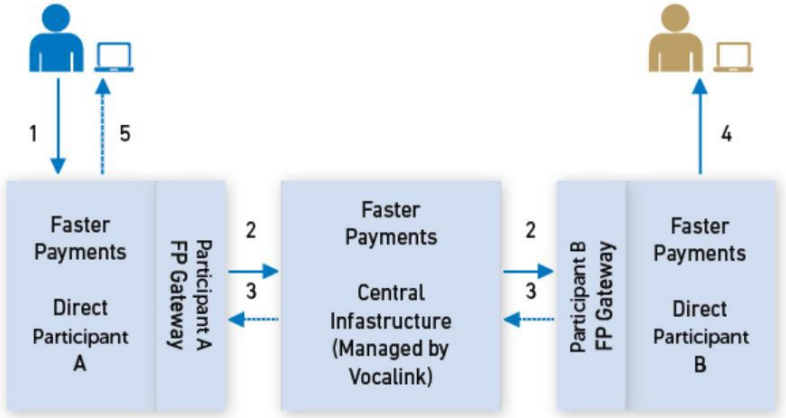
7.1 Faster Payment System (FPS) & Regtech 2.0

- **FPS (UK)**
  - Why?
  - In UK, Financial Market Infrastructure ('FMI'), the Scheme adheres to CPMI IOSCO Principles, with regard to Access (Principle 18)

➔ **Opening the e-Payment infrastructure to new players**

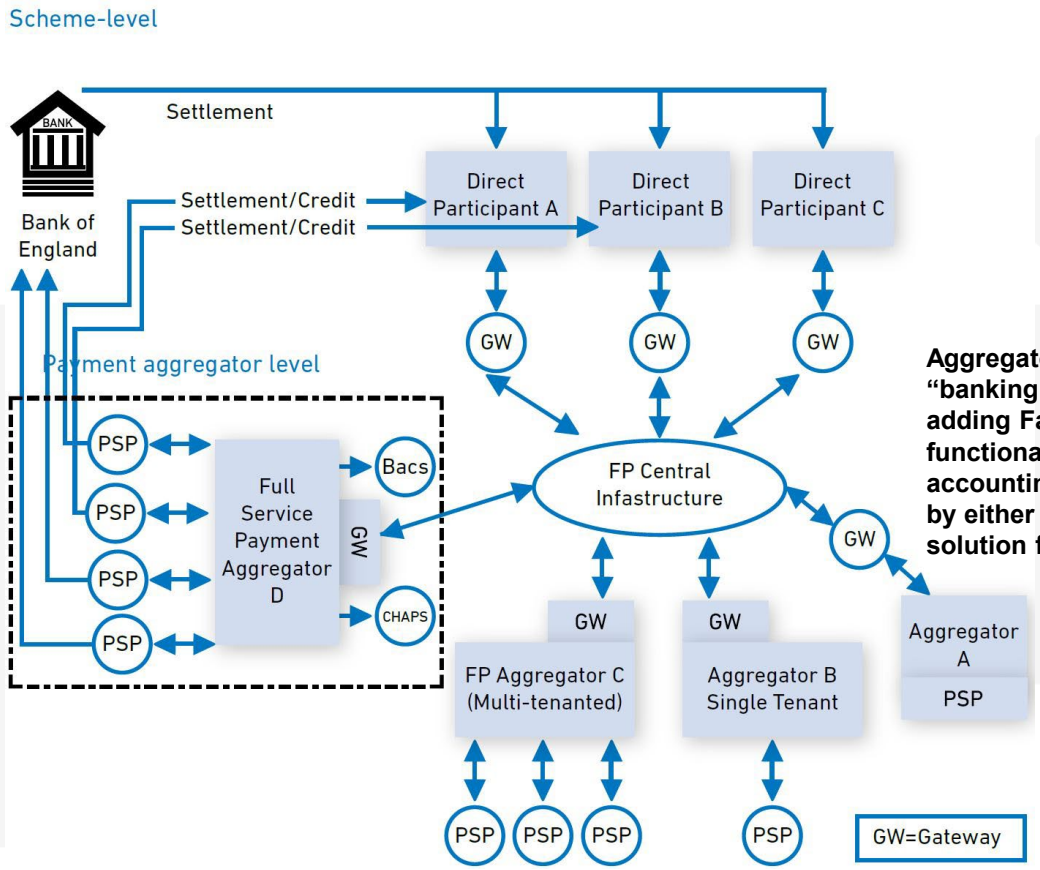
7.1 Faster Payment System (FPS) & Regtech 2.0

- **Direct Participant Payment Flow Schematic**
  - The payment routing of a typical Faster Payment that has been originated by Participant Bank A's customer to Participant Bank B's beneficiary.



1. Customer of **Direct Participant A** initiates a Faster Payment Instruction to credit Customer of **Direct Participant B**
2. **Direct Participant A** sends Faster Payment Message to credit customer of **Direct Participant B**
3. **Direct Participant B** responds in Real-Time either acknowledging or rejecting payment request from **Direct Participant A**
4. If acknowledged, **Direct Participant B** credits its customers account accordingly (normally real-time or up to 2 hours subjects to relevant fraud checks etc..)
5. **Direct Participant A** advises payment fate to its customer (whether its been acknowledged or rejected by **Direct Participant B**)

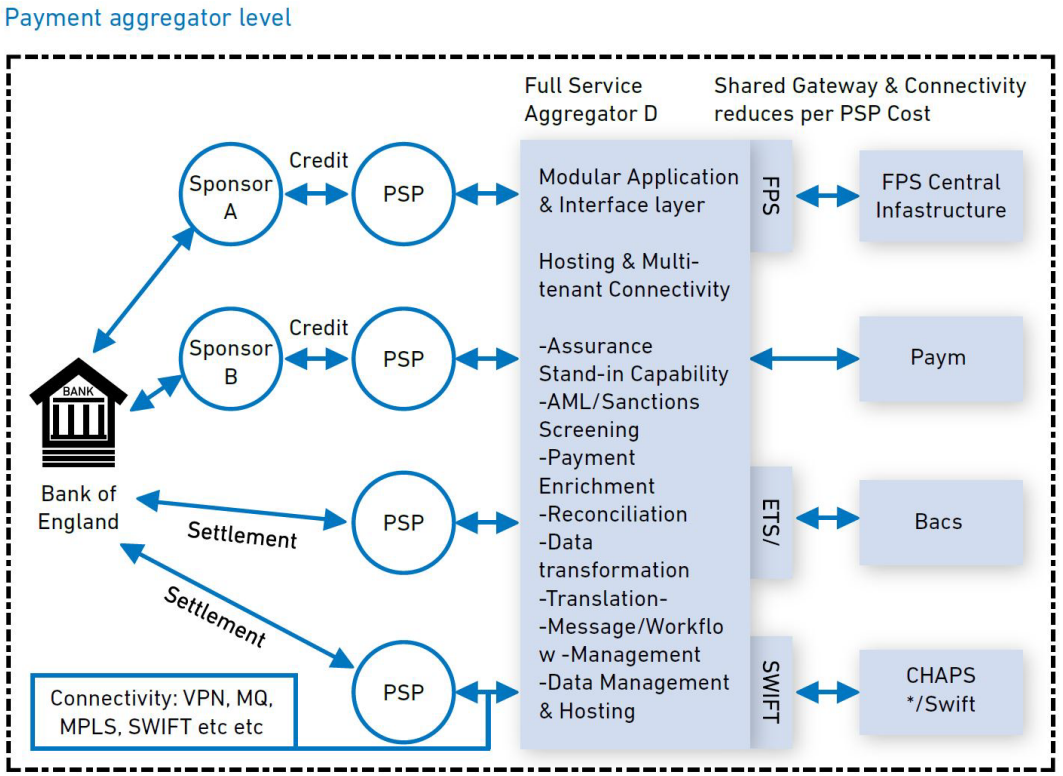
7.1 Faster Payment System (FPS) & Regtech 2.0



Aggregator A represents a "banking platform provider" adding Faster Payment functionality to their existing accounting platform technology, by either building or licensing a solution from another vendor.

Aggregator B is a single tenant solution, where a vendor is providing a managed solution for a single provider. The Scheme recognises that some Participants may want their own instance of such a solution.

7.1 Faster Payment System (FPS) & Regtech 2.0



This schematic shows Aggregator D from the previous diagram in more detail. The methods of connectivity (both into and out from the Aggregator) are in the competitive space; but must be able to conform with the Scheme's requirements regarding availability and speed of messaging.

Within the Aggregator, we would expect to see modular applications, allowing PSPs to pick and choose from a menu of options that best meet their needs.

7.1 Faster Payment System (FPS) & Regtech 2.0

Direct Participant offering sponsorship services

Direct Participant	Indirect Agency Sponsorship?	Direct Agency Sponsorship?	Further Information
BARCLAYS	Yes	Yes	www.barclayscorporate.com/products-and-solutions/cash-management/indirect-access.html
citi	TBC	TBC	melanie.martin@citi.com
Clear.Bank	Yes-due 2017	Yes-due 2017	https://www.clear.bank/home
HSBC	Yes	Yes	indirect.access@hsbc.com

7.1 Faster Payment System (FPS) & Regtech 2.0

HONG KONG MONETARY AUTHORITY
香港金融管理局

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A New Era of Smart Banking

The Hong Kong Monetary Authority (HKMA) today unveiled a number of initiatives that prepare Hong Kong to move into a New Era of Smart Banking. In a keynote speech delivered during the Annual Banking Conference of the Hong Kong Institute of Bankers, Mr Norman Chan, Chief Executive of the HKMA, outlined how the HKMA will take lead and help the banking sector to rise to a higher level and embrace the enormous opportunities brought about by the convergence of banking and technology.

The initiatives to be launched by the HKMA include:

1. Faster Payment System (FPS) – Both banks and Stored Value Facilities (SVF) operators can participate in the FPS, which supports the use of mobile phone numbers or email addresses for payments in Hong Kong dollar and Renminbi anytime and anywhere. FPS is scheduled to be launched in September 2018. In addition, an industry working group has been established to facilitate a common QR code standard, which would promote the wider use of mobile retail payments and greater convenience to customers and merchants.

2. Enhanced Fintech Supervisory Sandbox (FSS) 2.0 – FSS 2.0 will have three new features: (i) a Fintech Supervisory Chatroom will be set up to provide speedy feedback to banks and tech firms at an early stage of their Fintech projects; (ii) tech firms may have direct access to the sandbox by seeking feedback from the Chatroom without necessarily going through a bank; (iii) the sandboxes of the HKMA, the Securities and Futures Commission and the Insurance Authority will be linked up so that there will be a single point of entry for pilot trials of cross-sector fintech products. The FSS 2.0 will be launched by the end of 2017.

3. Promotion of Virtual Banking – The HKMA welcomes the introduction of virtual banks in Hong Kong and will consult the industry to review and amend the Guide to Authorization of Virtual Banks issued in 2000.

4. Banking Made Easy initiative – A new task force will be set up within the HKMA to work with the banking industry to minimise regulatory frictions in customers' digital experience, including remote onboarding, online finance and online wealth management.

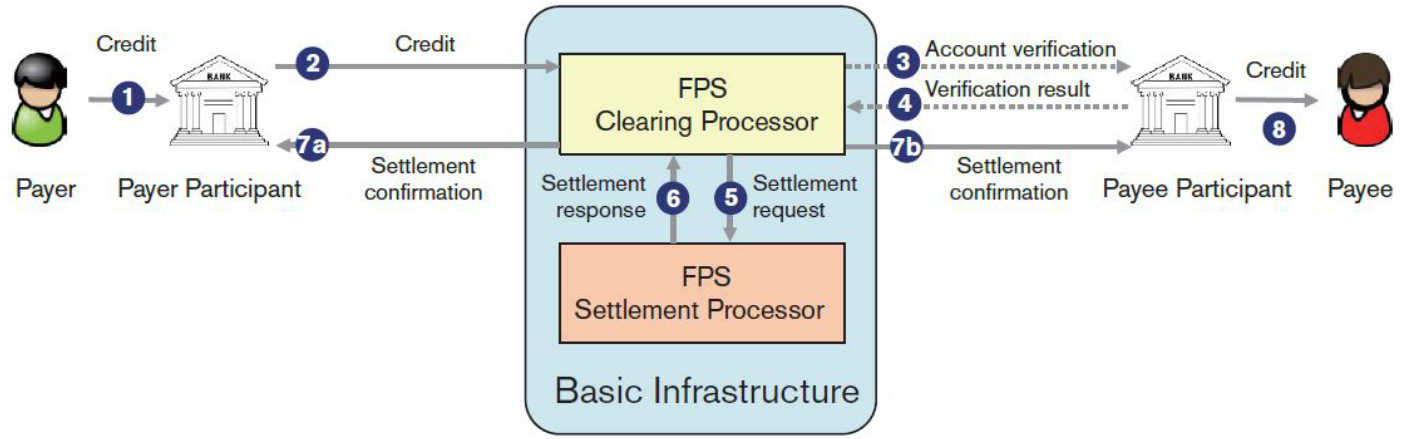
5. Open Application Programming Interface (API) – A policy framework on Open API will be formulated to facilitate the development and wider adoption of API by the banking sector, thereby stimulating innovations

Quick Links

- Be Careful of Bogus Phone Calls
- HKMA Information Centre
- Careers@HKMA
- Press Releases
- Speeches
- Statistics
- Guidelines & Circulars
- Registers

7.1 Faster Payment System (FPS) & Regtech 2.0

- **FPS (Hong Kong)**
  - Real-time credit transfer such as P2P, B2B and person to merchant (P2M), allowing banks and SVF operators to develop different front-end applications to meet customers' needs.

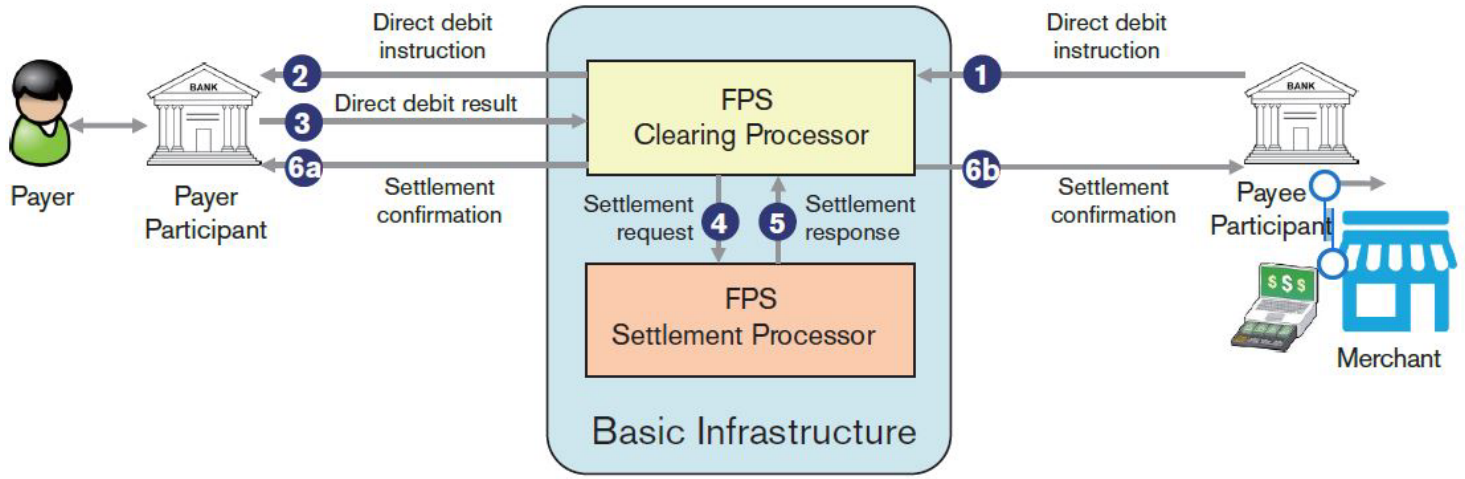


Note: Steps 3 and 4 can be skipped if payee's account status is confirmed (eg. registered merchant of an SP or CP).

https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb201809/fa2.pdf

7.1 Faster Payment System (FPS) & Regtech 2.0

- **FPS (Hong Kong)**
  - Real-time direct debit allows pre-authorized direct debit payment such as e-wallet top up, bill payment and e-commerce payment.



Note: A real time direct debit function is available upon a one-time direct debit authorisation (i.e. eDDA) is established.

https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb201809/fa2.pdf

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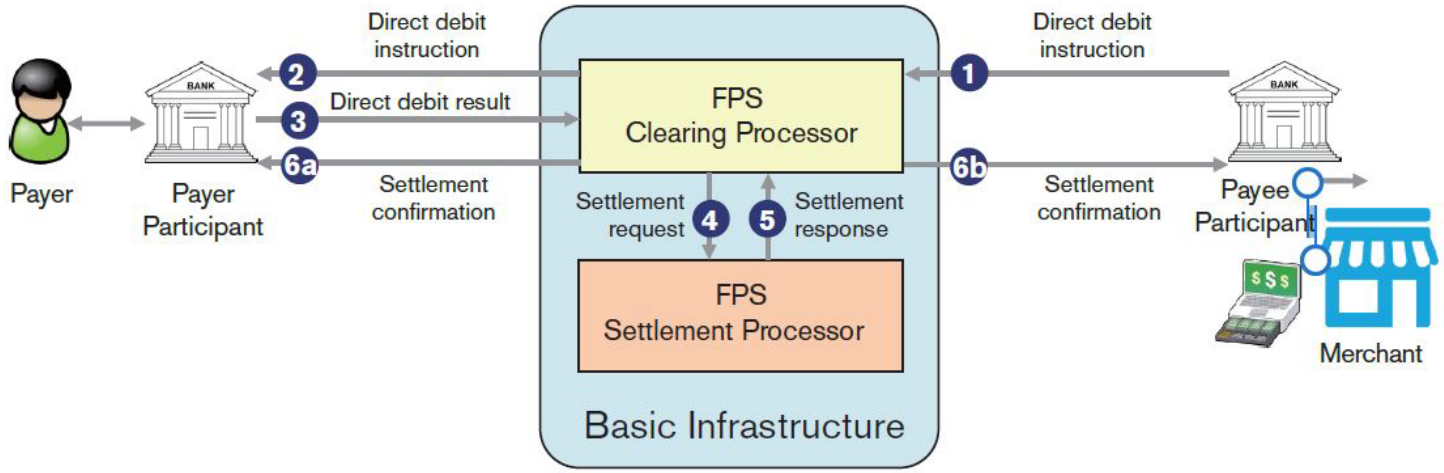

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For Regtech 2.0 in the FPS Architecture, how would it be different from Regtech 1.0?

- **Internal or external?**
- **Push or Pull?**
- **Cost saving?**
- **Generate Profit?**

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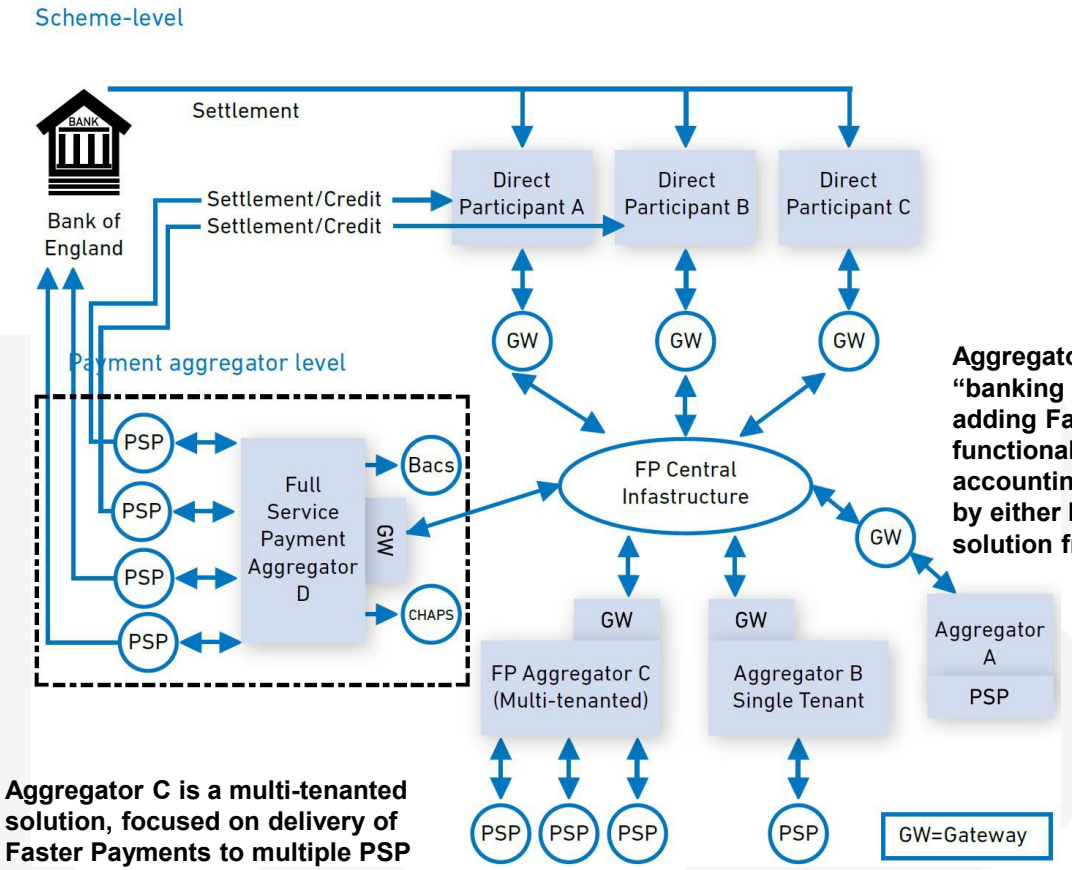
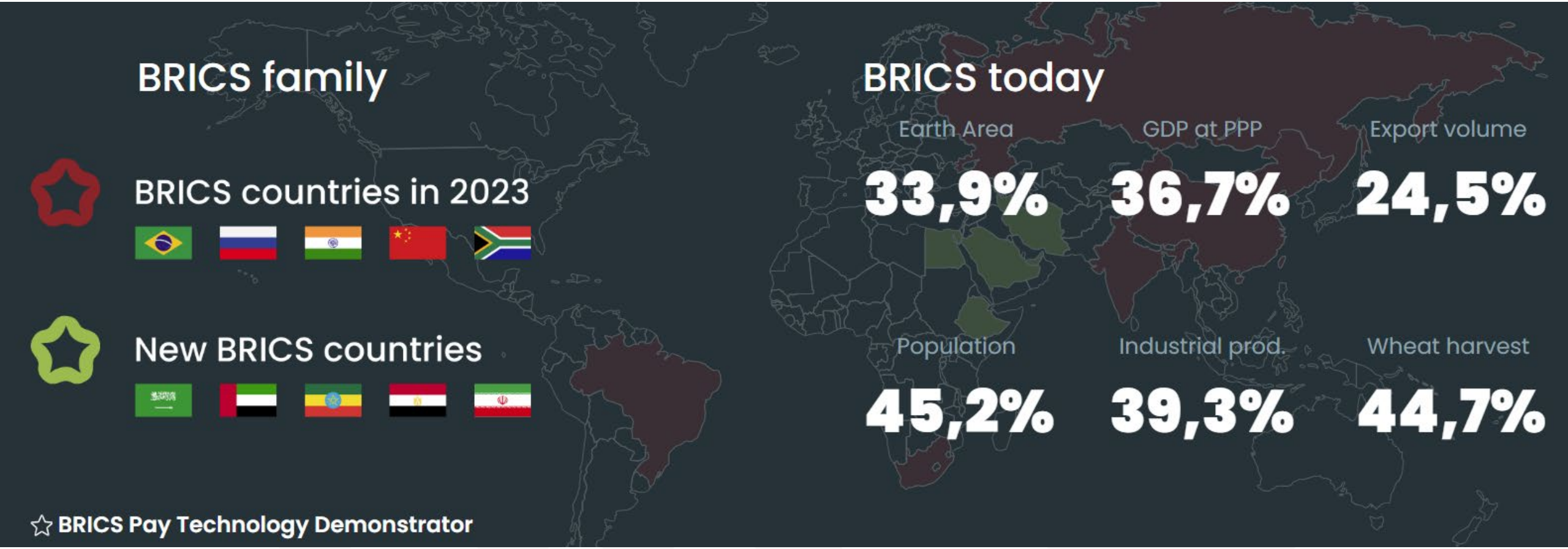


Aggregator A represents a "banking platform provider" adding Faster Payment functionality to their existing accounting platform technology, by either building or licensing a solution from another vendor.

Aggregator C is a multi-tenanted solution, focused on delivery of Faster Payments to multiple PSP participants.

Aggregator D is a multi-tenanted solution, supporting all payment types, for multiple PSP participants

Aggregator B is a single tenant solution, where a vendor is providing a managed solution for a single provider. The Scheme recognises that some Participants may want their own instance of such a solution.



BRICS PAY or **BRICS Pay** is a decentralized and independent payment messaging mechanism system that is affiliated with the BRICS organization.
https://en.wikipedia.org/wiki/BRICS_PAY

https://www.brics-pay.com/DemoMoscow.html

BRICS Pay Technology Demonstration

On October 17 and 18, during the BRICS Business Forum at the International Trade Center in Moscow, you can participate in testing the retail technologies of BRICS Pay. To do this, find a card with a one-time QR code, link it in the BRICS Pay app, and receive 500 rubles for purchases at stores labeled with BRICS Pay.

Promotional Rules "BRICS Pay Retail System Technology Demonstrator"

Правила акции «Демонстратор технологий розничной системы BRICS Pay»

BRICS Pay

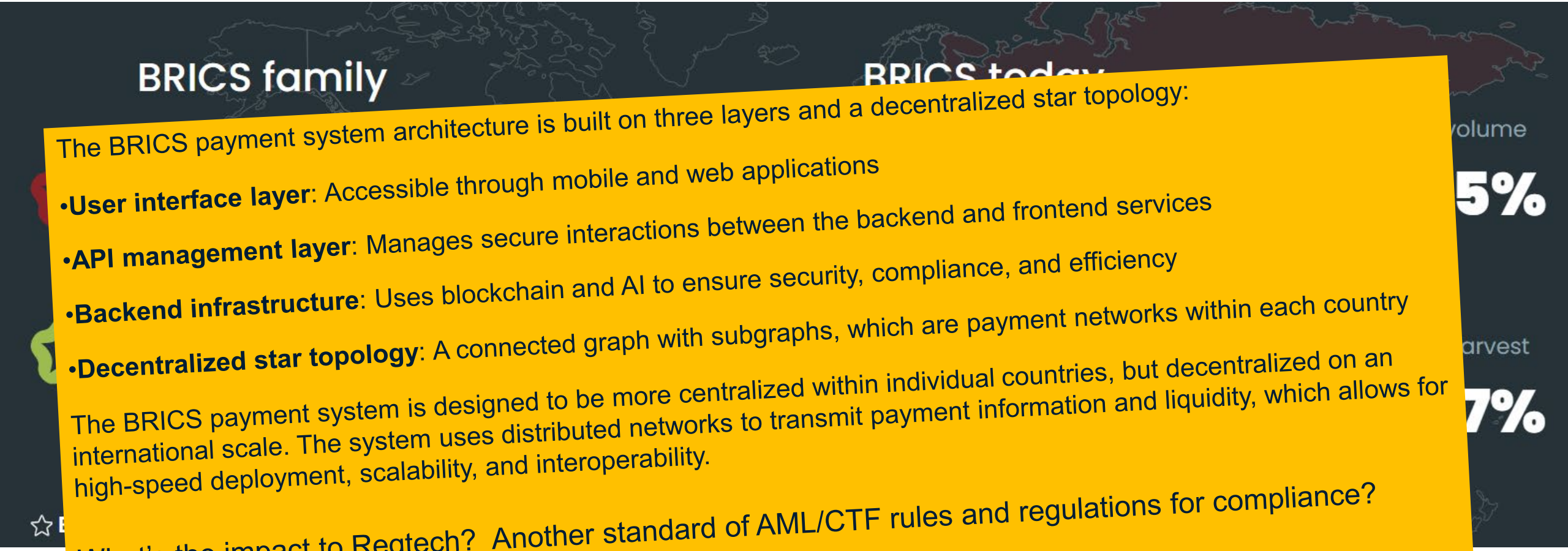
Promo Card

BRICS PAY

This is a mock-up of a bank card that can be linked in the BRICS Pay app to receive a gift of 500 rubles credited to your BRICS Pay account.
Scan the QR code with the BRICS Pay app.

You can pay for goods or services on October 17 and 18, 2024, at stores marked with BRICS Pay during the BRICS Business Forum.

Install the PWA BRICS Pay via the link:
qr.brics-pay.com



The BRICS payment system architecture is built on three layers and a decentralized star topology:

- **User interface layer**: Accessible through mobile and web applications
- **API management layer**: Manages secure interactions between the backend and frontend services
- **Backend infrastructure**: Uses blockchain and AI to ensure security, compliance, and efficiency
- **Decentralized star topology**: A connected graph with subgraphs, which are payment networks within each country

The BRICS payment system is designed to be more centralized within individual countries, but decentralized on an international scale. The system uses distributed networks to transmit payment information and liquidity, which allows for high-speed deployment, scalability, and interoperability.

What's the impact to Regtech? Another standard of AML/CTF rules and regulations for compliance?

https://www.brics-pay.com/

7.2 Case Analysis - Lending Club

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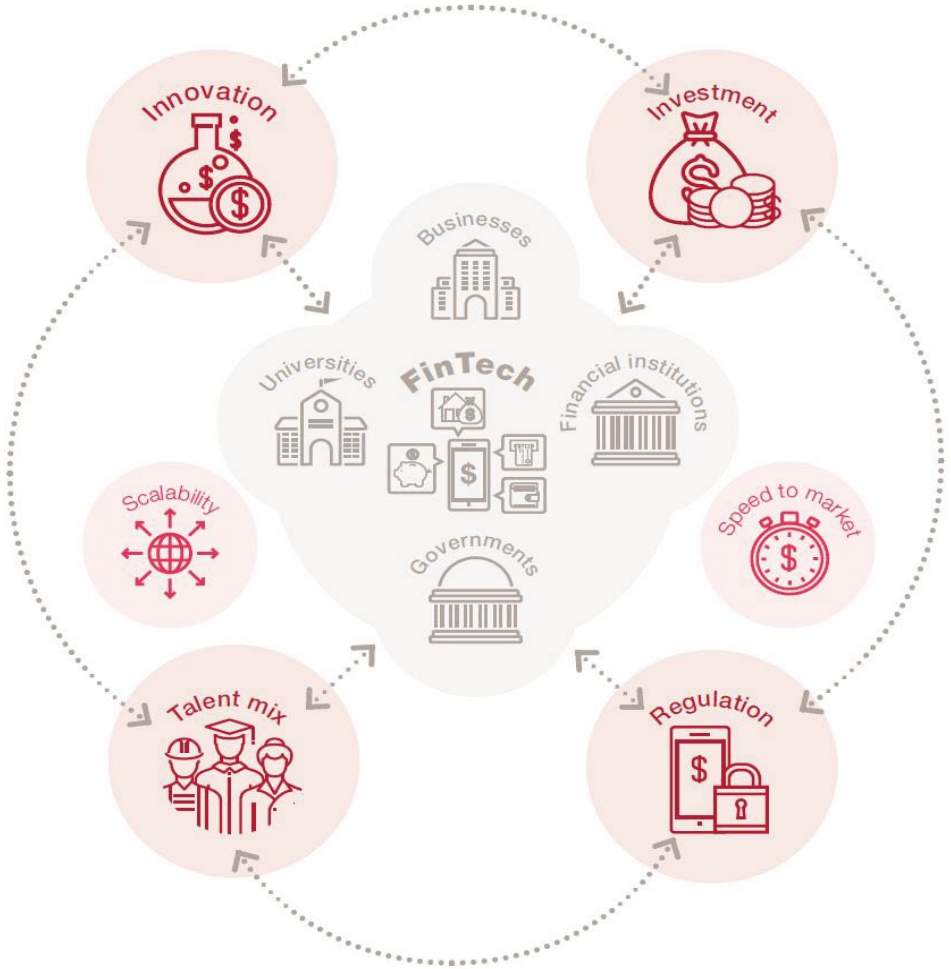
Figure 2: Components of the FinTech ecosystem



Canadian Banks – Embracing the Fintech Movement
Fintech 1.0 → Regtech 1.0

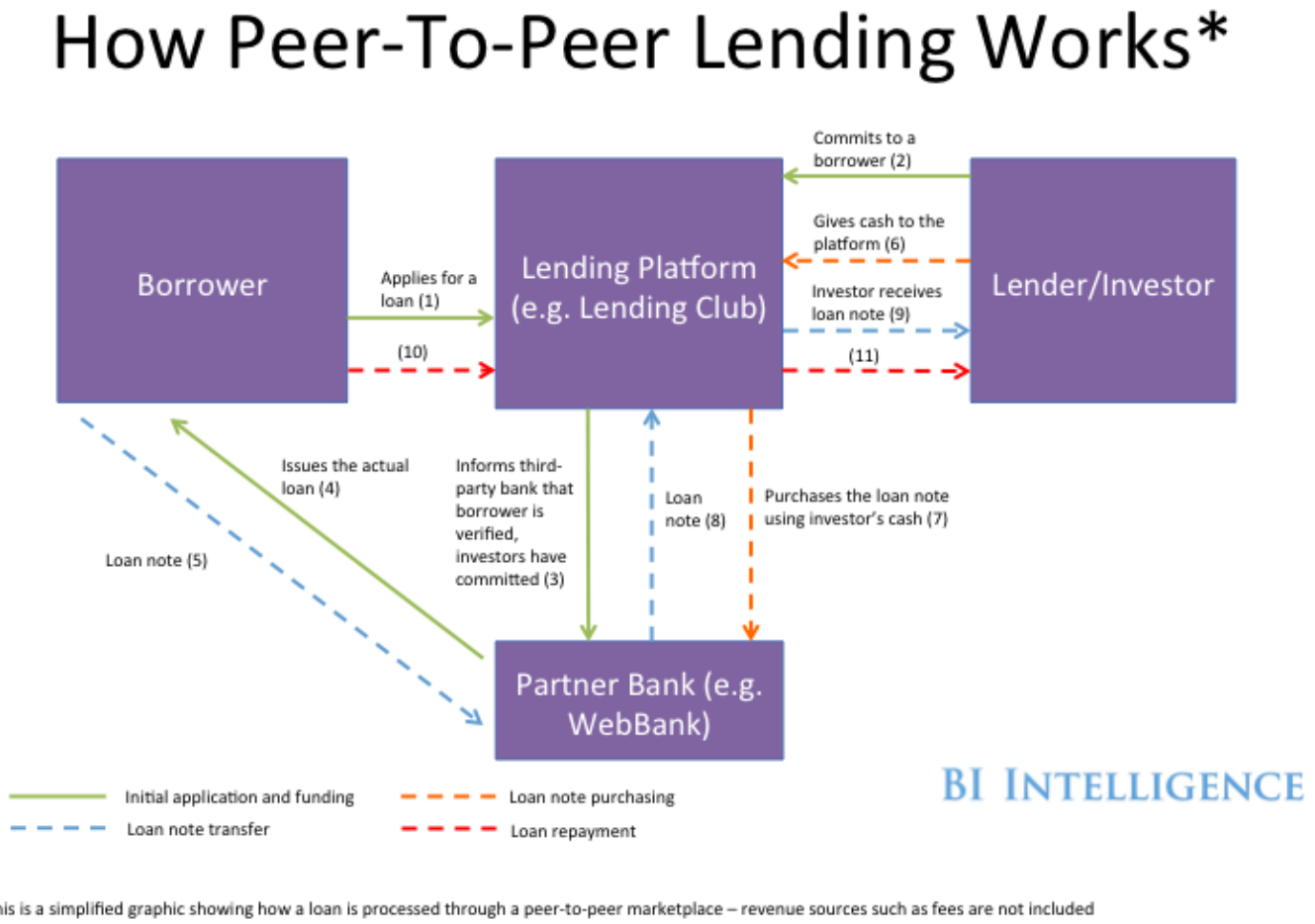
7.2 Case Analysis - Lending Club

Lending Club – a case example

7.2 Case Analysis - Lending Club

- **Lending Club**
  - The platform connects thousands of individual and business borrowers with regular people willing to fund their loans.
  - e.g.:
    A $1000 loan of a borrower will be made up of a multitude of $25 denominated Notes (and integral multiples of $25) funded by investors. These loans range from $1,000 to $35,000 in size and have terms of 36 or 60 months.
  - Borrower interest rates range from about 6.75% to about 30%, depending on credit score, credit history, and past borrowing record with LendingClub.

7.2 Case Analysis - Lending Club



https://www.businessinsider.com/peer-to-peer-lending-how-digital-lending-marketplaces-are-disrupting-the-predominant-banking-model-2015-05

* Document removed

7.2 Case Analysis - Lending Club

- **Lending Club**

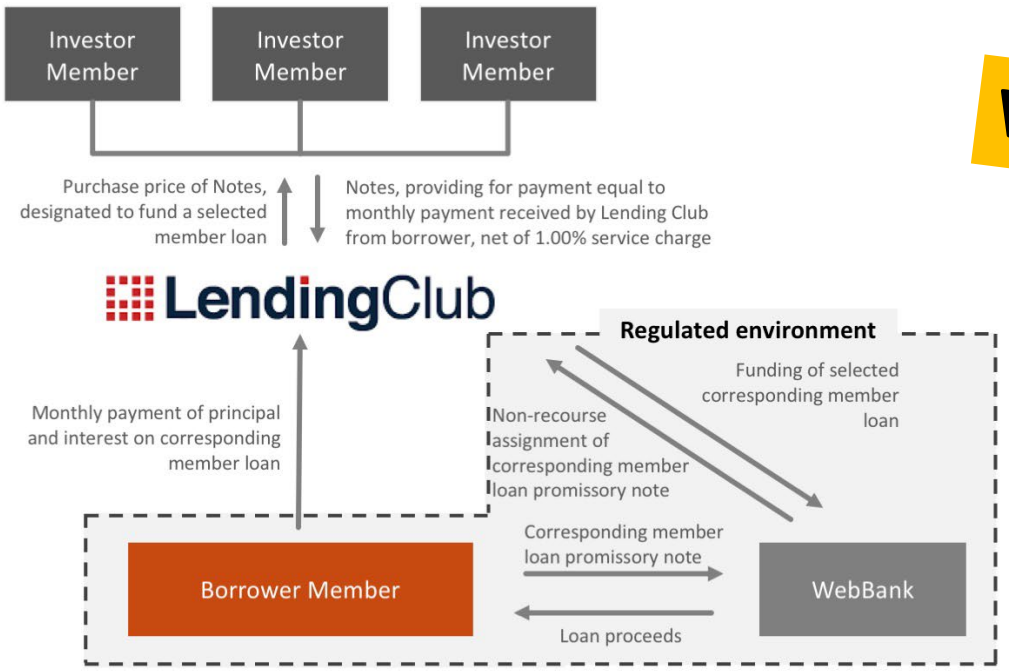
  LendingClub claimed that it does the matchmaking and the risk assessment before the underwriting, pricing and servicing the loans on behalf of investors.

  If so, why is there a WebBank there?

  The actual loan origination is done by WebBank, a Utah-chartered financial institution that sells the loans to LendingClub. So there's nothing peer-to-peer about it.

  LendingClub is an intermediary between a bank and institutional investors, a structure that moves the lending business out of a regulated environment into an unregulated one.

7.2 Case Analysis - Lending Club



Where is Regtech?

Chappuis Halder & Co.

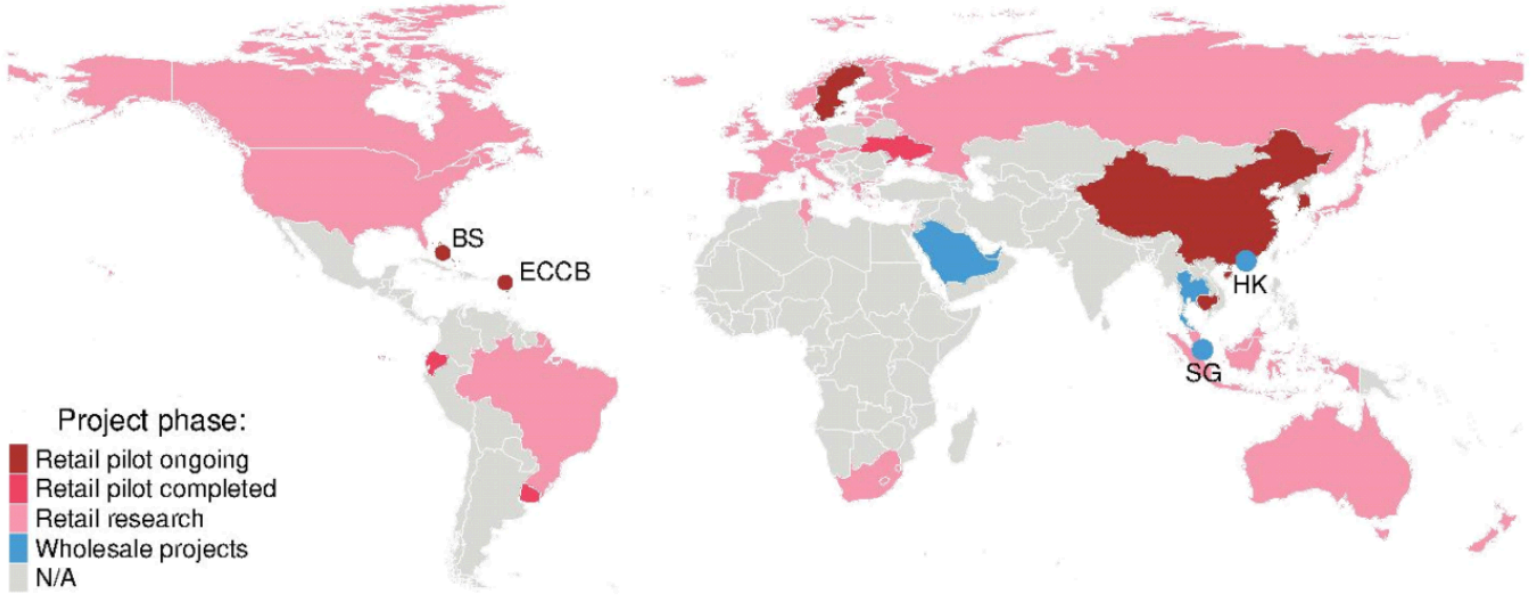
1

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

CBDC projects status

Graph 3



BS = The Bahamas; ECCB = Eastern Caribbean central bank; HK = Hong Kong SAR; SG = Singapore.

The use of this map does not constitute, and should not be construed as constituting, an expression of a position by the BIS regarding the legal status of, or sovereignty of any territory or its authorities, to the delimitation of international frontiers and boundaries and/or to the name and designation of any territory, city or area.

Source: central banks' websites.

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

- **CBDC (Central Bank Digital Currency)**
  - A central bank digital currency (CBDC) is a digital form of cash issued by a nation's central bank.
  - Digital forms of currency are already widely used today, e.g. debit or credit card, when you are paid via direct deposit, the associated financial institution must digitally record the transaction and update your account balance.
  - CBDC would be crypto-tokens on the DLT/Blockchain (permission/unpermission) to rather than just a electronic signal/record to resolve the “double spending” and “trust” issues.

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

- **DCEP (Digital Currency Electronic Payment)**
  - China's national digital currency DCEP (Digital Currency Electronic Payment, DC/EP) will be built with **Blockchain** and **Cryptographic technology**.
  - This revolutionary cryptocurrency could become the world's first Central Bank Digital Currency (CBDC) as it is issued by state bank People's Bank of China (PBoC).
  - The goal and objectives of the currency are to increase the circulation of the RMB and international reach – with eventual hopes that the RMB will a global currency like the US Dollar. **Is this the objective? Trust another gov't or P2P?**

https://boxmining.com/dcep/

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

- **DCEP (Digital Currency Electronic Payment)**
  - Project like Facebook Libra poses a threat to the sovereignty of any state, i.e. legal tender/fiat currency vs. crypto-currencies
  - The significance of DCEP is that it's designed as a replacement of the Reserve Money (M0) system, cutting back the cost and friction of bank transfers.
  - DCEP will alleviate the risks of offline paper money transactions such as anonymous counterfeiting, money laundering and illegal financing.

https://boxmining.com/dcep/

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

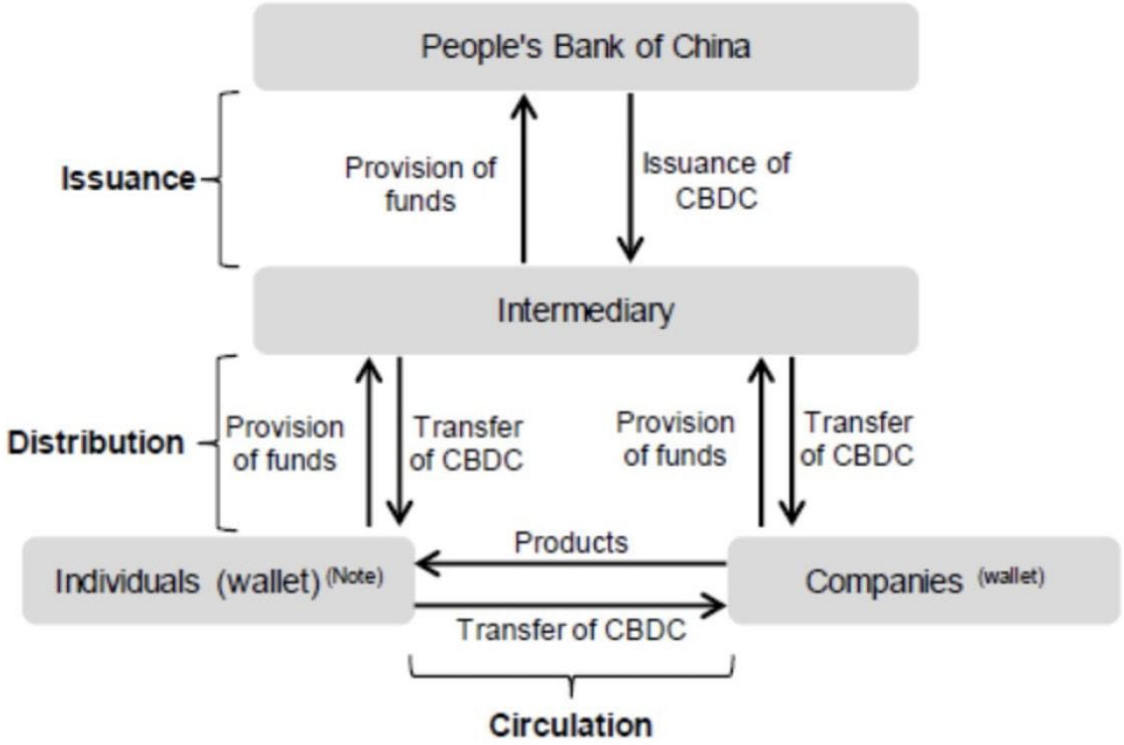
- **DCEP (Digital Currency Electronic Payment)**
  - This is because regulators can better monitor digital currency transactions, which some consider will greatly improve financial and monetary supervision.
  - DCEP can also reduce the costs involved in maintaining and recycling banknotes and coins.

https://boxmining.com/dcep/

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

Let's walkthru the DCEP Architect

Figure 2. System of CBDC Issuance, Distribution and Circulation



DCEP would operate on a two-tiered system (Image credit: https://www.rieti.go.jp/en/china/19122701.html)

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

Name: DCEP	**Name:** Libra	**Name:** Bitcoin
		
Creator: China	**Creator:** Facebook	**Creator:** Satoshi
Governance: Centralized	**Governance:** Centralized	**Governance:** Decentralized
Total Supply: Unlimited	**Total Supply:** Unlimited	**Total Supply:** 21,000,000
Backing Value: RMB	**Backing Value:** Currency Basket	**Backing Value:** Energy

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

A comparison between DCEP, Libra, Bitcoin, ..

	DCEP	LIBRA	BITCOIN	CASH
Anonymous?	Can be made anonymous	Yes	Yes	Yes
Type of blockchain technology used?	Smart contract, asymmetric cryptography etc.	Consortium blockchain	Public blockchain	Nil
Efficiency?	High	High	Low	Low
Decentralised?	No	Partially	Yes	No
Volatility?	Low	Low	High	Low
Portability?	High	High	Medium	Low
Security?	High	High	High	Low
Offline payment support?	Yes	No	No	Yes
Transaction speed (TPS/sec)?	220,000	1,000	7	N/A
Status?	Undergoing testing	In development	In circulation	In circulation

From this, what is your understanding of DCEP's DLT/Blockchain design?

https://boxmining.com/dcep/

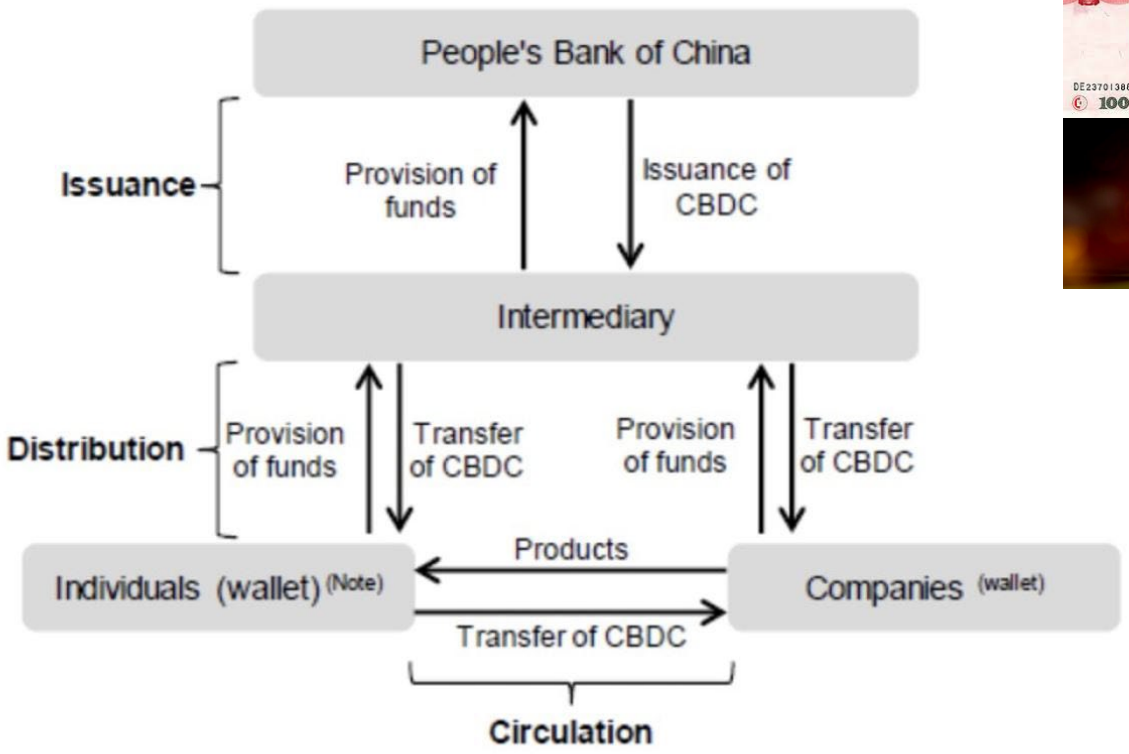
7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

- **Offline money transfer**
  - According to Official Sina Blockchain, DCEP will have NFC based payment options that don't require devices to be online during the transfer.
  - This will be poised as a direct replacement of paper money, as DCEP will be usable in areas without internet coverage.
  - In addition, DCEP doesn't require the mobile device to be bound to a bank account – meaning the unbanked population will also have access to the digital currency.

https://boxmining.com/dcep/

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

Figure 2. System of CBDC Issuance, Distribution and Circulation



DCEP would operate on a two-tiered system (Image credit: https://www.rieti.go.jp/en/china/19122701.html)

With DCEP, do we still need Regtech? SupTech?

7.3 -CBDC (Central Bank Digital Currency) / DCEP (Digital Currency Electronic Payment)

Re-examine DCEP and FPS

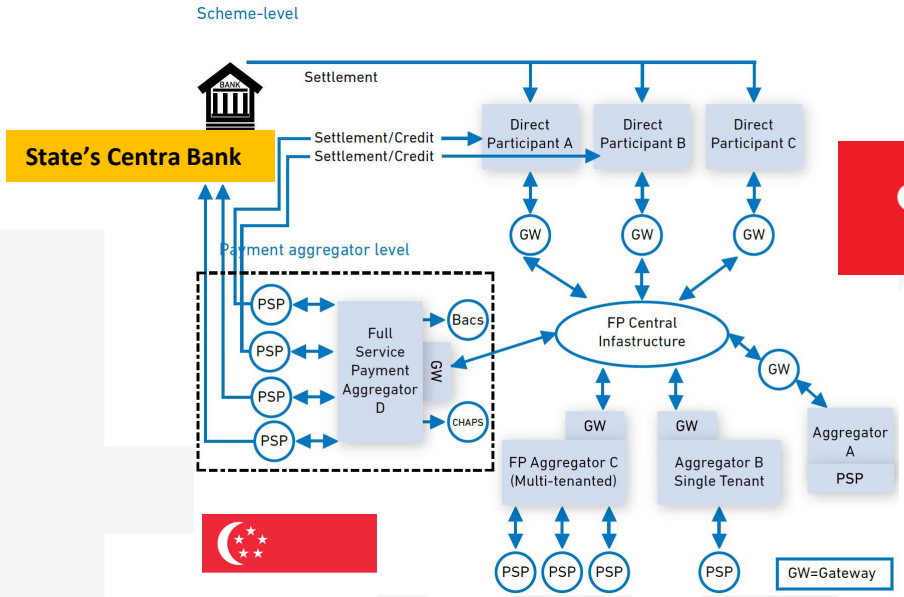
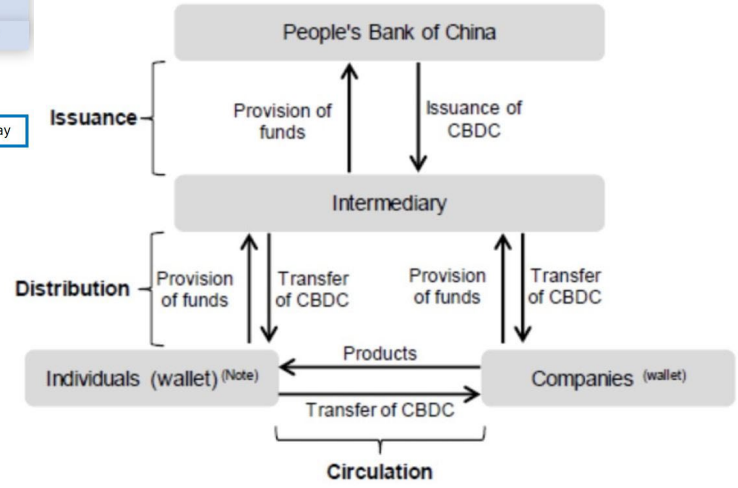


Figure 2. System of CBDC Issuance, Distribution and Circulation



DCEP would operate on a two-tiered system (Image credit: https://www.rieti.go.jp/en/china/19122701.html)

7.4 Smart Contracts

7.4 Smart Contracts

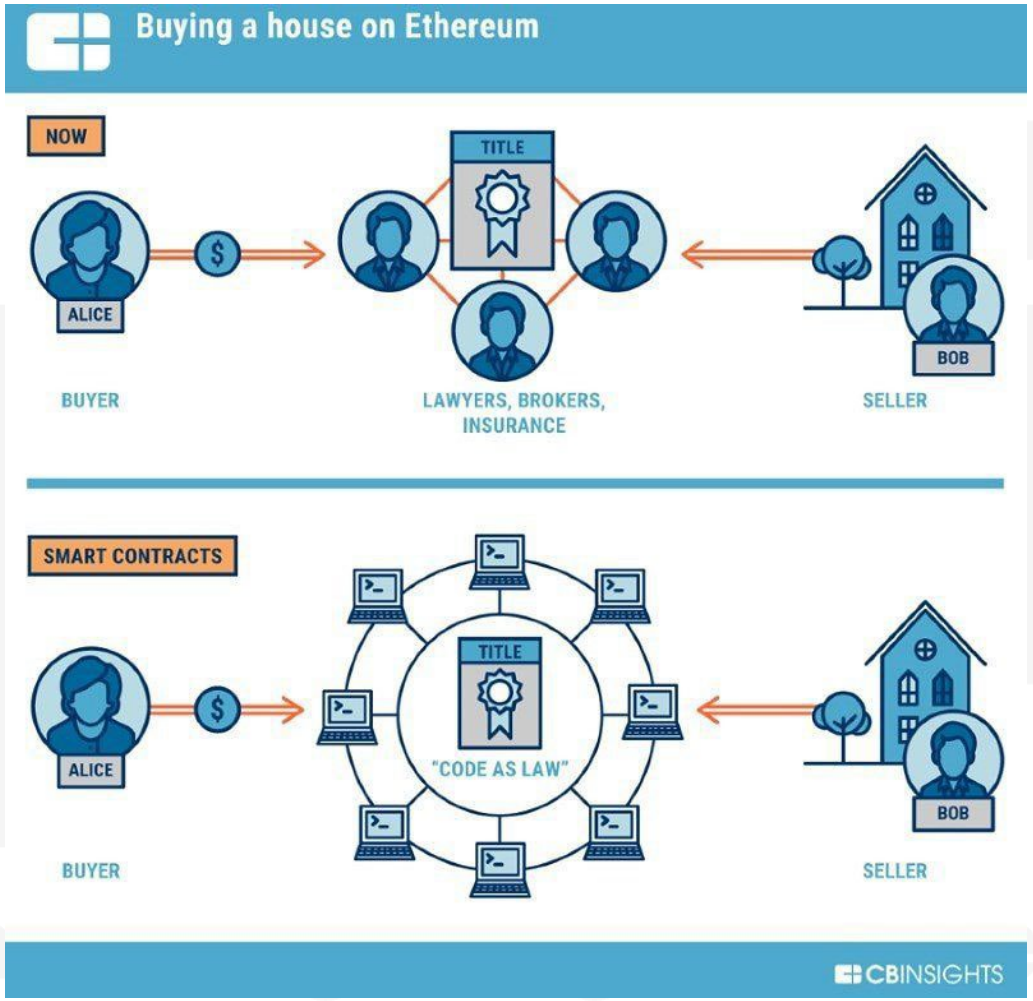
- Smart contracts are simply programs stored on a blockchain that run when predetermined conditions (time-driven or event-driven conditions) are met.

- They typically are used to automate the execution of an agreement so that all participants can be immediately certain of the outcome, without any intermediary's involvement or time loss.

- They can also automate a workflow, triggering the next action when conditions are met.

https://www.ibm.com/topics/smart-contracts

7.4 Smart Contracts



What info the regulator can "pull" instead of "push" from the TTP, i.e. the banks/FIs?

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

- **Five Regtech using Blockchain**

1. Intelligent regulatory advisor: an artificial intelligent frontend to the regulatory handbook to simplify registration.

2. Automated monitoring: monitoring of online and social media, and using natural language processing and sentiment analysis to monitor consumer opinions, concerns, and level of trust and identify market abuses.

Treleaven, P., and Batrinca, B., "Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and BlockChain" p.14-21, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

- **Five Regtech using Blockchain**

3. Automated reporting: using the Fintech paradigms of online communication, big data analytics, and distributed ledger technology to automate compliance and regulation reporting [known as Regtech in the U.K.: U.K. Government Office for Science (2015)].

4. Regulatory policy: using smart contract technology to codify regulations; and using computational modeling, such as agent-based systems, for assessing regulatory proposals' potential market impact before deployment (e.g., Basel IV, MiFID II, Solvency III).

Treleaven, P., and Batrinca, B., "Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and BlockChain" p.14-21, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

- **Five Regtech using Blockchain**

5. Automated regulation: the most interesting, using blockchain distributed ledger technology to record compliance reports and use smart contract technology [U.K. Government Office for Science (2016), Norton Rose Fulbright (2016)] to codify, computerize, and automate financial regulation and compliance (cf. algorithmic trading).

Treleaven, P., and Batrinca, B., "Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and BlockChain" p.14-21, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

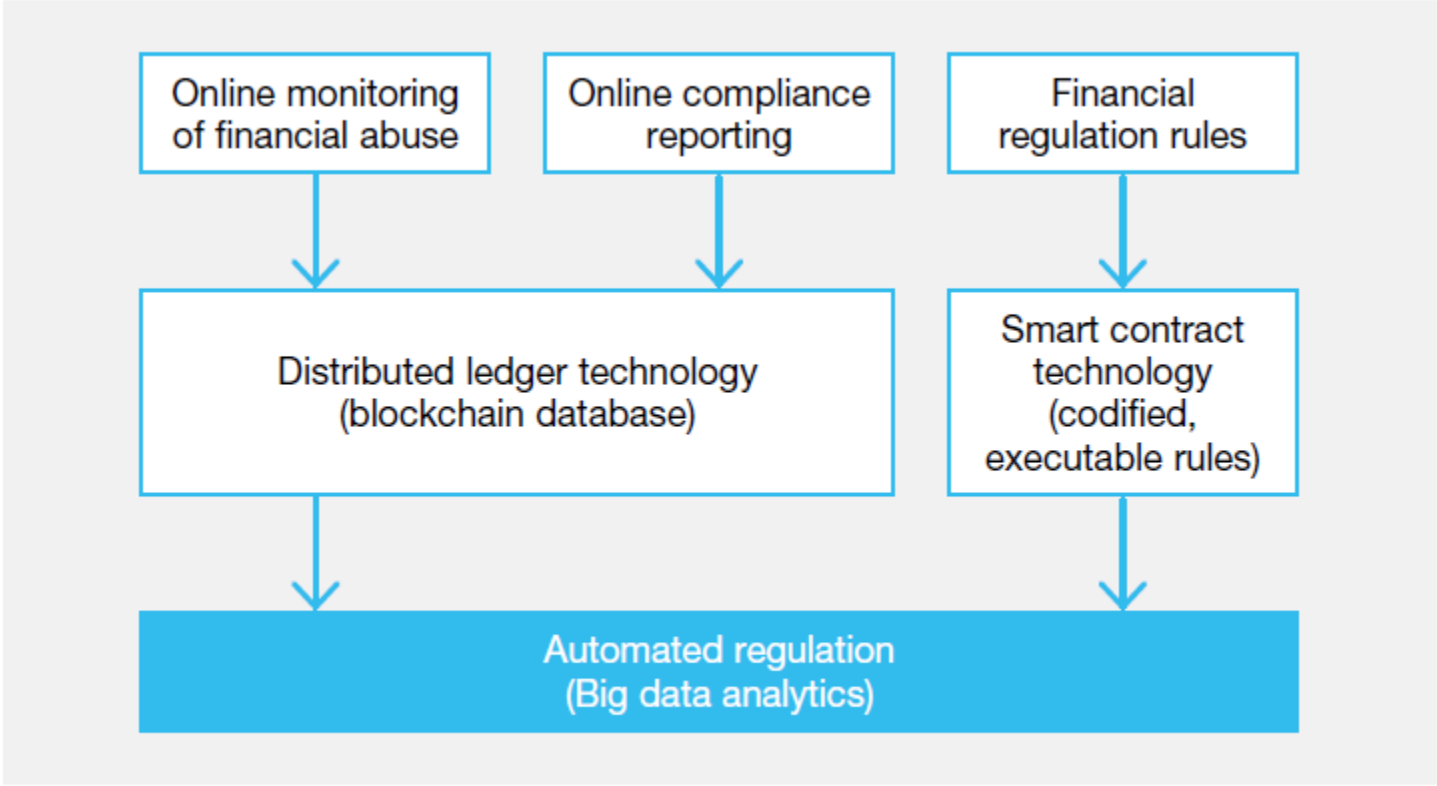


Figure 1 – Algorithmic regulation using blockchain technology

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

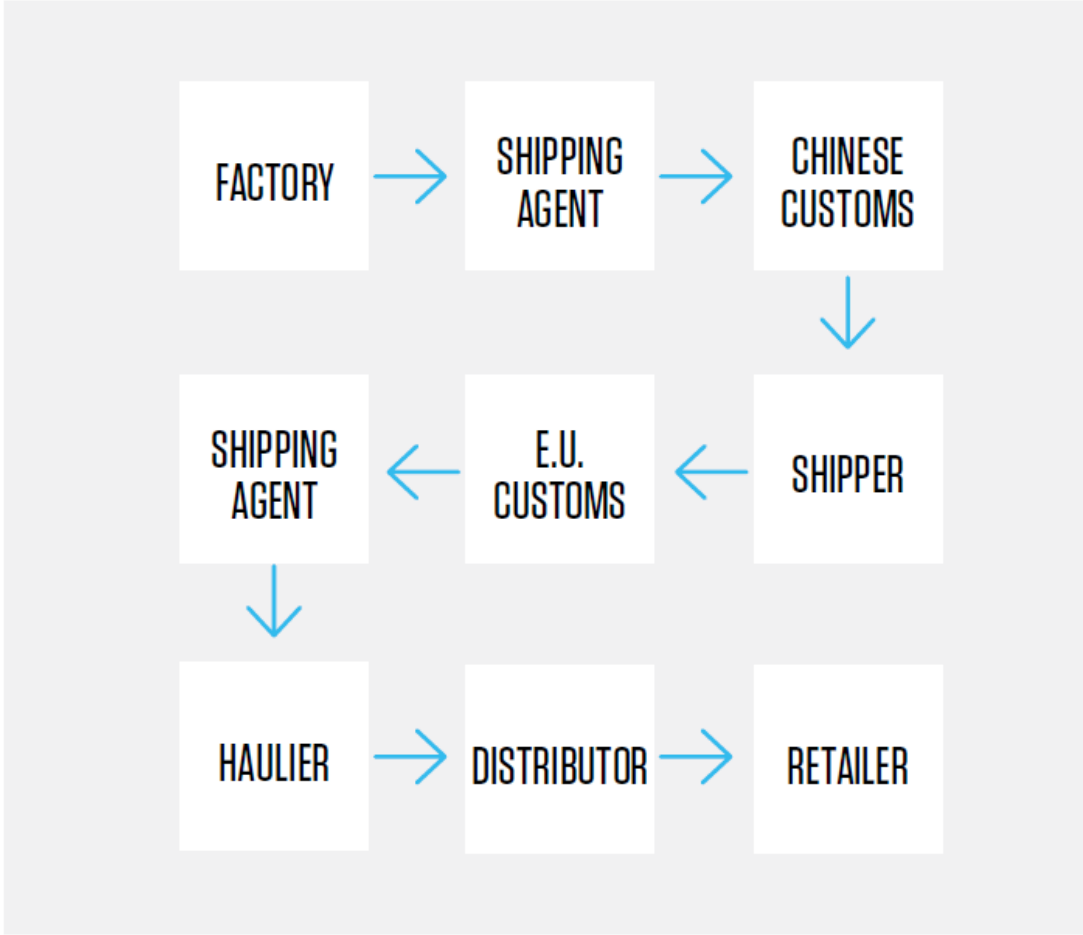


Figure 2 – Smart contracts in a supply chain

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

a. Simple smart contract code

```
from generateContract import generateContract

contractData = dict()

contractData['firstParty'] = {'name': 'First Company',
'additionalAgreement': 'additional provision text',
'signaturePrivateKey': '12gdf953&sd!815_7vx9bfgn4ngh874ng3$4'}

contractData['secondParty'] = {'name': 'Second Company',
'additionalAgreement': 'additional provision text for second company',
'signaturePrivateKey': '9bd$vs7&5309vdms0)fsd_kdv8vd'}

contractData['date'] = '08/08/2016'

contractData['state'] = 'UK'

contractData['provisions'] = ['First provision text', 'Second provision
text', 'Third provision text']

contract = generateContract(contractData)
```

b. Corresponding Plain Text

First company, known as "First Party," agrees to enter into this contract with second company, known as "Second Party", on 08/08/2016.

This agreement is based on the following provisions:

1. First provision text
2. Second provision text
3. Third provision text

Furthermore, First Party agrees:
additional provision text

and Second Party agrees:
additional provision text for second company

Invalidity or unenforceability of one or more provisions of this agreement shall not affect any other provision of this agreement. This agreement is subject to the laws and regulations of the state of U.K.

Signed:
First Company Valid signature

Second Company Valid signature

Figure 3 – Simple smart contract – declarative (Python) pseudo-code and corresponding Plain Text

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

```
# Example for checking if designated country is on US Treasury OFAC List:
firstParty = {'Country': 'UK', 'Credit': 100000}
secondParty = {'Country': 'North Korea', 'Credit': 250000}
def checkSanctionCountry(countryParty_1, countryParty_2):
    contractState = True
    contractTerminationReason = "Valid countries for a legal money transfer."
    sourceURL = "https://www.treasury.gov/resource-center/sanctions/Programs/Pages/Programs.aspx"
    # Get an up-to-date list of US Treasury sanctions countries from the supplied URL, e.g. currentSanctionList = getUpdatedSan-
ctionList(sourceURL, "US")
    # This returns a list similar to the following line:
    currentSanctionList = ["Iran", "North Korea", "Sudan"]
    if countryParty_1 in currentSanctionList:
        contractState = False
        contractTerminationReason = "The first party's country is part of the US Treasury's list of sanctions."
    elif countryParty_2 in currentSanctionList:
        contractState = False
        contractTerminationReason = "The second party's country is part of the US Treasury's list of sanctions."
    return (contractState, contractTerminationReason)
def sendMoney(firstParty, secondParty, transferValue):
    # Check the countries are not on the Sanction list
    contractState, contractTerminationReason = checkSanctionCountry(firstParty['Country'], secondParty['Country'])
    if contractState:
        if firstParty['Credit'] >= transferValue:
            firstParty['Credit'] -= transferValue;
            secondParty['Credit'] += transferValue;
            print "The transfer was successful."
        else:
            print "The transfer failed because of the following reason: " + "The first party has insufficient funds"
        return (firstParty['Credit'], secondParty['Credit'])
    else:
        print "The transfer failed because of the following reason: " + contractTerminationReason
        return (firstParty['Credit'], secondParty['Credit'])
transferValue = 50000 # USD
firstParty['Credit'], secondParty['Credit'] = sendMoney(firstParty, secondParty, transferValue)
print "The final credit for the first party is: " + `firstParty['Credit']`
print "The final credit for the second party is: " + `secondParty['Credit']`
```

Figure 4 – Smart regulation notation for U.S. Treasury sanctioned countries

7.5 -Algorithmic Regulation: Automating Financial Compliance Monitoring and Regulation using AI and Blockchain

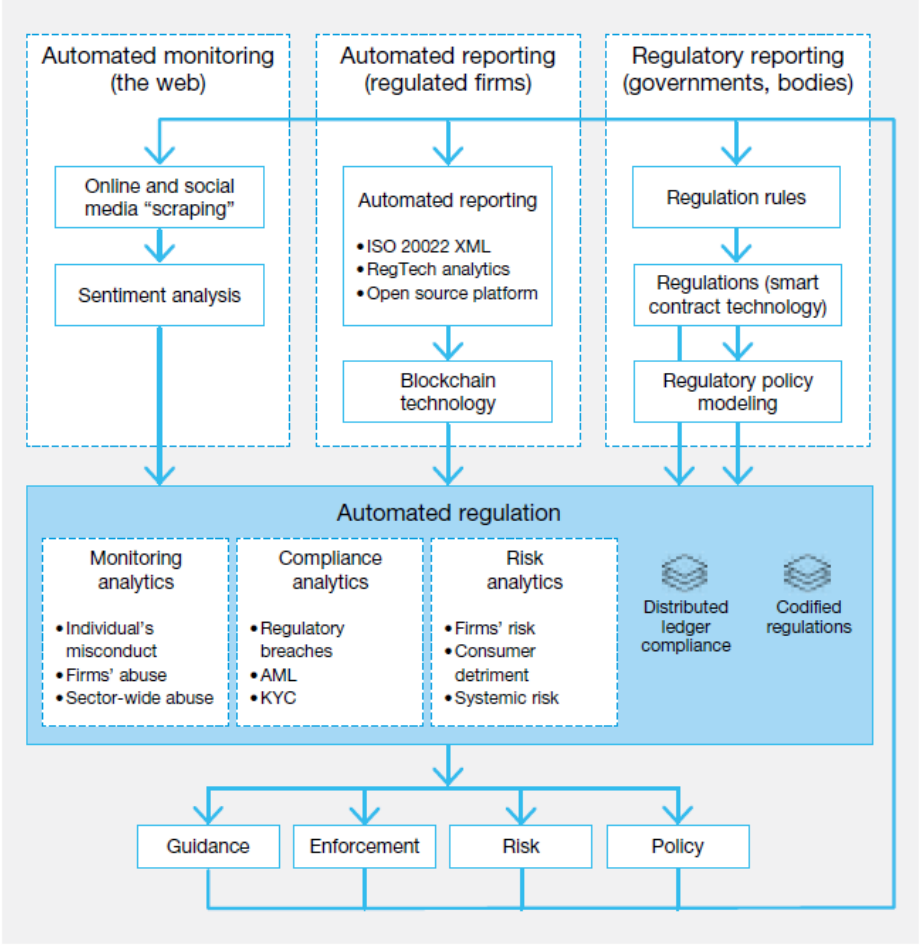


Figure 5 – Algorithmic regulation system

7.6 Standards-Based Technology Architecture for Regtech

7.6 Standards-Based Technology Architecture for Regtech

RegTech has the potential to help financial enterprises address the following issues:

(1) solve the regulatory interpretation problem;

(2) develop compliant governance and business policies;

(3) make regulatory compliance reporting more efficient and effective;

(4) help firms perform better data governance and analytics;

(5) enable integrated risk management; and

(6) automate controls across the business.

Butler, T., "Towards a Standards-based Technology Architecture for Regtech", p.49-59, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.6 Standards-Based Technology Architecture for Regtech

However, it also introduces two significant challenges:

(1) the translation problem which affects the design and implementation, and the regulatory interpretation and understanding; and

(2) the "Tower of Babel" problem, i.e. the lack of "common language" in the financial service industry.

Figure 1 shows the siloed nature of operational, regulatory, and other risk data, and the professional silos exist in financial services organizations themselves, i.e. the translation problem and the "Towel of Babel" problem.

Butler, T., "Towards a Standards-based Technology Architecture for Regtech", p.49-59, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.6 Standards-Based Technology Architecture for Regtech

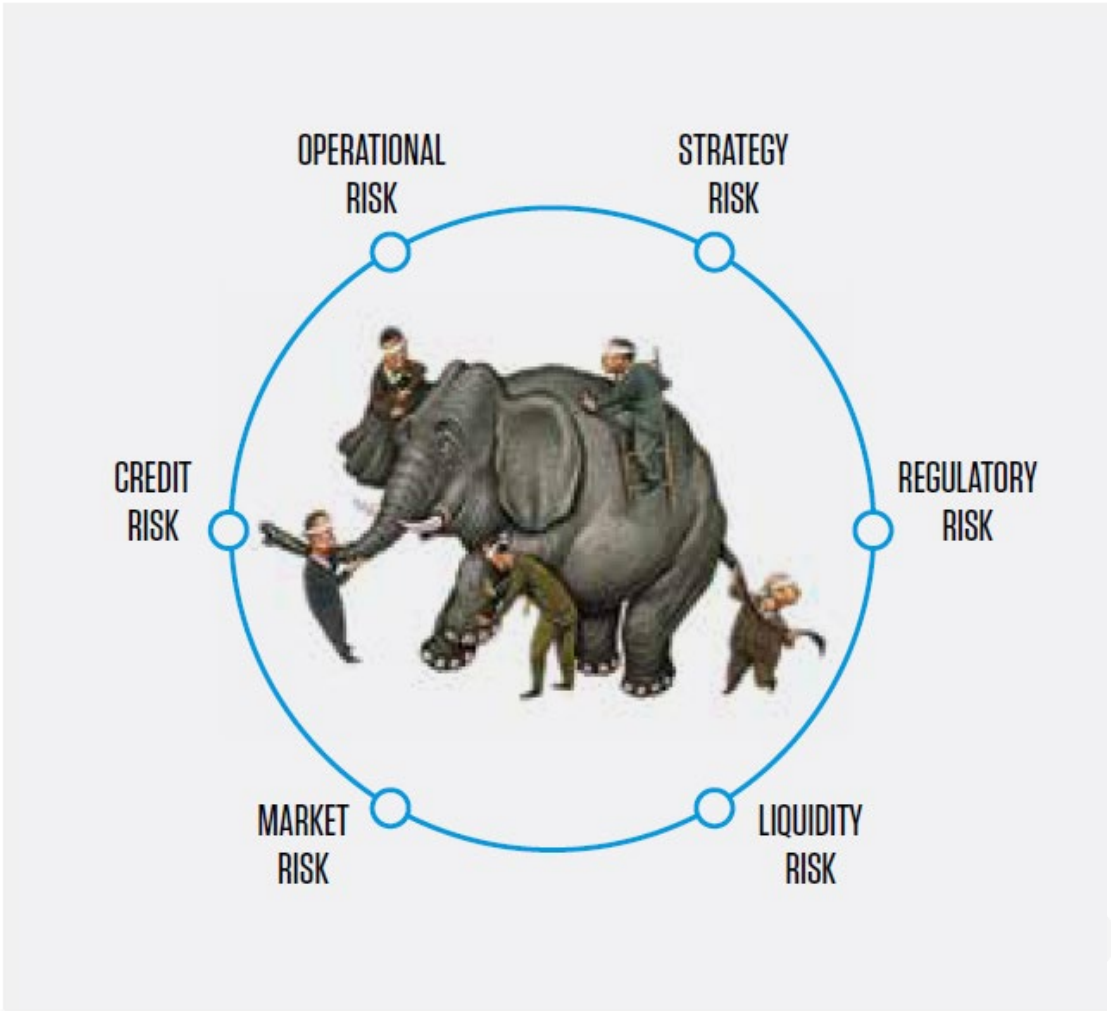


Figure 1 – Regulatory reporting and risk data

Butler, T., "Towards a Standards-based Technology Architecture for Regtech", p.49-59, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.6 Standards-Based Technology Architecture for Regtech

It is estimated that 50,000 regulatory texts were published by G20 members since 2009. There is an average of 45 new documents each week.

Butler proposed semantic models and related technologies enable unstructured and structured data to be endowed with meaning. (Fig 2 refers)

Butler, T., "Towards a Standards-based Technology Architecture for Regtech", p.49-59, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.6 Standards-Based Technology Architecture for Regtech

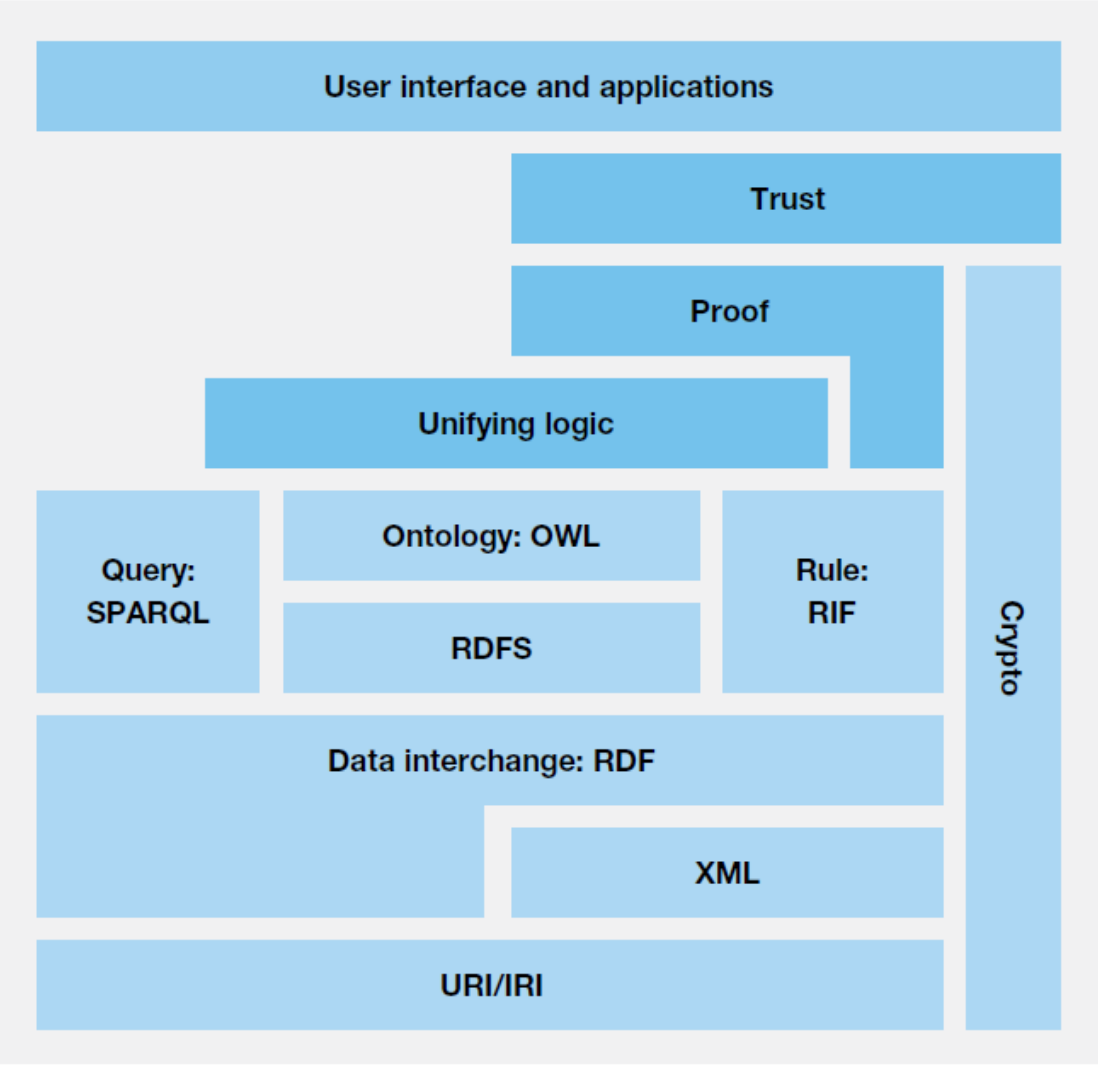


Figure 2 – W3C semantic web stack

At the bottom of the W3C semantic web stack is “uniform resource identifier” (URI), which is a string of characters used to identify resource in a network.

Above it is XML (extensible markup language), which defines a set of rules for structuring data and documents in a human-readable and machine-readable format.

The upper layers of the stack are built on top of XML.

7.6 Standards-Based Technology Architecture for Regtech

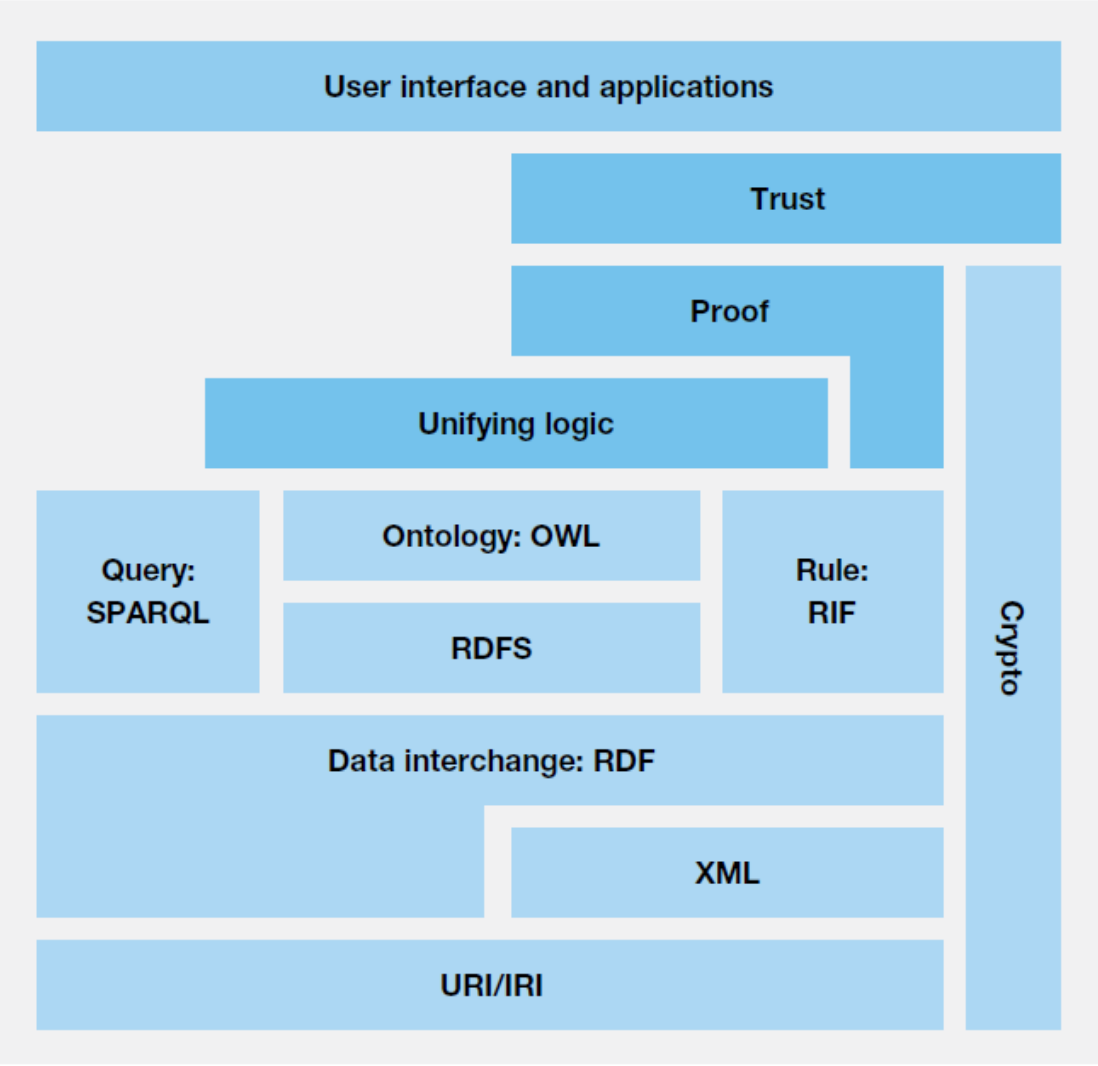


Figure 2 – W3C semantic web stack

For example, RDF (resource description framework) is one of the three foundational Semantic Web technologies, the other two being SPARQL and the "web ontology language" (OWL).

RDF is the data modeling language for SemTech.

OWL is the knowledge representation language.

Using the standards-based Technology Architecture, we can have a common standard/language/protocol in RegTech.

7.6 Standards-Based Technology Architecture for Regtech

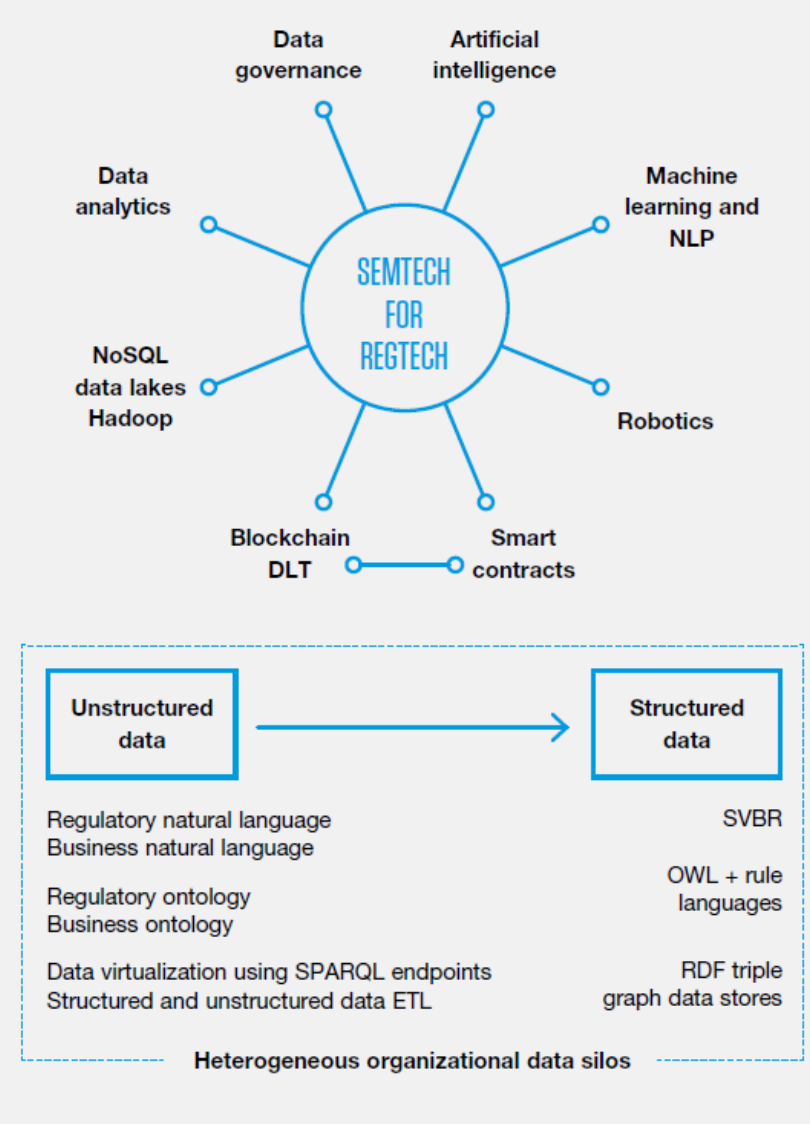


Figure 3 – SemTech for RegTech

This leads to the SemTech for RegTech to avoid ambiguity, misunderstanding, and communication failure among AI/Smart RegTech tools and solutions.

Butler, T., "Towards a Standards-based Technology Architecture for RegTech", p.49-59, the Capco Institute Journal of Financial Transformation, No. 45, April 2017.

7.7 Future Banking and Regtech Strategy

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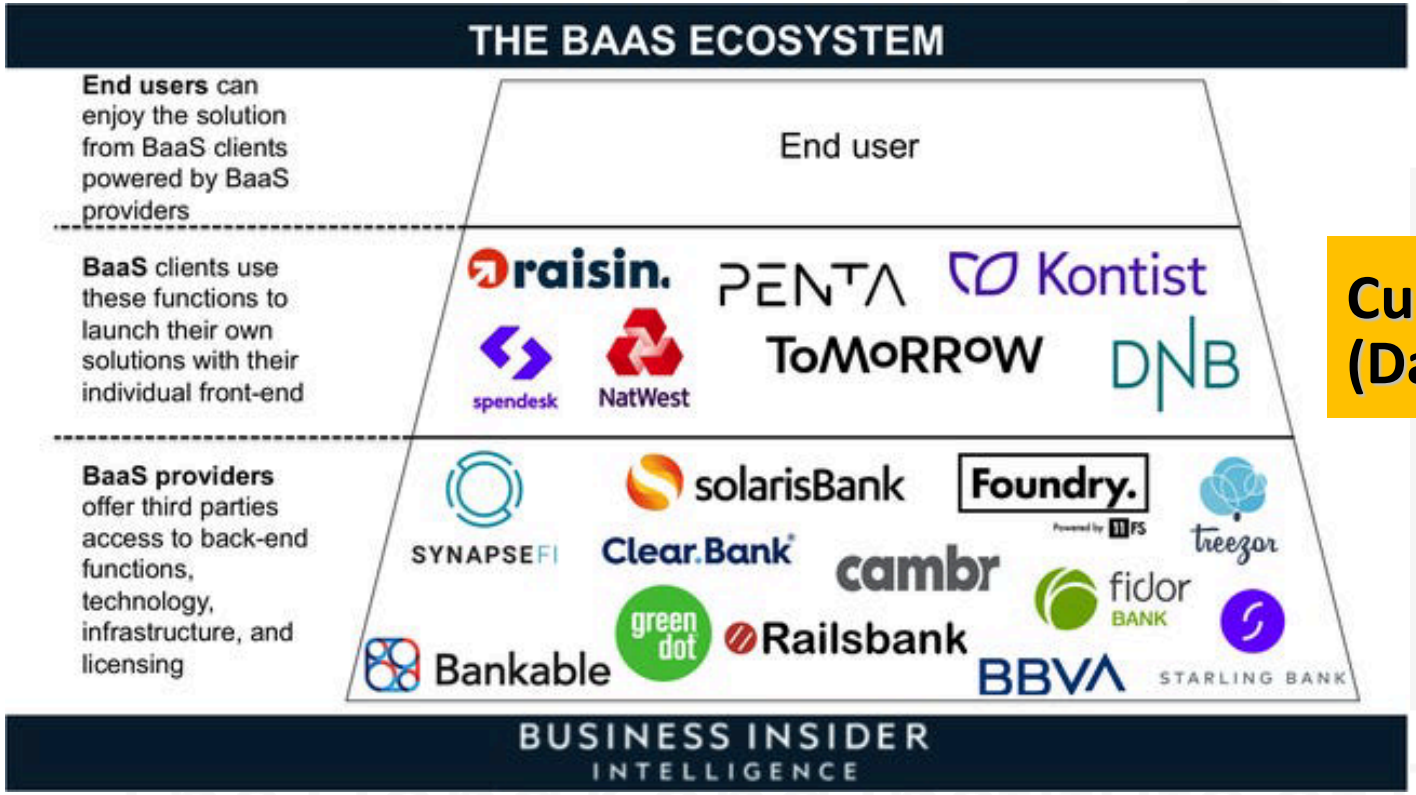
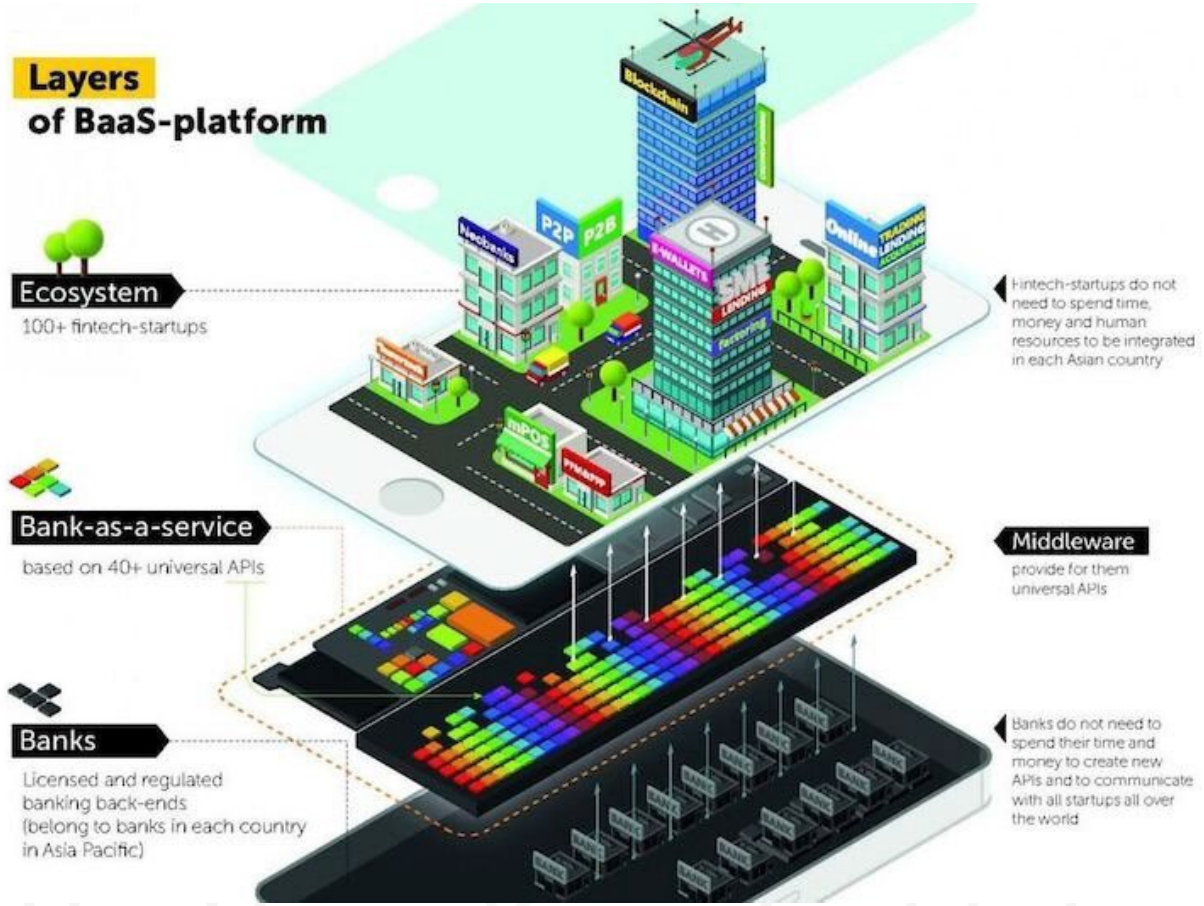
BaaS (Banking as a Service) Ecosystem



Customer-centric (Data-driven)

https://www.businessinsider.com/westpac-10x-future-technologies-partner-for-banking-as-a-service-2019-11

7.7 Future Banking and Regtech Strategy

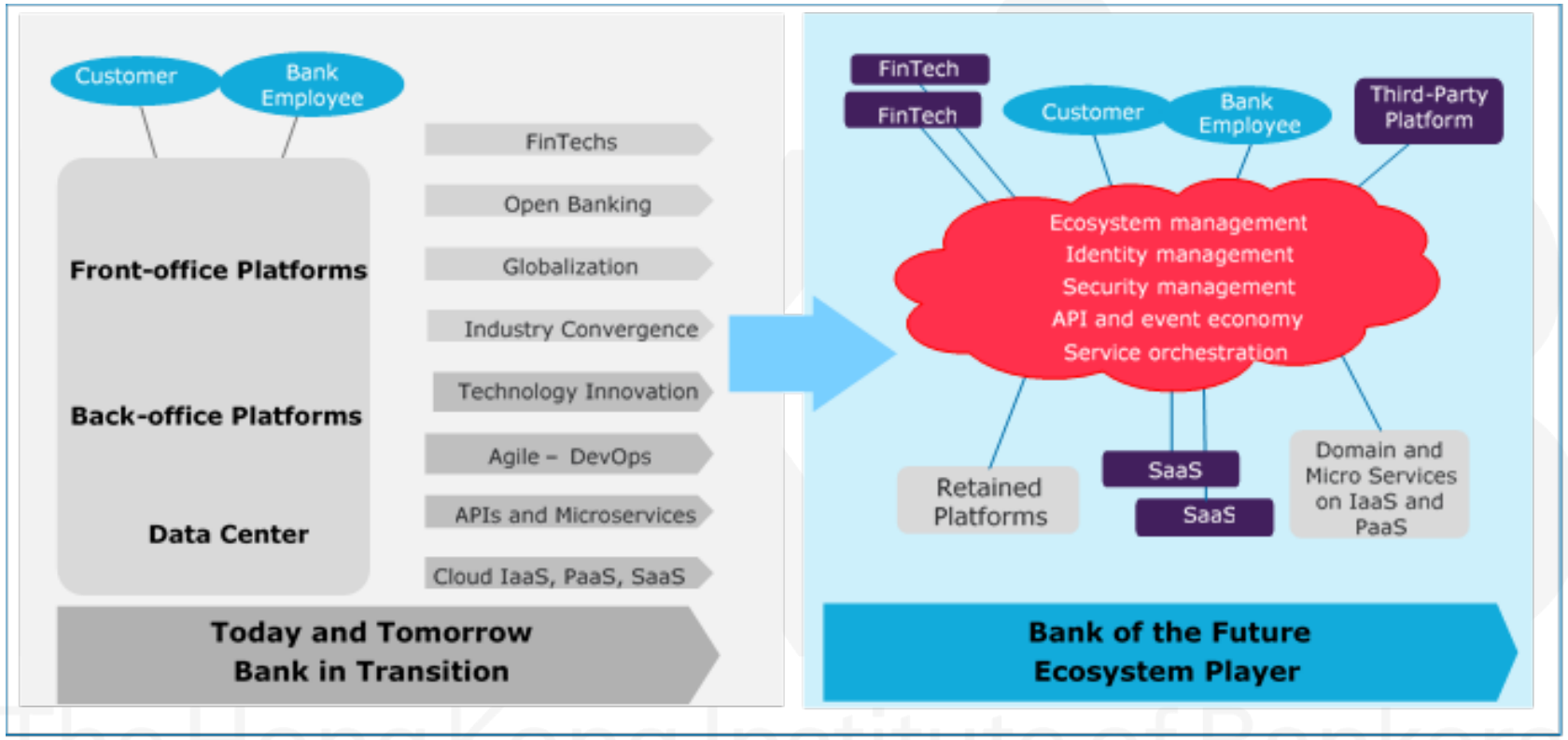


Customer-centric (Data-driven)

https://medium.com/fintechtris/fintech-focus-what-is-banking-as-a-service-baas-2627e9a73377

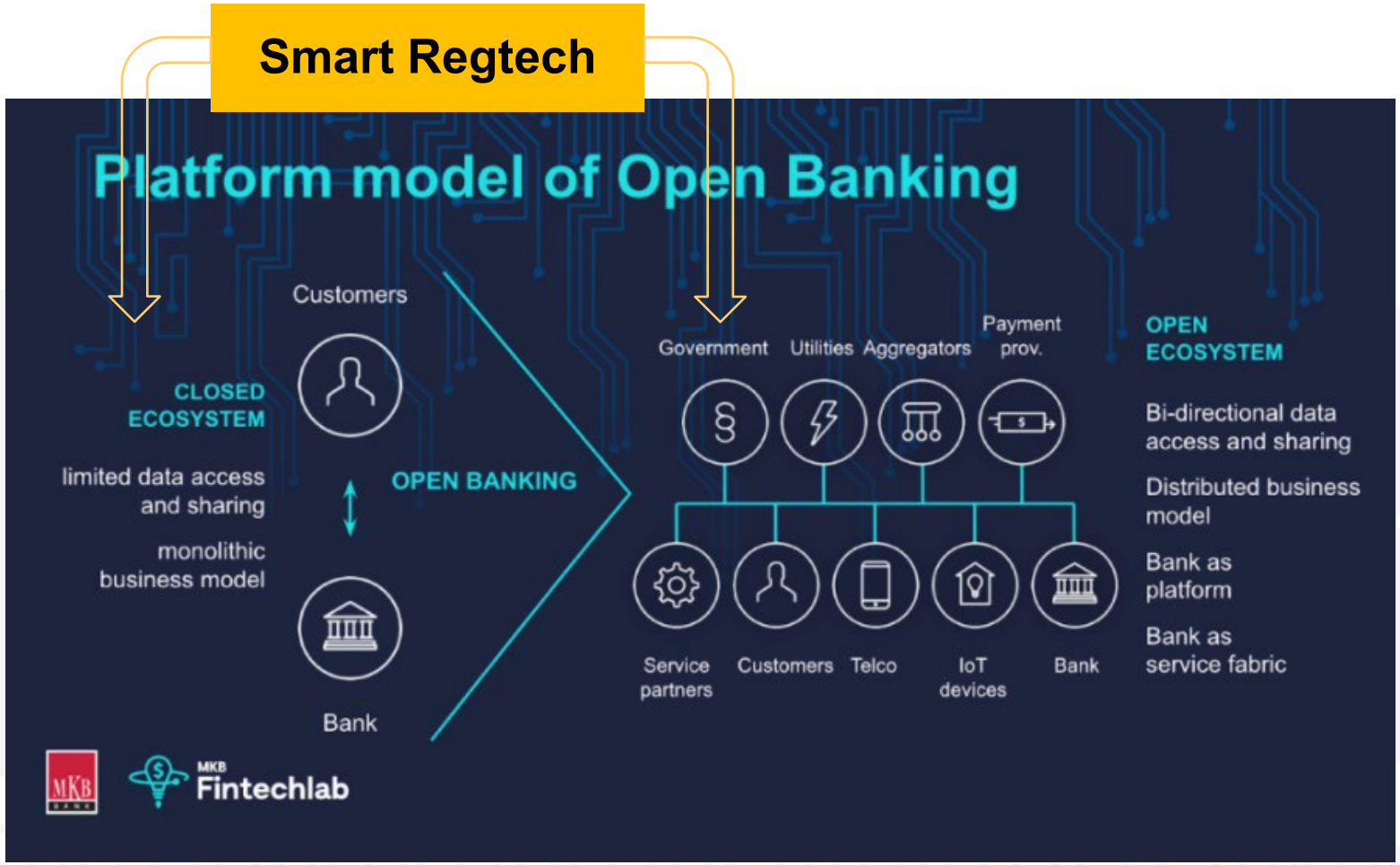
7.7 Future Banking and Regtech Strategy

Customer-centric (Data-driven)



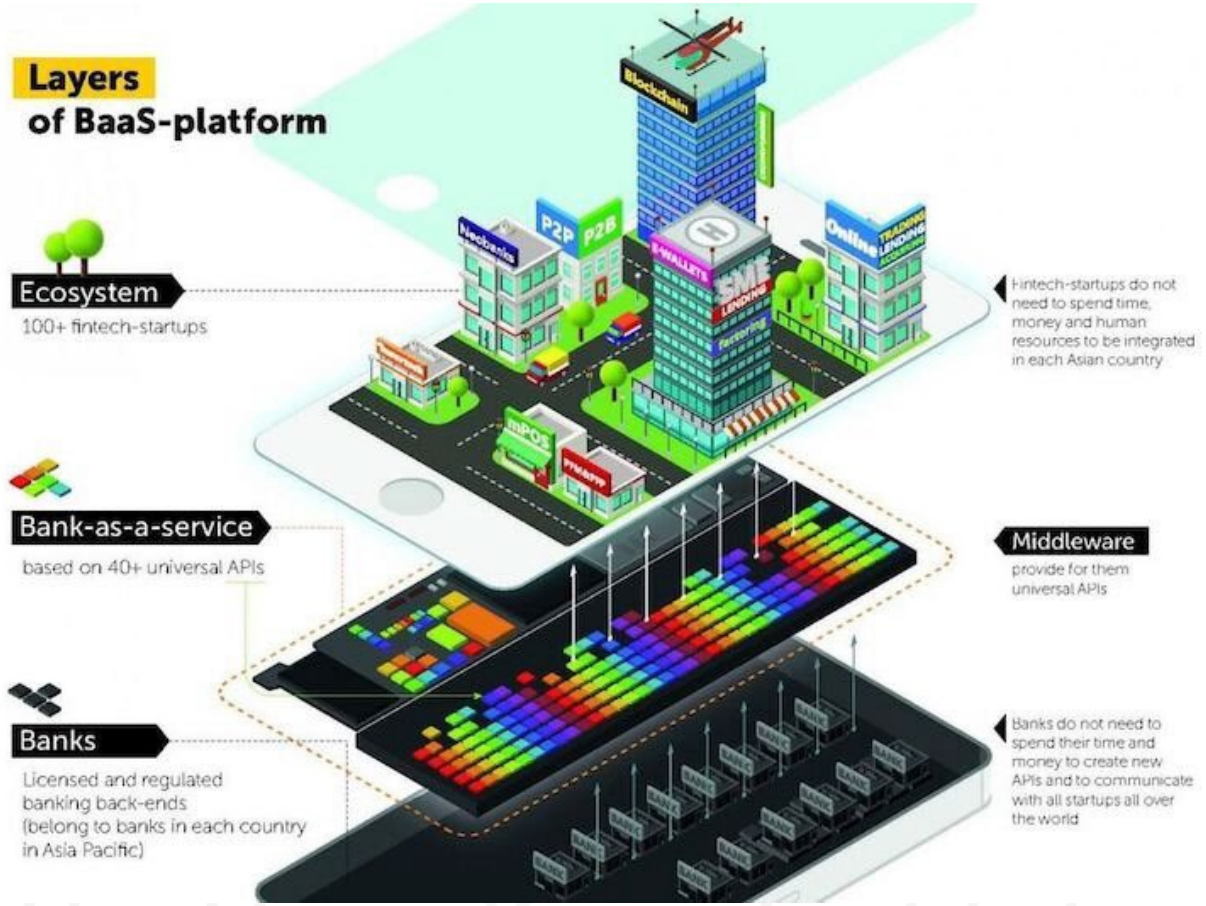
https://www.capgemini.com/2018/04/the-bank-of-the-future-an-ecosystem-of-services/

7.7 Future Banking and Regtech Strategy



https://mkbfintechlab.medium.com/open-banking-the-key-to-cooperation-between-banks-and-fintechs-a25876c2b63f

7.7 Future Banking and Regtech Strategy



Business IntelOps Team

- Fintel (proactive) & Incident Response (reactive) with talents from IT, data analytics, forensics, innovative design & modeling, and entrepreneurship
- Supported by Finance, Legal & Compliance units

https://medium.com/fintechtris/fintech-focus-what-is-banking-as-a-service-baas-2627e9a73377

Q&A

7.7 Chapter Summary

7.7 Chapter Summary

- The student should have a good understanding and be able to conduct in-depth assessment of the following subject matters (refer to the respective ppt slides and references):
  1. Regtech 2.0 and FPS (slide 9 – 23)
  2. Regtech for a collaboration model between a digital Bank and a Fintech platform (slide 24 – 30)
  3. CBDC/DCEP and its implication to Regtech 2.0 (slide 31 – 42)
  4. Automating financial compliance monitoring and regulation using AI and DLT/Blockchain (slide 43 – 54)
  5. Standard-based technology architecture for Regtech (slide 55 – 58)
  6. Future banking and Regtech strategy (slide 59 – 65)

7.8 Reference & Essential Readings Summary

7.8 Reference & Essential Readings Summary

- Refer to the reading list and the reference at the bottom of the ppt slides.
- Use ChatGPT to assist your reading and understanding of the subject matters.

7.8 Reference & Essential Readings Summary

Essential Readings

- Open Source Intelligence for Financial Investigator and AML Practitioners

  https://blackdotsolutions.com/blog/open-source-investigation-best-practices/

  https://blackdotsolutions.com/blog/what-is-osint/

  https://aml-toolbox.medium.com/financial-crimes-osint-tools-banking-5ede7edbc14f

- Four different types of intelligence and data analytics

  https://iterationinsights.com/article/where-to-start-with-the-4-types-of-analytics/

- "FinTech and the Strategy in the 21st Century, Chapter 6 - Understand RegTech for Digital Regulatory Compliance" p.85 - 102, T. Butler and L. O'Brien, Palgrave Macmillan

  https://link.springer.com/content/pdf/10.1007%2F978-3-030-02330-0_6.pdf

- RegTech Trends and top 100 RegTech companies

  https://www.apiax.com/regtech-guide/

7.8 Reference & Essential Readings Summary

Essential Readings

- Risk Management

  https://www.jisc.ac.uk/guides/risk-management/five-step-model

- FinTech disruptor

  https://www.cbinsights.com/blog/disrupting-european-banking-fintech-startups/

- FPS

  https://fps.hkicl.com.hk/eng/fps/index.php

  https://www.wearepay.uk/what-we-do/payment-systems/faster-payment-system/how-faster-payments-work/

  https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb201809/fa2.pdf

- Innovative Technology in Financial Supervision (SupTech) - the experience of early users, Bank for International Settlement

  https://www.bis.org/fsi/publ/insights9.pdf

7.8 Reference & Essential Readings Summary

Essential Readings

- CBDC / DCEP

  https://cbdctracker.org/

  https://www.investopedia.com/terms/c/central-bank-digital-currency-cbdc.asp

  https://boxmining.com/dcep/

- Banking-as-a-Service (BaaS)

  https://www.businessinsider.com/westpac-10x-future-technologies-partner-for-banking-as-a-service-2019-11

  https://medium.com/fintechtris/fintech-focus-what-is-banking-as-a-service-baas-2627e9a73377

  https://www.finastra.com/viewpoints/articles/future-banking-service-banking-trends-2024

7.8 Reference & Essential Readings Summary

Supplementary Readings

- China's National Digital Currency DCEP / CBDC Overview

  https://boxmining.com/dcep/

- World Bank Group, “Interoperability in Fast Payment Systems – Part of the World Bank Fast Payments Toolkit”, September 2021

  https://fastpayments.worldbank.org/sites/default/files/2021-10/Interoperability_in_FPS_Final.pdf

7.8 Reference & Essential Readings Summary

Further Readings

- Understanding digital signatures

  https://www.docusign.ca/how-it-works/electronic-signature/digital-signature/digital-signature-faq

- eID: discover one of the CEF building blocks

  https://hadea.ec.europa.eu/news/eid-discover-one-cef-building-blocks-2022-06-27_en

- Hayek, F.A., “Denationalization of Money: The Argument Refined. An Analysis of the Theory and Practice of Concurrent Curriencies”, Third Edition, The Institute of Economic Affairs, 1990

  https://nakamotoinstitute.org/static/docs/denationalisation.pdf

7.9 Review Questions

7.9 Review Questions

1. Use ChatGPT or similar AI tools to generate three questions on any of the topics that you have learned in this lecture. Critically analyze the respective answers to show that you have an in-depth understanding/insight/different perspective of the subject matters as compared to a “machine answer”. E.g. How would you address the issue innovatively?
2. There are several questions raised in this lecture that we have discussed in class. Pick any two to answer.

END