

# Blockchain & Money



**Class 13**

**October 30, 2018**

# Class 13 Overview

- Act 3: Financial Sector Use Cases
- Readings and Study Questions
- Payment Systems, Ledgers and Credit Cards
- Technologies Affecting Payments
- Mobile Payments
- Global and U.S. Payment Statistics
- Bitcoin and Blockchain Technology
- Conclusions

# Blockchain and Money – Act 3: Financial Sector Use Cases

- Class 13 & 14 (10/30 & 11/1): Payments
- Class 15 & 16 (11/6 & 8): Central Banks & Commercial Banking
- Class 17 (11/13): Secondary Markets & Crypto-Exchanges
- Class 18 (11/15): A New Approach to Crypto-Exchanges & Payments
- Class 19 (11/20): Primary Markets, ICOs & Venture Capital
- Class 20 (11/27): Primary Markets, ICOs & Venture Capital
- Class 21 (11/29): Post Trade Clearing, Settlement & Processing
- Class 22 (12/4): Trade Finance & Supply Chain
- Class 23 (12/6): Digital ID

# Class 13 (10/30): Readings

- *'The Federal Reserve Payment Study:2017 Annual Supplement'* Federal Reserve
- *'Global Payments Report'* Worldpay
- *'The Best Mobile Apps of 2018'* PC World
- *'Why China's Payment Apps Give U.S. Bankers Nightmares'* Bloomberg
- *'M-Pesa: how Kenya revolutionized mobile payments'* N26 Magazine
- *'Cross-border Retail Payments'* (pages 6 -15, 39) BIS

# Class 13 (10/30): Study Questions

- What are the major trends – mobile apps, digital wallets, open banking, and enhanced methods of bank transfers & authentication - in payment systems today?
- What lessons can be drawn from non-blockchain payment innovations, such as Alipay, WeChat Pay, M-Pesa, India's IMPS, and U.S. mobile payment apps?
- What are the challenges and opportunities in the current cross-border payment system architecture?

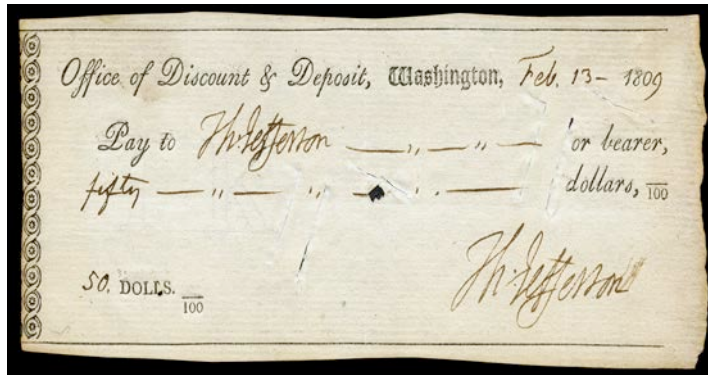
# Guest – Alin Dragos



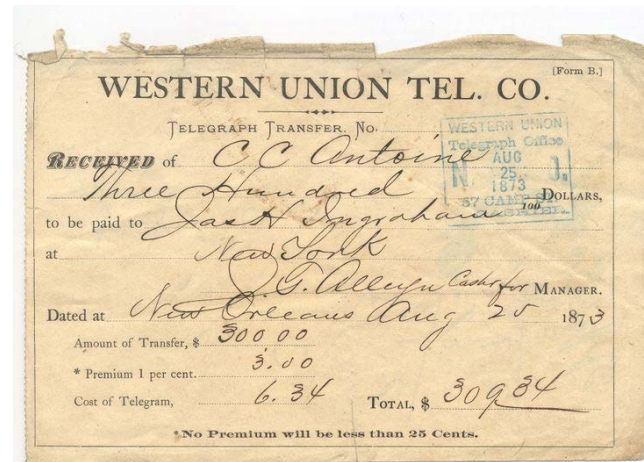
- *Heads strategic partnerships for the Digital Currency Initiative, and leads product management for the DCI's efforts on Layer 2 solutions.*
- *Before MIT, he was a vice president at First Data Corporation, a leading payment system provider – he was responsible for a \$200M P&L and an organization of ~200 employees.*
- *Previously, he spent 3 years in the startup world, raising seed funds, scaling up businesses and managing a post-acquisition integration.*

# Payment System

A Method to Amend and Record Entries on Ledgers for Money  
Authorizing, Clearing and Recording Final Settlement



**Personal Check**  
**Thomas Jefferson**  
**1809**



**Western Union**  
**Telegram**  
**1873**



Image by [ajmexico](#) on flickr. CC BY

**Telex**  
**1950s – 1970s**

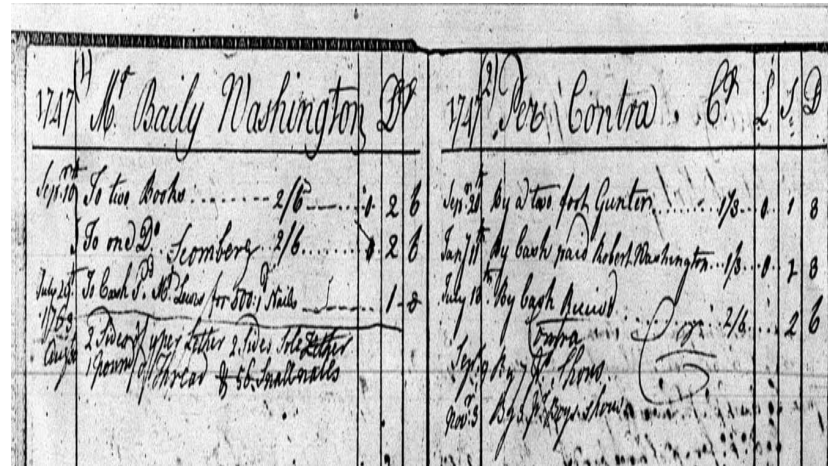
# Financial Ledgers

Record Economic Activity and Financial Relationships

Record Transactions and Accounts



**Proto Cuneiform**  
**Uruk, ca 3000 B.C**



**Personal Ledger**  
**George Washington**  
**1747**



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**IBM 360**  
**1961**



# Credit Cards

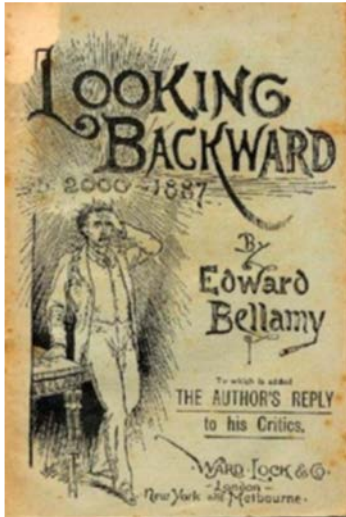


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Term 'Credit Card'  
Edward Bellamy's  
Science Fiction  
'Looking Backward'  
1887



Charge Plates &  
Credit Coins  
Late 1880s – 1960s



First Bank Card  
Charge-It  
First National Bank  
Brooklyn, 1946



Merchant Credit Cards  
Late 1920s – 2000s 9

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# Credit Cards



**First General Merchant Card**  
**Diners' Club**  
**1949**



**American Express**  
**First Plastic Card**  
**1959**



**Bank of America**  
**First General Purpose**  
**Credit Card**  
**1966**

# Credit Card Processing



**Slide Card Imprinter**  
**1950s**



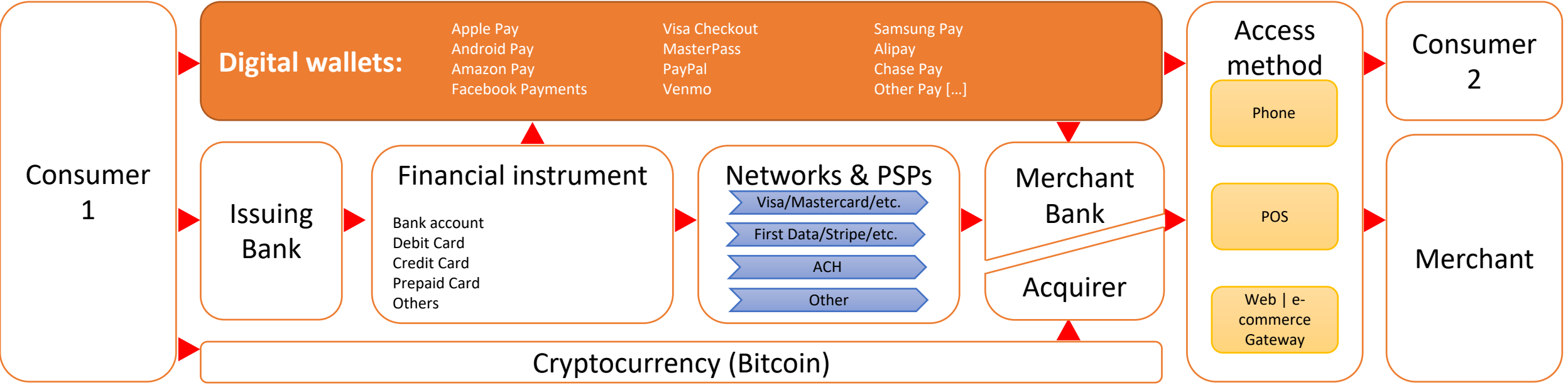
**Visa Imprinter**  
**1979**



**Payment Terminal**  
**2018**

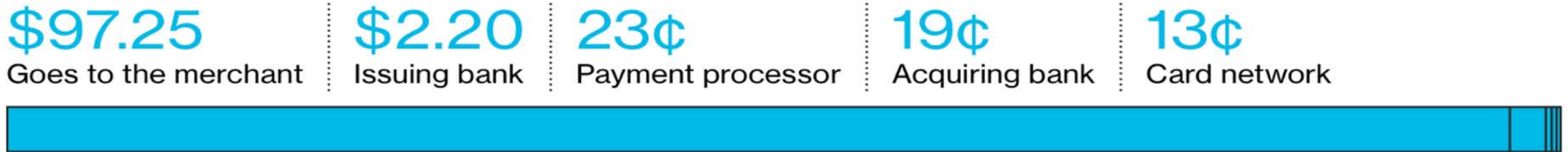
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# Modern Payment Systems



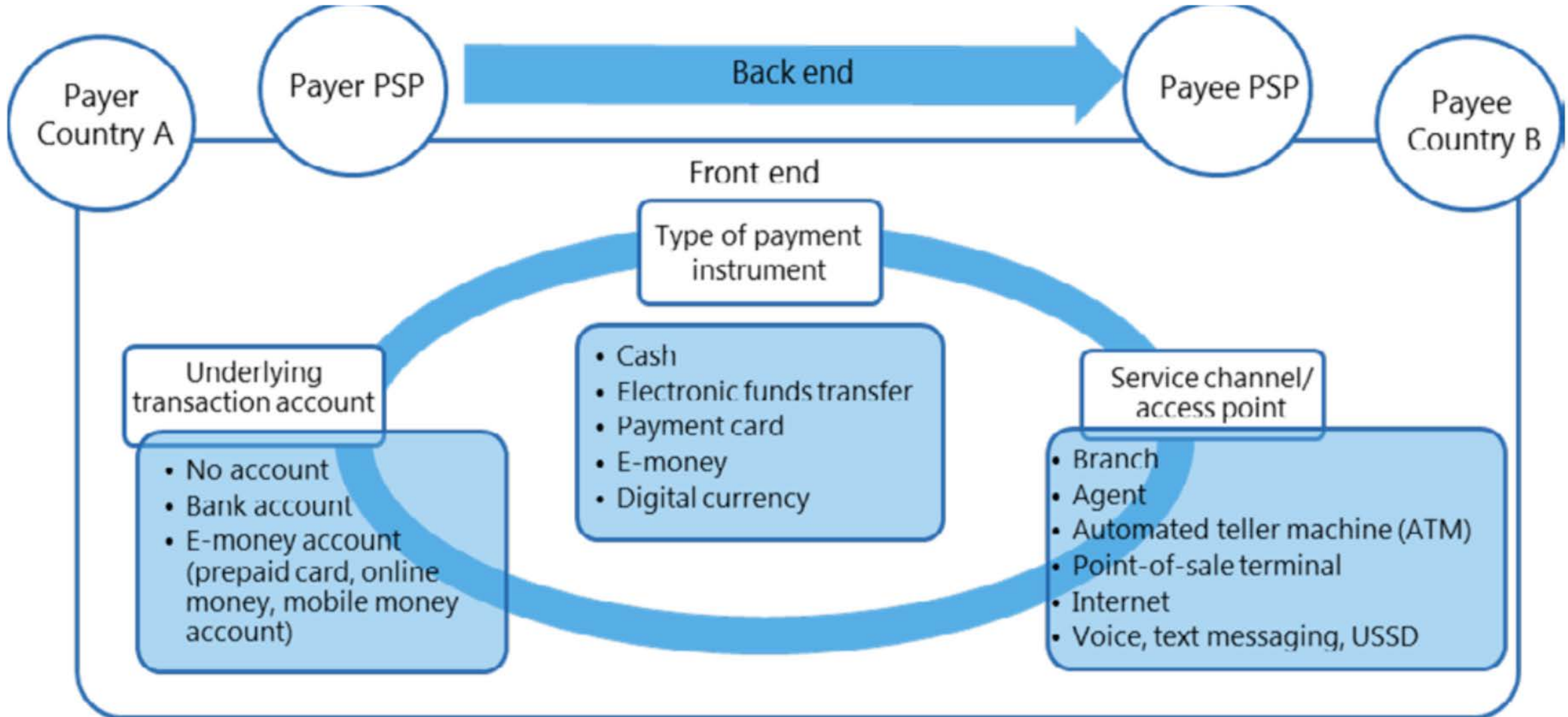
# Transaction Breakdown

In Typical \$100 Purchase

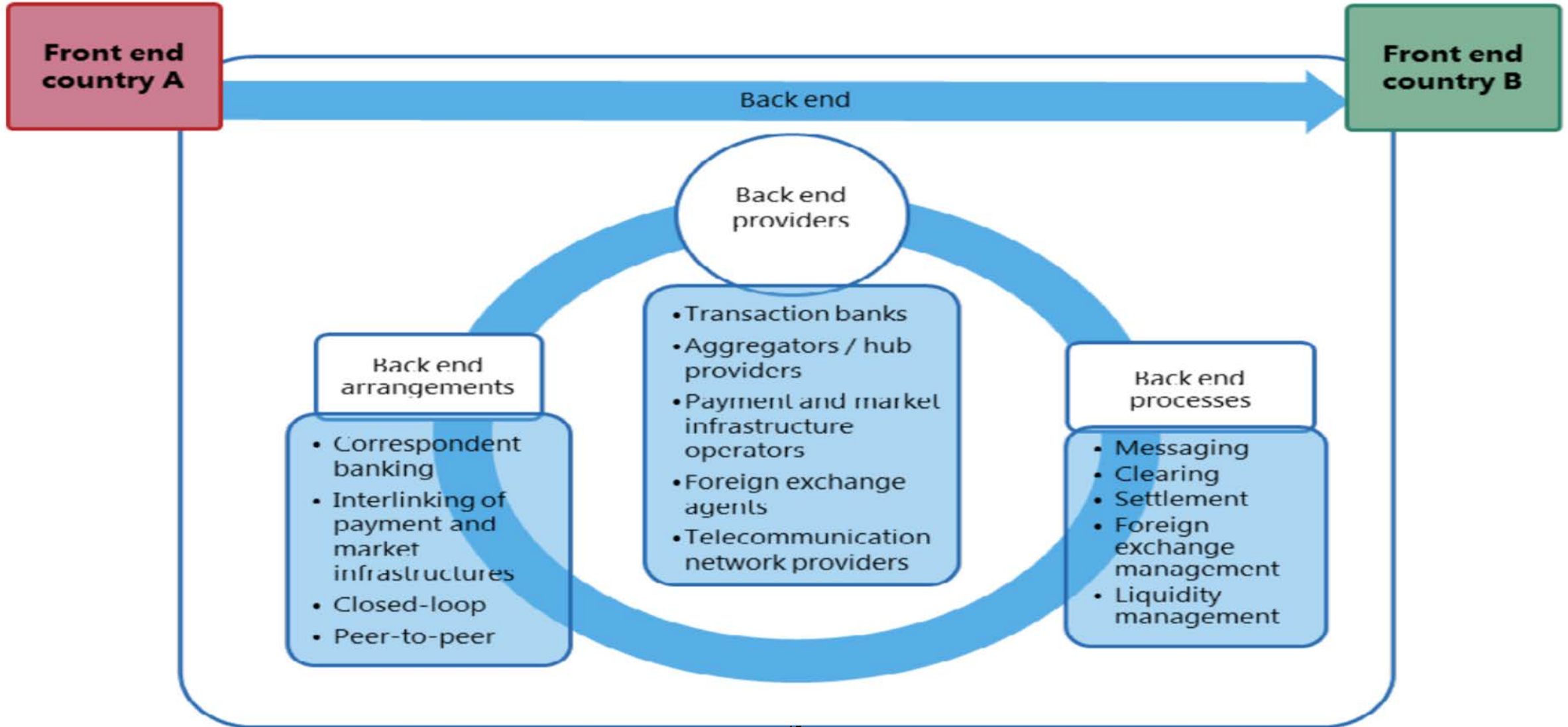


Source: *'Why China's Payment Apps Give U.S. Bankers Nightmares'*

# Cross Border Payments – Front End



# Cross Border Payments – Front End



# Public Policy Framework

- Guarding Against Illicit Activity
- Financial Stability
- Protecting the Investing Public



# Technologies of our Time Affecting Finance



Image by Tokumeigakarinoashima . CC0

## AI & ML



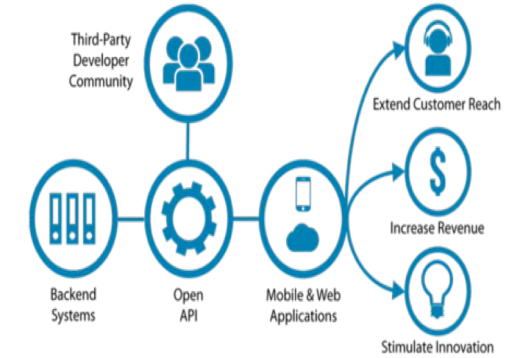
Image by Scott Robinson. CC BY.

## Blockchain



Image by Jacob Gube. CC BY.

## Cloud



Courtesy of RestCase. Used with permission.

## Open API



Image by NEC Corporation of America. CC BY

## Biometrics



Image by Mike Seyfang. CC BY.

## Chatbots



Image by Hakan Dahlstrom. CC BY

## Mobile



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## RPA

# Early Cryptographic Digital Currencies ... All Failed

- DigiCash (David Chaum) – 1989
- Mondex (National Westminster Bank) - 1993
- CyberCash (Lynch, Melton, Crocker & Wilson) – 1994
- E-gold (Gold & Silver Reserve) – 1996
- Hashcash (Adam Back) – 1997
- Bit Gold (Nick Szabo) – 1998
- B-Money (Wei Dai) - 1998
- Lucre (Ben Laurie) – 1999

# Digital & Mobile Payments



1998



1999



2003



2007



Mobile App

2011



2011



2013



2014

# Global Payments Methods

	2016	2021
■ Credit Card	29%	15%
■ eWallet	18%	46%
■ Bank Transfer	17%	16%
■ Debit Card	13%	8%
■ Cash on Delivery	9%	7%
■ Charge & Deferred Debit Card	6%	3%
□ Pre-Paid	3%	3%
■ PostPay	2%	1%
■ PrePay	2%	1%
■ Other	1%	0%

# Federal Reserve Report on Non-Cash Payments - 2015

	Number	Value	Average
<b>Card payments</b>	<b>103.5</b>	<b>5.65</b>	<b>55</b>
<b>Debit cards</b>	<b>69.6</b>	<b>2.56</b>	<b>37</b>
<b>Non-prepaid</b>	<b>59.0</b>	<b>2.27</b>	<b>38</b>
In person	49.5	1.58	32
Remote	9.5	0.69	73
<b>Prepaid</b>	<b>10.6</b>	<b>0.30</b>	<b>28</b>
General purpose	4.3	0.15	35
In person	3.6	0.10	29
Remote	0.8	0.05	63
Private label	3.6	0.07	20
Electronic benefits transfers (EBT)	2.6	0.08	29
<b>Credit cards</b>	<b>33.9</b>	<b>3.08</b>	<b>91</b>
General purpose	31.0	2.80	90
In person	21.7	1.30	60
Remote	9.3	1.50	161
Private label	2.8	0.28	98
<b>Network automated clearinghouse payments</b>	<b>19.3</b>	<b>41.64</b>	<b>2,159</b>
Credit transfers	8.0	26.78	3,333
Debit transfers	11.3	14.86	1,321
<b>Check payments</b>	<b>17.9</b>	<b>28.97</b>	<b>1,614</b>
U.S. Treasury checks	0.1	0.14	2,413
Postal money orders	0.1	0.02	226
Commercial checks <sup>1</sup>	17.8	28.80	1,618
Interbank <sup>1</sup>	13.3	20.92	1,573
On-us <sup>1</sup>	4.5	7.88	1,751

# **Satoshi Nakamoto: Bitcoin P2P e-cash paper**

## **October 31, 2008**

“I've been working on a new electronic cash system that's fully peer-to-peer, with no trusted third party.”

# Use Cases: Assessing Costs & Benefits

- **Benefits of blockchain technology?**
  - What problem or 'pain point' is being solved for stakeholders? For a company?
  - What value is being created or captured?
  - What are competitors doing to address similar 'pain points'?
  - Why is blockchain technology the best solution?
- **What are the specifics of the blockchain use case?**
  - Which costs of verification or networking can be reduced?
  - Which transactions need recording?
  - Which stakeholders need write and read access to ledgers?
  - What is the customer interface and how is it better than current interface?

# Use Cases: Assessing Costs & Benefits

- **Costs of technical challenges and transition?**
  - What tradeoffs of scalability, performance, privacy & coordination are necessary?
  - Can Permissioned blockchain adequately address use case?
  - How can broad adoption be realized?
- **Are *net* benefits sufficient?**



# Why use a Blockchain vs. Traditional Database?



## Traditional Databases

Trusted Party Hosts Data

Trusted Party can Create, Read, Update, & Delete (CRUD)

Client Server Architecture

## Private Blockchain

Known Participants

Private Write Capability

Append Only Timestamped Log

Publicly Verifiable

No Native Currency

## Public Blockchain

Unknown Participants

No Central Intermediaries

Public Write Capability

Peer to Peer Transactions

Token Economics

# Class 14 (11/1): Study Questions

- What lessons can be drawn from the challenges for blockchain related payment applications? Might Layer 2 solutions, such as Lightning, resolve these challenges?
- What are the opportunities in cross-border payments? In domestic P2P or P2B payments?
- What are tradeoffs of utilizing permissioned vs. permissionless payment applications?

# Class 14 (11/1): Readings

- *'How Blockchain Can Finally Fulfill its Promise in global Payments'* CoinDesk
- *'Extending the World of Payments to Blockchain'* ACI Worldwide
- *'The Payment Industry is About to be Struck by Lightning: Expert Take'* Coin Telegraph
- *'Why Stripe Gave up on Bitcoin and Blockchain Payments'* Fortune
- *'How XRP Fits into Ripple's Payment Products Explained'* CoinDesk

# Conclusions



- Payment Systems Amend and Record Ledgers for Money
- Technology is Rapidly Changing Payment Systems around the Globe
- Payment Systems cost 0.5 % – 1.0 % of Global GDP
- Blockchain Technology may Provide a new P2P Method to Make Payments
- In Assessing Potential Use Cases, though, the Devil is in the Details

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15.S12 Blockchain and Money  
Fall 2018

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