FinTech 2021: Primer

Mike Purewal Fall 2021

Overview & Landscape | Policy Enabler | Enabling Technology | FinTech Activities | Private FinTech Valuations

Outline

1. Overview & Landscape

2. Policy Enabler

3. Enabling Technology

4. FinTech Activities

5. Private FinTech Valuations

FinTech Definition [FSB 2017]

 "Technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services"
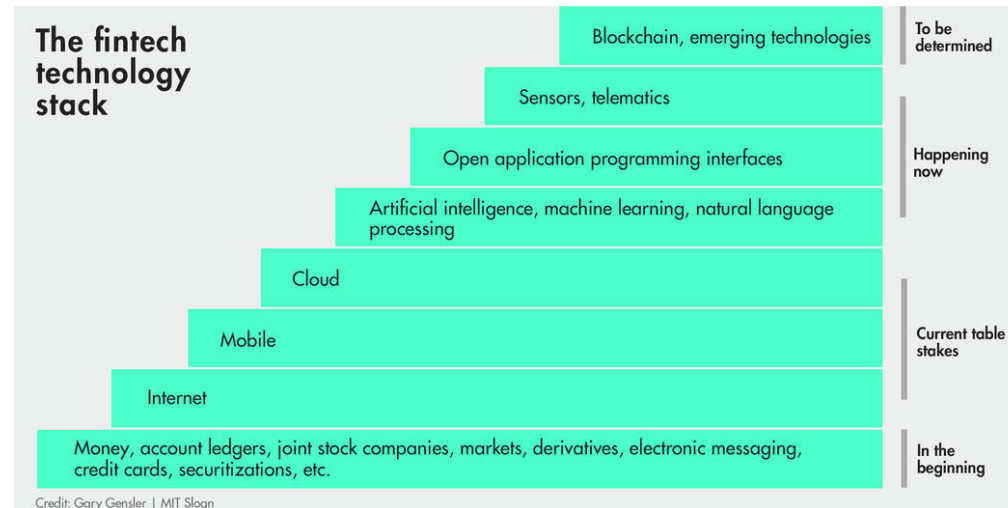
Participants: New School or Old School? Both.

- By this definition, FinTech consists of disrupters **and** incumbents: traditional players are too big in this space to ignore.

- Participants & Advantage:
  - Big Finance – Moat
  - Big Tech – Means
  - Start-ups – Asymmetric risk takers
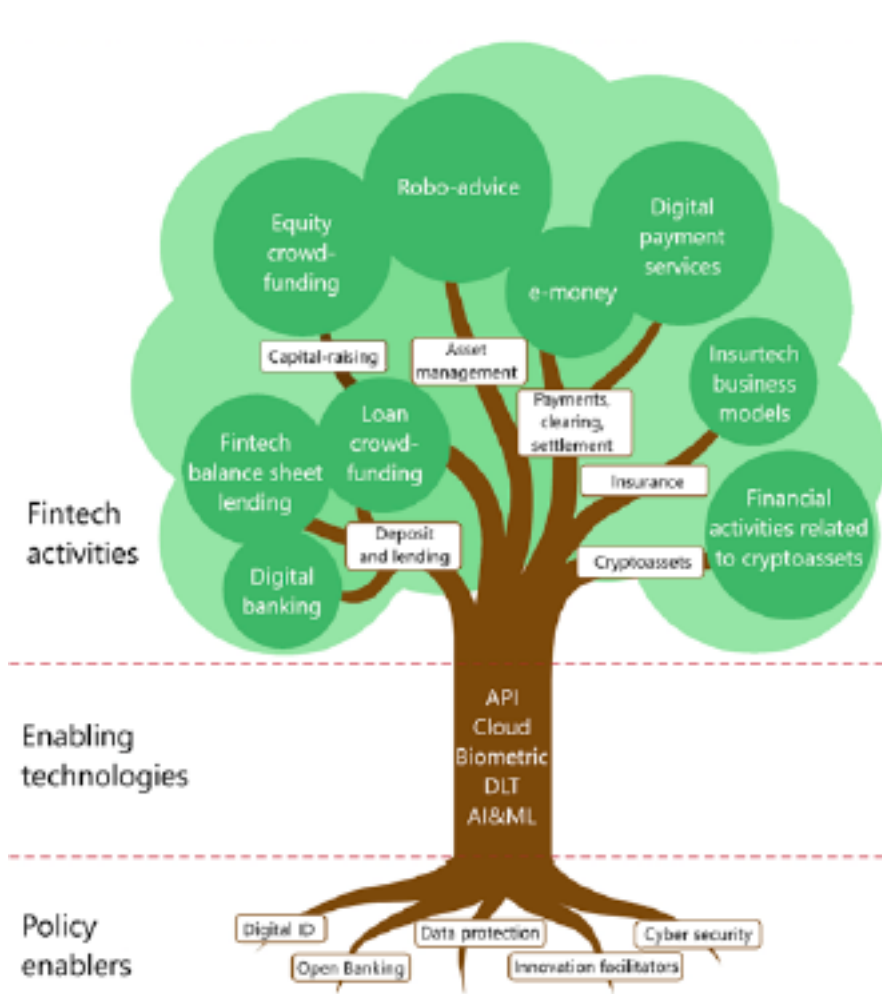
Crisis + Internet, Mobile, Cloud

'Recent' FinTech is an outgrowth of 2008 Great Financial Crisis (GFC).

- Technology firms moved in & offered services that have been only offered by traditional Financial Institutions. 3 developments from mid-1990s gave birth to Modern FinTech: **internet, mobile, cloud**.

- Regulatory responses & reforms following GFC:
  - Advantage for smaller FinTechs that don't fit in a regulatory 'box'. Example: Internet companies in 2000's.
  - New capital requirements created new models for risk transfer (RWA).

Technology enablers

The fintech technology stack

Layer	Timing
Blockchain, emerging technologies	To be determined
Sensors, telematics	Happening now
Open application programming interfaces	
Artificial intelligence, machine learning, natural language processing	
Cloud	Current table stakes
Mobile	
Internet	
Money, account ledgers, joint stock companies, markets, derivatives, electronic messaging, credit cards, securitizations, etc.	In the beginning

Credit: Gary Gensler | MIT Sloan

Conceptual Frameworks

BIS 2020 [No 23], page 2

FinTech Verticals

Payments Technology	Digital Banking	Digital Wealth Management	Capital Markets (Algorithmic trading, HFT, etc.)	FinTech Lending	Equity Crowdfunding	InsurTech	PropTech

Functional Areas

Financial Regulation
Risk Management
Funding
Valuation

Emerging Technologies for Financial Services

Distributed Ledger Technology / Blockchain
IoT (Internet - of - Things)
AI (Artificial Intelligence)
Big Data Analytics
Cybersecurity
Biometrics
Open Source Computing / API's
Cloud Computing
Quantum Computing
VR / AR (Virtual / Augmented Reality)
Automation / Robotics

FinTech Horizontals

Cashing in on innovation: a taxonomy of FinTech
Michael B. Imerman1   Frank J. Fabozzi 2020

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Taxonomy

- **Policy Enablers:** *Public policy measures & initiatives that support the development of FinTech activity & the use of enabling technology. [BIS]*
  - A. Open Banking / API
  - B. Data Protection
  - C. Cyber Security

- **Enabling Technologies***: Makes innovation possible in the provision of financial services & form the backbone of FinTech activities. [BIS]*
  - A. <u>Storage</u>: Cloud, Data
  - B. <u>Modeling Techniques</u>: AI, ML, DL, NLP, Open Source
  - C. <u>Compute & Hardware</u>: Cloud, Blockchain, DLT, Biometric, Geolocation

- **Fintech Activities**
  - A. Payments
  - B. Lending: Credit, Buy Now Pay Later (BNPL)
  - C. Deposits / Digital Banking: Challenger & Neo- Banks
  - D. Trading & Asset Management (Robo-Advisory)
  - E. Capital Markets
  - F. Insurance
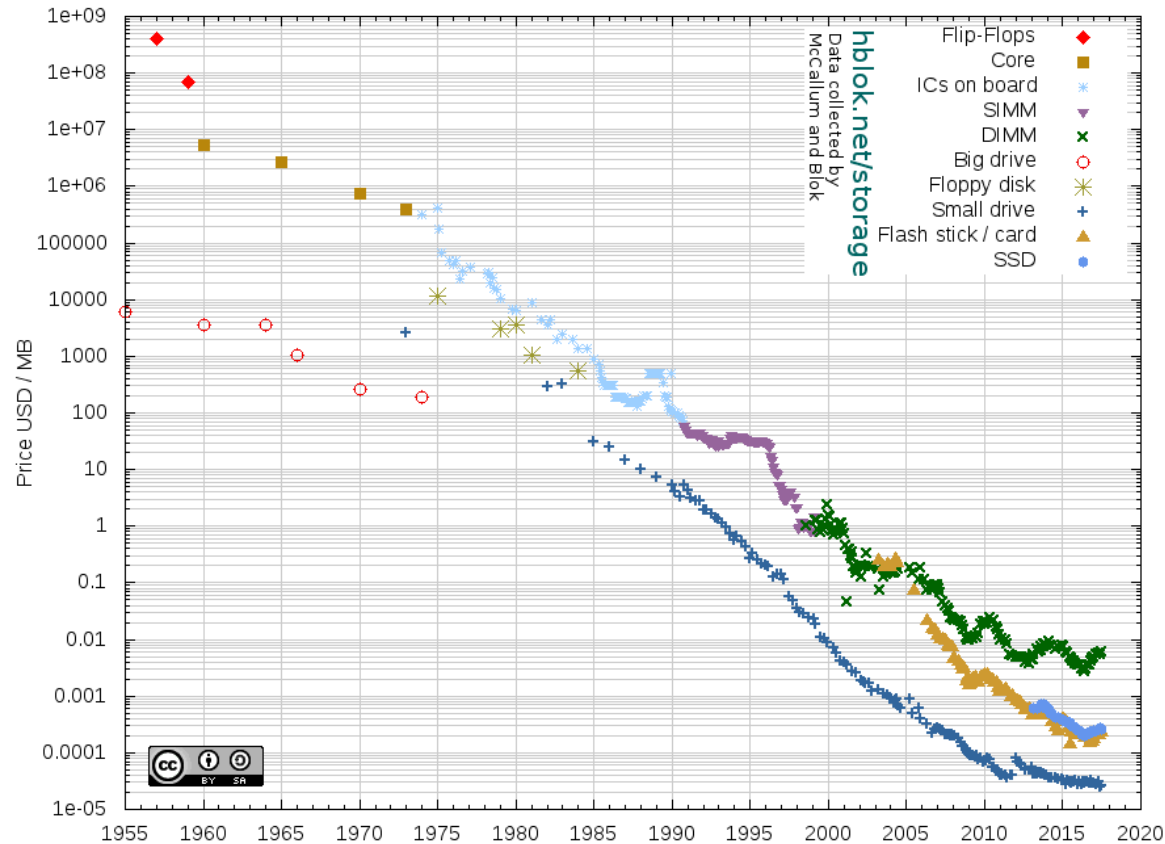
Application Programming Interfaces

Open Application Program Interfaces (Open API) allow *outside* Developers access & an ability to *Permissioned Customer Data* into 3rd Party Applications. [Mulesoft] Example: waiter, airline ticketing.

Open Banking

- **Open Finance** is enablement of 3rd party vendors to utilize customer permission for data access across *multiple products.* **Open Banking** applies specifically to payment accounts. [Investopedia, BIS, Barclays]

- Objectives: Account Opening, on-boarding, report generation, underwriting.

- Companies: Envest-Yodlee, MX, Plaid-Quovo, Galileo, Finicity, Plaid

- Regulation: Open Banking Standard (UK), PSD2 (Europe)

- Alternatives: Screen scraping, reverse engineering & robotic process automation (RPA)
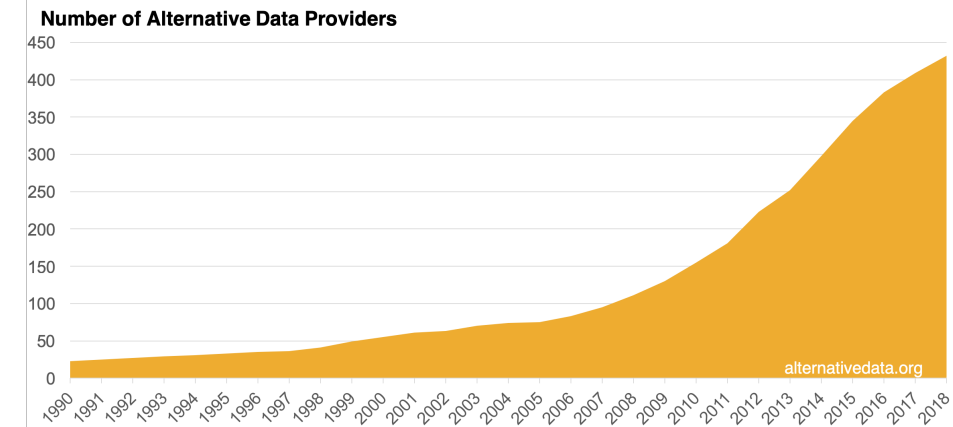
A. Storage: Data

Historical Cost of Computer Memory and Storage

Reduction of cost has made storage of data *very cheap*. Combined with 'digital everything'/mobile, companies have stored a vast amount of data to allow them to try to make more quantitatively driven decisions.

Alternative Data

Number of Alternative Data Providers

Alternative Data: refers to non-traditional data sets that investors use to guide investment strategy. Examples: credit card transaction data, mobile device data, IoT sensor data, satellite imagery, social media sentiment, weather data and ESG data. Reference

Source

B. Modeling Techniques

- **Artificial Intelligence**: IT systems that perform functions requiring intelligence when performed by people. [FSB 2017]

- **Machine Learning**: practice of using algorithms to parse data, learn from it, and then make a determination or prediction about something in the world. So rather than hand-coding software routines with a specific set of instructions to accomplish a particular task, the machine is "trained" using large amounts of data and algorithms that give it the ability to learn how to perform the task. [NVDIA]

- **Deep Learning**: is part of a broader family of machine learning methods based on artificial neural networks. [Wiki]

- **NLP**: subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human language. [Wiki]

- **Open Source**: source code that is made freely available for possible modification and redistribution. [Wiki]
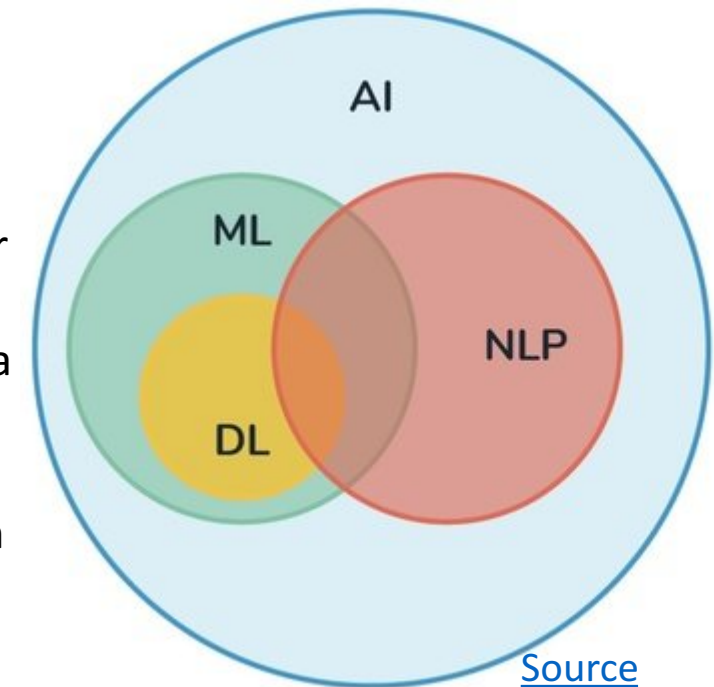
Source

- Linux:
  - Torvalds: "What astonishes so many people is that the open source model actually works."
  - 70% of web servers, including Azure.
  - Basis for Android: 86% smartphones.
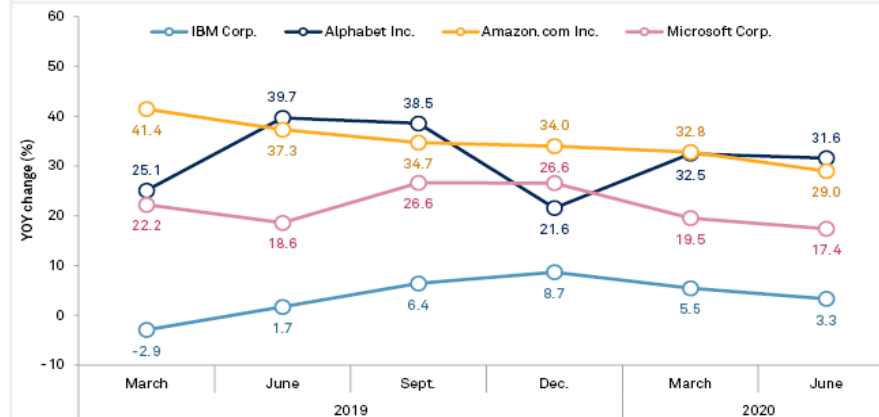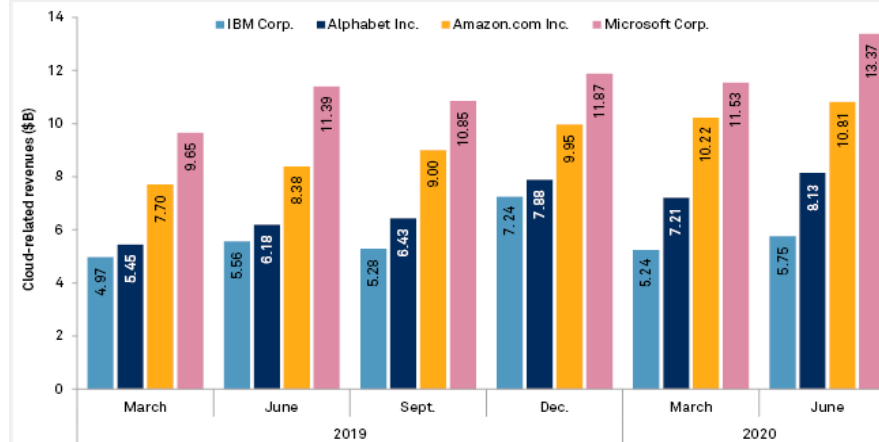 - 1991: 10k lines, 2009: 325M lines, 15k contributors, ~$8B estimate.

The Open Source Renaissance
Venture Deal Volume and Total Sizes

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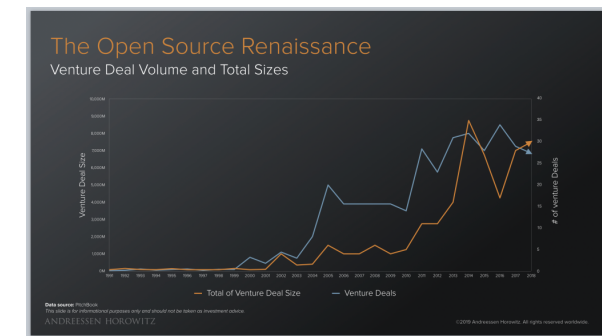
C. Compute / Hardware

Technology
- Cloud
- DLT
- Sensors
- Mobile
- API

Cloud market leaders' revenues and YOY performance

IBM Corp. ■ Alphabet Inc. ■ Amazon.com Inc. ■ Microsoft Corp.

Data compiled Aug. 3, 2020.
Amazon reports quarterly financial results for its Amazon Web Services or AWS as a stand-alone segment. The AWS segment includes global sales of computer, storage, database, and other service offerings for start-ups, enterprises, government agencies, and academic institutions. Microsoft's Intelligent Cloud segment includes a variety of public, private, and hybrid server products and cloud services for businesses and developers.
As of fourth quarter 2019, Alphabet separated its Google Cloud into a new segment from the Google other segment. For comparison this chart shows first-quarter 2019, second-quarter 2019, fourth-quarter 2019, first-quarter 2020 and second-quarter 2020 revenues as aggregates of Google Cloud and Google other segment revenues.
IBM's cloud figures reflect its new Cloud & Cognitive Software segment, comprised of cloud and data platforms, cognitive platforms and transaction processing platforms.
Sources: Company filings; S&P Global Market Intelligence

Source

How a blockchain works

1. A wants to send money to B
2. The transaction is represented online as a 'block'
3. The block is broadcast to every party in the network
4. Those in the network approve the transaction is valid
5. The block then can be added to the chain, which provides an indelible and transparent record of transactions
6. The money moves from A to B
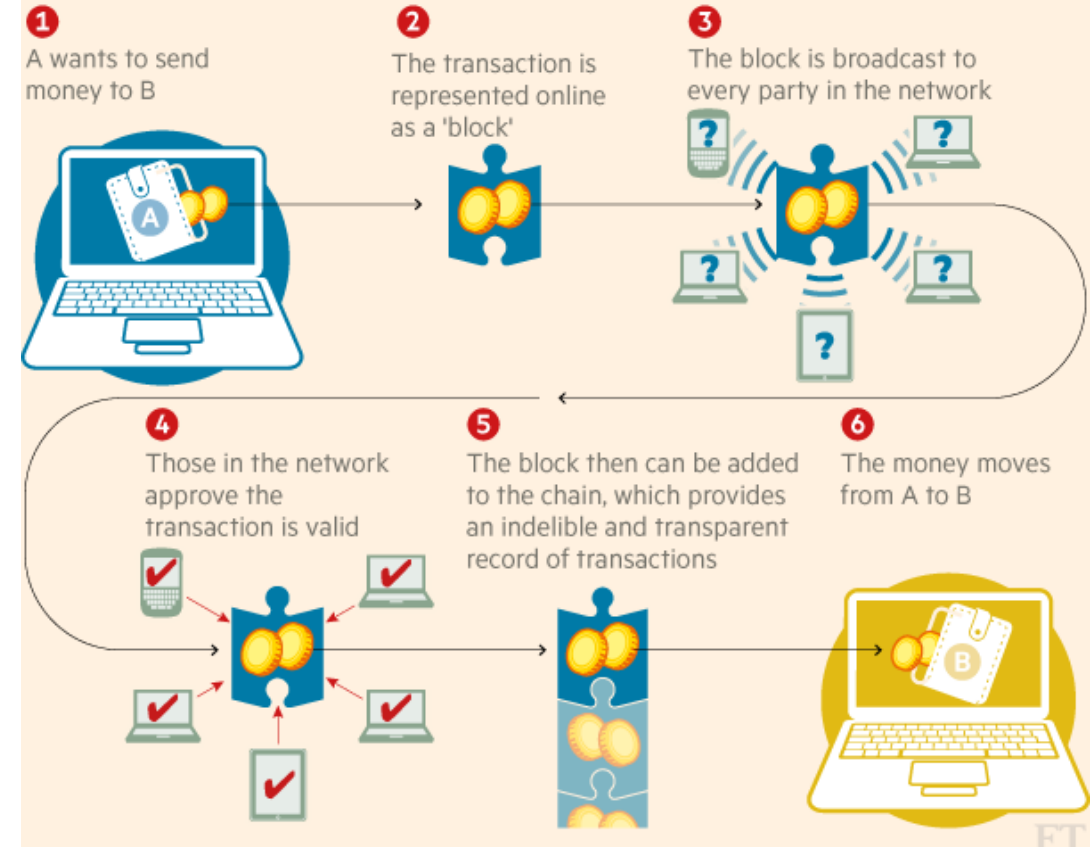
Source

"Any financial operation that has low transparency and limited traceability is vulnerable to disruption by blockchain applications."

–Bruce Weber and Andrew Novocin

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A. Payments

Trends[1]

North America e-com payment methods

	2020	2024*
Credit Card	32.0%	26.7%
Digital/Mobile Wallet	29.3%	40.5%
Debit Card	20.1%	19.5%
Charge & Deferred Debit Card	7.4%	3.8%
Bank Transfer	5.8%	3.2%
Buy Now Pay Later	1.6%	4.5%
PostPay	0.9%	0.7%
Pre-Paid Card	0.9%	0.2%
Direct Debit	0.8%	0.6%
Cash on Delivery	0.7%	0.1%
PrePay	0.4%	0.1%

North America POS payment methods

	2020	2024*
Credit Card	38.6%	38.4%
Debit Card	28.6%	25.8%
Cash	11.4%	8.7%
Digital/Mobile Wallet	9.6%	15.5%
Charge Card	4.0%	4.0%
Pre-Paid Card	3.9%	4.0%
POS Financing	3.9%	3.6%

Payment Structure[2]

CARDHOLDER — A. $100 CREDIT CARD PURCHASE → MERCHANT

F. PAYS ISSUER $100 — E. BILLS CARDHOLDER $100 — B. SUBMITS TRANSACTION DATA FOR AUTHORIZATION: $100 — D. MERCHANT PAID $97.25

VISA TAKES $0.13

ISSUER (CAPITAL ONE) KEEPS $2.20 IN INTERCHANGE FEE — $98.30 — C. ISSUER APPROVES TRANSACTION AND TRANSFERS MONEY — ACQUIRER (CHASE) KEEPS $0.19 FOR ACQUIRING FEE — $97.25

Background

Definitions:

- Digital Wallet: software-based system that securely stores users' payment information and passwords for numerous payment methods and websites. (Investopedia)

- Payment System: any system used to settle financial transactions through the transfer of monetary value. (Wiki)

- Embedded Payments: payment processing functionality that is included within a software solution such as business management software (Source). Apple, Uber, Starbucks

Opportunity

- Payment Pain Points: Chargebacks, complexity, costs, cross-border, data privacy, delayed settlement, financial/social inclusion, fraud, regulatory

- Companies:
    - eBay: BillMeLater (2008), First Data: Clover (2012), Square (2015), PayPal: iZettle (2018)
    - Venmo, Stripe ("payment products"), Toast

[1]https://worldpay.globalpaymentsreport.com/en/
[2]https://fin.plaid.com/articles/major-players-in-payment-processing/

Consumer Lending[1]

- **Lending Categories**: Mortgage, student loans, auto, credit card, personal

- **Online Marketplace**: Lending Tree (TREE), Lending Club (LC); note "P2P"->Marketplace Lenders (MPLs)

- **Credit Scoring**: Credit Karma, Sesame, Mint, Nerdwallet, Quizzle

- **Lending Value Chain[1] in the Loan Lifecycle**
  - Origination / Customer Acquisition
  - Credit Assessment / Underwriting
  - Disbursement
  - Servicing & Monitoring
  - Collection

Mortgages[2]

Mortgage Originators: Better, Blend, Rocket (Quicken)

Top mortgage originators in 2019

Company (top-level ticker)	Funded loans 2019 ($B)	Funded loans YOY change (%)	Loan approval rate[1] 2019 (%)	Loan approval rate YOY change (pps)	Market share (%) 2019 (%)	Market share YOY change (bps)
● Quicken Loans Inc.	141.64	73.9	71.22	3.2	5.32	124
● Wells Fargo Bank NA (WFC)	124.56	26.2	28.17	1.0	4.68	-27
● United Shore Financial Services LLC	107.95	159.2	82.55	2.7	4.06	197
● JPMorgan Chase Bank NA (JPM)	87.76	24.8	38.46	0.7	3.30	-23
● Bank of America NA (BAC)	85.27	50.2	46.49	4.4	3.20	36
● loanDepot.com LLC	44.87	38.9	57.91	4.6	1.69	7
● US Bank NA (USB)	41.28	35.4	38.12	1.8	1.55	2
● Caliber Home Loans Inc.	40.80	38.6	48.23	-4.1	1.53	6
● Fairway Independent Mortgage Corp.	37.63	45.5	74.74	0.5	1.41	12
● Freedom Mortgage Corp.	28.56	114.0	35.57	11.2	1.07	40
● Guaranteed Rate Inc.	27.56	59.5	66.00	0.3	1.04	17
● PNC Bank NA (PNC)	26.97	30.4	59.03	3.1	1.01	-2
● Citibank NA (C)	26.03	37.9	42.31	1.7	0.98	3
● Flagstar Bank FSB	22.76	16.7	55.04	5.1	0.86	-12
● First Republic Bank (FRC)	21.95	36.7	81.20	1.0	0.82	2
● Guild Mortgage Co.	21.27	32.3	71.20	1.3	0.80	-1
● Citizens Bank NA (CFG)	21.01	70.8	45.65	-3.5	0.79	17
● Nationstar Mortgage LLC (COOP)	19.90	96.1	37.67	-1.9	0.75	24
● Navy FCU	19.78	20.3	46.88	-8.5	0.74	-8
● Walker & Dunlop LLC (WD)	18.15	37.4	88.50	-3.0	0.68	2
Total U.S.[2]	2,661.74	33.4	53.15	2.1		

Company type: ● Commercial bank ● Mortgage bank ● Thrift ● Credit union

Buy Now Pay Later (BNPL)

- Klarna: $46B valuation (6/2021)
- AfterPay: $29B (Square acquisition 8/1/2021)
- Affirm
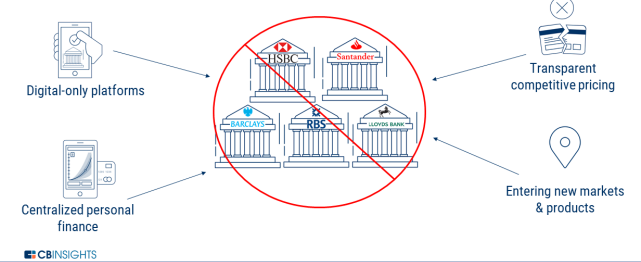- Makes money from merchant

Definition[1]

- **Challenger Banks**: May have recently received a banking or other financial license but are relatively new to the industry. Challenger banks tend to offer a fuller suite of products

- **Neo Banks**: Do not have a banking license; often they partner with incumbent institutions to provide support. Neo-banks also usually have a limited product line ("core banking products") and augment their produt line with personal financial management tools

THE FUTURE OF RETAIL BANKING
Will challenger banks replace physical branches?
Challenger banks are attacking banks across vectors

Digital-only platforms
Transparent competitive pricing
Centralized personal finance
Entering new markets & products

CBINSIGHTS

Features

- **Postal Banking[2]**: market for underserved (socially inclusive).

- **Example Companies**:
  - Intl: Monzo, Revolut, Stailing;
  - US: Chime, Simple, Varo, Current

- **Example Products[3]**

- **Covid Impact:** Incumbents->online & *improve* UX; Customer behavior: branches not as popular;

|		TransferWise	OakNorth	Ferratum	Tinkoff	SoFi	MyBank	WeBank
PROFILE	Founded	Mar-10	Jul-13	May-05	Nov-06	Aug-11	Jun-15	Dec-14
	Legal Status	E-Money Institution, Payment Institution, and others⁶	Bank	Credit Institution, incl. acceptance of deposits	Bank	Consumer Lender, Mortgage Lender, Money Broker, Investment Advisor, Insurance Agency, Money Transmitter	Bank	Bank
	Customer Segments	Retail & Business	Retail & Business	Retail & Business	Retail & Business	Retail	Business	Retail & Business
	Number of Customers (M)[1]	6.0	0.1	1.2	10.0	7.5	17.0	100.0
	Valuation ($B)[2,3]	3.5	2.8	0.2	3.8	4.8	n/a	20.6
	Total Funding ($M)[3]	773	1,000	n/a	90	2,400	n/a	168
	Home Country	UK	UK	Finland	Russia	United States	China	China
	International Presence	Available in 59 countries across all continents	-	25 countries, mainly in Europe and also Australia, Brazil, Canada, Mexico, New Zealand and Nigeria	-	-	-	-
KEY FEATURES	Current Account (incl. Debit / Prepaid Card)	✓	-	✓	✓	✓	-	✓
	International Transfers	✓	-	✓	✓	-	-	-
	Credit Card	-	-	-	✓	-	-	-
	Savings Account	-	✓	✓	✓	-	-	✓
	Investments	-	-	✓	✓	✓	✓	✓
	Personal Loans	-	-	✓	✓	✓	-	✓
	Residential Mortgages	-	✓	-	✓	✓	-	-
	Business Loans	-	✓	✓	-	-	✓	✓
	Insurance	-	-	-	✓	✓	-	-

[1]Fabozzi
[2]Postal Banking
[3]Fincog

Online Trading

- General trend, market influencer
  - "Quants Are Rethinking Stock Trades in the Manic Reddit Era"
- **Platforms:**
  - Retail Brokers: Schwab/TD (2020), MS/E-Trade (2020), Interactive Brokers
  - Asset Managers: Fidelity, Vanguard
  - Banks: JP, BofA (Merrill Edge)
  - FinTechs: Robinhood (2021 HOOD, $40B), Webull, Stash
- **Commission compression:** Race to zero.
- **"Alternative" revenue sources**: PFOF, Margin, Alternative Products (Options)

Retail frenzy helps US stock trading spike to new records
Average daily trading volumes (billions of shares changing hands)

Source: Bloomberg Intelligence
© FT
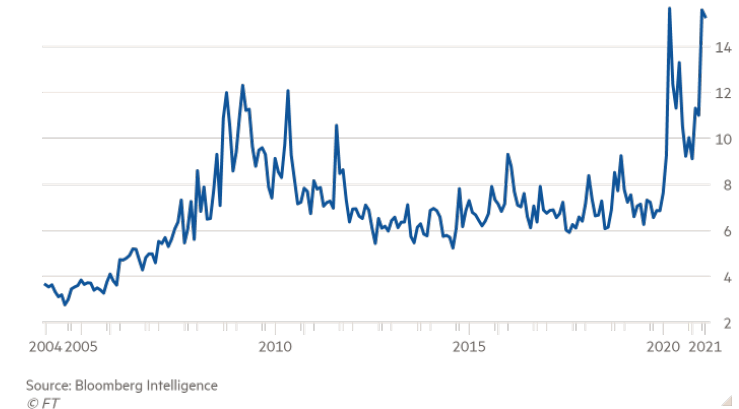
Asset Management

- Roboadvisory: Convergence of 1)online/mobile 2) AI, NLP 3) Passive Investing

- Passive Investing Trend: Indexing (1970s), ETF (1990s). Chart is US Equities only, but trend is across assets and markets.

- Companies: Betterment, Wealthfront, SigFig, Acorn, Vanguard

Passive Owns 53.8% of U.S. Domestic Equity Funds
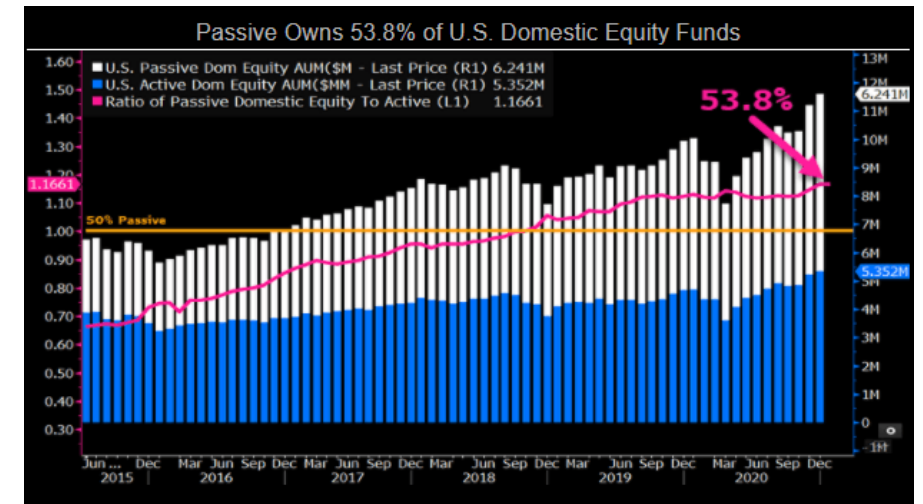
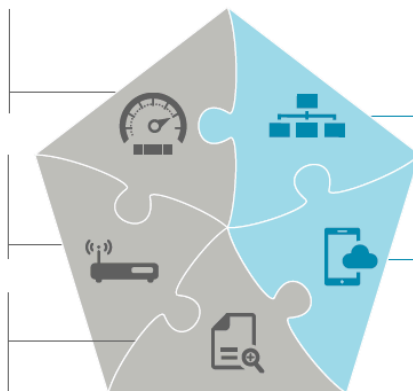## Overview[1]

CAPITAL MARKET INCUMBENTS

Scale
- Access to capital
- Distribution
- Trusted intermediary

Infrastructure
- Technology
- Existing connectivity
- Data access

Expertise
- Market structure
- Regulation
- Compliance

FINTECH

Business model
- Innovative approaches
- New models for access

Technology
- Alternative technology model
- Lean cloud or as-a-service offering

- Driven by the needs of incumbents, FinTechs address some of the nuanced functions

- Many 'small' buckets in vast Capital Markets (multi-$T)

- Disintermediation vs partnering with incumbents

- Factors driving demand:
  - Increase demand from market participants for electronic trading across asset classes.
  - Stricter balance capital requirements

[1]Future of FinTech in Capital Markets

Detail

1. <u>Access to capital / Alterative Funding Platforms</u>: *capital & liquidity*
    - Carta – Cap Table management
    - Elefant – Secondary trading
    - iCapital Network – Alternative investing platform

2. <u>Trade Execution / Core Market Infrastructure</u>: *greater transparency & efficiency*
    - IEX – Exchange
    - Trumid– Credit trading
    - Cloud9 – Voice Trading (#4)

3. <u>Post-Trade Digitization</u>: *optimize to maximize capital efficiency & mitigate operational risk*
    - CloudMargin – Collateral Management

4. <u>Data, Analytics & AI</u>: *predictive, business intelligence*
    - Kensho, Pitchbook, Addepar, Kantox, TruValue Labs, PeerIQ (many more!)

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By Sectors[1]

Category	Sum of Valuation ($B)	% Share
Fintech	516.18	22%
Internet software & services	293.39	12%
Artificial intelligence	287.04	12%
E-commerce & direct-to-consumer	210.56	9%
Other	202.76	9%
Health	142.61	6%
Auto & transportation	130.03	5%
Supply chain, logistics, & delivery	119.2	5%
Hardware	89.35	4%
Data management & analytics	86.39	4%
Edtech	75.53	3%
Mobile & telecommunications	63.5	3%
Consumer & retail	62.73	3%
Cybersecurity	58.9	2%
Travel	29.75	1%
Education	2.4	0%
Data management & analytics<	1.2	0%
Grand Total	**2371.52**	**100%**

By Sector / Country[1]

Category	Rest of World	Brazil	China	Germany	India	Sweden	United Kingdom	United States	Grand Total
Fintech	$ 46	$ 38	$ 9	$ 14	$ 40	$ 46	$ 49	$ 275	$ 516
Internet software & services	$ 37		$ 17	$ 2	$ 16	$ 1	$ 6	$ 215	$ 293
Artificial intelligence	$ 14		$ 180				$ 7	$ 86	$ 287
E-commerce & direct-to-consumer	$ 40	$ 10	$ 85	$ 1	$ 10		$ 4	$ 61	$ 211
Other	$ 17	$ 3	$ 8	$ 3	$ 4	$ 9	$ 8	$ 150	$ 203
Health	$ 5		$ 19	$ 4		$ 2	$ 6	$ 106	$ 143
Auto & transportation	$ 25		$ 44	$ 3	$ 7			$ 51	$ 130
Supply chain, logistics, & delivery	$ 27	$ 2	$ 12	$ 2	$ 13		$ 1	$ 62	$ 119
Hardware	$ 4		$ 54				$ 11	$ 20	$ 89
Data management & analytics	$ 5		$ 3	$ 11				$ 67	$ 86
Edtech	$ 6		$ 34		$ 19			$ 18	$ 76
Mobile & telecommunications	$ 17	$ 1	$ 22			$ 1		$ 23	$ 64
Consumer & retail	$ 5		$ 27				$ 1	$ 30	$ 63
Cybersecurity	$ 12		$ 1				$ 5	$ 40	$ 59
Travel	$ 6		$ 5	$ 2	$ 9			$ 7	$ 30
Education								$ 2	$ 2
Data management & analytics<								$ 1	$ 1
Grand Total	**$ 266**	**$ 53**	**$ 522**	**$ 42**	**$ 118**	**$ 58**	**$ 98**	**$ 1,215**	**$ 2,372**

- Private Company Unicorns: valuation >$1B.
- US (50%) & China (20%) are most of the overall $2.4T market. Remember, size does not equal growth potential (Brazil, India, China).
- 'Quietly', FinTech (22%) represents the largest share. *There's always money to be made in money?*

FinTech By Country

Country	Sum of Valuation ($B)	% Share
United States	$ 274.68	53%
United Kingdom	$ 49.08	10%
Rest of World	$ 46.23	9%
Sweden	$ 45.60	9%
India	$ 39.50	8%
Brazil	$ 37.80	7%
Germany	$ 13.93	3%
China	$ 9.36	2%
Grand Total	$ 516.18	100%

US FinTechs by Sub-Category (>$1.6B)

Sub-Category	Sum of Valuation ($B)
Payments	$ 156.30
Digital Banking	$ 29.40
Digital Wealth Management	$ 18.69
Lending	$ 14.50
Capital Markets	$ 9.20
Insurance Technology	$ 4.00
NA	$ 2.00
Grand Total	$ 234.09

Top 35 Private FinTech

Company	Valuation ($B)	Sub-Category
Stripe	$95.00	Payments
Chime	$14.50	Digital Banking
Plaid Technologies	$13.40	Payments
Robinhood	$11.70	Digital Wealth Manager
Ripple	$10.00	Payments
Brex	$7.40	Digital Banking
Better.com	$6.00	Lending
Toast	$4.90	Payments
Zenefits	$4.50	Payments
Chainalysis	$4.20	Payments
Next Insurance	$4.00	Insurance Technology
Gusto	$3.80	Payments
Blend	$3.30	Lending
Figure Technologies	$3.20	Lending
Cedar	$3.20	Payments
HighRadius	$3.10	Capital Markets
Circle Internet Financ	$3.00	Payments
BlockFi	$3.00	Digital Banking
Kraken	$2.92	Digital Wealth Manager
Tradeshift	$2.70	Payments
AvidXchange	$2.42	Payments
Paxos	$2.40	Capital Markets
Greenlight	$2.30	Digital Banking
Current	$2.20	Digital Banking
Addepar	$2.17	Digital Wealth Manager
ReCharge	$2.10	Payments
Tipalti	$2.00	Payments
Unqork	$2.00	Capital Markets
Ethos Technologies	$2.00	NA
Pipe	$2.00	Lending
MX Technologies	$1.90	Digital Wealth Manager
SpotOn	$1.88	Payments
Carta	$1.70	Capital Markets
Ramp Financial	$1.60	Payments
Extend	$1.60	Payments

- Payments is the biggest category, by far.

CB Insights + M. Purewal

Private FinTech Unicorns

Fintech

Appendix: References

- Cashing in on innovation: a taxonomy of FinTech. Michael B. Imerman, Frank J. Fabozzi 2020
- BIS: https://www.bis.org/fsi/publ/insights23.pdf
- FSB 2017: https://www.fsb.org/wp-content/uploads/R270617.pdf
- https://worldpay.globalpaymentsreport.com/en/
- https://fin.plaid.com/articles/major-players-in-payment-processing/
- Future of FinTech in Capital Markets
- CB Insights
- MIT Course Gensler

Notes

- tbd