HFS Research

HFS Top 10 Blockchain Platforms 2018

HFS Research author:
Saurabh Gupta, Chief Strategy Officer

TOP 10

November 2018

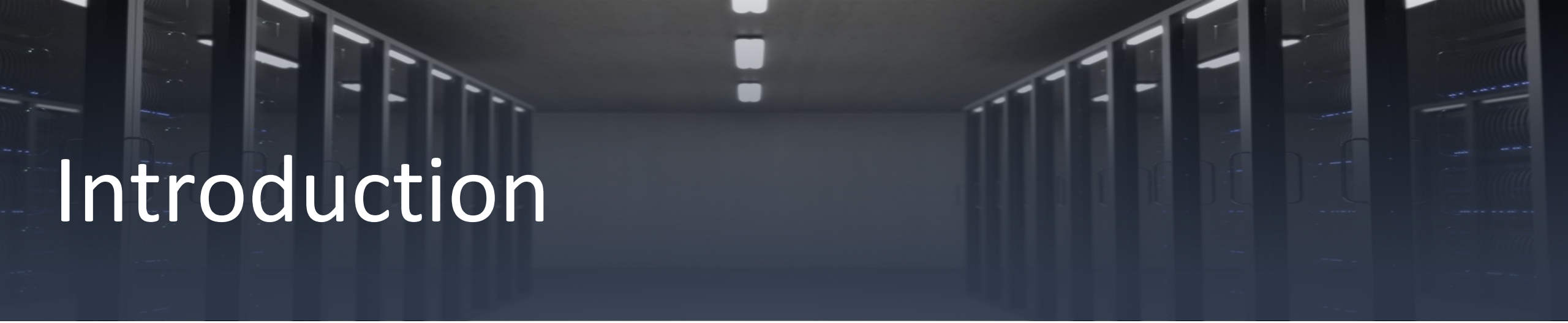
"Enterprise blockchain is no longer just a beautiful waterfall that people admire from a distance. Enterprises are starting to get wet (or at least feeling the mist)."

— Saurabh Gupta, Chief Strategy Officer

HFS Research

What you'll read

Topic	Page
Introduction	4
Research methodology	6
Executive summary	8
HFS Top 10 blockchain platforms 2018	14
Blockchain platform profiles	17
About HFS	29



Introduction

- Blockchain is emerging as a powerful architectural technology with the potential to impact enterprise and B2B ecosystems as much as the internet and cloud. The foundation for any blockchain solution is its underlying platform or framework, which sets the rules of the game.

- However, there is a plethora of such platforms emerging in the market as the business potential around blockchain unfolds! Given the nascence of the blockchain concept, the market standards have not yet emerged, and interoperability issues persist. As a result, choosing the right platform is critical to the success of your experiments with blockchain.

- From an enterprise or B2B adoption perspective, HFS assessed 10 leading blockchain platforms based on detailed discussions and inputs from power users of these platforms (enterprise clients and solution providers) as well as analysis of nearly 550 blockchain engagements across industries and across the globe.

Blockchain provider ecosystem

ILLUSTRATIVE LISTS, NOT COMPREHENSIVE

Blockchain solution providers

Service providers

accenture, Cognizant, IBM, LTI, NTT DATA, wipro

Consulting firms

Deloitte., EY, KPMG, pwc

Consortiums

B3i, Chamber of Digital Commerce, CU Ledger, Fundchain, IoT World Alliance, PTDL Group, r3, Red Lyra, swisscom

Startups

BitFury, BTL, coinbase, Filament, loyyal, Mirror, skuchain, symbiont

Academia, regulators, and not-for profits

ASSOCHAM, Berkeley, Blockchain Research Institute, IC3 The Initiative For CryptoCurrencies & Contracts, MIT, NACHA, University of Oxford, Singularity University, Stevens Institute of Technology, The Alan Turing Institute, tmforum, University of Cambridge, University of Copenhagen

Blockchain tools and software providers

BIGCHAINDB, Blockstream, bluzelle, CONSENSYS, CONTEXTLABS, Digital Asset Holdings, Gem, guardtime, IBM Bluemix, Microsoft Azure, symbiont

Blockchain platforms and frameworks

Permissionless (Public)

ethereum, factom, stellar

Permissioned (Private/Hybrid)

Chain, corda, HYPERLEDGER, MultiChain, MONAX, ripple

This report focuses on blockchain platforms

HFS Research

Research methodology

This Top 10 research is based on interviews with 30+ power users of blockchain platforms (enterprise clients and solution providers) and our proprietary database of nearly 550 blockchain engagements across industries and across the globe. The research is also augmented with information from publicly available information sources.

Blockchain platforms were assessed on the following three main dimensions:

33.3%

Voice of the customer

- Client satisfaction with solution
- Strength of developer community

33.3%

Ability to execute

- Relative adoption (based on number of engagements)
- Scalability (based on number of in-production solutions)
- Ecosystem strength (partner network and relative ease of deployment)

33.3%

Innovation

- Adaptability across industries and use cases
- Flexibility of deployment and functionality (private and public, smart contracts, customizability)
- Speed and throughput

Blockchain platforms covered in this report

TOP 10

Note: Other emerging blockchain platforms such as Axoni, IPFS, Tendermint, Digital Asset, Monax, IOTA, Hyperledger Indy were not assessed in detail given the lack of responses to build a statistically significant sample set

HFS Research

Executive summary

HFS Research

Executive summary

- **Enterprise blockchain gets real.** Only about 10% blockchain engagements are in the production/build stage, but this represents 50+ engagements in absolute terms (for our sample set of approximately 550 blockchain engagements). This increase is a significant jump from the same time last year where we reported single-digit production engagements. Sixty percent to seventy percent of blockchain engagements are in the POC/pilot stage, and a majority do not progress to production/build-out. Also note that almost all engagements at this stage are parallel or shadow production environments, where legacy environments have not been completely replaced.

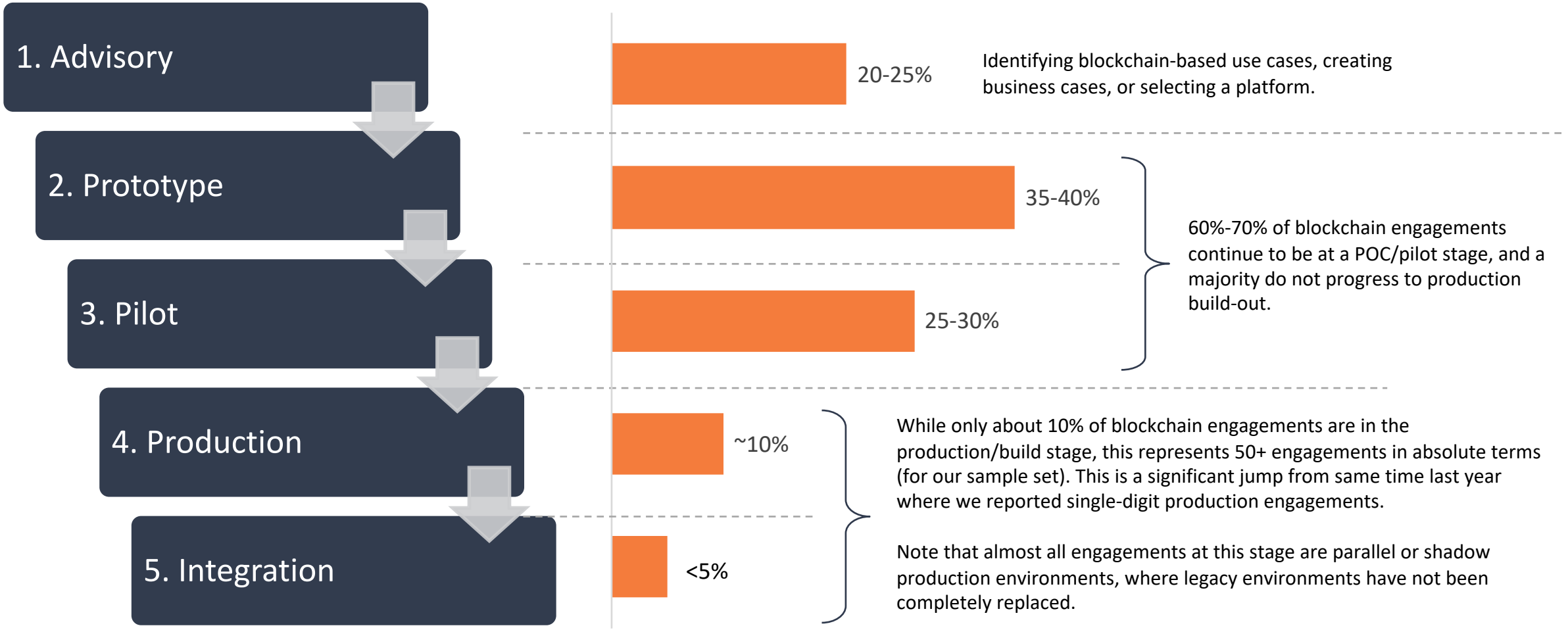
- **Blockchain has broader implications than financial services.** Banks were the first movers—but not necessarily the shakers—with a significant number of engagements around trade finance, payments, Know Your Customer (KYC) and identity, and cryptocurrency related initiatives stuck at POC/pilot stage. Meanwhile, several other industries (notably retail and CPG, energy and utilities, logistics, and government and nonprofit) rapidly adopting blockchain and moving beyond pilots to drive real value through provenance tracking (supply chain), records management, contract and compliance management, and F&A and procurement related use cases.

- **Choice of the underlying platform depends on the use case.** Every blockchain platform assessed in this report has its pros and cons (see detailed profiles) and unique features and functionality. Platform choice ultimately depends on the compatibility with the specific business use-case.

- **Blockchain technology is not the issue.** The success (or failure) of blockchain as a change agent will be determined by the resolution of business adoption challenges such as consortium formation and governance, cryptocurrency versus fiat tokenization, integration with other emerging technologies such as AI and IoT, and the viability of business cases.

- **Blockchain will not solve for world hunger.** Simply throwing blockchain at a business problem will not solve it. HFS developed the Blockchain Bullshit Buster (BBB)—a list of 10 non-technical questions that will help separate the blockchain gold from you know what!

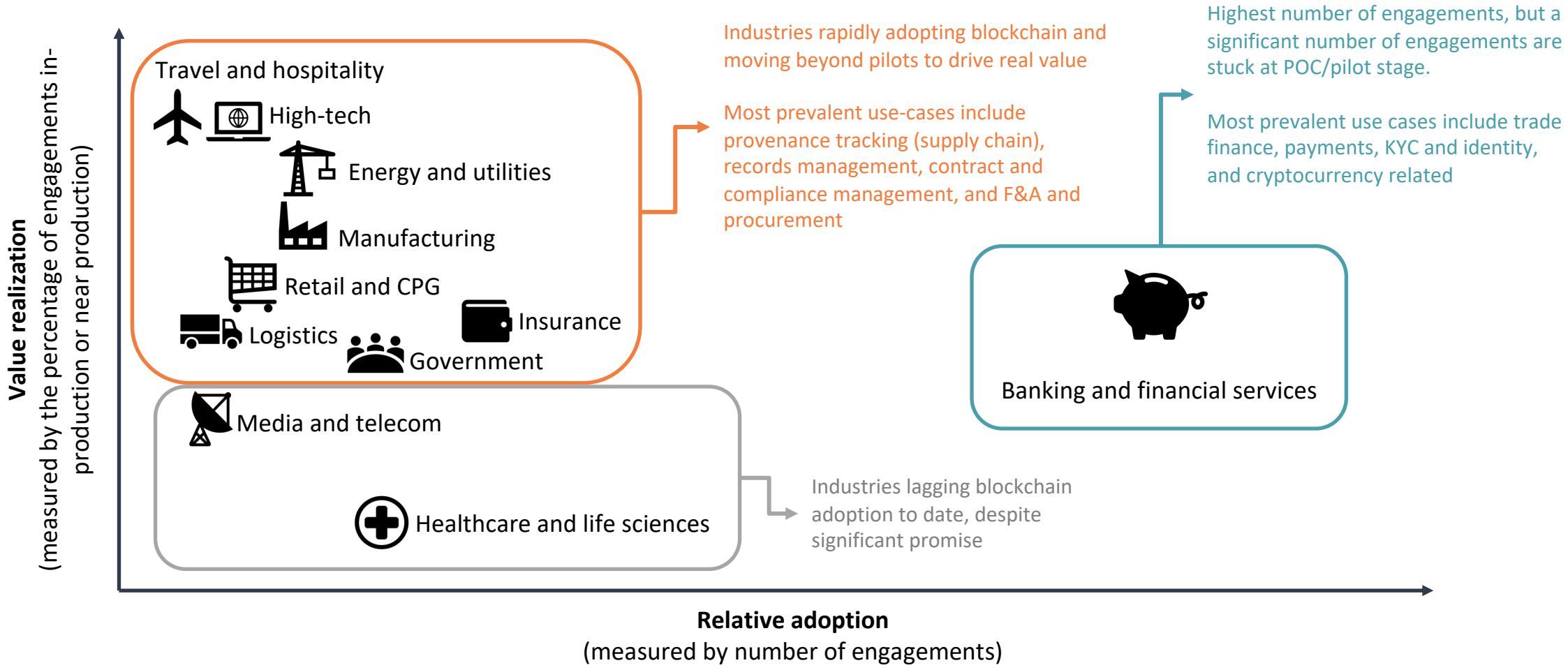
Enterprise blockchain gets real. There are 50+ in-production blockchain solutions in our sample set, which represents a nearly 5X jump in one year



Sample: 550 blockchain engagements across 15 solution providers

HFS Research

Banks were the first movers, but not necessarily the shakers



Sample: 550 blockchain engagements across 15 solution providers

HFS Research

Every blockchain platform assessed in this report has pros and cons and unique features and functionality

Blockchain platform	Ledger type	Crypto-currency *(coin market cap[1])*	Smart contracts?	Relative speed and throughput	% share of engagements[2]	% providers with experience[2]
Ethereum	Permissionless	Ether (US $21.5B)	Yes		30-35%	100%
Hyperledger Fabric	Permissioned	-	Yes		25-30%	100%
Quorum	Both private and public capabilities	Based on Ethereum	No		10-15%	79%
R3 Corda	Permissioned	-	Yes		5-10%	86%
Bitcoin	Permissionless	Bitcoin (US $114B)	No		5-10%	36%
Ripple	Permissioned	XRB (US $18.2B)	No		1-5%	43%
Multichain	Permissioned	Based on bitcoin	No		1-5%	43%
Hyperledger Sawtooth	Generic framework for public, private, permissioned use	-	Yes		1-5%	36%
Stellar	Permissionless	Lumens/XLM ($4.2B)	No		<1%	14%
Factom	Permissionless	Factom/FCT ($0.4B)	No		<1%	14%

1. *Coinmarketcap.com as of Oct 16, 2018*
2. *550 blockchain engagements across 15 solution providers*

HFS Research

Amid the hype and mad use cases there is some gold, but it's getting lost in the noise. Introducing the HFS Blockchain Bullshit Buster (BBB):

Blockchain BS busters	Key question to ask?	Your response?			
		No	Not really	Probably	Yes
Principle 1: Replacing ledgers is pointless	Are there many organizational entities involved that require distributed ledgers?	Stop! Blockchain is not for you.	Wait! Do you really need blockchain?	Caution! Get some professional help	Go! You've hit blockchain gold
Principle 2: The realpolitik chestnut	Do you have a real unsolved business problem versus a vision for a utopian world?				
Principle 3: Change for the sake of change	Is there a real burning platform?				
Principle 4: Blindly quoting the network effect	Do all entities have a common goal that they will work together on to have any chance of a network effect?				
Principle 5: Garbage in, garbage out	Can you ensure that data written on blockchain is correct (through IoT integrations or other means)?				
Principle 6: Stone carvings	Do you need the data to persist forever for complete auditability without any censorship?				
Principle 7: Speed of light	Is transaction processing in seconds acceptable (versus processing thousands of transactions in a second)?				
Principle 8: The privacy conundrum	Are you sure that you will not need to store private information on blockchain?				
Principle 9: Law ambiguity	Are the rules of the game concise and clear enough to be implemented as smart contracts?				
Principle 10: The good old cost-benefit equation	Does the outcome deserve significant long-term investment?				

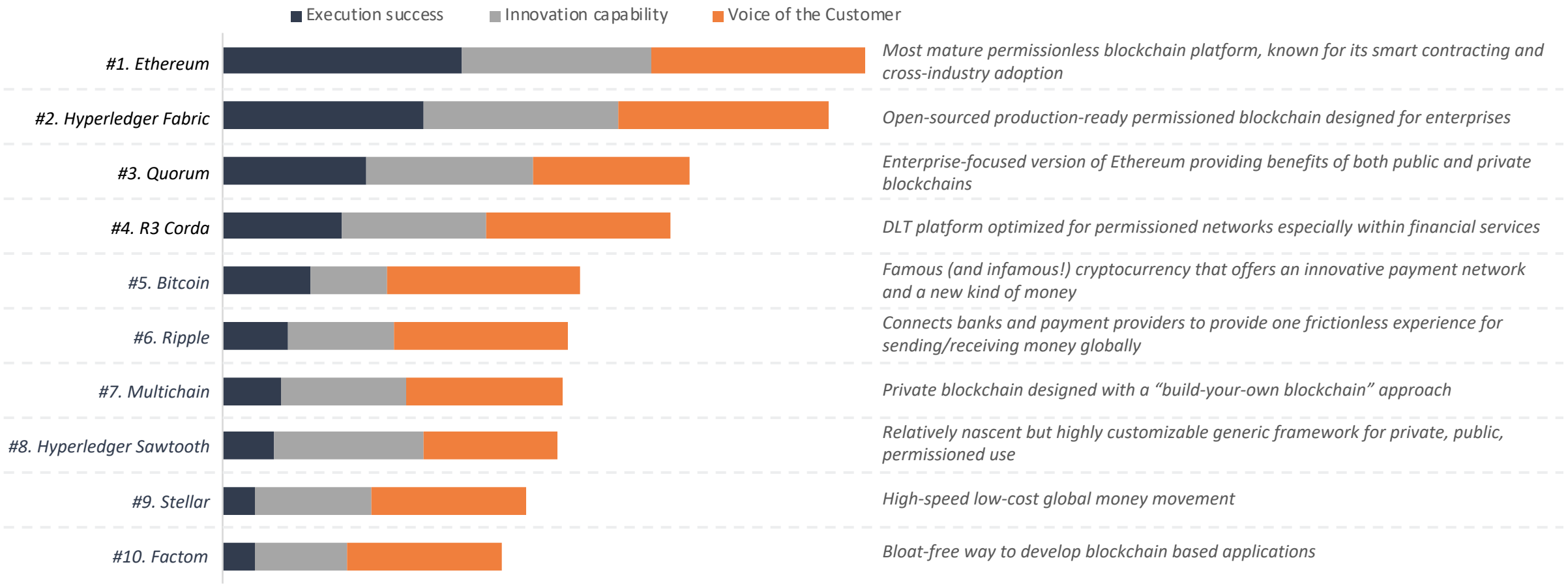
Refer to the POV titled "Is blockchain a giant digital joke?" for more details on the HFS BBB

HFS Research

HFS Top 10 blockchain platforms 2018

HFS Research

HFS Top 10 blockchain platforms 2018



Note: Other blockchain platforms such as Axoni, IPFS, Tendermint, Digital Asset, Monax, IOTA, Hyperledger Indy were included in our outreach but are not included in this research output given lack of responses to build a statistically significant sample set

Sample: Based on responses from 30+ super users of blockchain platforms (enterprise clients and solution providers) and database of 550 blockchain engagements

Source: HFS Research 2018

HFS Top 5 blockchain platforms by individual assessment dimensions

HFS ranking	Ability to execute			Innovation capability			
	Relative adoption *(# of engagements)*	Scalability *(In-production deployments)*	*Ecosystem strength (partner network and ease of deployment)*	Adaptability across industries and use cases	Flexibility in deployment and functionality	Speed and throughput	Voice of the customer
#1	ethereum	ethereum	ethereum	ethereum	HYPERLEDGER Sawtooth	ripple	ethereum
#2	HYPERLEDGER Fabric	HYPERLEDGER Fabric	HYPERLEDGER Fabric	HYPERLEDGER Fabric	ethereum	stellar	HYPERLEDGER Fabric
#3	Quorum™	Quorum™	r3	Quorum™	HYPERLEDGER Fabric	MultiChain	bitcoin
#4	bitcoin	bitcoin	Quorum™	r3	r3	r3	r3
#5	r3	r3	MultiChain	MultiChain	Quorum™	HYPERLEDGER Sawtooth	ripple

Note: Other blockchain platforms such as Axoni, IPFS, Tendermint, Digital Asset, Monax, IOTA, Hyperledger Indy were included in our outreach but are not included in this research output given lack of responses to build a statistically significant sample set

Sample: Based on responses from 30+ super users of blockchain platforms (enterprise clients and solution providers) and database of 550 blockchain engagements

Source: HFS Research 2018

Blockchain platform profiles

HFS Research

Ethereum: Mature permissionless blockchain platform known for its smart contracting and cross-industry adoption

Dimension	Rank
HFS Top 10 position	**#1**
Ability to execute	
Relative adoption	#1
In-production deployments	#1
Ecosystem strength	#1
Innovation capability	
Adaptability across industries	#1
Deployment flexibility and functionality	#2
Speed and throughput	#9
Voice of the customer	#1

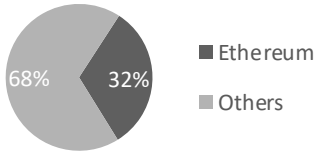
Overview

- Founded by the 22-year-old Russian-Canadian Vitalik Buterin, Ethereum is one of the most mature blockchain platforms available today.
- Known for its robust smart contracting functionality and flexibility, it is used widely across multiple industry use cases.
- The permissionless (or public) platform is designed for mass consumption, not restricted access (typical requirement for privacy requirements in enterprise use cases).
- It is PoW (proof of work) based, resulting in potential latency issues, though it might change its consensus algorithm to faster PoS (proof of stake) in future versions.
- Enterprise Ethereum Alliance (EEA) and Hyperledger advanced the global blockchain business ecosystem through joint associate memberships.
- All leading service providers assessed by HFS have experience with Ethereum.

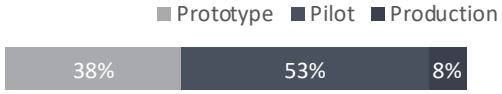
Relative share of enterprise blockchain engagements

(N = 534 enterprise blockchain engagements)

% market share



Relative maturity of engagements



Industry coverage

(Size of font indicates relative adoption)

Strengths

- There is widespread adoption across industries with backing from 250+ enterprises that form the Ethereum Enterprise Alliance (EEA).
- The public blockchain (with private blockchain support) has strong open community support and robust SDK available in multiple languages (Java, Python, etc.).
- Its medium- to long-term vision has a clear and comprehensive roadmap with rigorous implementation.
- It is suitable for a wide variety of shared-data-related use cases that require smart-contract-based automation and self-governance.
- Ethereum is easily deployable with no investment needed for a network. Only need to develop smart contracts and Dapps.
- Ethereum supports the use of several different tokens to represent digital assets that can be used in conjunction with Ether (its native cryptocurrency).

Challenges

- Native privacy controls are limited. Blockchain data is public—there is no built-in access control.
- There are limitations in smart contracting coding (Solidity). Building complex business rules and verifying functionality are challenging.
- Throughput (or transaction speed) is slow. It may become better when switched to PoS from PoW.
- Scaling of transactions remains a challenge. The permissionless construct means that there is no one to fix problems when they occur, which is not helpful in an enterprise setting.
- Recurring cost via Ethers can become high (if public).
- Upgrading smart contracts is challenging. New contracts need to be installed, and older transactions need to be accessed by the older contract's address.
- Enterprises are not inclined to use public blockchain.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

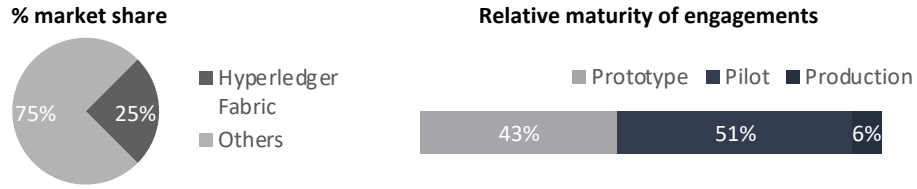
Hyperledger Fabric: Open-sourced production-ready permissioned blockchain designed for enterprises

Dimension	Rank
HFS Top 10 position	**#2**
Ability to execute	
Relative adoption	#2
In-production deployments	#2
Ecosystem strength	#2
Innovation capability	
Adaptability across industries	#1
Deployment flexibility and functionality	#2
Speed and throughput	#7
Voice of the customer	#2

Overview

- Hyperledger, hosted by Linux Foundation and launched in 2016, is an open-source collaborative effort to advance cross-industry blockchain technologies.
- One of its key goals is to create enterprise-grade distributed-ledger frameworks and codebases. Hyperledger boasts more than 270 collaborating enterprises.
- Hyperledger Fabric is one of the eight ongoing Hyperledger projects initially contributed by IBM and Digital Asset. It is an attractive blockchain framework for enterprise solutions because of its modular architecture, which allows plug-and-play components around consensus and membership services.
- In July of 2017, it announced the release of Hyperledger Fabric 1.0, its first production-ready environment for enterprises.
- Enterprise Ethereum Alliance (EEA) and Hyperledger advanced the global blockchain business ecosystem through joint associate memberships.
- All leading service providers assessed by HFS have experience with Hyperledger Fabric.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)



Industry coverage
(Size of font indicates relative adoption)

Strengths

- The private and permissioned blockchain platform focuses on performance and scalability. It is marketed as “A blockchain platform for the enterprise."
- It shows flexibility across a multitude of use-cases across industries and has strong industry backing.
- It has advanced architecture, a solid roadmap, the support of a vast community, and SDK support available in multiple languages (Golang, Node.js, Java).
- It is open-source with pluggable consensus, modularity, customizability, and the ability to build business rules using smart contracts.
- The concept of channels for selective data visibility resonates with a lot of companies worried about their data being revealed to competitors on the network.

Challenges

- Its limited decentralization is suitable for private chains only. A centralized governance body is required for scaled up implementations.
- Constantly evolving code versions pose challenges in production deployment and make it costly to implement.
- Critics don’t find the consensus algorithm in Fabric as secure as a PoW.
- It does not have a native cryptocurrency.
- Heavy dependencies and high memory footprint both in development and runtime. The whole development toolchain is required to compile and assemble container for each smart contract
- Complex multi-nodes make it difficult for developers to set up.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

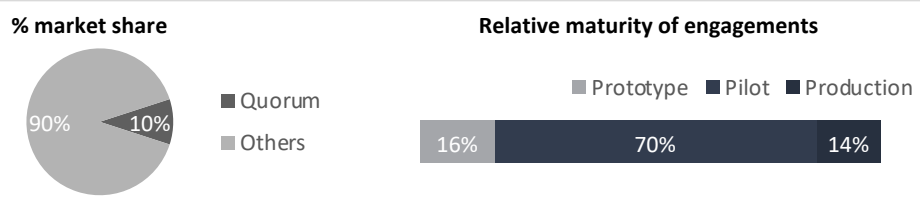
Quorum: Enterprise-focused version of Ethereum providing benefits of both public and private blockchains

Dimension	Rank
HFS Top 10 position	**#3**
Ability to execute	
Relative adoption	#3
In-production deployments	#3
Ecosystem strength	#4
Innovation capability	
Adaptability across industries	#3
Deployment flexibility and functionality	#2
Speed and throughput	#4
Voice of the customer	#6

Overview

- Developed by J.P. Morgan and leveraging Ethereum since 2015, Quorum is designed to handle use cases requiring high-speed and high-throughput processing of private transactions with a permissioned group of participants.
- It does not use the PoW consensus algorithm but uses a vote-based algorithm and others, enabling it to process hundreds of transactions per second, depending on how the smart contracts and networks are configured.
- Quorum is designed to develop and evolve alongside Ethereum. It only minimally modifies Ethereum's core, thus Quorum is able to incorporate the majority of Ethereum updates quickly and seamlessly. Just like Ethereum, Quorum is open sourced, is free to use in perpetuity, and encourages experimentation.
- About 80% of the leading service providers assessed by HFS have experience with Quorum.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)



Industry coverage
(Size of font indicates relative adoption)

Strengths

- Quorum is an enterprise-focused version of Ethereum that offers similar advantages.
- Quorum offers faster consensus than Ethereum and provides benefits of both private and public capabilities.
- Quorum is open sourced and offers full privacy and built-in ZKP (zero knowledge proof).
- It supports cryptocurrency, the ERC20 token standard, and multiple consensus mech.
- The SDK is available in multiple languages (Java, Python, JavaScript).
- Third-party tools for blockchain setup and configuration are available

Challenges

- Private transaction consensus is between private parties only
- Functionality around private transactions is still under development.
- Quorum is a transaction-focused platform with few applications outside the financial sector.
- There is no clear product roadmap, and community participation is low.
- Documentation to help people become Ethereum developers is lacking.
- It is challenging and complex to verify the functionality of smart contracts.
- There are limitations in smart contracts; building complex business rules is a challenge.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

R3 Corda: DLT platform optimized for permissioned networks especially within financial services

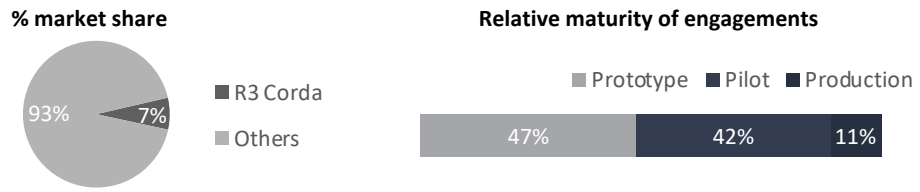
Dimension	Rank
HFS Top 10 position	**#4**
Ability to execute	
Relative adoption	#5
In-production deployments	#5
Ecosystem strength	#3
Innovation capability	
Adaptability across industries	#4
Deployment flexibility and functionality	#2
Speed and throughput	#5
Voice of the customer	#4

Overview

- In 2015, a consortium of some of the world's biggest financial institutions launched R3 and created Corda, an open-source distributed ledger platform. Its partner network encompasses more than 60 companies.
- Corda was designed with banking in mind, but other use cases in supply chain, healthcare, and government are emerging.
- There is no built-in token or cryptocurrency for Corda. It is a permissioned blockchain that restricts access to data within an agreement to only those explicitly entitled to it, rather than the entire network. Its consensus system takes into account the reality of managing complex financial agreements. It is also known for its focus on ease of integration with legacy systems.
- Approximately 85% of the leading service providers assessed by HFS have experience with R3 Corda.

Relative share of enterprise blockchain engagements

(N = 534 enterprise blockchain engagements)



Industry coverage

(Size of font indicates relative adoption)

Strengths

- R3 Corda is optimized for permissioned networks with financial use cases.
- It has better privacy and transaction speed because data is shared on a need-to-know basis.
- Advanced security model, easy project start in development due to familiar Java patterns and coding style, lightweight in dependencies, low CPU and memory footprint.
- Relatively more scalable as transactions are validated only by parties involved.
- It uses non-cryptocurrency-based tokenization.
- Its pluggable consensus mechanism allows Corda to behave uniquely in unique settings.

Challenges

- R3 Corda was built to support financial domain use cases.
- It does not employ all key attributes of blockchain architecture.
- It is not fully decentralized due to the involvement of notaries, who take care of validating (states) and signing transactions.
- Throughput measurement is complex given various network level components and services such as doorman and notary, which are critical and need to be deployed.
- The default behavior of point-to-point transactions can be cumbersome to manage.
- The software is stable but slow (Community 3.1); developers state that many bugs are still present.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

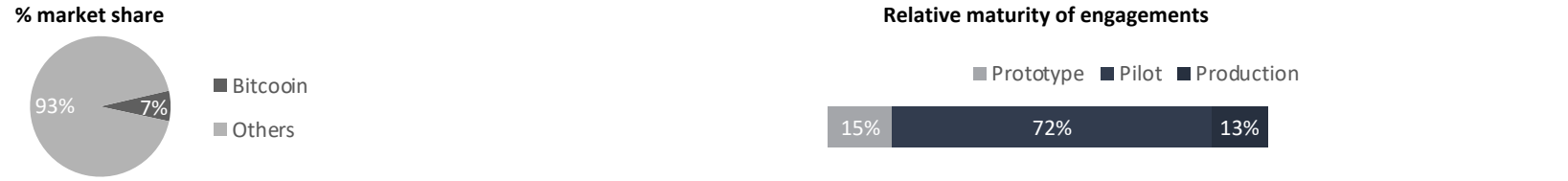
Bitcoin: The famous (and infamous!) Bitcoin is a peer-to-peer cryptocurrency that offers an innovative payment network and a new kind of money

Dimension	Rank
HFS Top 10 position	**#5**
Ability to execute	
Relative adoption	#4
In-production deployments	#4
Ecosystem strength	#7
Innovation capability	
Adaptability across industries	#6
Deployment flexibility and functionality	#6
Speed and throughput	#10
Voice of the customer	#3

Overview

- Bitcoin was invented by an unknown person or group of people using the name Satoshi Nakamoto, which released it as open-source software in 2009. Bitcoins are created as a reward for a process known as mining; they can be exchanged for other currencies.
- From an enterprise perspective, Bitcoin represents a peer-to-peer cryptocurrency that manifests itself into an innovative payment network and a new kind of money. It offers a secure and inexpensive way to handle payments.
- About 35% of the leading service providers assessed by HFS have experience with Bitcoin from an enterprise deployment perspective.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)



Strengths

- Bitcoin is the most popular blockchain application, and it is responsible for the popularization of the blockchain technology.
- It displays high maturity as the first and most stable blockchain.
- Bitcoin is fully decentralized and widely adopted across the globe with a robust community and rich ecosystem.
- Its cryptocurrency has a large usage network and high adoption.
- It offers freedom in payment, information transparency, and security and control.
- Bitcoin's transaction fees are relatively low, and the network is reliable.
- It can be integrated with sidechain and others to use for other business cases

Challenges

- As a permissionless peer-to-peer cryptocurrency with transaction speed and scalability limitations, Bitcoin has limited use in the enterprise market.
- Bitcoin was not initially designed to support smart contracts; it is limited to transfer of value.
- The recurring transaction costs via the bitcoin network are high.
- Political interference as many governments and central banks are making it difficult to use bitcoin.
- Consensus-based (PoW), which incurs computational overhead and high energy consumption.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

Ripple: Connects banks and payment providers to provide one frictionless experience for sending and receiving money globally

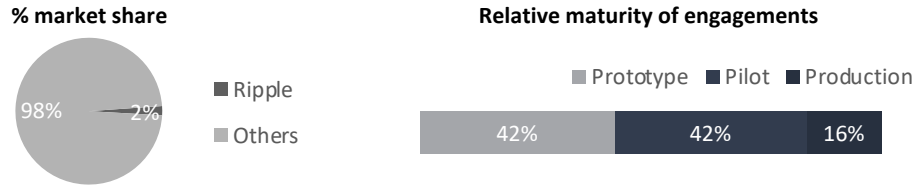
Dimension	Rank
HFS Top 10 position	**#6**
Ability to execute	
Relative adoption	#6
In-production deployments	#7
Ecosystem strength	#6
Innovation capability	
Adaptability across industries	#10
Deployment flexibility and functionality	#6
Speed and throughput	#1
Voice of the customer	#5

Overview

- Ripple was founded in 2012 as Opencoin and took its current name in 2015. It connects banks, payment providers, digital asset exchanges, and corporations through RippleNet, with nearly-free global transactions and no chargebacks.
- It enables global payments through its digital asset XRP, which has become one of the most popular cryptocurrencies, just behind Bitcoin and Ether. XRP is touted to be faster and more scalable than most other blockchains.
- More than 75 clients are in various stages of commercial deployment across three primary use cases: managing cross-border payments (xCurrent), minimizing liquidity costs (xRapid), and sending payments across various networks (xVia).
- About 45% of the leading service providers assessed by HFS have experience with Ripple.

Relative share of enterprise blockchain engagements

(N = 534 enterprise blockchain engagements)



Industry coverage

(Size of font indicates relative adoption)

Banking & Financial Services

Strengths

- Its scalability, performance, and interoperability make it extremely strong for payments use cases.
- It has higher transaction throughput and than Bitcoin. Ripple confirms transactions faster than 4 seconds, and it handles more than 10,000 transactions per second.
- Ripple continues to appeal to larger banks; XRP continues to gain traction. The blockchain holds the third-largest market capitalization amongst cryptos after Bitcoin and Ethereum
- It can perform currency independent money and security exchange.
- Ripple is already in production

Challenges

- Ripple is not based on a completely decentralized model. It can be pre-mined and adopts a more centralized model than other crypto platforms, which gives the issuing company a dominant share of issued tokens.
- Ripple, the company, has more than 60% of XRP. Even in the unlikely event of massive sell-offs, it has 51% control of the company and hence the blockchain
- Its focus on payments makes it a stretch for other uses.
- There is no flexibility of writing custom smart contracts; it needs to use XRP cryptocurrency to make transactions.
- Many countries already have international and internal payment systems. It is difficult for Ripple to go mainstream soon.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

HFS Research

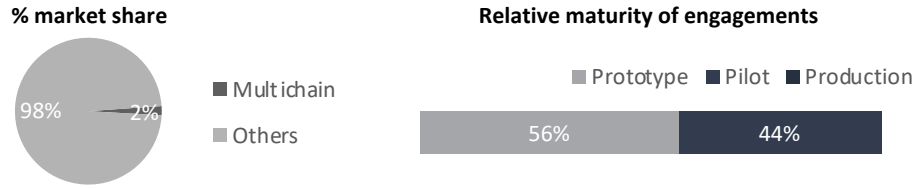
Multichain: Private blockchain designed with a “build-your-own blockchain” approach

Dimension	Rank
HFS Top 10 position	**#7**
Ability to execute	
Relative adoption	#8
In-production deployments	#8
Ecosystem strength	#5
Innovation capability	
Adaptability across industries	#5
Deployment flexibility and functionality	#6
Speed and throughput	#3
Voice of the customer	#6

Overview

- MultiChain Private Blockchain is the latest offering from Coin Sciences.
- It aims to help organizations quickly build and deploy blockchain applications.
- It is a permissioned private blockchain that follows Bitcoin protocol designed with a “build-your-own blockchain” approach that aims to free banks from the more rigid options of competing offerings.
- It is developer friendly, customizable, and offers flexible security features.
- About 45% of the leading service providers assessed by HFS have experience with Multichain.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)



Industry coverage
(Size of font indicates relative adoption)

Strengths

- Strengths include ease of use, flexible deployment options, and speed and scalability (1000+ transactions per second).
- It has native multi-currency support, which is suitable for data sharing, timestamping, and encrypted archiving.
- Added storage in metadata (up to 8MB per transaction).
- Supported languages include Python, C#, JavaScript, PHP, and Ruby.
- Recently released interesting features like data streams for enhanced privacy and data segmentation and handling off-chain data while storing hashes on ledger.

Challenges

- Multichain supports limited use cases.
- The smart contract feature is not available, but it is on the roadmap.
- Private transactions are not available. Privacy and confidentiality of the transactions need to be custom-built.
- There is no standard structure to store metadata. The SDK is not available.
- The developer community is small and not very robust.
- Multichain does not yet support point-to-point communication.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

Hyperledger Sawtooth: Relatively nascent but highly customizable generic framework for private, public, permissioned use

Dimension	Rank
HFS Top 10 position	**#8**
Ability to execute	
Relative adoption	#7
In-production deployments	#6
Ecosystem strength	#8
Innovation capability	
Adaptability across industries	#6
Deployment flexibility and functionality	#1
Speed and throughput	#5
Voice of the customer	#10

Overview

- Hyperledger, hosted by Linux Foundation and launched in 2016, is an open-source collaborative effort to advance cross-industry blockchain technologies. One of its key goals is to create enterprise-grade distributed-ledger frameworks and codebases. Hyperledger boasts more than 270 collaborating enterprises.
- Hyperledger Sawtooth is one of eight ongoing Hyperledger projects. It is a modular platform for building, deploying, and running distributed ledgers. Distributed ledgers provide a digital record (such as asset ownership) that is maintained without a central authority or implementation.
- About 35% of the leading service providers assessed by HFS have experience with Hyperledger Sawtooth.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)

Strengths

- The generic framework for public, private, and permissioned use make it useful across multiple industries and use cases.
- Building large networks given relatively easier integration
- It has the advantage of being highly customizable to the business process of the use case
- It has comparatively better throughput and time to finality.
- It can scale through its use of hardware (Intel SGX) and secure consensus mechanism (PoET—Proof of Elapsed Time).
- The swappable consensus and dynamic configuration (never have to take down the node) make it particularly useful for the enterprise.

Challenges

- Hyperledger Sawtooth is still in the development phase, which results in a higher implementation cost.
- It is not fully decentralized due to the involvement of a trusted execution environment (TEE).
- People identify Hyperledger with Fabric. Also, as Hyperledger Fabric is upgrading very fast, Sawtooth may not have time to get an enterprise foothold
- It is difficult to identify Sawtooth-specific use cases.
- It is less feature-rich than the other top enterprise-ready platforms but no less capable. This means it often requires more custom development than other platforms covered in this report.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

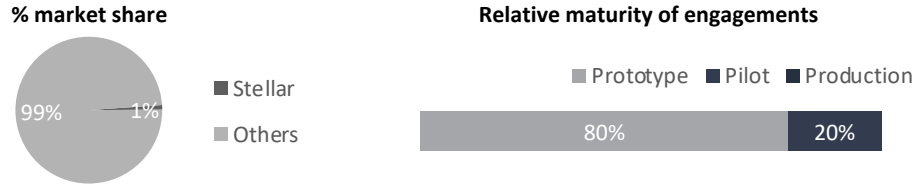
Stellar: High-speed low-cost global money movement

Dimension	Rank
HFS Top 10 position	**#9**
Ability to execute	
Relative adoption	#9
In-production deployments	#8
Ecosystem strength	#9
Innovation capability	
Adaptability across industries	#6
Deployment flexibility and functionality	#6
Speed and throughput	#2
Voice of the customer	#8

Overview

- Stellar is a platform that connects banks, payments systems, and people to move money quickly, reliably, and at almost no cost.
- Lumens (XLM) is Stellar's native asset or cryptocurrency. Lumen supply is determined by fixed protocol-level rules. The number of lumens created at genesis was 100 billion. Every year, there is a 1% inflation rate. New lumens cannot be generated arbitrarily by anyone
- Lumens are needed for transaction fees and minimum balances on accounts on the Stellar network in order to prevent people from overwhelming the network and to aid in prioritization.
- Each transaction has a minor fee—0.00001 lumens—associated with it. This fee prevents users with malicious intentions from flooding the network (otherwise known as a DoS attack). Lumens serve as a security measure that mitigates DoS attacks that attempt to generate large numbers of transactions or consume large amounts of space in the ledger.
- About 15% of the leading service providers assessed by HFS have experience with Stellar.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)



Industry coverage
(Size of font indicates relative adoption)

Strengths

- Stellar is a public blockchain platform.
- It has a high transaction speed (3-5 second transaction time, 3000+ transactions per second).
- The cost per transaction is low ($0.01 per 300,000 transactions).

Challenges

- Limited use cases are supported, primarily for financial applications.
- There is no smart contract support.
- Private network setup is not supported.

Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

HFS Research
2884g5g1

Factom: Bloat-free[1] way to develop blockchain based applications

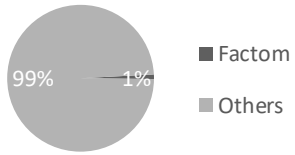
Dimension	Rank
HFS Top 10 position	**#10**
Ability to execute	
Relative adoption	#10
In-production deployments	#8
Ecosystem strength	#9
Innovation capability	
Adaptability across industries	#6
Deployment flexibility and functionality	#6
Speed and throughput	#7
Voice of the customer	#8

Overview

- Factom aims to transform the way organizations secure and share their data. It is targeting the way that organizations handle data (both physical documents and digital files) by providing an unalterable records system used for auditing, authentication, quality control, and a number of other data control use cases.
- The underlying data infrastructure of Factom is an open source platform. Factom's Blockchain solution provides a single version of the truth through a Decentralized Network of Authority.
- About 15% of the leading service providers assessed by HFS have experience with Factom.

Relative share of enterprise blockchain engagements
(N = 534 enterprise blockchain engagements)

% market share



Relative maturity of engagements

Strengths

- The distributed record-keeping system stores huge amounts of records on the blockchain.
- It functions as a verification and validation layer by allowing for document authentication and secure sharing of sensitive documents.
- It creates a protocol for blockchain applications that provide functions and features beyond currency transactions.
- It constructs a standard, effective, and secure foundation for these applications to run faster, cheaper, and without bloating Bitcoin.
- It offers a greater degree of transaction scalability and lower costs than Bitcoin.
- It is good for document-management-related use cases.

Challenges

- Heavy sized document and file storage may cause scalability issues.
- There is a lack of proven use cases.
- Some critics argue that proof of authority consensus is less secure than Bitcoin.
- Hash on blockchain needs to continually be compared to off-chain data to validate integrity.
- It is based on Bitcoin blockchain, and there is not much flexibility for writing custom smart contracts.
- As an original fork from the Bitcoin blockchain, the platform must continue on its planned roadmap to be increasingly robust for widespread Enterprise use.

1. Bloat. The Bitcoin blockchain has a size limit of 1 MB per block. Any application that wants to write and store information using the blockchain will add to the traffic
Based on responses from 30+ super users of blockchain platforms (enterprise clients, advisors, and service providers)
Source: HFS Research 2018

About HFS

HFS Research

HFS Research author

Saurabh Gupta
Chief Strategy Officer | HFS Research

Saurabh oversees HFS' global research function managing the global team of analysts across US, Europe, and Asia-Pac. He works closely with the CEO to set the strategic research focus and agenda for HFS Research, understanding and predicting the needs of the industry and ensuring that HFS maintains its position as the strongest impact thought leader for business operations and services research.

As an analyst, Saurabh leads our coverage for horizon 3 change agents such as blockchain, business services (such as finance & accounting and supply chain) as well as overarching and cross-cutting themes under the OneOffice concept like digital change management

He is a recognized thought leader and passionate problem solver in the global services industry. With 15+ years of experience across client, provider, advisory, and analyst roles, he brings a uniquely realistic and wide-ranging perspective to our industry's challenges and opportunities. Before joining HFS, Saurabh led strategy for Genpact's CFO and transformation services, helped shape the Business Process Services (BPS) strategy for AbbVie, managed Everest Group's global BPS practice, and worked as a techno-functional consultant at Infosys.

Saurabh.Gupta@hfsresearch.com

HFS Research

HFS Research

HFS Research: Defining future business operations

- The HFS mission is to provide visionary insight into major innovations impacting business operations, including: automation, artificial intelligence, blockchain, Internet of things, digital business models, and smart analytics.
- HFS defines and visualizes the future of business operations across key industries with its OneOffice™ Framework.
- HFS influences the strategies of enterprise customers, to help them develop OneOffice backbones to be competitive and to partner with capable services providers, technology suppliers, and third-party advisors.
- Read more about HFS and our initiatives on our website.


HFS Research
Defining future business operations
HFSResearch.com | @HFSResearch