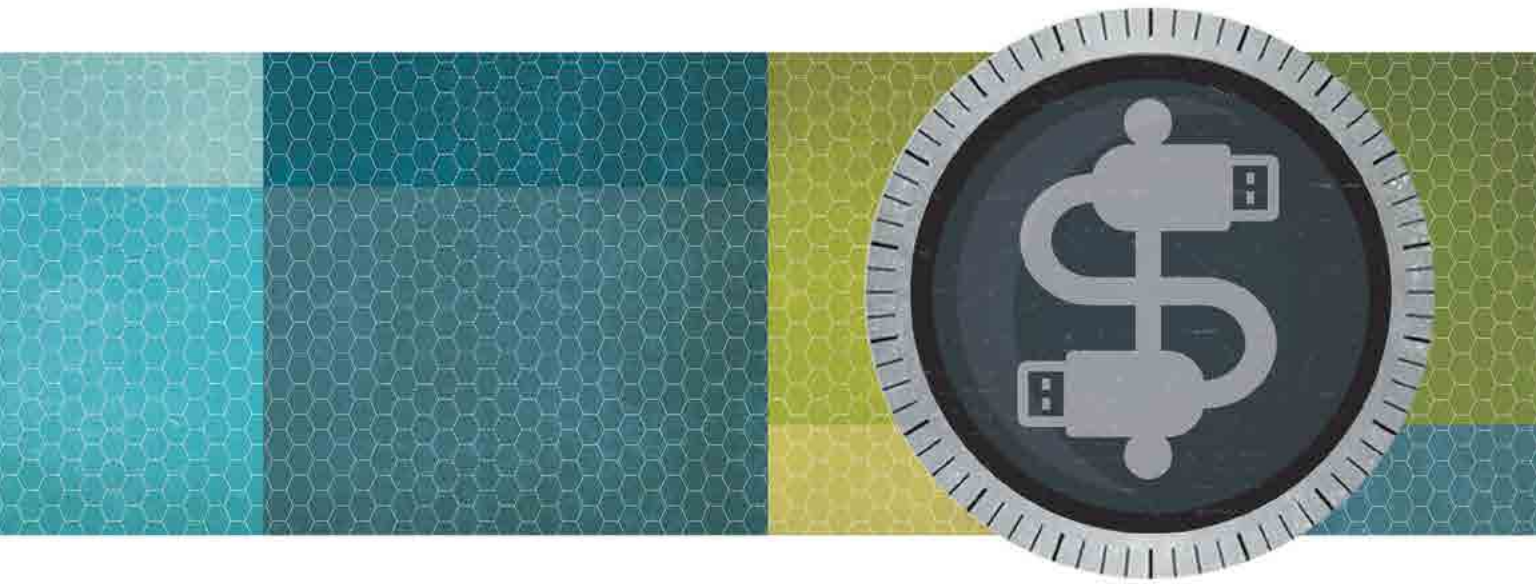


# Connect peers

Leveraging the evolving digital infrastructure to empower the edge



A pattern study from the Center for the Edge's  
*Patterns of Disruption* series

**Deloitte.**  
University Press

Deloitte Consulting LLP's Strategy & Operations practice works with senior executives to help them solve complex problems, bringing an approach to executable strategy that combines deep industry knowledge, rigorous analysis, and insight to enable confident action. Services include corporate strategy, customer and marketing strategy, mergers and acquisitions, social impact strategy, innovation, business model transformation, supply chain and manufacturing operations, sector-specific service operations, and financial management.

# Contents

Overview		2
Case studies		16
Is my market vulnerable?		22
Endnotes		23
Contacts		27
Acknowledgements		28
About the authors		29
About the research team		30

# Overview

## Connect peers

### Leveraging the evolving digital infrastructure to empower the edge

**Def. Replace centralized authority and intermediation with a distributed governance structure that enables market participants to interact directly with one another in a trusted environment that increases visibility of interaction data.**

As the digital infrastructure evolves to provide richer connectivity and new mechanisms for trust and governance, the rationale for centralized intermediation in some arenas will be challenged by new forms of peer-to-peer interaction. As the means for establishing trust-based interactions becomes more widely distributed, coordination costs will decline, and more value can be gained by connecting with others than by providing services in-house or limiting access. Combinations of people, resources, and entities with diverse specializations can now come together to help resolve difficult business challenges and profit from high-impact solutions. Such peer-to-peer models will make public layers of data that were previously controlled by hubs. As a result, many marketplace participants, as well as third-party analytics firms, will have access to potentially valuable information to learn from in order to be able to improve performance, create new value, or discover new opportunities.

In the report *Patterns of disruption: Anticipating disruptive strategies in a world of unicorns, black swans, and exponentials*, we explored, from an established incumbent's point of view, the factors that turn a new technology or new approach into something cataclysmic to the marketplace—and to incumbents' businesses. In doing so, we identified nine distinct patterns of disruption: recognizable configurations of marketplace conditions and new entrants' approaches that can pose a disruptive threat to incumbents. Here, we take a deep dive into one of these nine patterns of disruption: **connect peers**.

*Note: This pattern is unique in the series in that it is primarily speculative. Hence the cases focus on where we see signals of where this pattern might play out.*

Figure 1. Pattern snapshot



Historically, companies have chosen to keep activities in-house for two reasons: either they can perform the activity better than anyone else or the cost of coordination, including the potential cost of an interruption in service or supply, was higher than the perceived value they might gain from working with an external party. Powerful platforms emerged to reshape our models for establishing trust and reputation across wide networks of participants, changing the way, and with whom, we interact. Think about how Airbnb became a reliable broker of trust between participants or how Uber did the same in the context of ride-sharing. These hubs (see the sidebar on definitions) centralized certain activities associated with the provision of commercial services (such as branding, trust, and payment), and decentralized others (such as supply infrastructure, service provisioning, and in some cases, pricing). However, some of these services, such as

reputation measures, can also serve as lock-in mechanisms. If you have a strong following on YouTube, for example, that doesn't necessarily translate into a following on Vimeo.

Today, hubs and traditional hierarchical institutions provide value through coordination, contracting, and search services (see figure 2). They also centralize and control potentially valuable data and activities, controlling who can participate and how they can interact with others through proprietary and often invisible protocols. These companies often benefit from controlling the flow of data, either by keeping it proprietary and using it to glean insight into improving their own performance or by selling it to others. At the same time, such control can also increasingly be a liability as hackers target owners of data, and demand for privacy and security pushes toward restricting access further in an effort to protect personal information. As a result, other

## Definitions

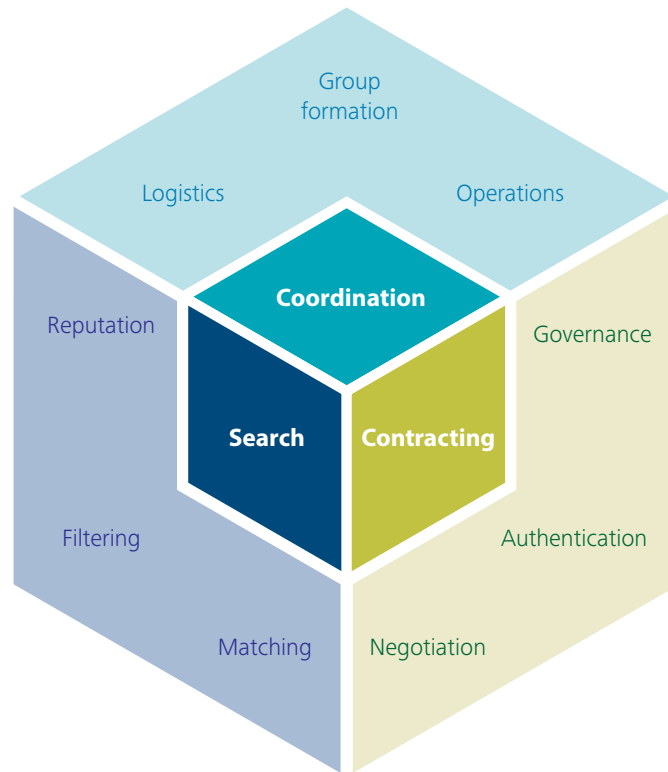
Many of the terms in this paper have been used with varying intent and meaning elsewhere. In the interest of clarity, we have defined how we are using the terms below, recognizing that our definitions may be slightly different than others'.

**Hub (or hub-and-spoke model):** A proprietary platform upon which participants conform to a set of standardized interactions using standardized packages of services. Governance mechanisms, protocol, data, participation terms, and outcomes are largely proprietary and often invisible to participants.

**Peer-to-peer (P2P):** A dynamic in which entities interact without the use of proprietary protocols or mediation by a centralized control. A P2P platform is defined by a set of public, open protocols through which participants interact and gain access to significant amounts of data about interactions on the platform.

**Protocol:** A rule or convention that allows two or more entities to communicate, transmit data, exchange information, share resources, or transact. Protocols may also encompass social and interpersonal interactions, and tend to be built on top of layers of other protocols; they may be more or less visible, or open to additions of layered services.

**Services:** Applications of protocols that are tailored to specific use cases, making participant interactions more effective and efficient. As overlays to specific protocols on a P2P network, services may address tasks such as discovery, messaging, dispute resolution, matching, moderation/escrow, or inventory management.

**Figure 2. Coase's costs**

In the 20th century, firms were organized to scale capabilities efficiently with processes that were highly standardized, closely integrated, and tightly specified for predictability. The need for governance, authority, and specialization led to models in which a central authority coordinates all activities. Now, technology is reducing the costs typically associated with search, coordination, and contracting.

Source: Deloitte analysis; Ronald H. Coase, "The nature of the firm," *Economica* 4, no. 16 (1937), pp. 386–405.

Graphic: Deloitte University Press | DUPress.com

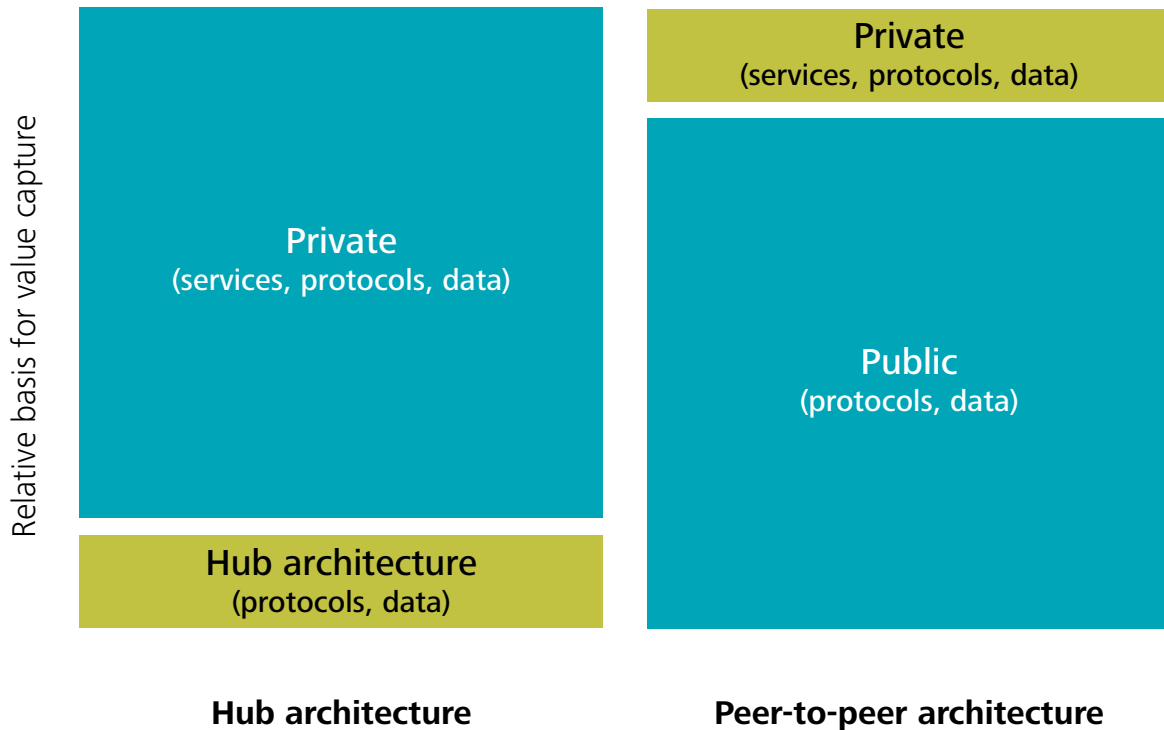
participants in the marketplace don't have access to data that could help them improve performance or discover new opportunities, and many innovations in business practices and processes, unlike in social and cultural arenas, remain localized and their impact marginalized by virtue of a lack of incentives to share learnings and practices across enterprises. The hubs and their owners also tend to benefit from network effects—they create more value as more participants use them—and the same increasing value applies to the data as well, except that the participants don't share in those increasing returns if they don't have access to the data.

New infrastructures have made it possible both to gain more control over the increasing

amount of data that we create, while also enabling a more nuanced capturing and sharing of data. A layer of anonymized or pseudonymized interaction data is open to the public, while other layers of personal data can be kept private or shared for specified uses (see figure 3<sup>1</sup>).

For example, personal biographic data about the individual might be kept private and stored separately from the user's stream of transaction/interaction data, which the user could release to a specified third-party advisor to run analytics against. Meanwhile, the aggregate marketplace transaction data would be publically available (legally and technically open for use without restriction) to anyone.<sup>2</sup> This has the potential to make data both more

Figure 3. Value capture in hub-and-spoke versus peer-to-peer



Over time, hubs developed large proprietary protocol and services layers that captured more and more value based on proprietary data and feedback loops. The incentives for sharing protocols or the data were limited because it was difficult to maintain ownership and track usage.

Peer-to-peer (P2P) architectures have become more attractive as a result of increased ability and incentives to share data and a means of capturing value from protocols. The more participants build on top of a given protocol, the more value it creates; the more participants that use it, the more value the providers of that protocol can capture. Data in this context provides more of a basis for value creation than value capture, as it allows for all participants to improve the protocol. As a result, the switching costs between services is likely to decline significantly in a P2P context, increasing competition and the opportunities for capturing value from publicly available protocols and data.

Source: Deloitte analysis; Joel Monegro, "Fat protocols," Union Square Ventures, August 8, 2016, <https://www.usv.com/blog/fat-protocols>, accessed August 31, 2016.

Graphic: Deloitte University Press | DUPress.com

secure and more available and to increase our collective ability to add value to that data while also reducing the coordination costs, ultimately loosening the hold of proprietary applications and tightly specified models of interaction (hubs).

As the factors of production—data, protocols, and, increasingly, physical assets—become more accessible to more participants and the cost of finding and employing productive assets and skills declines, the value derived from collaboration or partnering will

likely exceed the cost of coordination for a wider range of activities. Where this occurs, it will shift power from incumbent hubs and hierarchies, which have created value through more tightly specified means of coordination, contracting, and search and captured value by controlling the flow of information and limiting options for participants. For those incumbents, the value won't be where it used to be. The very data layer that drove centralization and concentrated power may be the downfall of some hubs and hierarchies.



New peer-to-peer (P2P) platforms will emerge to support P2P interactions at scale through the use of public protocols designed to expand public access to data while enhancing privacy. These P2P platforms aren't just for financial transactions. Decreasing costs of coordination, tracking, and establishing trust help make a range of other interactions between peers possible; for instance, by tracking contributions and use of digital files, Ujo Music helps make it easier and more financially viable for musicians, songwriters, and other artists to collaborate.<sup>3</sup> Increased co-creation opens up more opportunities for value capture throughout the ecosystem. It can also create new opportunities for more specialized or modular services as well as entities that can help participants manage and use their data. As each service provider focuses on offering fewer services, the service provider will likely improve its performance in the broader ecosystem, moving horizontally across what might currently be thought of as adjacent markets. Firms offering horizontal services can

benefit from exposure to an increasing variety of customers and learn even faster. The more activities and outcomes can become public, the more learning can take place from the resulting information flows, with potentially widespread benefits for participants.

The disruptive potential of this pattern resides in the accelerated, widespread, learning that comes from making data public. This open access to data drives learning and innovation in several ways. First, the data can be used to

generate insights about the participant's use to help the participant gain more value within the interactions or otherwise improve their performance. Second, it can be used to gain insights about collective interactions to identify new needs and service gaps that can be profitably met. Finally, the data can be used to help make the transactions/interactions more efficient or effective from the perspective of the platform or service provider.

While the incumbent, or a new hub, could try to provide this learning, the value gained from such activity is likely to be much greater when a diversity of third-party analytic tools

and techniques is brought to bear, each asking different questions of the data and analyzing it through different lenses. Such diversity can only happen effectively if the data are made open. We should note that a potential drawback of open data is that, with a sufficient accumulation of transactions, the data set could be queried such that individual identities would be discoverable. The degree to which this is a real problem and the precautions that might

be taken against it remain to be seen as P2P platforms develop.

There aren't yet many examples of this type of accelerated learning on P2P platforms because the P2P platforms are so new. However, Code for America's open data initiative provides a non-P2P illustration of the innovation and performance improvement that can come of opening data to diverse third parties. Over the past six years, many cities that have opened up their data have improved

“We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.”

—Amara's Law

services to citizens, gained insights into challenges, and seized the opportunity to leverage capabilities that reside outside of government—for a fraction of the cost.<sup>4</sup>

For example, Chicago hired its first chief data officer, signed the open data executive order, and held hackathons to invite new ideas. The transparency increased participation from a wider pool of talent and stakeholders, from private, public, and nonprofit sectors, and encouraged collaboration. Service improvements included the Chicago Health Atlas, which provides health trends in specific neighborhoods and Foodbourne Chicago, which searches for food poisoning tweets and links it to an online form to inspect the restaurant.<sup>5</sup> Other innovations included SpotHero, a start-up that leverages transportation data to help parking spot owners rent out spaces,<sup>6</sup> and 2nd City Zoning, a nonprofit initiative to help people understand if their building is being zoned.<sup>7</sup> Third parties are also able to observe and build off the work of others—after Tom Kompare developed the Flu Shot App in Chicago, Boston used his open source code to quickly customize and deploy it for the city.<sup>8</sup> Lastly, participants can begin to apply learning from their own data such as in the case of Expunge.io, a nonprofit initiative that helps people begin the process of erasing

their juvenile records with the help of public court documents.<sup>9</sup>

Open data provides the fuel for new and improved services, helping to increase efficiency and effectiveness as well as drive economic growth. It is important to note that the learning potential we are talking about from P2P is greater than just releasing batches of data sets over time—the public data layer created by these P2P platforms will automatically capture data as a byproduct of the interactions, making them accessible in real time, much in the same way that your vehicle location can be automatically used for traffic updates via apps like Waze.

Incumbent hubs, for their part, may use captured data to learn and improve faster, but learning remains internal to the hub. They may even analyze the data to create more value for participants by helping them improve performance as well, and in doing so, stave off competition for a time. But it is the data that drive real value for the participants—that is the core disruption. Learning is amplified as more participants can engage around the data and even more so when action is taken based on that data and one can learn from the results. Therefore, this pattern depends upon enough data being made public and accessible to drive significant learning at all of these levels that is

“[Today], our data may [only] nominally belong[s] to us [...] in order to access it or manipulate it, we require chaperones to shuttle us from digital room to digital room: We don't own our data; we just visit it from time to time.”

—Morgan E. Peck<sup>10</sup>

far greater than what a hub might accomplish through improving its own use of data for the benefit of the platform and participants. Thus, this pattern will also depend on the P2P platforms gaining a critical mass of participants to begin generating valuable learning, enough to start differentiating value from the incumbents beyond transaction cost savings. As a result, this pattern may tend to emerge first in emerging markets, in parts of the world or niches that are underserved, that are not currently dominated by an efficient and effective hub.

Initially, hubs will likely be challenged on the basis of the value they are providing as coordination, contracting, and search costs decrease. To the extent that hubs and hierarchies artificially limit access and availability to relevant factors of production, they may reduce the cost of coordination by virtue of reducing the number of options available, but in doing so they will also reduce the value-creating potential of all participants relative to what is now possible in the market. As P2P platforms draw more participants, and the number, diversity, and quality of interactions increase, the platform will likely gain greater returns from the resulting differentiation than incumbents can gain from efficiency.

An important driver of this pattern is the increasing performance pressures that the participants on today's hubs are experiencing.<sup>11</sup> Participants will likely demand learning to improve their own performance, as well as flexibility to collaborate and leverage an ecosystem. This may prove increasingly incompatible with the control an incumbent tries to exert on participants to preserve predictability and capture value.

The more diverse participants you have and the greater the quantity and quality of their interactions, the more value creation and capture opportunities there will be for the peer-to-peer platform. Peer-to-peer platforms will likely capture value through some subscription, usage, or transaction fees; however, with fewer barriers to exit and movement, participants are also likely to capture more value than

they do today. If the P2P platform or protocol developer tries to capture too much value, however, someone may choose to replicate the protocol and lower the prices.<sup>12</sup> Participants will be able to pack up their data and move elsewhere. In other words, network effects will still exist; they'll just be less powerful.

Incumbents may have difficulty responding to this pattern, in large part because of broader trends which have reduced costs associated with search, coordination, and contracting.<sup>13</sup> Reduced costs would tend to decrease the value of what hubs provide while making it easier to seek out specialized, third-party options. What had been hubs' advantage—simplification—now becomes a disadvantage—lack of options. More traditional incumbents that are not acting as hubs may also be vulnerable to this pattern, especially given that customers have become more comfortable with receiving nonstandardized products and services and increasingly expect products and services tailored to meet specific needs.

Many firms, whether hubs or non-hub incumbents, will find that their in-house capabilities are less differentiated, and worse, their proprietary services may be preventing the firm from taking advantage of the expertise that resides outside of its four walls. There may be incentive for incumbents to hold on to proprietary centralized data and protocol assets for as long as they can squeeze incremental value from them. So, while they are locking up data, peer-to-peer challengers will be making data and protocol layers available, presumably helping their participants and themselves to learn faster, spawning specialized service providers, and also getting participants to defect from the incumbent, thus chipping away at both the incumbent's revenue stream and the value of the proprietary data. Over time, the incumbent will likely fall short of being world-class and face growing performance pressures, while specialized service providers, with incentive to stand out amongst their peers, will likely continue to get better at a faster rate.

For those hubs that try to embrace third-party services (like better matching algorithm services), the very act of making their “hub” more modular may cannibalize their value capture opportunities. Because more participants will have a greater opportunity to learn about what works in which contexts, and because participants will have greater access to a wider range of transaction histories, such hubs will be able to adjust their offerings to achieve targeted outcomes, including potentially shifting from a transaction-fee model to an outcome-based revenue model. For example, if a particular services provider can increase the likelihood of your finding a job on OpenBazaar (over Craigslist) and do so more quickly for less money, as a participant on the platform, the provider would be able to provide the data and analytics to prove it. The lower switching costs between services will further amplify the impact on incumbents.

In an interesting way, incumbent hubs’ capital would also become obsolete in that the money raised, with the associated expectations for returns, may be more of a hindrance than a help. If new P2P platforms can offer lower costs (or zero costs) as a market-entry strategy, the new entrant with less capital may actually have greater degrees of freedom to pursue markets with low margins, and their lower fee structures will likely be more attractive to more participants, generating higher volume as a result. In banking, for example, new entrants would have more leeway than established players to develop opportunities in the 175 countries that don’t have fully modern banking and payment systems.<sup>14</sup>

“I think that  
blockchain will be  
to banking and law  
what the Internet  
was to media.”

—Joi Ito, director of the MIT Media Lab<sup>16</sup>

Aside from banking, lower costs and lower capitalization structures will help open up many opportunities globally in markets that may previously have been dismissed as too low-margin. Of course, the actual costs of a P2P platform will depend upon overcoming the challenges typically associated with the need for consensus and establishing trust in a given environment (see “Digging deeper” for further discussion). Finally, as has been stated already, incumbents have derived value and competitive advantage from holding proprietary data and won’t be likely to want to release

that control. Yet, the data itself—some parts of it—may become a liability, although this may occur as a result of privacy and security concerns, irrespective of a P2P challenger.<sup>15</sup> The final, significant challenge for incumbents will likely be the new mind-set represented in P2P. Many incumbents struggle even with breaking down internal silos

for transparency and collaboration, let alone opening data and protocols for collaboration across enterprises. The bigger issue is one of giving up the need to control and operating through trust, instead—in this case, trust established by distributed mechanisms that don’t derive from the absolute control of a hub or hierarchy. Incumbents may be stuck in a command-and-control mind-set, yet, increasingly, without the need to create trusted environments themselves. In addition, the belief in control may cause incumbents to act to protect stocks of data and prevent them from effectively participating in flows of information and knowledge creation.

## Distributed public records (DPR) technology

There's a lot of buzz in the technology and business worlds about the revolutionary capabilities of blockchain—but as our colleagues in Australia describe, the term is often used too broadly.<sup>17</sup> What many of us know as blockchain is, taking a larger view, one example of distributed public records technology.

This technology is the basis for a “distributed ledger,” a database, which may have assets attached, that is maintained by a group of peers rather than a central authority. It can be shared across multiple sites, geographies, or institutions. Each participant in a network has an (identical) and immutable copy of the ledger, and any changes to the ledger are reflected in all copies in near real time. The assets described can be financial, legal, physical, or electronic. Asset security and accuracy are maintained cryptographically, using “keys” and signatures to control who can do what within the shared ledger. Entries can be updated by one, some, or all of the participants, according to rules agreed on by the network.<sup>18</sup>

### **So why all the excitement over blockchain?**

First, blockchain provided one solution to the vexing problem of how to be certain the data is trustworthy in a P2P environment. It's a technology that, for the first time, allows for a data layer that is organizationally decentralized—allowing anyone to write and store information to it—while being logically centralized—giving everyone access to a single verified information set.

Previously, the only way to aggregate, verify, and centralize data was to also centralize control of that data through a service provider—for example, Snapchat (for social communication) or eBay (for commerce).<sup>19</sup> With blockchain, however, processes such as data centralization and authentication can be distributed. And blockchain advocates assert that that distribution provides immunity to the pressures of power arising from concentration of economic activity; consider how, after the 2008 economic collapse, the trusted ratings agencies were pressured to adjust securities ratings.<sup>20</sup>

### **What are the benefits of blockchain?**

Primarily, blockchain creates a new set of incentives for sharing data and protocols. Until recently, it was difficult to capture value from sharing the protocols underlying one's services, because it was difficult to effectively track and verify subsequent use of those protocols. As a result, most protocols existed only within proprietary applications or services, which one had to buy to use the embedded protocols. Usage-based pricing opened up possibilities somewhat, but still gave service providers ultimate control over source code.

Today, however, we're seeing new incentives to make the underlying protocols and data more accessible, boosting both development and adoption. In addition, interest in a protocol set can increase interest in the service layer as more participants realize that they can increase their own value by building new services on top.<sup>21</sup> With the potential to more easily monetize protocols, the rate of change and innovation at the protocol layer will likely accelerate and may lead to more activity in areas where protocols have been missing or underdeveloped.

P2P platforms aren't going to dominate in every arena, nor will all hubs be equally vulnerable. Figuring out how to make P2P work effectively, navigating the choice of protocols, and balancing incentives for participation against tactics for capturing value—none of that is trivial. In addition to the potential obstacles noted in the “Distributed public records” callout, the learning curve and need to change mind-sets in order to embrace P2P mean that it will likely only gain traction against incumbent hubs, at least initially, where the participants perceive a high value in getting rid of the hub or of gaining access to the data relative to the added complexity. Therefore, hubs are expected to be more vulnerable under three conditions: (1) the hub captures so much value that it results in an inefficient market for a significant number of potential participants; (2) the hub imposes so many restrictions that it becomes difficult for participants to interact with one another and relevant choice is curtailed relative to other potential platforms;

and (3) the hub restricts access to valuable data or abuses the trust that participants place in it by using the data to harm the participants in some way.

In addition, within those conditions, the nature of the goods and services in some arenas may make the hubs of *Expanded Reach* or even traditional integrated firms a more optimal structure. For example, where goods require immediate availability, guaranteed access, and maintenance, such as expensive machinery or tools, a centralized source and controlled quality and condition might be most valuable. In addition, arenas of physical goods, such as fashion—where rights management is often difficult to track and discovery cannot be automated because needs that are hard to articulate make tacit knowledge far more important—may limit the appeal of P2P platforms. Finally, arenas where there are typically high costs of failure, such as in waste management or mining, are an unlikely target.

# Digging deeper



## Why are so many incumbents investing in blockchain if it's disruptive?

As with many other new technologies (for example, cloud, mobile, IoT), many incumbents approach it, at least initially, as a tool to be implemented within their existing operations. To the extent this works, it allows the company to take advantage of the often significant cost savings that it can generate. Such is the case for many incumbents; they are investing in blockchain initiatives to gain efficiencies, such as using the technology to decrease transaction settlement and automate regulatory compliance, and potentially have a head start on capabilities in case it proves to be important, but ultimately they remain focused on maintaining standardized and tightly specified process flows.

The disruptive mechanisms we describe in this paper, to the extent they derive from blockchain or another distributed public record technology, are driven by first- and second-order network effects: first by having a more diverse set of participants engage around specific goals; second, by opening the diverse set of data up to analysis by a broader set of participants. In practice, many different degrees of openness are likely to emerge. However, the greater opportunities may be captured by those who embrace the full potential of this technology. For every Amazon that structured its operations around the Internet, there are likely a hundred WebVans, and many incumbents will find ways to survive with more incremental approaches. Will they be the leaders in the relevant market segments? Likely not.

Today, most incumbents' use of blockchain is somewhere in between efficiency and broadening participation. The next choice they can expect to face will be much harder in that they will need to open up the data to expand learning beyond their own organization. Those that restrict access to data or protocols will in effect restrict the amount of learning for most participants. Interestingly, many of the new peer-to-peer platforms, by virtue of their underlying structure, explicitly rule out the possibility of centralization, and thereby increase the trust participants place in them. For example, OpenBazaar, a decentralized marketplace, is designed such that there is no central authority controlling trade, taking a cut, or monitoring data, and as a result, service providers that build on top of it also cannot control the network.<sup>22</sup> Incumbents may be challenged to find a middle ground between their centralized, proprietary business models and the distributed, open business models that are now becoming possible.

## Digging deeper (cont'd)

### Why is this pattern not mature yet? What needs to occur for this pattern to become disruptive?

Distributed public records technology and the practices and ecosystem around it are both complex and evolving rapidly. So, although the current implementations of blockchain-based offerings don't resolve all of the outstanding questions about this technology, each contributes to our understanding of what is possible and helps to drive further development of the technology and the business models that use it. One thing is certain; The fact that blockchain provided a solution to the problem of how to be certain you can trust the information you receive is likely to have profound implications for how we organize our economic activity going forward.<sup>23</sup>

Looking ahead, however, there are several elements, described in detail by our Australian colleagues in *Bitcoin, blockchain, and distributed ledgers*, that could stand in the way of P2P, at least for a while:

- **Security:** Security depends on the size of the network, the distribution of power within it, and the consensus mechanism being used; so, to the extent that different distributed public record technologies compete with one another in these early stages, the security of any given distributed public record technology could be compromised by virtue of having too few participants or highly concentrated decision-making rights. Furthermore, as these technologies evolve, they will be challenged to balance the need for adaptability (making changes to the protocols to correct for significant vulnerabilities) with the need for immutability (making sure transaction histories cannot be changed or reversed).<sup>24</sup>
- **Speed:** While many DPR technologies are more efficient than paper-based processes, many are still slow relative to current electronic settlement processes. At a clearing speed of three transactions per second and blocks committed every 10 minutes, for instance, bitcoin at least isn't going to be a viable alternative to current high-volume payment services that operate in real time.<sup>25</sup>
- **Cost:** The less that is known about participants in a peer-to-peer network, the less trustworthy they may be considered, the more costly it is to establish consensus. The cost of establishing consensus on the bitcoin blockchain, which explicitly accounts for a lack of trust between participants, for example, has been decreasing over time; it fluctuated between four and ten dollars per transaction over the past year.<sup>26</sup>
- **Interoperability:** To the extent that multiple DPR technologies compete with one another, data may end up being trapped in multiple underlying protocols or record systems, increasing the need for different DPR technologies to be interoperable.



## Digging deeper (cont'd)

- **Regulation:** Regulatory changes and/or more aggressive application of existing laws (like anti-money laundering laws or know your customer laws) to distributed ledger technologies could have a significant impact on their future scope and scale.<sup>27</sup>

It is worth noting that at least three of these challenges (security, speed, cost) are related to the proof-of-work consensus mechanism. Consensus processes will likely change to better match the needs of specific use cases. Some blockchains, like Ethereum, are considering changing their consensus protocol to be faster and lower-cost. In fact, Ethereum is already operating on the order of 1,000 transactions per second and expects to achieve “unlimited scalability” by 2018 through changes to both the consensus mechanism and processing.<sup>28</sup> Meanwhile, reputation mechanisms over time may reduce the need for resource-intensive security measures required by the premise of “trust no one” employed by bitcoin. As these environments evolve, there is likely to be more agreement around which blockchains and consensus mechanisms work best in certain contexts and more effort to establish interoperability.<sup>29</sup>

### How is this speculative? Aren't Airbnb and Wikipedia P2P?

Although the term P2P has been applied to many new companies organized around some degree of decentralization and distributed power, most, like Airbnb, don't fit our definition of making the data and protocols open and public. Wikipedia does not fit because it involves many participants building one product. We'd need to say that variants of Wikipedia are limited and, although the execution is distributed beyond the organization itself, the protocols for what is included/rejected are not public or alterable by others in a scalable way. Finally, other platforms, like product platforms (for example, iOS) are not P2P because the underlying protocols that enable an ecosystem of third-party service providers are closely held. The P2P we have defined is open data and wide sharing of the underlying protocols that allow for many-to-many relationships.

# Case studies

## P2P digital rights management disrupts music industry intermediaries (*speculative*)

In the world of music streaming, artists struggle to understand whether they are properly compensated. The lack of transparency into digital rights management (DRM) is heightened by the increasingly large roles intermediaries such as record labels and aggregation platforms are playing in the industry. Streaming services allow listeners to stream their favorite songs while ensuring all rights holders, from recording companies to agencies, are compensated. Because rights and credit information is fragmented among different intermediaries that often conflict, streaming services organize this data before each party can be paid out.<sup>30</sup> In return, streaming services take a significant cut of royalties, which then pass through multiple intermediaries, such as labels and publishers, each taking a share. A publisher, for example, might take 30–50 percent of royalty income to create commercial opportunities, manage royalties, and register an artist's work.<sup>31</sup> In the end, the artists receive limited compensation, and the

process may take upwards of two years<sup>32</sup> to work through each intermediary's timelines, fee structures, and reporting standards.<sup>33</sup> At the same time, artists may be reticent to collaborate because they don't believe they will be fairly compensated or even acknowledged for their contributions. For example, Jay Z didn't receive compensation for the Gray Album, despite it being a remix of Beatles and Jay Z songs.<sup>34</sup> Although there was an attempt to create a centralized database, the Global Repertoire Database (GRD), it ultimately disbanded in the absence of strong incentives for participating parties.<sup>35</sup>

Blockchain technology shows potential for helping artists get better transparency and ultimately capture more value. For example, Ujo Music is an open platform that creates a decentralized and transparent database of rights and rights owners, while automating royalty payments through the use of smart contracts.<sup>36</sup> Creators can publish ownership information and user policies on a blockchain

that is viewable by all participants. As a result, all rights owners can be automatically compensated when content is bought or used, and contract structuring, monitoring, and costly breaches are reduced. This eliminates the need for a costly middleman to centralize and manage streaming royalties. For artists who depend on up to 700,000 different streams of revenue for a single song,<sup>37</sup> this can be an efficient way to track transactions in a centralized and secure location beyond streaming as well.

With this peer-to-peer model, artists, service providers, and listeners can take advantage of new learning opportunities. For example, for a song such as Imogen Heap's *Tiny Humans*, the royalty breakdown and amounts, artist collaborators, song transaction history, and licensing pricing are all publically available on Ujo Music's website.<sup>38</sup> Artists may gain insight into industry averages for royalties and common terms of service for contracts as well as about compensation for fellow collaborators. Visibility into the terms of service also offers insight into what services are valued, potentially spurring entrepreneurs to improve upon and create new services. Open data also aids collaboration; for example, by analyzing the top played songs, an artist might decide trumpets are the key to the next hit song. The artist could filter by trumpet players within the entire catalog of music and assemble collaborators that fit the rhythm, tone, and style they need. The blockchain technology further encourages collaboration, allowing anyone with a new business model or application to plug in and interact. For instance, an artist could build a personal website on top of the blockchain, and everyone from the graphic designer to the shirt manufacturer could be automatically compensated every time a shirt was sold.

Ultimately this data can also give rise to new creative outlets—artists, empowered by the knowledge that they will be properly compensated for their contributions, have incentive to learn from one another. Greater access to data further encourages organizations like Hitrecord.org, an open platform where creatives can contribute texts, images, audio, or video and collaborate with other artists, to create new productions. Pieces are selected for commercialization and all supporting artists are compensated for their efforts, with \$2 million paid out so far.<sup>39</sup> While small relative to the overall music industry, this type of access offers artists an alternative to record companies. From a listener's perspective, open data provides new opportunities to co-create with artists and push the boundaries of music.

Incumbents who attempt to respond may face challenges due to prior entanglements with intermediaries: An open model challenges the need for a middleman to ensure that right holders are compensated for streamed plays. Because Ujo does not charge for its services, incumbents would have to justify their cut. In addition, incumbents that try to use P2P networks may risk big labels pulling their content off because P2P networks reduce an artist's dependency on the services—for example, royalty management, songwriting—that big labels provide. As artists and listeners demand increased personalization, developers can build other services such as different user interfaces and the ability to develop custom playlists on top of the blockchain. As a result, streaming services may find themselves competing with armies of many that are intent on making them obsolete.

## OpenBazaar/OB1 challenges Craigslist (*speculative*)

A Web 1.0 success story, classified advertisement platform Craigslist disrupted the newspaper classified business in the 2000s.<sup>40</sup> Having started as a local San Francisco event email listserv, it now operates as a general purpose marketplace and continues to grow, from \$115 million in revenues in 2011 to a projected \$381 million in 2015, despite fierce competition from specialized classified verticals (such as those focused on used cars or jobs or dating).<sup>41</sup>

In fact, numbering around 40 employees and 60 million monthly users, Craigslist has a projected revenue per employee of \$9.6 million, which exceeds that of Google, Facebook, Apple, and Amazon.<sup>42</sup> The Craigslist business model leverages network effects and provides exceptionally low-cost/free coordination and liquidity to users while charging listing fees only for select categories.<sup>43</sup> With 1.5 million users per employee and 78 percent profit margin, there are no frills in the form of sophisticated user interfaces or additional services. Craigslist's size and continued low costs have dominated the classifieds business.<sup>44</sup>

Craigslist has succeeded despite little investment to improve customer experience. Peter Zollman of AIM Group said of Craigslist in 2015, "I think it is a prolific tool but it is also a business that has an ethos of anonymity that leads to crime, fraud and abuse."<sup>45</sup> Inefficiencies such as fake or fraudulent listings/offers and poor professionalism/accountability among participants can be attributed to the lack of authentication and reputation facilities.<sup>46</sup> While Craigslist continues to offer low-cost access to millions of products and services, it has proven to be highly protective of its data. Over the years, Craigslist has issued

cease-and-desist orders and pursued litigation against entrepreneurs who leverage its data to provide additional services or offerings.<sup>47</sup>

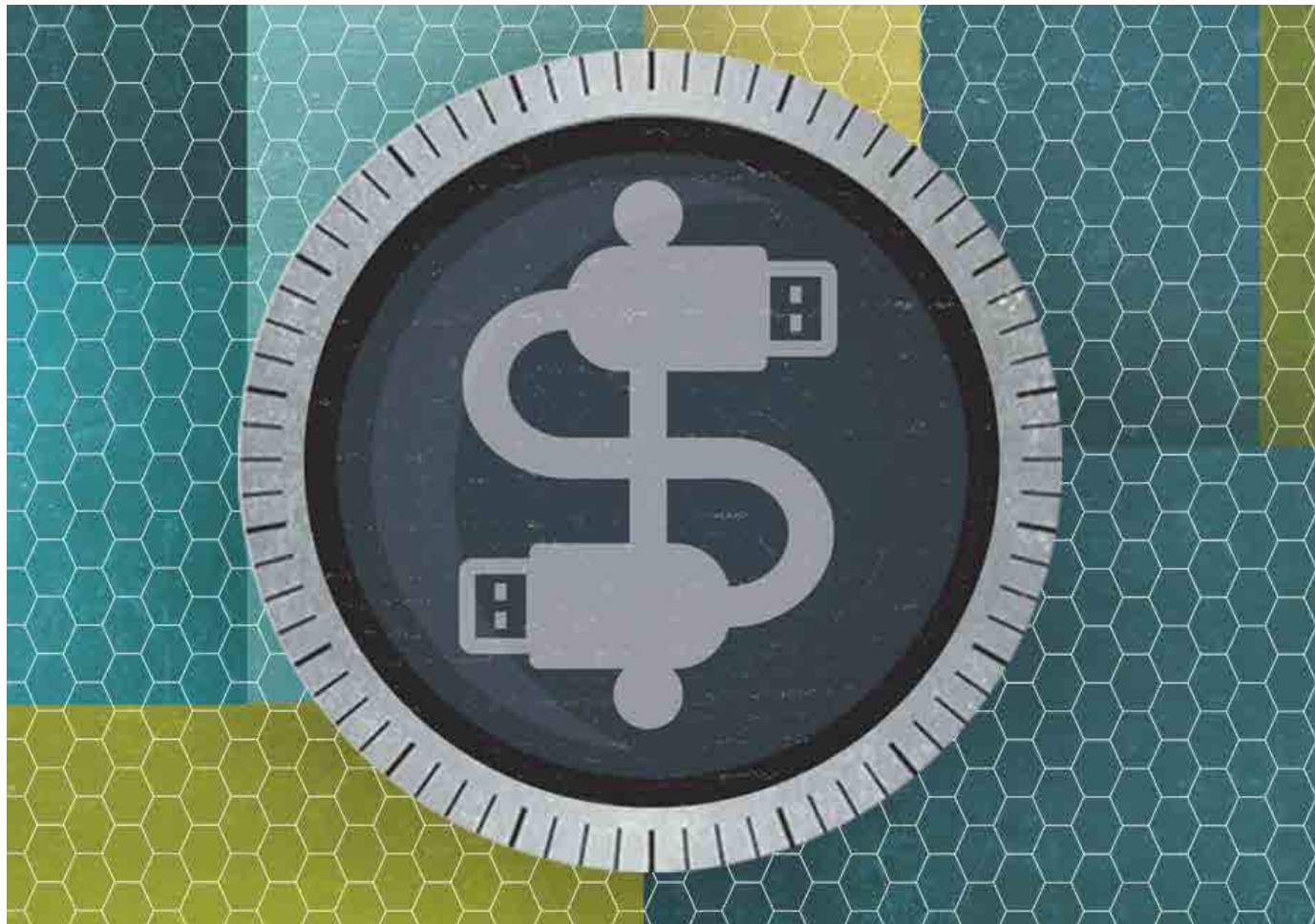
OpenBazaar represents a new form of competitor; leveraging blockchain technology, it is a P2P marketplace defined by an open protocol and is open source, so there is no way for a central authority to reap network effects. OpenBazaar connects its users directly and makes data publically available. Because there is no intermediary, participants have very few restrictions, no fees, no accounts to create, and participants only reveal the personal information that they choose.<sup>48</sup>

The protocol launched in April 2016 and is in its early stages, with significant features still in development. As transactions occur, information about the vendor (pseudonymized), buyer (pseudonymized), listing, price, and reviews are recorded and made public. Vendors can analyze this data to potentially draw insights about market trends, pricing, and customer segmentation—likely leading to both better choices and performance outcomes.<sup>49</sup> Peer-to-peer communication in the form of email, website links, and direct, encrypted messaging can help vendors personalize their services. Virus Media, a vendor on OpenBazaar, describes the implementation of the chat feature as "really [making] you feel as if you're walking into someone's shop."<sup>50</sup> The communication tools could also enable vendors to form groups in order to share leading practices and align on common interests, such as influencing OpenBazaar to develop infrastructure support for new business models.<sup>51</sup>

Open data and protocols can also lead to the development of third-party services that reduce transaction costs and establish

trust among trading pairs. Already built into OpenBazaar are facilities for escrow, mediation, reputation, and transaction insurance. Each service is open for competition, and there are no restrictions from other services being provided. Thus, sensors and an authentication service can establish the ownership and authenticity of a product, who created it, whether it has been recalled for safety reasons, and its status of operability. Details for all listings, profiles, and catalogs are available

for download and can be imported such that a user who chooses not to use OpenBazaar's interface can create a custom interface with whichever programming language she chooses. A store owner could reasonably develop a front-end website, with OpenBazaar facilitating exchanges and connecting to a variety of third-party services. Similarly, a curator could aggregate listings for a category of goods and match buyers and sellers as a service.



## Git displaces centralized version control (Apache Subversion and Concurrent Version System)

Software developers working on large projects, often with dozens of others developing interrelated pieces of code, use version control systems (VCS) to monitor source code and track all changes (who made it, why they made it, what it was intended to accomplish).<sup>52</sup> Without version control, undesired edits can be difficult to correct, unknown changes can lead to unknown errors, and new work may be lost, resulting in confusion and wasted time. Historically, these have been centralized systems, such as Concurrent Versions System (CVS) and Apache Subversion (SVN). However, in recent years, Git—a decentralized version control system—has emerged, grabbing 30 percent of the market directly from CVS and SVN between 2010 and 2013 (see figure 4).<sup>53</sup>

With CVS (the original free version control software) and SVN (a free software later developed by the Apache foundation), the source code is controlled by a single entity that maintains “The One True Source.”<sup>54</sup> In effect, coders check out the latest draft of code, make edits, and then check the new version back into the centralized system. Although this process maintained control, it made simultaneous work difficult; if two developers wanted to work on the same project at the same time,

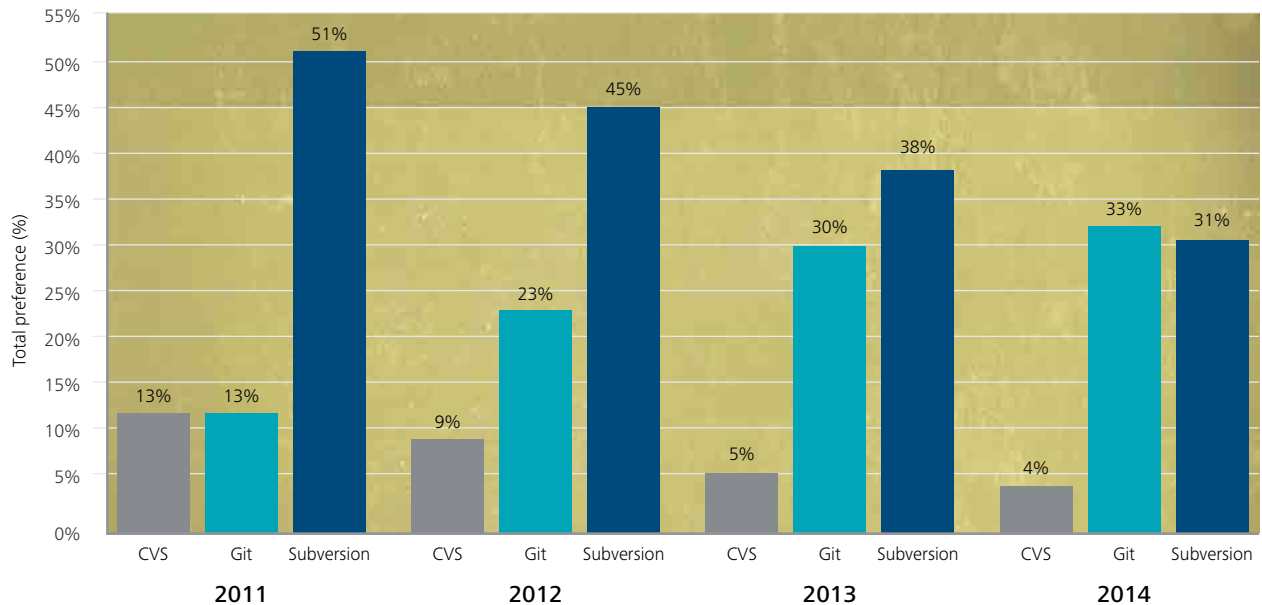
their productivity was marred by the sequential nature of the system. Of the two centralized models, SVN was generally preferred within software developer communities due in part to its speed, ingrained functionality, and overall modernity.<sup>55</sup>

When Git entered the market in 2005 at the hand of Linux creator, Linus Torvalds, it offered a new alternative—decentralized version control.<sup>56</sup> Decentralized version control systems focus less on control, and more on communication. Developers can “fork” the main source tree, taking code offline to make changes before requesting to merge the changes back to the original source. All merge requests are reviewed by team members who see a snapshot of the updates and accept or reject the edits.<sup>57</sup> They can also pass the edited code to other coworkers for additional edits prior to merging back to the controlled source. By allowing parallel development, Git helps increase the speed of development and improve product quality because developers can make small updates that would likely be deprioritized to avoid slowing down primary development in a centralized system.

Riding the wave of reduced barriers to entry for software-as-a-service companies and an increase in open-sourced, distributed

“When we use a network, the most important asset we get is access to one another.”

—Clay Shirky, *Cognitive Surplus: Creativity and Generosity in a Connected Age*

**Figure 4. Developers' preference of version control systems, 2011–2014**

Note: Numbers add to less than 100 because source survey included additional options.

Source: Ian Skerrett, "Eclipse Community Survey 2014," Eclipse Foundation, Inc., June 23, 2014, <http://www.slideshare.net/IanSkerrett/eclipse-community-survey-2014>, accessed August 31, 2016.

Graphic: Deloitte University Press | DUPress.com

development, Git began to gain traction in 2010 in a market dominated by Subversion. In just three years, Git grew from being used on 11 percent of projects to 38 percent of projects as centralized systems CVS and SVN experienced declining market share. This was in part due to the support of GitHub's community activities and the transition of Atlassian from Subversion to Git.<sup>58</sup>

As free services, SVN and CVS aren't concerned by revenue cannibalization. The more significant challenge is that in order to respond effectively, they would need to develop an entirely new, decentralized, product. Moving from tracking and control to collaborative design represents a dramatic shift—in process and in mind-set—that is difficult to quickly adapt for older systems.

In fact, Git's adoption may have been slow at first because in addition to requiring

developers to learn a new tool and syntax, decentralized systems challenge the way developers think and the processes that they have used for success.<sup>59</sup> However, as more people gain familiarity with Git and begin to trust and value decentralized systems, network effects are expected to accelerate adoption. As it is currently used, Git is not a true P2P platform in that it is within a company (permissioned access) rather than more broadly, and code is developed for one product (many-to-one) rather than many. As it is currently used, Git creates first-order network effects where participants benefit from others using it. With greater ability to track and attribute use of lines of code, it is possible that a platform like Git could become a true P2P platform, with incentive for data sharing that would generate second-order network effects to drive further learning and economic opportunity.

# Is my market vulnerable?

## **Do a large number of customers or partners feel underserved (e.g., shortages or price fluctuations) and/or do they incur high transaction costs using your service?**

Peer-to-peer platforms have the potential to establish a foothold in markets where customers or partners feel that the hub is capturing too much value or making profits that are disproportionate to the success of others on the hub. As customers or partners find it easier to collaborate with each other, they may discover they can get more value from collaborating across a wider range of activities. They may begin to demand more value or lower costs and push back against the lack of options or flexibility that typically comes from a tightly specified hub or other company.

## **Are your customers or partners asking for access to data or questioning how their data are being used?**

Businesses and individuals are under increasing pressure and will increasingly value and demand products and services that can help them improve their performance. At the same time, they tend to be more aware of the amount of data they are creating and the potential to get insights from it, to find collaboration partners, to track outcomes, or to discover new opportunities—if they can get access to it. As they gain access to data in other arenas, such as in personal wellness applications or order histories with vendors, their perception of the value of data will likely increase and they will demand increased access to data.

## **Is it difficult for customers and partners to interact with one another without relying on your services; are they feeling constrained by strict user agreements?**

If you control user interactions with strict user agreements and protocols, market participation is limited. Consumers and businesses may be less inclined to participate in networks that don't allow as much flexibility to collaborate and interact in ways that meet their specific needs.

## **Do you create reasons for participants to mistrust your use of their data?**

Consumers are becoming increasingly wary of how companies use this information and what value consumers get in return. Consumers who interact with companies that misuse their data are likely more willing to switch to networks that establish trust-based interactions and encourage collaboration and co-creation.



# Endnotes

1. This graphic is based on a dynamic that Joel Monegro of Union Square Ventures described in a post on “Fat protocols,” <https://www.usv.com/blog/fat-protocols>, accessed August 30, 2016.
2. The Open Knowledge Foundation defines open data as data that can be freely used, shared, and built upon by anyone, anywhere, for any purpose. Practically, this means that accessing and reusing the data is both legal and technically feasible, typically machine readable, and available in bulk versus single records, <http://blog.okfn.org/2013/10/03/defining-open-data/>, accessed August 30, 2016.
3. *Bitcoin Magazine*, “Three startups trying to transform the music industry using the blockchain,” November 13, 2015, <https://bitcoinmagazine.com/articles/three-startups-trying-to-transform-the-music-industry-using-the-blockchain-1447444594>, accessed September 7, 2016.
4. “Code for America: Become a fellow,” <https://www.codeforamerica.org/do-something/work-with-us>, accessed August 30, 2016.
5. Foodborne Chicago website, <http://www.foodbornechicago.org/>, accessed August 30, 2016.
6. Christopher Whitaker, “The @CivicWhitaker Anthology,” Smart Chicago Collaborative, September 2015, <http://www.slideshare.net/smartchicago/the-civicwhitaker-anthology-53351581>, accessed August 30, 2016.
7. Open City, “Projects,” <http://opencityapps.org/#projects>, accessed August 30, 2016.
8. Christopher Whitaker, “Flu app spreads,” Code for America, January 17, 2013, <https://www.codeforamerica.org/blog/2013/01/17/flu-app-spreads/>, accessed August 30, 2016.
9. Expunge.io, <http://www.expunge.io/>, accessed August 30, 2016.
10. Morgan E. Peck, “The future of the Web looks a lot like bitcoin,” July 1, 2015, <http://spectrum.ieee.org/computing/networks/the-future-of-the-web-looks-a-lot-like-bitcoin>, accessed August 31, 2016.
11. John Hagel, John Seeley Brown, Tamara Samoylova, *Success or struggle: ROA as a true measure of business performance*, Deloitte University Press, October 30, 2013, <http://dupress.deloitte.com/dup-us-en/topics/operations/success-or-struggle-roa-as-a-true-measure-of-business-performance.html>, accessed September 13, 2016.
12. Albert Wenger, “Crypto tokens and the coming age of protocol innovation,” *Continuations*, July 28, 2016, <http://continuations.com/post/148098927445/crypto-tokens-and-the-coming-age-of-protocol>, accessed August 30, 2016.
13. Part of the reduction in contracting costs comes from the fact that “search” includes identifying trusted parties. To the extent that technology-enabled models provide new ways of establishing trust among participants, as well as automating enforcement, contracting either becomes less necessary or less costly.
14. Marc Andreessen, “Why bitcoin matters,” *The New York Times*, January 21, 2014, <http://dealbook.nytimes.com/2014/01/21/why-bitcoin-matters/>, accessed August 30, 2016.
15. Ryan Garner, “Companies once thought they’d make big money off big data—now it’s their biggest liability,” *Quartz*, June 2, 2016, <http://qz.com/697452/companies-once-thought-theyd-make-big-money-off-big-data-now-its-their-biggest-liability/>, accessed August 30, 2016.

16. HPE Matter, "The next Internet: The disruptive potential of bitcoin and blockchain," <https://www.hpematter.com/issue-no-6-fall-2015/next-internet-disruptive-potential-bitcoin-and-blockchain>, accessed December 16, 2015.
17. Peter Williams, *Bitcoin, blockchain & distributed ledgers: Caught between promise and reality*, Deloitte Centre for the Edge, Australia, April 16, 2016, <http://www2.deloitte.com/au/en/pages/technology/articles/distributed-ledgers.html>, accessed August 31, 2016.
18. Ibid.
19. Albert Wenger, "Bitcoin: Clarifying the foundational innovation of the blockchain," *Continuations*, December 15, 2014, <http://continuations.com/post/105272022635/bitcoin-clarifying-the-foundational-innovation-of>, accessed September 1, 2016; Wenger, "Crypto tokens and the coming age of protocol innovation."
20. See "Moody's, S&P caved to Goldman, UBS mortgage pressure, Levin says," *Bloomberg News*.
21. Monegro, "Fat protocols."
22. OpenBazaar blog, "The OB1 team," June 11, 2015, <https://blog.openbazaar.org/openbazaar-is-entering-a-new-phase-with-funding/>, accessed August 30, 2016.
23. Andreessen, "Why bitcoin matters." Marc Andreessen referred to how bitcoin addressed the Byzantine's general problem as "a breakthrough in computer science—one that builds on 20 years of research into cryptographic currency, and 40 years of research in cryptography, by thousands of researchers around the world [...] the consequences [of which] are hard to overstate."
24. Vitalik Buterin, "On settlement finality," Ethereum blog, May 9, 2016, <https://blog.ethereum.org/2016/05/09/on-settlement-finality/>, accessed August 30, 2016.
25. Kyle Croman, Christian Decker, and Ittay Eyal, "On scaling decentralized blockchains (a position paper)," February 2016, [https://www.researchgate.net/publication/292782219\\_On\\_Scaling\\_Decimalized\\_Blockchains\\_A\\_Position\\_Paper](https://www.researchgate.net/publication/292782219_On_Scaling_Decimalized_Blockchains_A_Position_Paper), accessed August 30, 2016.
26. Blockchain.info website, <https://blockchain.info/charts/cost-per-transaction?daysAverageString=7&timespan=all>, accessed August 31, 2016.
27. Joichi Ito, "Why anti-money laundering laws and poorly designed copyright laws are similar and should be revised," March 14, 2016, <http://pubpub.ito.com/pub/dmca-drm-aml-kyc-backdoors>, accessed September 1, 2016.
28. Vitalik Buterin, "Ethereum: Platform review: Opportunities and challenges for private and consortium blockchains," accessed August 1, 2016.
29. Vitalik Buterin, the inventor of Ethereum, said he was excited to see BTC Relay provide the first-ever production release of such cross-blockchain communication of this kind. He said he hopes to see it set an example for interoperating cross-blockchain applications, whether between Ethereum and bitcoin, other blockchains and Ethereum and public and private or consortium chains. With this capability, Ethereum, on account of the stateful, computational power of its smart contract and EVM capabilities, can serve as a substrate for many "glue" protocols that will join blockchain networks and other decentralized services into an Internet of decentralized systems, August 21, 2016, <http://www.bitcoinisle.com/2016/08/21/btc-relay-bridges-btc-with-ethereum-allowing-btc-verification-for-smart-contracts/>, accessed August 30, 2016.
30. Phil Barry, "DEVCON1: Ujo Music-Phil Barry," December 17, 2016, <https://www.youtube.com/watch?v=GFSknHNquOQ>, accessed September 1, 2016.
31. Paul Resnikoff, "Now you know everything about music publishing," *Digital Music News*, February 28, 2014, <http://www.digitalmusicnews.com/2014/02/28/understandpublishing/>, accessed September 1, 2016.
32. Barry, "DEVCON1."
33. D.A. Wallach, "Bitcoin for rockstars: How cryptocurrency can revolutionize the music industry," December 11, 2014, <http://www.dawallach.com/blog/2014/12/11/bitcoin-for-rockstars-how-cryptocurrency-can-revolutionize-the-music-industry>, accessed August 31, 2016.
34. Mike Masnick, "Jay-Z explains he is 'honored' to have his work remixed by others," November 19, 2010, <https://www.techdirt.com/articles/20101119/00342311929/jay-z-explains-he-is-honored-to-have-his-work-remixed-others.shtml>, accessed August 30, 2016.
35. Wallach, "Bitcoin for rockstars."

36. *Bitcoin Magazine*, “Three startups trying to transform the music industry using the blockchain,” November 13, 2015, <https://bitcoinmagazine.com/articles/three-startups-trying-to-transform-the-music-industry-using-the-blockchain-1447444594>, accessed September 1, 2016.
37. Rethink Music Initiative, *Fair music: Transparency and payment flows in the music industry*, Berklee Institute of Creative Entrepreneurship (BerkleeICE), <http://www.rethink-music.com/>.
38. Imogen Heap, website, [https://alpha.ujomusic.com/#/imogen\\_heap/tiny\\_human/tiny\\_human](https://alpha.ujomusic.com/#/imogen_heap/tiny_human/tiny_human), accessed August 31, 2016.
39. Hit record, website, <https://www.hitrecord.org/help>, accessed September 2, 2016.
40. John Hagel, John Seely Brown, Maggie Wooll, and Andrew de Maar, *Unbundle products and services: Giving you just what you want, nothing more*, Deloitte University Press, January 11, 2016, <http://dupress.deloitte.com/dup-us-en/focus/disruptive-strategy-patterns-case-studies/disruptive-strategy-unbundling-strategy-stand-alone-products.html>, accessed September 13, 2016.
41. Noah Davis, “Craigslist revenue pegged at \$115 million this year, dropping for the first time in 9 years,” *Business Insider*, October 7, 2011, <http://www.businessinsider.com/craigslist-revenue-drops-for-the-first-time-in-9-years-not-that-it-matters-2011-10>, accessed August 31, 2016; AIM Group, “AIM Group 2015 Craigslist report,” <https://www.aimgroup.com/store/cirs/2015-craigslist-annual/>, accessed August 31, 2016.
42. Deloitte analysis: “Factsheet,” Craigslist, <http://www.craigslist.org/about/factsheet>, accessed on August 31, 2016; “2015 Alphabet 10-K,” Alphabet (61,814 employees and \$75.0B revenue), February 11, 2016, [https://abc.xyz/investor/pdf/20151231\\_alphabet\\_10K.pdf](https://abc.xyz/investor/pdf/20151231_alphabet_10K.pdf), accessed August 31, 2016; “2015 Facebook 10-K,” Facebook (12,691 employees and \$17.9B revenue), April 27, 2016, [https://s21.q4cdn.com/399680738/files/doc\\_financials/annual\\_reports/2015-Annual-Report.pdf](https://s21.q4cdn.com/399680738/files/doc_financials/annual_reports/2015-Annual-Report.pdf), accessed August 31, 2016; “2015 Apple 10-K,” Apple (110,000 employees and \$53.4B revenue), October 28, 2015, <http://files.shareholder.com/downloads/AAPL/2750393070x0xS1193125%2D15%2D356351/320193/filing.pdf>, access August 31, 2016; “2015 Amazon 10-K,” Amazon (230,800 employees and \$14.6B revenue), January 28, 2016, <http://www.annualreports.com/HostedData/AnnualReports/PDF/2015%20Annual%20Report.pdf>, accessed August 31, 2016.
43. \$25 to \$75 for job listings in certain cities, \$10 for brokered apartment listings in New York, and \$5 to \$10 for “therapeutic services” ads, *Verge*.
44. Adrienne Jeffries, “Craigslist finally forced to innovate as competition edges in,” October 19, 2012, <http://www.theverge.com/2012/10/19/3521020/craigslist-innovation-map-view-padmapper>, accessed August 31, 2016.
45. Stephanie Slifer, “Expert: Craigslist’s ‘ethos of anonymity’ leads to crime,” January 28, 2015, <http://www.cbsnews.com/news/expert-craigslist-ethos-of-anonymity-leads-to-crime/>, accessed August 31, 2016.
46. Pipes to Platforms, “How to disrupt Craigslist,” <http://platformed.info/how-to-disrupt-craigslist/>, accessed August 31, 2016.
47. Ibid.
48. OpenBazaar, “About OpenBazaar,” <https://openbazaar.org/>.
49. OpenBazaar blog, “Decentralized reputation in OpenBazaar,” <https://blog.openbazaar.org/decentralized-reputation-in-openbazaar/>, accessed August 31, 2016.
50. OpenBazaar blog, “OpenBazaar ecosystem: Virus Media,” October 8, 2015, <https://blog.openbazaar.org/openbazaar-ecosystem-virus-media/>, accessed August 31, 2016.
51. OpenBazaar, “OpenBazaar docs,” <https://docs.openbazaar.org/>.
52. Matt Asay, “Git is giving subversion a run for its money: What took so long?” *ReadWrite*, January 21, 2014, <http://readwrite.com/2014/01/21/git-subversion-developers>, accessed December 14, 2015.
53. Stephen O’Grady, “DVCS and Git sage in 2013,” *RedMonk*, December 19, 2013, <http://redmonk.com/sogrady/2013/12/19/dvcs-and-git-2013/#ixzz2qyfVpSR9>, accessed December 14, 2015; Git, “A short history of Git,” <https://git-scm.com/book/en/v2/Getting-Started-A-Short-History-of-Git>, accessed December 14, 2015.

54. Asay, "Git is giving subversion a run for its money."
55. PushOK Software, "SVN vs CVS," <http://www.pushok.com/software/svn-vs-cvs.html>, accessed December 14, 2015.
56. Asay, "Git is giving subversion a run for its money."
57. Ibid.
58. Stephen O'Grady, "Fear of forking," RedMonk, November 16, 2010, <http://redmonk.com/sogrady/2010/11/16/fear-of-forking/>, accessed December 14, 2015.
59. Asay, "Git is giving subversion a run for its money."
60. Ibid.

# Contacts

**Blythe Aronowitz**

Chief of staff, Center for the Edge  
Deloitte Services LP  
+1 408 704 2483  
baronowitz@deloitte.com

**Peter Williams**

Chief edge officer, Centre for the Edge  
Australia  
Tel: +61 3 9671 7629  
pewilliams@deloitte.com.au

**Wassili Bertoen**

Managing director, Center for the Edge  
Europe  
Deloitte Netherlands  
+31 6 21272293  
wbertoen@deloitte.nl

# Acknowledgements

This research would not have been possible without generous contributions and valuable feedback from numerous individuals. The authors would like to thank:

Austin Hill  
Alex Fowler  
Christopher David  
Carolyn Cross  
Carolyn Brown

Austin Dressen  
Max Zipperman  
Brandon Lassoff  
Blythe Aronowitz  
Jodi Gray

Carrie Howell  
Junko Kaji  
Duleesha Kulasooriya  
Kevin Weier

# About the authors

**John Hagel** (co-chairman, Deloitte Center for the Edge) has nearly 35 years of experience as a management consultant, author, speaker, and entrepreneur, and has helped companies improve performance by applying IT to reshape business strategies. In addition to holding significant positions at leading consulting firms and companies throughout his career, Hagel is the author of bestselling business books such as *Net Gain*, *Net Worth*, *Out of the Box*, *The Only Sustainable Edge*, and *The Power of Pull*. Connect with him on LinkedIn at <https://www.linkedin.com/in/jhagel> or @jhagel on Twitter.

**John Seely Brown** (JSB) (independent co-chairman, Deloitte Center for the Edge) is a prolific writer, speaker, and educator. In addition to his work with the Center for the Edge, JSB is adviser to the provost and a visiting scholar at the University of Southern California. This position followed a lengthy tenure at Xerox Corporation, where JSB was chief scientist and director of the Xerox Palo Alto Research Center. JSB has published more than 100 papers in scientific journals and authored or co-authored seven books, including *The Social Life of Information*, *The Only Sustainable Edge*, *The Power of Pull*, and *A New Culture of Learning*.

**Andrew de Maar** (head of research, Deloitte Center for the Edge) leads the Center's research agenda and helps clients make sense of and profit from emerging opportunities on the edge of business and technology. He has worked with a wide range of public, private, and nonprofit entities to help executives explore long-term trends that are fundamentally changing the global business environment and identify high-impact initiatives that their organizations can pursue to more effectively drive near-term performance improvement and large-scale transformation.

**Maggie Wooll** (head of eminence and content strategy, Deloitte Center for the Edge) combines her experience advising large organizations on strategy and operations with her passion for getting the stories behind the data and the data behind the stories to shape the Center's perspectives. At the Center, she explores the intersection of people, technologies, and institutions. She is particularly interested in the impact new technologies and business practices have on talent development and learning for the future workforce and workplace.

# About the research team

This report and the pattern write-up series would not have been possible without the hard work of our research team, colleagues who tracked down case studies and cheerfully dug for data and more data on the way to understanding.

**John Day** (research fellow, Deloitte Center for the Edge) is passionate about exploring foundational shifts and future scenarios through the lens of analytics and historical techno-economic precedent to develop creative new growth and innovation strategies. A one-time entrepreneur, he is fascinated by the creative destruction paradox and challenges with corporate renewal. Day's consulting experience at Deloitte focuses on portfolio management and strategic alternatives analysis within entertainment, media, and sports. At the Center, he developed and tested perspectives on topics related to disruption, peer-to-peer models, blockchain technologies/economics, scalable learning, and the future of work.

**Stephen Casscells-Hamby** (research fellow, Deloitte Center for the Edge) is passionate about the intersection of analytics, strategy, and innovation as a way to anticipate change and shape new business opportunities. As a consultant in Deloitte Consulting LLP's Strategy & Operations practice, he has helped clients improve outcomes by integrating analytics into their strategic thinking. At the Center, he researched long-term opportunities for increasingly prevalent disruptive forces and the power of peer-to-peer connections as a driver for positive change.

**Lucy Pan** (research fellow, Deloitte Center for the Edge) is passionate about leveraging emerging technologies to accelerate the efforts of nonprofits and organizations focused on addressing society's most pressing challenges. As a senior consultant within Deloitte's strategic risk services, she has spent the past three years working in a variety of industries to help clients discover and manage key risks to their strategy. At the Center, her research focused on how companies can transform to address disruptive forces in the market, as well as on the power of peer-to-peer networks in driving innovation.

**Shujaat Ahmad** (research fellow, Deloitte Center for the Edge) is focused on exploring competitive advantage for firms through innovative alignment of their corporate, talent, and social impact strategies. As a manager in Deloitte Consulting LLP's Strategy & Operations practice, he has spent the last five years helping clients on both front-end corporate strategy and back-end supply chain and services excellence across a range of industries, including high tech and retail. Ahmad is passionate about strategic planning for disruption and about fair value creation through peer-to-peer business models.



# About the Center for the Edge

The Deloitte Center for the Edge conducts original research and develops substantive points of view for new corporate growth. The center, anchored in Silicon Valley with teams in Europe and Australia, helps senior executives make sense of and profit from emerging opportunities on the edge of business and technology. Center leaders believe that what is created on the edge of the competitive landscape—in terms of technology, geography, demographics, markets—inevitably strikes at the very heart of a business. The Center for the Edge’s mission is to identify and explore emerging opportunities related to big shifts that are not yet on the senior management agenda, but ought to be. While Center leaders are focused on long-term trends and opportunities, they are equally focused on implications for near-term action, the day-to-day environment of executives.

Below the surface of current events, buried amid the latest headlines and competitive moves, executives are beginning to see the outlines of a new business landscape. Performance pressures are mounting. The old ways of doing things are generating diminishing returns. Companies are having a harder time making money—and increasingly, their very survival is challenged. Executives must learn ways not only to do their jobs differently, but also to do them better. That, in part, requires understanding the broader changes to the operating environment:

- What is really driving intensifying competitive pressures?
- What long-term opportunities are available?
- What needs to be done today to change course?

Decoding the deep structure of this economic shift will allow executives to thrive in the face of intensifying competition and growing economic pressure. The good news is that the actions needed to address short-term economic conditions are also the best long-term measures to take advantage of the opportunities these challenges create.

For more information about the Center’s unique perspective on these challenges, visit [www.deloitte.com/centerforedge](http://www.deloitte.com/centerforedge).





# Deloitte. University Press



Sign up for Deloitte University Press updates at [DUPress.com](http://DUPress.com).

## **About Deloitte University Press**

Deloitte University Press publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte University Press is an imprint of Deloitte Development LLC.

## **About this publication**

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

## **About Deloitte**

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee, and its network of member firms, each of which is a legally separate and independent entity. Please see [www.deloitte.com/about](http://www.deloitte.com/about) for a detailed description of the legal structure of Deloitte Touche Tohmatsu Limited and its member firms. Please see [www.deloitte.com/us/about](http://www.deloitte.com/us/about) for a detailed description of the legal structure of Deloitte LLP and its subsidiaries. Certain services may not be available to attest clients under the rules and regulations of public accounting.

Copyright © 2016 Deloitte Development LLC. All rights reserved.  
Member of Deloitte Touche Tohmatsu Limited