

DIGITAL SYSTEMS & TECHNOLOGY

Financial Services: Building Blockchain One Block at a Time

Despite a fragmented and still maturing ecosystem, the time has come for firms to move aggressively in developing business and technology strategies for a blockchain-enabled world. Those that linger in the experimentation phase will be left behind by the rapid pace of innovation, according to our study.

EXECUTIVE SUMMARY

Even as blockchain is poised to disrupt the financial services industry, from operations to business models, most organizations face substantial uncertainty about how the blockchain ecosystem will develop and the changes it will unleash. While some early adopters are pushing ahead rapidly, most firms remain content with learning about the technology and testing proofs of concept internally until the future direction comes into focus. (For a definition of blockchain, see Quick Take, page 6.)

But waiting for clarity before moving forward is not a viable option. To ensure they are not left behind, firms need to move quickly to determine how their business strategy can leverage blockchain, build the required capabilities into their business processes and technology systems, and become comfortable with collaborating on projects with external partners, customers and even competitors.

These are some of the key takeaways from our global survey of 1,520 executives from 578 financial services firms on how they expect blockchain to impact their industry and the steps they are taking to prepare. (For more on the study, see the methodology, page 25.)

Respondents concur that blockchain will have a major impact on their industry, although opinions differ among the leadership hierarchy. While senior executives are more likely to expect that blockchain will fundamentally restructure their industry, senior managers are more tempered in their outlook, having a better appreciation of the obstacles that must be addressed.¹

While we share the view that blockchain has the potential to generate substantial benefits, firms will need to overcome significant challenges to reap these rewards, including rethinking their business models, changing their approach to stakeholder engagement and managing the substantial culture change required to collaborate with external partners in blockchain consortia.

Even as blockchain is poised to disrupt the financial services industry, from operations to business models, most organizations face substantial uncertainty about how the blockchain ecosystem will develop and the changes it will unleash.

Key Findings

Our study reveals the following issues that financial services firms need to consider to succeed in a blockchain-enabled world.

- **Blockchain will change the game in financial services, at many levels.** Blockchain has the ability to dramatically boost efficiency and reduce costs in a wide variety of areas, including trade settlement, trade finance, KYC/identity management initiatives and collateral management, to name a few. But its impact on business strategy will be even more important.

Blockchain will open new markets and spur additional competition from nontraditional players in existing markets. In our study, 91% of survey respondents said blockchain will be either critical or important to their firm's future, while nearly half said it will fundamentally transform the industry. Most respondents said their firm is looking to gain competitive advantage through blockchain, and roughly three-quarters predicted that revenues will grow by more than 5% from its adoption.


- **When developing their blockchain strategy, organizations should strive for clarity but accept uncertainty.** Blockchain will rewrite the rules of competition in financial markets, and firms need to ensure their business strategies keep pace. Yet, only 48% of respondents said their firm has defined a blockchain strategy, and just 42% said they've identified the functional areas and business processes that could be affected by blockchain. This is not a technology issue to be left to the IT function. Instead, business stakeholders need to be involved from the outset to define the business opportunities that blockchain can enable. A top barrier to adoption, in fact, is understanding blockchain use cases, according to 53% of respondents.

Blockchain projects need clear goals, but firms should recognize that it may not be possible to precisely quantify costs and benefits at this stage, due to the fact that benefits are often strategic and will appear over the long term. We believe financial institutions should be thinking beyond applications and apply an aphorism hatched in the pre-commercial Internet age by Sun Microsystems, Inc.: "The network is the computer."²

- **Platform selection is a vital factor in determining blockchain success.** With a wide variety of blockchain platforms on the market, firms need to carefully choose the appropriate technology for each business case. The selection is not a purely technical decision; rather, the choice should be based on business issues, including whether the platform's capabilities match the requirements of the use case, including security, privacy and smart contract capabilities, and whether the network appears to have the potential to survive over the long term.

To avoid becoming locked into a proprietary technology, firms should consider the increasingly popular open source blockchain networks, while remaining alert to additional tactics that limit the ability to switch networks, such as the need for proprietary services or hidden infrastructure costs that only become apparent over time.

With the ultimate winners yet to be determined, firms are well-advised to gain experience with a variety of networks, including those such as R3 that are distributed ledger technology platforms



Although some internal blockchain solutions can increase efficiency, the greatest benefits will accrue for firms that participate in networks of partners, customers and competitors.

built through industry-wide collaboration, as well as those that are broader ecosystem initiatives, such as Ethereum and four different Hyperledger frameworks. Respondents believe both public and private blockchains will grow rapidly in importance, with 86% noting that public (i.e., permissionless) blockchains will gain prominence within the next five years, while 80% said the same about private (i.e., permissioned) blockchains.

- **Concerns loom over privacy/security and scalability.** The biggest external obstacles to blockchain adoption, according to respondents, are privacy/security and scalability/latency (each named by 69% of respondents). Privacy and scalability concerns are greatest with public (permissionless) blockchain networks, and open source communities are aggressively working to address these issues. In contrast, permissioned blockchains are already integrating capabilities to limit access to information and transactions.

Despite the security concerns, blockchain networks actually provide much greater security than traditional approaches since their design prevents data from being tampered with or changed, and these decentralized networks lack a single point of failure. We expect executives to recognize the greater security of blockchain networks as they gain more experience with the technology.

Scalability and processing speeds are an issue for business applications that have large transaction volumes or cannot tolerate delays, such as in capital markets. Firms should keep abreast of the fast-developing innovations in these areas to ensure they are designing a solution that can remain competitive with blockchain's first-movers.

- **Blockchain requires a culture of collaboration.** Although some internal blockchain solutions can increase efficiency, the greatest benefits will accrue for firms that participate in networks of partners, customers and competitors. This will be a new experience for many firms; 56% of respondents cite working with ecosystem members as a principal obstacle to adoption.

Most firms are drastically underestimating the significant changes this will require in their existing culture and assumptions, and only 6% of respondents cited culture and change management as a significant obstacle. Firms need to develop a "network-first" mindset and embrace the idea that it can be more important to grow the size of the market than just their own slice of the pie. To spur this shift, organizations should consider the ability to collaborate successfully when evaluating blockchain proofs of concept.

- **In the short term, it's good enough to modify, not overhaul, business processes and technology systems.** Over the longer term, the greatest benefits will be captured by firms that redesign their business processes and technology systems to take best advantage of blockchain capabilities. But in the near term, most firms are assessing how to modify their existing processes and systems to support blockchain.

QUICK TAKE

A Blockchain Primer

Blockchain is a decentralized software mechanism that enables a public distributed ledger system. The technology allows the tracking and recording of assets and transactions without the presence of a central trust authority such as a bank.

Blockchain networks create proof of ownership by using unique digital signatures that rely on public encryption keys known to everyone on the network and private keys known only to the owner. Complex algorithms drive consensus among users, ensuring that transaction data cannot be tampered with after verification, reducing the risk of fraud.

These networks also enable peer-to-peer exchange of data, assets and currencies through rules-based smart contracts in a more efficient, transparent and cost-effective manner. Once created, smart contracts execute automatically once their terms are met, without the need for human intervention.³

Blockchain platforms can be public (i.e., permissionless) like Bitcoin, with anyone allowed to submit a transaction and take part in validating other transactions. They can also be private (i.e., permissioned), where only authorized people participate in sharing and validating information.⁴

The majority (91%) of respondents said they believe blockchain will be either critical or important to their firm's future, while 48% said it will fundamentally transform the industry.

For example, 48% of respondents believe blockchain will add to their current operating models without drastically changing them. Similarly, 41% of respondents said their firm plans to replace some parts of the legacy system to enable blockchain adoption, and 23% said they were looking for a hybrid solution that retains the legacy system as-is. Firms that integrate blockchain with existing processes and systems will be able to quickly implement new blockchain solutions.

While some firms are taking the lead on developing blockchain applications with real-world potential, most are continuing to experiment. But firms cannot afford to wait for the fragmented blockchain landscape to converge and business applications to become more clear. Fast action is needed to address the significant strategic, operational and cultural changes required to succeed. Moving forward will require working with broad cross-functional teams to explore detailed use cases and identify the necessary steps for moving these to market.

Even now, blockchain is rewriting the rules of competition. Firms that lag behind in applying blockchain to their business will find themselves unable to catch up with traditional competitors or fintech startups that have acted quickly to position themselves in blockchain-enabled financial markets.

BLOCKCHAIN: A GAME-CHANGING TECHNOLOGY

First used in 2009 for the digital cryptocurrency Bitcoin, blockchain technology will have an enormous impact on the financial services industry. Banks and other financial services firms will use blockchain to reduce expenses, identify new markets and compete effectively with fintech startups and other nontraditional players. Blockchain also poses the threat that some traditional players will be disintermediated in financial markets. The fundamental changes that will occur put the financial services industry at the forefront of the blockchain revolution.

In our study, 91% of respondents said they believe blockchain will be either critical or important to their firm's future, while 48% said it will fundamentally transform the industry. Roughly half of respondents reported that their firm has 11 or more professionals on their blockchain team (see Figure 1, next page).

Senior executives were most bullish on blockchain's impact, with 57% expecting it will fundamentally transform their industry compared with 39% of senior managers. While senior executives have a vision for what blockchain can achieve, managers on the front lines may have a greater appreciation for the significant challenges that must be addressed to make that vision a reality.

Blockchain Team Size

Roughly half of respondents reported that their firm has 11 or more professionals on their blockchain team.

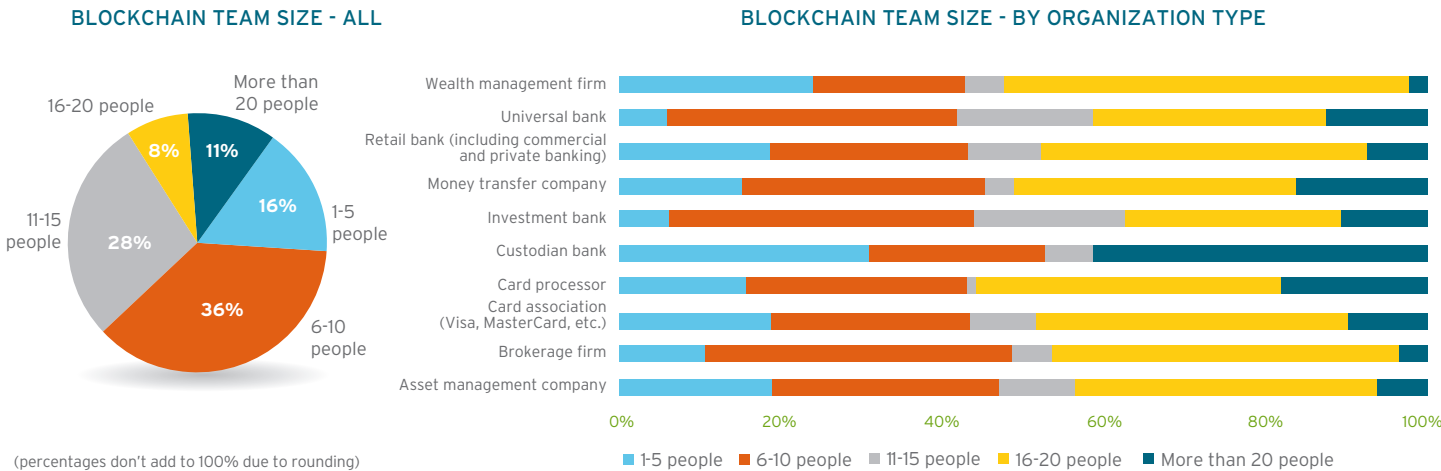


Figure 1

Top Expected Benefits

Respondents believe blockchain will address many industry pain points, especially data management and transparency.



Note: Multiple responses allowed.
Figure 2

Blockchain can help the industry address many of its pain points, and respondents said they expect it to yield important benefits, including improved data management (47%), transparency (46%), risk management (40%), speed of digitization (39%) and streamlining of processes (39%) (see Figure 2).

Among many potential applications, the Spanish bank BBVA used the Ripple distributed ledger platform to reduce the time needed to transfer money internationally from four days to seconds.⁵ In trade

finance, blockchain could improve workflows and reduce costs by issuing bills of lading and letters of credit as digital assets on the network and using smart contracts to execute automatically once its terms have been met.

Increasing Efficiency and Reducing Costs

The increased efficiency from blockchain-enabled processes could save the banking and financial services industry up to \$20 billion in annual infrastructure costs for cross-border payments, securities trading and regulatory compliance.⁶ Ninety-five percent of respondents said the technology will improve regulatory compliance, including 49% who said it will improve it to a large extent. Virtually all respondents (98%) said blockchain will save their firm money, with 39% expecting savings of more than 5%.

The vast majority of respondents (90%) said their firm has identified or is in the process of identifying functions or processes that can be automated with blockchain, and three-quarters said they expect the technology will eventually allow them to automate 2.5% or more jobs at their company.

Automation may account for much of the savings. The vast majority of respondents (90%) said their firm has identified or is in the process of identifying functions or processes that can be automated with blockchain, and three-quarters said they expect the technology will eventually allow them to automate 2.5% or more jobs at their company.

For example, we recently worked with a leading U.S. commercial bank that faced the challenge of having multiple subsidiaries, each with different enterprise systems that frequently needed to share general ledger postings with each other. The bank sought to eliminate manual intervention and automate settlement and reconciliation of transfers between its subsidiaries in real time using smart contracts supported by blockchain. The project created a complete end-to-end solution to achieve these objectives, using Ethereum to store general ledger balances and Factom to store settled general ledger postings.

In another project, we assisted a large U.S. commercial bank to streamline its mortgage process using Ethereum smart contracts to transfer title deeds automatically between sellers and buyers, and maintain the information on the transaction without the need for a centralized solution. The project demonstrated how smart contracts can be leveraged to improve efficiency of multi-signer title deed transfer processes.

The benefits included minimizing manual interventions, improving security and transparency by storing title deeds on a decentralized ledger, and creating an immutable record of title ownership and any changes to a property.

Creating New Business Opportunities

Blockchain networks will also create new revenue opportunities in several ways:

- **Open new markets that are currently underserved**, such as in emerging markets and for less credit-worthy consumers in developed markets. Currently, it's difficult to obtain information on these customers and for them to interact with financial institutions. Look for new banking, lending and international payment options to develop around the globe.

- **Improve customer experience and increase opportunities for cross-selling and retaining revenue.** For example, the due diligence required to comply with know-your-customer (KYC) regulatory requirements currently takes an average of 24 days, which represents a lost opportunity of up to \$25,000 per customer in cross-selling revenue. If banks were to share their KYC data on a blockchain network, they could onboard new customers more quickly, as well as slash due diligence costs and reduce risk.
- **Create entirely new business models over the long term.** For example, by applying blockchain technology to a KYC solution, banks can more easily share credentials and turn a portion of the business that has historically been a cost center into a profit center.

Reflecting these opportunities, roughly three-quarters of respondents predicted revenues for their firm will grow by more than 5% by adopting blockchain. Again, senior executives were significantly more optimistic, with 51% expecting revenue growth of more than 10%, compared with just 23% among senior managers.

Only about half of respondents (48%) said their firm has defined a blockchain strategy, and just 39% said their organization has created the required internal policies and governance.

But while blockchain will create new revenue opportunities, it also has the potential to create winners and losers. Roughly two-thirds of respondents are concerned that the disintermediation facilitated by blockchain will have either a significant or moderate adverse impact on their firm.

In a future of decreased infrastructure costs for conducting financial transactions, the barriers to entry in financial markets will fall, democratizing and commoditizing some traditional services. Firms that can move quickly on blockchain to realize a cost advantage while successfully providing value-added services will succeed. Moving too slowly introduces the risk of being usurped by technology providers offering financial utility models.

DEVELOPING A STRATEGY IN THE FACE OF UNCERTAINTY

Blockchain will disrupt traditional financial business models while also setting higher standards for efficient operations, and firms need to recognize the new competitive landscape that is emerging. Simply implementing blockchain technology does not provide a competitive advantage in and of itself, as the infrastructure and application are shared and thus are commodities.

Instead, competitive advantage can only be secured when firms leverage and integrate the blockchain application better than competitors do on the same platform. Alternatively, competitive advantage can occur across a value chain on which the shared infrastructure provides a lower-cost footprint than a competitor's value chain does. Firms need to design their business strategy to take advantage of the new capabilities available and devise a response as traditional business models are disrupted.

Consider retail at the advent of the Internet. A retailer would have had to recognize that the Internet was not simply another sales channel, but instead see how e-commerce would fundamentally shift its relationship with customers, as well as upend traditional business models. Similarly, financial institutions should recognize that blockchain will commoditize many of the transactional aspects of



Card processing companies are furthest along, with 65% of respondents at these firms reporting they have defined a strategy, which may be the result of experimentation with Bitcoin. In contrast, concerns over the speed and scale of blockchain networks may explain why only about 20% of respondents at brokerage firms reported having a strategy.

their business and alter how they differentiate in the market. No longer will a transactional customer relationship be sufficient, and financial firms must move up the value chain and compete on value-added services.

Although executives know that blockchain will be important to their future success, many firms have not developed a strategy to move forward. Only about half of respondents (48%) said their firm has defined a blockchain strategy, and just 39% said their organization has created the required internal policies and governance.

Further, a blockchain strategy assumes that a firm has identified the functional areas and business processes that could be affected by the technology, yet only 42% of respondents said their organization has completed such an assessment. Clearly, most firms have much more work to do.

Card processing companies are furthest along, with 65% of respondents at these firms reporting they have defined a strategy, which may be the result of experimentation with Bitcoin. In contrast, concerns over the speed and scale of blockchain networks may explain why only about 20% of respondents at brokerage firms reported having a strategy.

There are many practical and strategic reasons for moving quickly:

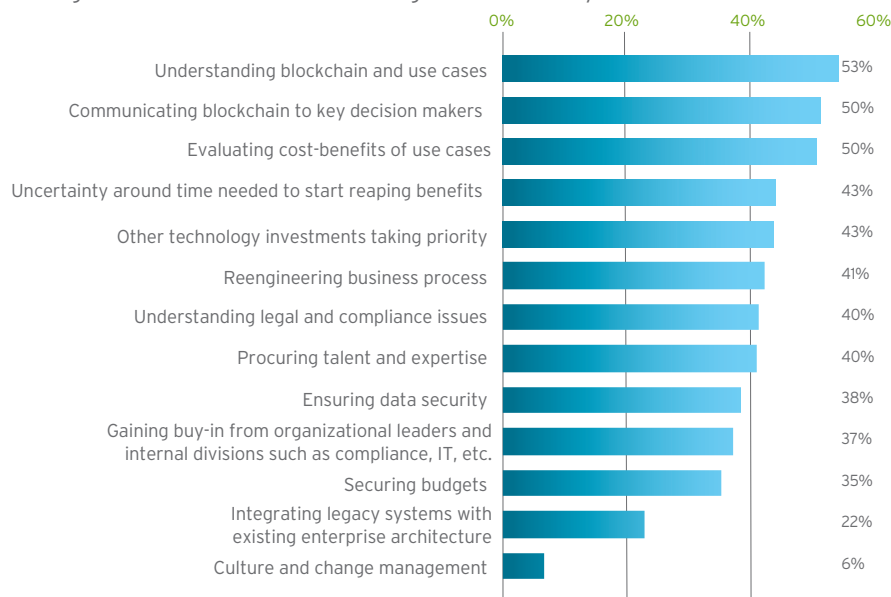
- **Road-testing new processes** before committing significant resources will enable quicker rollout with less risk.
- **Developing required capabilities in business processes and technology systems** will provide a greater ability to respond flexibly to future changes in blockchain networks.
- **Gaining experience in collaborating with partners** in blockchain networks.
- **Influencing how network governance will be structured.** Any firm that has not made plans to work on blockchain outside its own walls needs to reassess its pace.

Developing a blockchain strategy should not be seen as a technical issue, driven by IT. The internal barriers to adoption cited most often by respondents relate to business and strategic issues, such as understanding blockchain and use cases (53%), as well as communicating blockchain to key decision makers (50%) (see Figure 3, next page). Launching and evaluating blockchain projects should be a strategic conversation that includes senior executives and stakeholders from throughout the organization. (For more guidance on developing a blockchain strategy, see Quick Take, page 13.)

Developing a blockchain strategy should not be seen as a technical issue, driven by IT.

Top Internal Barriers to Adoption

The most often cited internal barriers to adoption were business and strategic in nature, such as understanding blockchain and communicating what it is to key decision makers.



Note: Multiple responses allowed.
Figure 3

When business stakeholders are not involved in blockchain projects from the get-go, implementation can be delayed, and buy-in can suffer. While a proof of concept or pilot shows how the technology works, a more important goal is learning whether a blockchain solution is optimal for the business problem, as well as how its implementation will change the organization and its strategy.⁷ Firms drastically underestimate the substantial challenges of managing the changes that blockchain will require, with only 6% of respondents citing culture and change management as a top barrier to blockchain adoption. (For more insights, see the “Creating a Culture of Collaboration” section, page 19.)

Evaluating cost benefits of use cases is a top internal barrier to blockchain adoption, cited by half of the study respondents. To overcome this hurdle, it’s best to see blockchain as a strategic imperative rather than a cost-benefit equation. Firms may not be able to precisely determine the benefits of a project at the outset because many outcomes will be strategic in nature. However, they should work to specify the objectives they want to achieve so they can judge success.

To ensure that trials and pilot projects can translate successfully into live production applications, it’s important to create a dialog with diverse stakeholders on strategy and results. The iterative learning that comes with experimentation can go a long way toward building buy-in throughout all levels of the organization.

QUICK TAKE

Developing an Effective Blockchain Strategy

Financial services firms need to develop a cohesive blockchain strategy, rather than taking on projects in a piecemeal fashion. The following considerations can help them move forward on the best path toward a blockchain strategy:

- **Develop a cross-functional team with a business sponsor to drive the strategy.** Rather than emanating from IT, blockchain projects should be designed to address specific business problems or opportunities, and business stakeholders should be involved from the outset.
- **Set clear goals.** Assess whether blockchain is well suited to the business issue being addressed, and clearly specify the objectives that will be achieved.
- **Don't wait until costs and benefits are clear.** Learning will be iterative, and costs and benefits may only become defined more clearly as the project progresses. In addition, many reasons to move forward are strategic in nature and cannot be quantified at the outset.
- **Stay flexible.** Recognize that blockchain is still in the early stages of development; innovation will continue, and the infrastructure will evolve.
- **Explore a variety of platforms, including both permissioned and permissionless.** For each use case, choose a platform based on how well it is tailored to the business need, not the one that's getting the most market attention.
- **Don't expect to retain as-is business processes and technology systems.** Examine current processes and systems to determine if they need to be redesigned to fully leverage blockchain capabilities.
- **Gain experience collaborating with other firms.** Don't underestimate the importance - and challenge - of managing the people side of change to create a culture of collaboration. Work with industry partners on blockchain projects and assess the obstacles in working successfully with external organizations.
- **Focus on blockchain projects with real-world potential.** The risk of doing nothing is greater than the risk of doing the wrong thing.

QUICK TAKE

Japanese Megabank Expands Blockchain Investment after Successful Trials

Mizuho Financial Group, one of Japan's largest banks, is an early adopter of blockchain. We partnered with Mizuho to develop a blockchain solution for sharing sensitive documents among its subsidiaries around the world. We also helped test how blockchain could enable the bank's subsidiaries to tokenize internal money transfers, eliminating the need for cumbersome and manual data reconciliation.

For Mizuho, the trials confirmed that blockchain can create an effective platform for information sharing among multiple group companies, resulting in potential cost savings and enhanced usability.⁸

The solution was designed using Ethereum for smart contracts, BigchainDB for decentralized storage and Interplanetary File System (IPFS) for decentralized file transfer. In addition to meeting the business need, the project helped Mizuho understand how to leverage the different strengths of platforms to build an overall solution.

In April 2017, Mizuho announced it would work with us to use Corda, the open source distributed ledger platform developed by R3, to digitize trade documents such as letters of credit and bills of lading. The goals are to reduce fraud, optimize the speed and efficiency of transactions and enhance visibility for all parties involved in trade finance.⁹

SELECTING THE RIGHT PLATFORM

The future of the blockchain ecosystem is still in flux, and there is no clear consensus on what shape it will take. When asked who they believe is likely to govern the blockchain network in their industry, 47% of respondents said a consortium would play that role, 26% said a third party, such as a start-up, 19% said an existing organization within the industry, and 8% said a public network such as Ethereum or Bitcoin (see Figure 4).

Respondents agreed that both public and private blockchain networks will gain importance rapidly, with 86% indicating that public (i.e., permissionless) blockchains will gain prominence within the next five years, and 80% saying the same about private (i.e. permissioned) blockchains (see Figure 5).

Blockchain platforms are characterized by a strong network effect, meaning that the value of the platform grows with each additional user and/or company participant. This trend generally leads to market consolidation around a small number of players. However, given the different market needs stemming from use-case-specific regulation and industry-specific performance requirements, it is unlikely that one blockchain network will dominate the industry.

Future Governance

Most respondents believe a consortium will form to govern blockchain networks.

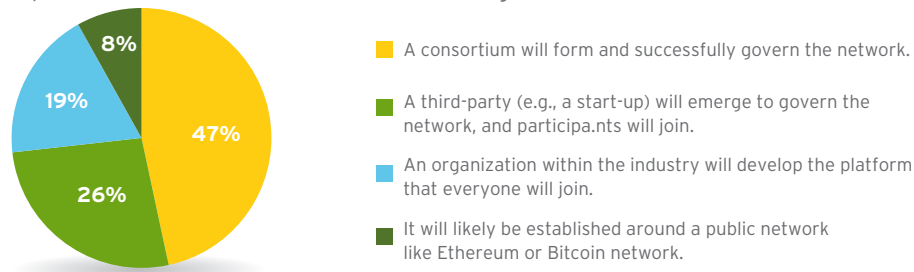


Figure 4

Timeframe for Blockchain to Gain Prominence

Respondents agreed that both public and private blockchain networks will gain importance rapidly.

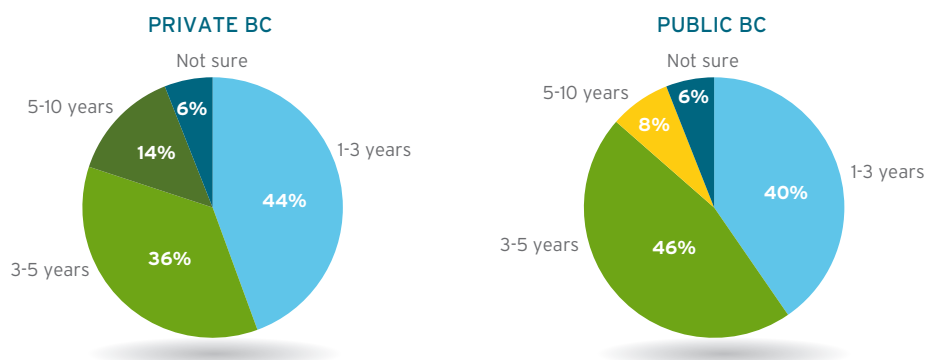


Figure 5

Differentiation among public networks is already occurring; examples include Bitcoin's strength as a cryptocurrency and Ethereum's in smart contracts. Hybrid models continue to emerge, such as the efforts to build a corporate version of Ethereum with increased privacy functionality. Platform differentiation is also emerging, with platforms optimized for smart contracts like Corda, Hyperledger and Monax, and others optimized for asset transfer and provenance, such as Chain and MultiChain. We see further differentiation occurring around industry-focused platforms such as Corda for banking and financial services and Ripple for cross-border payments.

We believe consolidation will occur around a handful of platforms – both public and private – that will co-exist based on market demand for differentiated features. Firms may use a public blockchain when the priority is to make it easy for the greatest number of users to connect, and performance requirements, such as speed, are less important. On the other hand, private blockchains offer a number of advantages, such as the ability to change the network's rules, greater security and less costly transactions because they only have to be verified by a few nodes.¹⁰

We believe consolidation will occur around a handful of platforms, both public and private.

Firms are taking a variety of approaches; 43% of respondents said their organization is planning to adopt a permissioned blockchain (only for trusted participants), 37% said they prefer public blockchain, and 15% said their firm is opting for private blockchain within the organizational firewall (i.e., between various departments). Respondents at credit card processors most often said that their firm is planning to adopt an open blockchain (56%), while those at brokerage firms were more likely than others to report that their firm is planning to adopt a permissioned blockchain open only to trusted participants.

Given the uncertainty over which platforms will prevail, 86% of respondents said their firm is hesitant to join a platform, including 39% who said they are very hesitant. For firms that see blockchain as critical to their future success, the decision to join a platform brings a sense of greater potential risk. Among these respondents, 55% said their firm is very hesitant to join or select a platform, compared with only 17% for those who don't believe blockchain is important to their future success.

Firms should analyze which platform is best suited for the business needs of each application. This assessment should consider:

- **Applicability.** Does the platform possess features, such as smart contracts, that meet the needs of the business use case?
- **Capability.** Does the technology meet the business requirements for privacy, security, scalability and speed?

- **Business risk.** Does the platform create unacceptable levels of business risk? For example, firms should consider whether a platform has reasonable long-term prospects, such as having gained some traction and diverse developer support, and if there is vendor dependency, such as from strict IP rights or platform lock-in.

Since it is unclear which platforms will be the eventual blockchain winners, firms should ensure they are not “all-in” on any one platform. Seventy-eight percent of respondents said their firm is following this approach and exploring four or more platforms, including 44% who said they are exploring seven or more. The most common platforms are Bitcoin (49%), the original public blockchain Ethereum (42%), which allows developers to build decentralized, private applications on top of its open source platform and run smart contracts, and Ripple (41%).

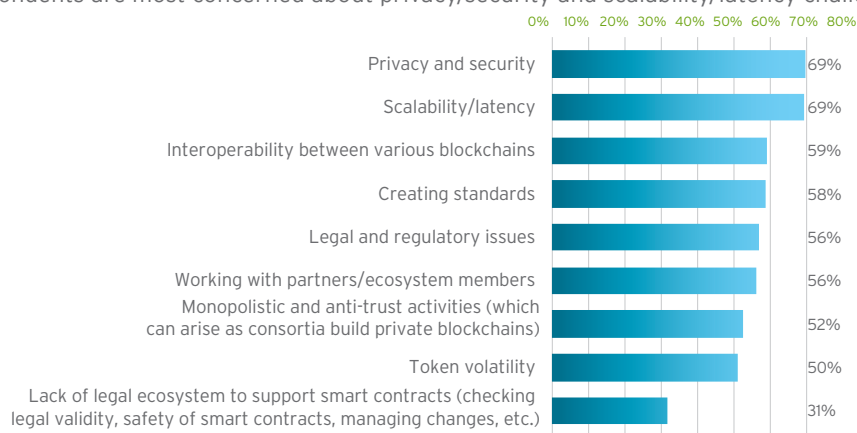
We believe it is critical for firms to explore open frameworks because they influence the development of the permissioned platforms. But firms are also asking for help in exploring permissioned platforms such as Corda, Hyperledger Fabric, MultiChain and Monax, among others.

Employing the increasingly popular open source blockchain platforms can help avoid lock-in. However, even blockchain technology companies that are using open source technology will try to lock in participants in other ways, such as requiring the use of proprietary services or the need to make substantial investments in infrastructure.

Interoperability among platforms will be a key issue going forward. If sharing data among blockchain networks becomes easy, the market will support a greater number of platforms, decreasing the risk of selecting the “wrong” platform. If not, a network that offers plug-and-play modules for various use cases could ultimately dominate. Fifty-nine percent of respondents considered a lack of interoperability to be one of the top external obstacles to blockchain adoption because it increases the risk of committing to a platform (see Figure 6).

Blockchain’s External Challenges

Respondents are most concerned about privacy/security and scalability/latency challenges.



Note: Multiple responses allowed.

Figure 6

Despite concerns over privacy and security, the fact is that blockchain technology's cryptography and tamper-resistant design prevent data from being altered. Further, having data reside on a network eliminates a single point of failure.

ADDRESSING PRIVACY/SECURITY AND SCALABILITY CONCERNS

When asked about the top external roadblocks to blockchain adoption, the two issues cited most often were privacy/security and scalability/latency (each named by 69% of respondents) (see Figure 6, previous page).

Privacy/Security

Most of the concerns regarding privacy and security result from permissionless blockchains such as Bitcoin and Ethereum. Many financial services firms were introduced to blockchain through Bitcoin, which is built on the principles of 100% data transparency and anonymity. However, firms don't want their data to become public, and in many cases, regulations restrict how customer data can be shared. Much of the ongoing innovation in public blockchain platforms is designed to allow firms to limit access to data.

Permissioned blockchains, on the other hand, provide firms with the ability to determine which participants can access data. Among the innovations that permissioned blockchains have developed in this area are:

- **Channels.** These allow peers to "subscribe" to what can be characterized as an independent chain of blocks on which information is only available to peers with access to the channel.
- **Node specialization.** R3 uses the concept of notaries, which are specialized nodes that parties can designate to validate the transaction and thus prevent double spend. The other nodes on the network are not able to see any details of the transaction, and hence privacy is maintained.

While these innovations have not yet been tested at scale in live production, they are reducing privacy and security concerns for permissioned platforms.

Despite concerns over privacy and security, the fact is that blockchain technology's cryptography and tamper-resistant design prevent data from being altered. Further, having data reside on a network eliminates a single point of failure. Although problems can still occur at the endpoints where human interaction occurs, these issues can be quickly identified and isolated.

The concerns over blockchain security can be compared to the fear of self-driving cars. People expect self-driving cars to have a spotless safety record, and whenever one is involved in an accident, this is cited as evidence that the technology is not safe. In fact, though, self-driving cars are expected to substantially reduce the number of vehicle accidents, which are mostly the result of human error.¹¹ As with other technologies, it takes time for people to become comfortable with a new technology, which we believe will also occur with blockchain.

Scalability/Latency

While security concerns are being addressed, innovators are also working on the challenges of scalability and latency. Ripple announced its Ripple Consensus Ledger that can handle nearly 1,000 transactions per second,¹² and speeds will undoubtedly continue to increase. Financial services firms should consider the speed required for their specific use cases. For example, certain capital market transactions, which cannot tolerate even brief delays, may not be feasible until blockchain speeds increase further. Current processing speeds, meanwhile, may be sufficient for applications that are less time-sensitive, such as loan processing.

Platforms often tout scalability as a key feature, but firms should remember that these marketing claims may not match reality. When testing speed, firms need to make sure they are assessing the time required for the complete process, from transaction initiation through final confirmation. Some platforms quote misleading speeds that don't incorporate the entire lifecycle of the transaction.

Another factor to consider is the inherent trade-off between speed and security. Transaction times become faster as a platform becomes more centralized; yet greater centralization means the platform is less secure because of reliance on a trusted intermediary.

CREATING A CULTURE OF COLLABORATION

Blockchain's greatest benefits will come from industry-wide networks. However, getting there at scale may prove difficult in an industry that does not traditionally embrace collaboration. Roughly two-thirds of respondents reported that their firm is working with external partners and with other industry partners/competitors, but 56% cited working with partners/ecosystem members as one of the top external obstacles to blockchain adoption.

Blockchain's greatest benefits will come from industry-wide networks. However, getting there at scale may prove difficult – 56% of respondents cited working with partners/ecosystem members as one of the top external obstacles to blockchain adoption.

Issues that present a “high” level of difficulty included establishing connectivity with partner systems (50%), identifying and finalizing blockchain use cases (49%) and convincing partners to share experimental data (45%) (see Figure 7, next page).

Perhaps even more important, collaborating successfully requires participants to have a network mindset, where they are focused on growing the size of the pie and not simply on their own individual slice of the market. With network-based markets, a firm can often increase its margins by including competitors, which adds to the value of the network.

The rise of peer-to-peer (P2P) lending and money movement platforms provides an instructive example. Banks could have collaborated more effectively to improve the efficiency of money movement.

Since banks were not able to collaborate to provide these channels, P2P money movement platforms arose to fill this vacuum. In this case, banks may have given up the lucrative area of customer relationship ownership to firms managing these P2P platforms while retaining the costly portions of underwriting risk and managing money movement.

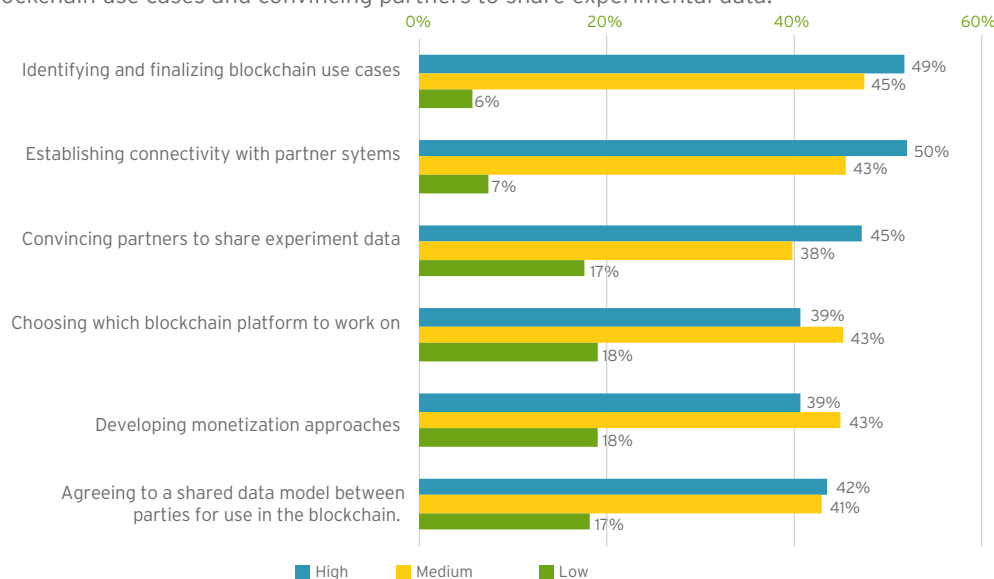
Nearly half of respondents (47%) said they believe a consortium of different firms will form to govern the blockchain network in their industry. The collaborative industry projects underway include:

- **R3:** Formed by 80 of the world's largest banks to manage agreements between regulated financial institutions.¹³
- **Enterprise Ethereum Alliance:** Formed by 30 large corporations to create a private, open source version of Ethereum for businesses to track financial data and contracts.¹⁴
- **Hyperledger:** A global open source collaborative effort, hosted by The Linux Foundation, which was created to advance cross-industry blockchain technologies. The consortium includes leaders in finance, banking, Internet of Things, supply chains, manufacturing and technology.

Firms will need to carefully manage the cultural change required to become comfortable collaborating with customers, partners and competitors. Firms find it difficult to imagine sharing data with competitors, given the many structural, cultural and regulatory barriers that have been put in place to prevent this. Encouraging the desire to upend long-established practices won't be easy in an industry that has traditionally been conservative and risk-averse. Further, most firms don't appear to recognize the challenges of changing their accustomed ways of doing business. Only 6% of respondents cited culture and change management as a top internal barrier to adopting blockchain.

Difficulties in Working with External Partners/Stakeholders

Respondents reported difficulty with connecting with partner systems, identifying and finalizing blockchain use cases and convincing partners to share experimental data.



Note: Multiple responses allowed.

Figure 7

Fifty-eight percent of executives said they believe blockchain will significantly impact their firm's operating models. Yet, only 24% of executives rated their firm's ability to integrate blockchain with its existing processes and systems as high.

Many firms even struggle to collaborate internally, and a first step is to develop blockchain projects that require collaboration internally by different lines of business or functional areas. As firms gain experience and comfort with blockchain-enabled solutions that integrate information across their organization, they can begin to transfer the experience and knowledge gained to external projects.

Firms should also include cultural and process barriers as evaluative criteria in blockchain proofs of concept that involve other organizations. In projects that involve partners, firms should focus less on proving the technology and more on identifying policies, processes or cultural practices that limit or restrict effective collaboration. In some cases, current regulations may present an obstacle to collaboration, but a good approach is to consider what could be achieved if these regulatory barriers were eliminated or lessened in the future.

RETHINKING BUSINESS PROCESSES AND TECHNOLOGY SYSTEMS

Financial services firms anticipate that numerous blockchain use cases will be identified across cards and payments, capital markets, banking and utilities (see Figure 8, next page). They also realize pursuing these use cases will require changes to the associated business processes and technology systems. Fifty-eight percent of executives said they believe blockchain will significantly impact their firm's operating models, including business processes and technology systems. Yet, only 24% of executives rated their firm's ability to integrate blockchain with its existing processes and systems as high, while fully 44% said they do not even know their firm's capabilities.

To fully exploit the technology's potential, a firm should not simply clone its current business processes onto a blockchain, which would only replicate existing inefficiencies. Instead, it should consider the original intent and business purpose of its processes and take the opportunity to restructure and streamline them by asking how they can be reimaged by leveraging blockchain. The rethink of business processes should be conducted in tandem with an assessment of the changes required in technology systems to take best advantage of blockchain solutions.

Although this is the longer-term vision, most firms are instead assessing how they can retrofit their existing processes and legacy technology systems to support blockchain. They are looking to build applications that address a business need but don't require extensive changes to current processes and systems. Forty-eight percent of respondents said they believe blockchain will add to their current operating models without drastically changing them, while only 31% said blockchain will replace current operating models with entirely new models. Executives at card processors (43%) and at money transfer firms (43%) are more likely to expect that blockchain will replace existing operating models, which is likely due to the possible effect of cryptocurrencies on their businesses.

Firms are taking a similarly incremental approach to their technology systems. Forty-one percent of executives said their firm plans to replace some parts of the legacy system to enable blockchain adoption, while 23% said their organization would pursue a hybrid solution that allows it to retain legacy systems as-is but also deploy blockchain. Just 3% said they'd identified new blockchain solutions for unaddressed problems or opportunities, such as creating an application on a fresh stack, as opposed to focusing on integration with existing systems.

Firms that develop the ability to integrate blockchain with existing business processes and technology infrastructures will benefit from the ability to quickly implement blockchain business applications.

Wide Variety of Use Cases

Potential applications of blockchain span the financial services gamut and may be re-prioritized over time.





Line of Business	Top Current Use Cases	Top Future Use Cases
Cards & Payments 	51% International payments 46% Inter-bank settlements 39% Cryptocurrencies	47% Inter-bank settlements 42% Cross-currency transactions 39% Micropayments 31% Loyalty programs/gift cards
Capital Markets 	37% Repurchase agreements 37% Smart bonds 37% Equity issuance	37% Smart bonds 41% Equity issuance 39% OTC derivatives 30% Shareholder voting
Banking 	39% Automotive finance 36% Mortgage lending 35% Trade finance	41% Automotive finance 37% Supply chain financing 35% KYC processing
Utilities 	40% Document management 40% Asset digitization 39% Bill payment	45% Asset digitization 40% Bill payment 38% Document management 38% Contract management

Figure 8

Over the longer term, however, the greatest opportunities will come from fundamentally rethinking operating models rather than simply layering blockchain on top of existing processes and systems.

Blockchain innovation teams are often limited by business sponsors who want to address shorter-term business needs. However, firms should encourage their innovation teams to engage with corporate development and corporate strategy to introduce a longer-term view of the technology's potential (see Figure 8). As firms begin to see the benefits that blockchain can deliver, they will likely begin to make more fundamental changes to their operating models to unlock more value.

While it's important for firms to move aggressively on blockchain, they should do so with their eyes wide open. Blockchain's potential is enormous, but so is the hype. Blockchain networks are competing for members, and each is trying to position itself as the ultimate winner.

LOOKING FORWARD

The stakes of blockchain are too high for financial services firms to take a wait-and-see approach. Blockchain technologies promise to dramatically streamline operations and reduce costs, while opening up new revenue opportunities and markets.

While early adopters are moving into blockchain production, most of the industry remains in a planning and experimental phase. Yet, there is only so much that a lab can prove. Firms should not only run trials internally but also place a priority on conducting them through engagements with outside organizations.

Financial services firms need to define a business strategy that takes into account the substantial expected impacts of blockchain. They also need to codify their approach to this technology, including identifying the areas in their organization where it will have the greatest impact. Moving from pilot to production will require firms to assess the necessary changes to business processes, technology systems and the organizational culture, as well as where they will need additional expertise and partnerships.

While it's important for firms to move aggressively on blockchain, they should do so with their eyes wide open. Blockchain's potential is enormous, but so is the hype. Blockchain networks are competing for members, and each is trying to position itself as the ultimate winner. Which platforms will survive as the fragmented blockchain market converges is still to be determined, so firms should focus on selecting the platform for each use case that provides the capabilities needed, while minimizing business risk. Organizations can further reduce risk by avoiding commitment to a single network and gaining experience with multiple platforms, especially those with open source technology.

Firms should determine today how blockchain fits into their 2020 roadmap and ensure that their projects have a clear trajectory that can take them from the lab into the real world. Firms that remain stuck in the planning phase face the prospect of being left behind as their more aggressive competitors capture an impregnable first-mover advantage.

FOOTNOTES

- ¹ In this report, “senior executives” are respondents with C-suite or vice-president titles; “senior managers” are respondents with the title of director, senior manager or asset manager.
- ² A popular advertising slogan coined by Sun Microsystems’ executive John Gage, https://en.wikipedia.org/wiki/John_Gage.
- ³ Smart contracts are not unique to blockchain, but they are greatly enhanced by blockchain networks.
- ⁴ For more information on how blockchain works, please see our report “Demystifying Blockchain,” Cognizant, 2017, <https://www.cognizant.com/whitepapers/demystifying-blockchain-codex2199.pdf>.
- ⁵ Samburaj Das, “BBVA Uses Ripple Blockchain for Spain-Mexico Money Transfer in Seconds,” Cryptocoins News, April 28, 2017, <https://www.cryptocoinsnews.com/bbva-ripple-money-transfer/>.
- ⁶ Yessi Bello Perez, “Santander: Blockchain Tech Can Save Banks \$20 Billion a Year,” CoinDesk, June 16, 2015, <http://www.coindesk.com/santander-blockchain-tech-can-save-banks-20-billion-a-year>.
- ⁷ For more information on getting started with blockchain, see Cognizant’s 2016 report “Blockchain: Instead of Why, Ask Why Not?” <https://www.cognizant.com/whitepapers/Blockchain-Instead-of-Why-Ask-Why-Not-codex1973.pdf>.
- ⁸ “Completion of Blockchain Technology and Mizuho Digital Current Trials,” Mizuho Financial Group, Inc. and Cognizant Japan KK, Feb. 23, 2017, https://www.mizuho-fg.com/release/pdf/20170223release_eng.pdf.
- ⁹ “Mizuho Financial Group Partners with Cognizant to Develop a Distributed Ledger Solution for More Efficient and Secure Trade Finance,” Cognizant, April 25, 2017, <http://investors.cognizant.com/2017-04-25-Mizuho-Financial-Group-Partners-with-Cognizant-to-Develop-a-Distributed-Ledger-Solution-for-More-Efficient-and-Secure-Trade-Finance>.
- ¹⁰ Vitalek Buterin, “On Public and Private Blockchains,” Ethereum blog, August 7, 2015, <https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/>.
- ¹¹ “Driverless Cars Could Reduce Traffic Fatalities by Up to 90%, Says Report,” Science Alert, October 2015, <https://www.sciencealert.com/driverless-cars-could-reduce-traffic-fatalities-by-up-to-90-says-report>.
- ¹² Warren Anderson, “Ripple Consensus Ledger Can Sustain 1,000 Transactions per Second,” Ripple blog, Feb. 28, 2017, <https://ripple.com/dev-blog/ripple-consensus-ledger-can-sustain-1000-transactions-per-second/>.
- ¹³ David Rutter, “When Is a Blockchain Not a Blockchain?” R3cev.com blog, Feb. 24, 2017, <http://www.r3cev.com/blog/2017/2/24/when-is-a-blockchain-not-a-blockchain>.
- ¹⁴ Nathaniel Popper, “Business Giants to Announce Creation of a Computing System Based on Ethereum,” *The New York Times*, Feb. 27, 2017, <https://www.nytimes.com/2017/02/27/business/dealbook/ethereum-alliance-business-banking-security.html>.

Acknowledgments

The Cognizant Research Center (CRC), led by Director Anand Chandarmouli, conducted this survey and analyzed the findings in collaboration with Cognizant’s Blockchain and Distributed Ledger Consulting Practice. Key contributors include: Rashi Goyal, Manager, Blockchain and Distributed Ledger Practice; Gagan Jain, Manager, Blockchain and Distributed Ledger Practice; Marie Leaf, Consultant, Blockchain and Distributed Ledger Practice; and Chayan Keshari, Chief Architect, Blockchain and Distributed Ledger Practice.

The authors would like to also thank CRC research analysts Akhil Tandulwadikar, Vinaya Kumar Mylavaram and Sanjay Fuloria, as well as Reshma Trenchil, a Senior Manager in Cognizant’s Thought Leadership program, for their insightful contributions to this research report.

Methodology

We conducted an online survey among 1,520 individuals familiar with blockchain from 578 financial services firms from January through early March 2017. When asked to describe their level of understanding blockchain, 29% described themselves as expert, 43% as proficient, 20% as competent and 8% as beginner or novice.

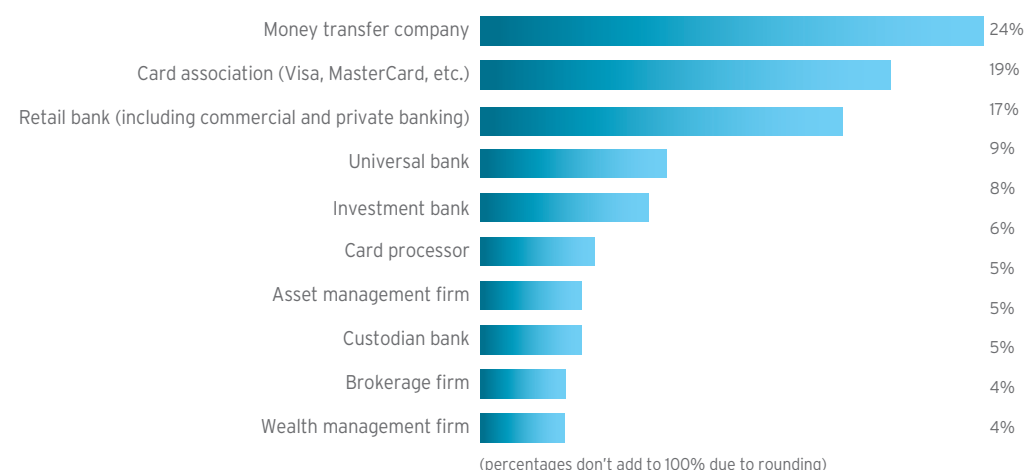
Roughly, 33% of respondents are from North America, 46% are from Europe, and 21% are from Asia Pacific. Respondents work in a variety of industry segments, including money transfer companies (24%), card associations (19%) and retail banks (17%) (see Figure 9).

Respondents have the following titles: 12% C-suite, 24% vice-president, 29% director, 26% senior manager and 8% asset manager. In our analysis, we refer to respondents with C-suite or vice-president titles as “senior executives” (36% of total sample), while respondents with the title of director, senior manager or asset manager are called “senior managers” (64%).

Respondents work in the following functional areas: 21% in IT, 21% in operations, 21% in R&D/innovation, 17% in compliance and security, 17% in strategy and 3% in legal.

Industry Segments Represented

Which of the following best describes your organization?



ABOUT THE AUTHORS



Lata Varghese

AVP & Leader, Cognizant
Blockchain and Distributed
Ledger Consulting Practice

Lata Varghese is a Cognizant Assistant Vice-President who leads the company's cross-industry Blockchain and Distributed Ledger Practice. In this role, she oversees the practice's efforts in providing business and technology consulting and implementation services related to the blockchain and distributed ledger suite of transformative technologies. Lata's expertise resides in business consulting, go-to-market, alliances and partnerships, as well as thought leadership creation. Her focus is on helping clients explore innovative shared infrastructure platforms and solutions that can be enabled by blockchain. Lata has over 20 years of consulting and technology service expertise in the banking and financial services industry and brings wide and varied experience across multiple geographies and services. She obtained her bachelor's degree in electrical engineering from the National Institute of Technology Calicut and an MBA from Xavier Institute of Management. Lata can be reached at Lata.Varghese@cognizant.com | <https://www.linkedin.com/in/lata-varghese-06821a1/>.



Manish Tomer

Director, Cognizant
Blockchain and Distributed
Ledger Consulting Practice

Manish Tomer is a Director within Cognizant's Blockchain and Distributed Ledger Consulting Practice. A thought leader and strategist with 13-plus years of experience in the banking and financial services business and technology spaces, Manish provides out-of-the-box thinking and exceptional problem-solving skills to clients seeking competitive advantage. In his current role, he leads a team of blockchain consultants for use case identification, solutions design and implementation across the capital markets, trade finance, KYC, corporate lending and payments sectors. In the blockchain space, Manish has experience with Corda, Hyperledger Fabric, Ethereum, Chain, consensus algorithms and smart contracts. Manish is also a certified data scientist and is credentialed in big data, design thinking, cryptocurrencies and financial risk management. Manish holds an MBA in finance from IIM Lucknow and a bachelor's degree in computer science from NIT Allahabad. He can be reached at Manish.Tomer@cognizant.com | <https://www.linkedin.com/in/manish-tomer-frm-48541a1/> | [@manishtomer21](https://twitter.com/manishtomer21).



Fletcher McCraw

Senior Consultant, Cognizant
Blockchain and Distributed
Ledger Consulting Practice

Fletcher McCraw is a Senior Consultant in Cognizant's Blockchain and Distributed Ledger Consulting Practice. He brings five years of consulting experience in the healthcare and financial services industries. In his current role, Fletcher advises clients across industries on their blockchain strategy, use case assessments and best practices. Fletcher also manages the team's partnerships with start-ups, trade associations and other technology companies. He can be reached at Fletcher.McCraw@cognizant.com | <https://www.linkedin.com/in/fletcherMcCraw/> | [@FletchMcCraw](https://twitter.com/FletchMcCraw).





ABOUT COGNIZANT'S BLOCKCHAIN AND DISTRIBUTED LEDGER PRACTICE

Cognizant's Blockchain and Distributed Technologies Practice offers advisory, consulting and blockchain implementation services to organizations across industries. We uniquely bring together deep industry experience, extensive blockchain technical expertise, and intimate knowledge of the enterprise IT environment to guide our clients' journeys from prototype and pilot through production. Our collaboration with the industry's leading lights, combined with hands-on expertise with both open source and proprietary frameworks, gives us the business and technological capabilities to assist organizations industry-wide in their efforts to make blockchain a value-yielding and dependable shared infrastructure solution across the extended enterprise. For more information, please visit www.cognizant.com/blockchain.

ABOUT COGNIZANT BANKING AND FINANCIAL SERVICES

Cognizant's Banking and Financial Services business unit, which includes consumer lending, commercial finance, leasing insurance, cards, payments, banking, investment banking, wealth management and transaction processing, is the company's largest industry segment, serving leading financial institutions in North America, Europe and Asia-Pacific. These include 17 of the top 20 North American financial institutions and nine out of the top 10 European banks. The business unit leverages its deep domain and consulting expertise to provide solutions across the entire financial services spectrum, and enables our clients to manage business transformation challenges, drive revenue and cost optimization, create new capabilities, mitigate risks, comply with regulations, capitalize on new business opportunities, and drive efficiency, effectiveness, innovation and virtualization. Learn how Cognizant helps clients lead with digital at cognizant.com/banking-financial-services or follow us @Cognizant.

ABOUT COGNIZANT

Cognizant (NASDAQ-100: CTSI) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses. Headquartered in the U.S., Cognizant is ranked 230 on the Fortune 500 and is consistently listed among the most admired companies in the world. Learn how Cognizant helps clients lead with digital at www.cognizant.com or follow us @Cognizant.

World Headquarters

500 Frank W. Burr Blvd.
Teaneck, NJ 07666 USA
Phone: +1 201 801 0233
Fax: +1 201 801 0243
Toll Free: +1 888 937 3277

European Headquarters

1 Kingdom Street
Paddington Central
London W2 6BD England
Phone: +44 (0) 20 7297 7600
Fax: +44 (0) 20 7121 0102

India Operations Headquarters

#5/535 Old Mahabalipuram Road
Okkiyam Pettai, Thoraipakkam
Chennai, 600 096 India
Phone: +91 (0) 44 4209 6000
Fax: +91 (0) 44 4209 6060