



Top of Mind
Issues facing technology companies

Blockchain reaction

Tech companies plan
for critical mass



Why now?

Blockchain proponents say it will revolutionize many industries – again. You’ve seen it before: in smartphones, the cloud and digital disruption. In those revolutions, the tech industry itself was among the first disrupted. So we’ve taken a close look at blockchain’s promise and peril for this report. We focus on where tech companies may experience the most impact today and in the near future. We intend the report to inform and stimulate your discussion about the possibilities and strategic considerations emerging from this potential-rich, but still immature, technology. Enjoy!

Greg Cudahy

EY Global Leader – TMT

Technology, Media & Entertainment and

Telecommunications

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Collected EY insights

“To date, blockchain has transformed only people’s thinking. We don’t yet even know all the questions blockchain technology will raise, much less the answers. But waiting for the technology to take hold is too late. Now is the time to start defining the questions and influencing policy that will lead to answers.”

Channing Flynn
EY Global Technology Sector Leader
Tax Services

The report at a glance

EY’s analysis of blockchain suggests it may have the most impactful potential of the entire portfolio of disruptive technologies that are now emerging. But it also has the most obstacles to success, ranging from technical to cultural. Tech companies need to understand blockchain’s impact or risk being disrupted going forward.

- ▶ **Right tech, right time:** Blockchain is emerging into the world at the precise right moment for its promised secure, tamper-proof digital records technology to have a giant enabling impact.
- ▶ **Revolutionary potential:** Should blockchain work as advertised, it could revolutionize many industries that rely on trusted intermediaries or that now require strong central authorities – replacing those institutions with algorithmically based trust among peers.
- ▶ **Disruptive range:** It could disrupt business models, business processes, supply chains and customer relationships throughout the global economy.
- ▶ **Accelerating transformations:** Blockchain is arriving simultaneously with the IoT and the sharing economy, not to mention digital transformation. It has the potential to accelerate them all.
- ▶ **New models and markets:** It has the potential to remake the financial services industry as “embedded finance”; help eliminate digital rights theft and reduce tax evasion; open up new markets where today’s transaction costs create a practical lower limit; and enable pay-for-performance, industrial mash-ups and the industrial IoT.
- ▶ **Algorithmic trust:** Trusted transactions among networked peers that have no other basis on which to trust each other are derived from nearly unbreakable encryption, which validates all current and historical transactions in a given blockchain.
- ▶ **Secure, by design:** Because blockchain was designed from the ground up for holistic security, blockchain approaches are influencing the development of cybersecurity products and services.
- ▶ **Too slow to scale?** But the computational “cost” of blockchain’s certainty raises questions about its scalability.
- ▶ **PR problem:** Blockchain suffers from its association with bitcoin, the first blockchain app.
- ▶ **Lack of authority:** Its peer-to-peer nature raises concerns about the absence of central authorities or intermediaries – what agency would establish standards and protocols for a given industry?
- ▶ **Readiness is all:** Unless tech companies start thinking now about what their products and services look like in a blockchain-enabled world, they will not adapt quickly enough to remain competitive with those that do.

Another disruptor emerges

Is there another tech-enabled global business and societal revolution in the making?

Add blockchain to the portfolio of technologies that could trigger chain reactions across business models, business processes, supply chains and customer relationships throughout the global economy. Like 3D printing, the sharing economy and IoT, blockchain promises to build the kind of critical mass that produces explosive disruption. In roughly five years, blockchain has gone from unknown to more than US\$1.1 billion of venture capital invested.¹ Incumbent technology companies' blockchain reaction has been to launch widespread pilot projects in areas as diverse as financial services, energy, agriculture and IoT.

“Blockchain is developing much faster than anyone expected. To think the impact to your industry is many years away is very risky.”

Angus Champion de Crespigny
Financial Services Blockchain
and Distributed Infrastructure
Strategy Leader
Ernst & Young LLP (US)

Firing the imagination

Blockchain is firing the imaginations of executives in the technology industry – and many others – because the technology records transactions in a way that enables it to automate trusted activity among digitally networked peers. Should it succeed the way proponents envision, blockchain technology has the potential to streamline and accelerate business processes, increase cybersecurity and reduce or eliminate the roles of trusted intermediaries (or centralized authorities) in industry after industry.

To do so, however, it must overcome obstacles ranging from its own technical and public perception issues to uncertainty around tax and regulatory consequences, resistance from intermediary businesses whose roles could be diminished or eliminated and potentially large workforce disruptions.

Early experiments

Nonetheless, early blockchain focus has centered on the financial services industry, partially in reaction to bitcoin (the cryptocurrency that is an application running on the first public blockchain). Banks, traders, exchanges and regulators are involved in many pilot projects and have launched multiple industry consortia to study blockchain's use.

The blockchain reaction has spread far and fast from there. In a New York City neighborhood, a private experimental blockchain helps homeowners share solar-electric power generated on their rooftops without the local power utility's involvement. Other blockchain pilots power the network behind an IoT-connected clothes washing machine that orders its own detergent when running low, autonomous agricultural sensors that control water flow in fields and a variety of new cybersecurity approaches that anticipate a near future in which more powerful computers render current approaches obsolete.

Why now?

The blockchain reaction will pull in different industries at different times with differing levels of disruption, bringing both opportunity and risk. Those risks include disruption to existing business models and operations, as well as new tax, legal and policy implications that can trip up corporate leaders and global policymakers.

The scope of a blockchain reaction, especially for tech companies, may require a sizable pivot. Understanding the nature of that pivot, and the tax, legal and policy questions it will raise, will take time and preparation. "You've got to understand your North Star when it comes to these disruptive technologies; the wind won't always be at your back as industry transformations occur, and clarity of the end goal is critical," urges Greg Cudahy, EY Global Leader – TMT. We anticipate critical mass in financial services technology in a 3- to 5-year time horizon, with other industries following quickly. But, points out Angus Champion de Crespigny, Ernst & Young LLP's Financial Services Blockchain and Distributed Infrastructure Strategy Leader, "blockchain is developing much faster than anyone expected. To think the impact to your industry is many years away is very risky."

Disruptive technologies interacting in unpredictable ways

New technologies are arriving on the scene at a far faster pace than ever before – creating a continuous cycle of innovation and disruption. In fact, blockchain is emerging as part of a portfolio of disruptive technologies, many of which are interacting – in unpredictable ways – and accelerating each other toward critical mass. These include artificial intelligence, virtual reality, robotic process automation, big data analytics, cloud computing, asset-sharing digital marketplaces (aka the sharing economy) and IoT. Blockchains have particular applicability to sharing economy and IoT models, both of which involve large numbers of collaborating peers.

Now is the time for tech companies to think proactively about their blockchain reactions. How will your business strategies, products and services look and behave in a blockchain-enabled world? We hope to facilitate your thinking with our analysis of blockchain business prospects and challenges and the tax, legal and policy implications that will emerge as blockchain reaches critical mass.

Key takeaways

- ▶ Blockchain creates tech-based trust among peers.
- ▶ Blockchain interacts with other fast-emerging disruptive technologies.
- ▶ The technology is still very immature.
- ▶ Tech companies should think now about the potential impact.

Blockchain defined

While the internet is a world-changing medium for information exchange, blockchain is "the first native digital medium for peer-to-peer value exchange. Its protocol establishes the rules – in the form of globally distributed computations and heavy duty encryption – that ensure the integrity of the data traded among billions of devices without going through a trusted third party. Trust is hard-coded into the platform. ... [Blockchain] acts as a ledger of accounts, a database, a notary, a sentry and clearing house, all by consensus."²

Industrial IoT defined

These are alliances that bring together a given sector's industrial assets, instrumented with IoT technology, into sharing-economy-style digital marketplaces. Once instrumented and organized this way, industrial asset utilization should rise significantly, driving down cost for all market participants.

Industrial mash-ups defined

These are alliances in which one or more parties make use of assets or capabilities of another party to create new business value, without affecting the other party's ongoing use of the assets or capabilities for their original business purpose. Industrial mash-ups are fluid partnerships that replace the "physical" vertical integration of an M&A or JV with an ecosystem of collaborating partners to bring the new business idea to market. They make possible the pursuit of new ideas that would not be viable under traditional M&A or JV approaches.

² This definition is from "How the Tech Behind Bitcoin Will Change Your Life," *Time*, 6 May 2016, © 2016 Time Inc., by business technology guru Don Tapscott and his

The blockchain effect

Can tech companies afford to take a wait-and-see attitude with blockchain?

Tech companies that responded too slowly to the mobile or cloud disruptions paid a high price. Blockchain technology faces challenges, to be sure, and the time horizon of its impact is not clear. But here is what is clear: blockchain has the potential to cause new existential business disruptions for companies across many segments of technology.

"If blockchains disrupt an industry, the challenge for companies is to use blockchain technology to put those businesses back together leaner, meaner and better than they were before."

Edwina Fitzmaurice
EY Global Business Development
Leader, Advisory

Blockchains threaten vertical software/SaaS and services

Perhaps most obvious is the disruptive threat to companies providing technologies to specific industries, whether financial services, energy, health care or agriculture. Blockchain technology makes possible new business models and streamlined business processes. If it works as expected, customers in every industry that tech companies serve will be assessing blockchain-based alternatives to their current information technology (IT) architectures to explore blockchain's potential to provide strategic and competitive advantages.

Case in point: if blockchains really prove to reduce cost and increase trust in financial transactions, financial services firms may decide to migrate quickly to blockchain – and away from their existing transaction-processing technologies. Software and services incumbents must be ready with blockchain-based platforms and solutions, or see the opportunity go to one of any number of well-funded blockchain start-ups. Similar scenarios will occur in many industries.

Says Edwina Fitzmaurice, EY Global Business Development Leader, Advisory: "Technology incumbents have to decide how they will add value in blockchain-based industry-specific solutions, and pursue that strategy at a pace appropriate to their individual situation. If blockchains disrupt an industry, the challenge for companies is to use blockchain technology to put those businesses back together leaner, meaner and better than they were before."

Enabling distributed processing and storage

Blockchains may also cause the ground to shift rapidly beneath providers of cloud services, especially infrastructure-as-a-service (IaaS) providers. "Blockchains are a particularly good mechanism for distributing a computing workload," explains Paul Brody, EY Americas Strategy Leader, Technology Sector.

“Companies trying to operate at the speed of innovation will find that ignoring the tax implications of their investment and operational decisions until late in the game could force them into a last-minute rethink.”

Channing Flynn

EY Global Technology Sector Leader
Tax Services

There are already limited examples of parallel-processing networks that take advantage of idle time in networked devices. But because blockchains can create anonymous, peer-to-peer trust while providing a low-cost way to distribute computing, they could enable the approach on a massive scale. Says Brody: “With blockchain, you can manage large, complex networks by having the devices communicate and manage each other on a peer-to-peer basis, securely, instead of building an expensive data center to handle the processing and storage load. It turns out that having these devices manage themselves is between 90% and 95% cheaper than the data center model.”

Already, a blockchain start-up offers “distributed cloud storage.” Its model enables anyone with unused disk space to rent it out, while the company’s blockchain infrastructure manages the process of encrypting and distributing files among a potentially vast number of renters’ devices.

Fitzmaurice amplifies this potential: “Particularly with the rise of IoT, there will be billions of high-powered computers embedded everywhere without a lot to do all day long. Coordinating those into powerful distributed processing networks is one of blockchain’s big promises.”

Blockchain and IoT

Blockchain’s secure, tamper-proof digital records technology and smart contracts could have a big enabling impact on development of IoT ecosystems. “The IoT and blockchain technologies were kind of made for each other,” says Brody. Blockchain’s attributes are a match to IoT’s challenges, and thus could become the underlying infrastructure for many IoT networks.

IoT networks face a security challenge because they may have thousands, millions or even billions of small devices with valuable data distributed across them. They also face a management challenge in coordinating and acting on the information the network produces, and an accounting challenge in determining and sharing the value created by network participants. Certainly not least is the trust challenge, as most IoT networks will comprise ecosystems of cooperating partners, not single corporate entities. Blockchain’s trust, security and smart contracts elements could potentially address all these challenges.

How blockchain distributes, secures and automates trust

Blockchains are essentially public or private distributed databases containing records of every transaction ever made among participants in a given network, encrypted into time-stamped blocks via a cryptographic hash function. Each block’s hash result is a unique identifier and is incorporated into the next block for integrity verification. Blockchains further protect data integrity by distributing a full copy of the database to each participant; revisions must be agreed to by a majority of participants.

Blockchain’s hash function plus its majority consensus approach add up to a powerful new approach to information security. “Blockchain shifts cybersecurity from depending on one to depending on many, and a large volume of people are much more trustworthy than any one individual,” says Brody. The approach makes blockchains virtually tamper-proof.

Finally, blockchain includes a technology called “smart contracts.” These are bits of executable code that act only if specific conditions within the blockchain are met. Combined with the blockchain elements already described, smart contracts can automate trusted activity among participants, such as payment transfers upon completion of a specific task, or partial payment for reaching an agreed-to milestone.

“The impact of blockchain will be measured at the start and at some point it will then rise exponentially because the technology becomes far more useful as more people add themselves to the network. The risk is that if companies aren’t thinking about this now, there will suddenly come an inflection point, and then it will be too late.”

Jeff Wong

EY Global Chief Innovation Officer

“Blockchain has a useful impact in every business but it’s probably most empowering at the lower end of the market. The transactions we couldn’t do before because they were too expensive will create new markets.”

Paul Brody

EY Americas Strategy Leader
Technology Sector

Blockchain and the sharing economy

Those same blockchain elements could help streamline and automate sharing economy business processes – a key challenge for sharing economy companies, as described in EY’s report, *Get ready: open to sharing means open for business*. Blockchain’s suitability for the sharing economy could be important, as virtually every industry in the global economy is undergoing digital disruption that will change the value of their asset bases and capabilities. Companies are thinking about how to increase asset/capability utilization through sharing in digital marketplaces, or how to leverage others’ assets/capabilities to create new forms of business value.

All these opportunities, across all sectors of the global economy, have at least one thing in common: they require multiple corporations to partner. Tech companies could use blockchain’s secure, virtually tamper-proof distributed ledger technology and automation capability to provide the platforms needed to bring sharing economy opportunities to fruition.

Blockchain and cybersecurity

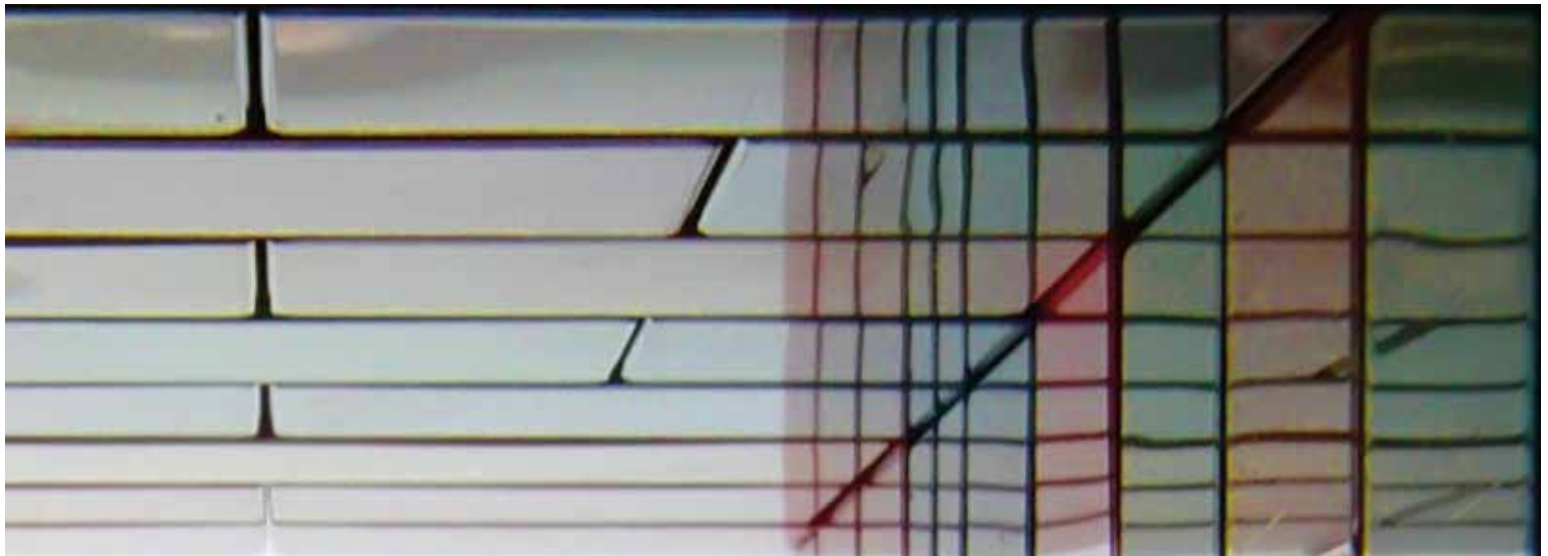
Blockchain technology is designed from the ground up for holistic security. Blockchains provide inherent security related to end-point protection, user identity, transactions, network communications, inept or malicious insiders and even compromised nodes or server failure.³

Blockchain’s approaches are influencing multiple emerging cybersecurity products and services. For example, blockchain security mechanisms have been incorporated into a new digital signature technology based on hash-function cryptography, a proposed secure peer-to-peer core internet protocol to replace HTTPS and a prominent university’s approach to analyzing encrypted data while protecting the underlying information from exposure.⁴ Key to blockchain’s security approach is the shift to consensus-based authentication and decision-making (see “How blockchain distributes, secures and automates trust,” page 7).

Consumption-based pricing models

Another way in which blockchain may disrupt tech companies is by accelerating the migration (begun by cloud computing) from unit-based pricing models to usage- or transaction-based models. “Consumption-based pricing will clearly be a business process disruptor,” says Cudahy. “Eventually, maybe even semiconductor companies won’t be paid on the basis of the cost of a chip, but will bill customers differently based on how often and how much the customer uses that capacity.”

³ “How blockchains are redefining cyber security,” *Information Age*, 24 December 2015, © 2015 Information Age Media Ltd., accessed via <http://www.information-age.com/technology/security/123460713/how-blockchains-are-redefining-cyber-security>



Tax and regulatory impact

While migration to consumption-based pricing may demonstrate the most obvious impact on tech companies' tax and regulatory responsibilities, all the blockchain movements described would have an impact.

"Today, the processes of validating that the revenue was earned and then paying the appropriate tax on that revenue are both done retroactively," says Channing Flynn, EY Global Technology Sector Leader, Tax Services. "But blockchain technology may be able to do it in real time, openly and transparently." Depending on the details of such an implementation, the approach might dramatically reduce companies' cost of tax compliance, reduce tax evasion, expose more corporate information to public scrutiny and eliminate or dramatically change millions of jobs. Governments around the world have begun to explore the possibilities.

Tech company, disrupt thyself!

Given blockchain's massive potential to disrupt technology companies' business models, business processes, product and service architectures as well as tax, legal and regulatory responsibilities, executives must begin thinking through the impact on their organizations right away.

"It's time to think through, in a logical, strategic way, how to effectively disrupt yourself before others do it to you," says Champion de Crespigny. "Companies should identify new blockchain-enabled opportunities, assess the risks and time their entries to capture and build competitive positions."

EY's Jeff Wong, Global Chief Innovation Officer, adds that tech companies must not become complacent even if the immediate material impact of blockchain technology is not significant. "The impact of blockchain will be measured at the start and at some point it will then rise exponentially because the technology becomes far more useful as more people add themselves to the network. The risk is that if companies aren't thinking about this now, there will suddenly come an inflection point, and then it will be too late," Wong explains.

Key takeaways

- ▶ Blockchain threatens existing vertical tech vendors.
- ▶ It may accelerate distributed clouds, the sharing economy and IoT.
- ▶ Blockchain is influencing cybersecurity development.
- ▶ It could reduce the cost of tax compliance while increasing transparency.
- ▶ Blockchain will grow slowly until critical mass – then rise exponentially.

"In a world where every transaction is recorded in real time, then of course there is no way to hide illegal businesses and there is no way not to pay the tax that is due."

Daniel Krauss

EY Global Advisory Innovation Leader

Imagining a blockchain world

What if blockchains remake work, life and play the way the compass changed seafaring, internal combustion engines changed transportation or penicillin changed medicine?

One reason the blockchain reaction is racing toward critical mass faster than previous disruptive technologies is that it is arriving in the midst of the digital transformation already sweeping through most sectors of the global economy. Consequently, despite the obstacles still to be overcome, businesspeople and governments are preconditioned to recognize blockchain's potential and tech companies have already established much of the digital infrastructure required to realize blockchain business visions.

Early pilots are already underway in many industries, as mentioned in our overview. They tend to focus on blockchain uses that drive cost out of business processes by making transactions more efficient. While these may be highly valuable uses, it is the entirely new business scenarios that have the potential to disrupt and remake entire industries; that promise to reduce or eliminate intermediary businesses; and that raise challenging new tax, compliance and regulatory questions. "Blockchain is starting out just like the internet," says Champion de Crespigny. "One of the internet's initial uses – email – made sending letters easier, faster and less costly, but that is not why it disrupted so many industries."

The "embedded finance" scenario

In financial services, the first round of blockchain pilots is exploring more efficient ways to provide today's services, such as transferring equities or other financial instruments in blockchain environments with potentially faster settlement and far lower transaction costs.

But the long-term blockchain vision is of markets that run by themselves, with finance embedded directly into the natural activities occurring within those markets. "In such an environment, the finance industry will look very different than it does today," says Champion de Crespigny.

Automotive ecosystem with embedded finance

One possible near-future "embedded finance" scenario involves a blockchain hosting all-inclusive records of an automotive ecosystem. Ownership, financing, registration, insurance and service transactions could all be tracked together. Such a blockchain would make it possible for a manufacturer of driverless cars, for example, to place its cars in a ride-hailing company's fleet. Every time the car is paid for a ride, a blockchain smart contract with embedded financing delivers a revenue share to the manufacturer. The manufacturer may never need to "sell" a car to a consumer; it may not need bank financing, depending on the long-term cash flow resulting from its share of every transaction entered into by its products.

"Because a few people misused bitcoin, many see blockchain as bad instead of thinking it's good for the economy because it reduces inefficiencies posed by intermediaries."

David Golden

EY Americas Director, Capital Markets Tax

“The internet of things and blockchain technologies were made for each other.”

Paul Brody
EY Americas Strategy Leader
Technology Sector

Other blockchain scenarios

Blockchain's diverse business and industry possibilities are ultimately limited only by everyone's collective imagination. The following seven scenarios demonstrate the breadth of the technology's potential impact.

- ▶ **Embedded health.** As in the embedded finance scenario, a blockchain could host a health care information ecosystem including providers, payers and patients, along with their related data (electronic health records, pharmaceutical data, real-time health telemetry from wearable activity trackers, etc.). Payments could run seamlessly among the insurer, patient and provider. Even though no one party owns or controls all the information, smart contracts could define circumstances in which private information is shared, such as releasing medical information to emergency responders treating accident victims. Further, “Feedback from wearables could either reduce or increase a person's premium in real time, depending on the reward system established by the insurer,” says Champion de Crespigny.

- ▶ **Eliminating digital rights theft.** Publishing digital works, such as music, in a blockchain environment could reduce or even eliminate piracy. Says EY's Cudahy: “If anytime anybody uses a music file anywhere in the world, that action is automatically recorded by a public blockchain, and the transaction can be validated, you will no longer have digital rights theft.” Of note, a British songwriter has announced plans for a blockchain-based music ecosystem in which artists can place their songs and control song data and terms of usage, with transaction royalties distributed in real time to the artists, producers, writers and engineers involved in a song's production.⁵

- ▶ **New credit markets for low-cost assets.** Transaction costs put a practical lower limit on the practice of using assets as collateral to secure a loan. By taking so much cost out of transactions, blockchain could open up lending to whole new classes of lower-value assets. “Blockchain has useful impact in every business but it's probably most empowering at the lower end of the market,” says Brody. “The transactions we couldn't do before because they were too expensive will create new markets.”

“Imagine how much blockchain technology can speed up reporting for financial institutions. By collecting data that is already validated and trustworthy, it would cut out so many steps.”

Mazhar Wani
Global Compliance & Reporting
Ernst & Young LLP (US)

- **Pay-for-performance.** Smart contracts could automatically enforce pay-for-performance agreements in many industries, the simplest example of which is in shipping. A sender could agree to pay US\$25 if a package is received by 10 a.m. tomorrow, US\$15 for 5 p.m., US\$5 for the following day and after that, nothing.
- **Government tax enforcement.** The European Union's recent move to stop producing €500 notes may be only the beginning of a growing move away from "hard cash" to digital transactions. "In a world where every transaction is recorded in real time, then of course there is no way to hide illegal businesses and there is no way not to pay the tax that is due," notes Daniel Krauss, EY Global Advisory Innovation Leader. A report this year by the UK Government Chief Scientific Advisor proposes a blockchain-based European value-added tax (VAT) system that would increase transparency to "make the black market economy more difficult to conceal" and "include smart contracts designed to outsmart the tax quasi-compliant economy."⁶
- **Industrial mash-ups.** Blockchains could become an enabling engine for the extensive partnering required to pursue certain kinds of new business opportunities, particularly in the sharing economy or IoT. "Industrial mash-up" is a term EY coined to describe alliances in which one or more parties make use of assets or capabilities of another party to create new business value, without affecting the other party's ongoing use of the assets or capabilities for their original business purpose. "Industrial mash-ups are fluid partnerships that replace the 'physical' vertical integration of an M&A or JV with the 'virtual' integration of an ecosystem of collaborating partners to bring the new business idea to market," explains Jeff Liu, EY Global Technology Sector Leader, Transaction Advisory Services.
- **Industrial IoT.** Blockchain technology could help bring together IoT and sharing economy models via industrial mash-ups' envisioned ecosystems of collaborating partners to create what EY calls the industrial IoT. Idle time of high-value industrial assets can be worth up to millions of dollars per day or per hour – and the fact is industrial assets are often quite underutilized. "Blockchain-powered industrial IoT networks will allow us to connect industrial assets – everything from shipping containers to MRI machines to construction equipment – into real-time digital marketplaces where we can make better use of them," says Brody. "Blockchains would become the interaction engines for these marketplaces, supporting financing, rental, insurance – all kinds of services."

"Blockchain-powered industrial IoT networks will allow us to connect industrial assets – everything from shipping containers to MRI machines to construction equipment – into real-time digital marketplaces where we can make better use of them."

Paul Brody
EY Americas Strategy Leader
Technology Sector

Key takeaways

- New blockchain business scenarios could remake entire industries, from finance to health care to media.
- Blockchain could dramatically improve tax enforcement.
- It will enable industrial mash-up partnering.

⁶ *Distributed Ledger Technology: beyond block chain*, A report by the UK Government Chief Scientific Adviser, © 2016 Crown, accessed via www.gov.uk/government/

Achieving the vision

What challenges could prevent blockchain from getting to critical mass?

A number of obstacles stand in the way of blockchain proponents' business vision of peer-to-peer markets running themselves with embedded finance and other automated smart functions. Perhaps first among these is widespread confusion on at least two fronts: how blockchain technology works and how it differs from bitcoin.

First, let's address the bitcoin-blockchain connection. Blockchain and bitcoin are often viewed as synonymous. The truth is the bitcoin virtual cryptocurrency simply was the first application of blockchain technology to hit the market (see sidebar).

Blockchain's bitcoin backlash

To add to the confusion, blockchain suffers from a public relations problem we think of as bitcoin backlash, partly because criminals and terrorists have used bitcoin while remaining anonymous – leading to the perception that blockchain offers unbreakable anonymity. "Because a few people misused bitcoin, many see blockchain as bad instead of thinking it's good for the economy because it reduces inefficiencies posed by intermediaries," explains David Golden, EY Americas Director, Capital Markets Tax. "So I'm concerned some governments will try to slow it down."

Challenges to blockchain adoption

Successful widespread deployment of blockchain technology is challenged by obstacles of its own making (e.g., potential technical limitations or the transparency and peer-to-peer philosophies at its heart) as well as by uncertainties around regulatory, legal, privacy and taxation issues. Critical challenges that may slow blockchain adoption include the following.

Technical issues

Initial implementations of blockchain, such as for bitcoin, are computationally intensive because of the cryptography that protects data blocks and links them into a chain. That slows the technology, creating a scalability concern that blockchain will not be able to meet demand in terms of transactions per second for many industry uses. There is also concern over anonymity. However, blockchains are not anonymous; they associate all transactions with users identified by a blockchain address. As with an email address, anonymity is possible but only through separate actions to thwart traceability from the blockchain address to the account owner.

Lack of central authority

This one is ironic for a technology whose promise includes eliminating the need for a central authority. As a practical matter, however, some official body is needed to establish standards and protocols for interoperability among multiple public or private blockchains participating in a given industry. "Markets will need a global body to establish standards and verify that the blockchain is doing what it is supposed to," says EY's Flynn. "Perhaps something like the International Monetary Fund or the United Nations. Until that happens, the global adoptability of blockchain remains in doubt."

The bitcoin-blockchain connection

Blockchain came into the world as the technology that underpins the bitcoin virtual cryptocurrency. Blockchain was first described in a 2008 paper published by Satoshi Nakamoto, the pseudonym used by the anonymous person or people who designed bitcoin. It was first implemented in bitcoin's original source code. Since then, perspectives on bitcoin have waxed and waned, the latter partly because of the way criminals and terrorists have used bitcoin. But blockchain has seen continuously growing interest in its widespread applicability.

Too much transparency

Information asymmetries – from patents to trade secrets to customer insights culled from big data analytics – lie at the heart of market power and profits. EY's Krauss notes: "The reason consumers are more empowered today is because the internet reduced information asymmetry between buyers and sellers. With blockchain, if you are able to see all the different suppliers and transactions within an industry, this reduces the remaining information asymmetry in that industry. What happens to the market power of established companies?"

Talent upheaval

The very nature of work will likely morph significantly if blockchains achieve widespread adoption. Blockchain-based automation will eliminate many current jobs, and new roles will emerge demanding new skill sets. EY's Flynn believes, for example, that in finance, "we'll see many future roles that will require financial and technology expertise combined into a sort of financial technologist. Or perhaps a 'taxologist' – a word I just made up to describe someone who understands how governments around the world are using technology like blockchain to make sure they collect the monies they are due."

Regulatory uncertainties

While virtually every government's regulatory apparatus is studying blockchain, their reactions cover the spectrum. The most advanced government-sponsored blockchain usage may be Estonia's virtual e-residency program, which is experimenting with a blockchain infrastructure to offer public notary services to virtual e-residents no matter where they physically live – its first official act was to register the marriage of two Spanish-born London residents.⁷ "Blockchain represents a fundamental shift in how complete industries or economies will function, so the regulations we have today probably won't fit the business model of tomorrow," says Matthew Hatch, EY Americas FinTech Leader.

Legal disruption

Estonia's public notary service may be only the first way blockchain might disrupt current legal customs and even the legal profession itself. "With blockchain, the theory is you can much better document transactions and therefore avoid any crime connected with the possibility of hidden transactions," says Richard Goold, EY's Global Technology Law Leader. Further, if every transaction is somehow documented, then fraud will be lowered. "The entire legal system as we know it might extinguish if blockchain can provide more efficient ways to manage the business relationship between individuals and companies," says Peter Katko, EY's Global Digital Tax Law Leader.

Privacy debate

Privacy is a two-sided coin. Today, for example, bitcoin's blockchain implementation protects privacy, thus enabling illicit transactions. Future blockchains are envisioned to maintain identity transparently, potentially exposing transactions that today are private. "There is ongoing public debate about where to draw the line between privacy and transparency," stresses Katko.

Early blockchain tax implications

From a tax perspective, the initial opportunities and issues presented by blockchain are high level. Blockchain's transparency and real-time validation of transactions could help automate and simplify taxation of trading transactions, particularly in the area of value-added taxes (VAT) and other sales taxes. This could significantly lower an organization's cost of tax compliance.

Less clear-cut is blockchain's impact on corporate income tax. Some tax authorities are already questioning the alignment of profits and profit-making activities among companies' global headquarters and their worldwide subsidiaries. Blockchains could conceivably add firepower to their anti-tax-avoidance campaigns, allowing jurisdictions to obtain intragroup transaction data in real time. They also have unpredictable implications amid growing intragovernment sharing of tax information and global activists' calls for a new era of tax transparency.

"If most of the benefits accrue to tax administrations and not to businesses, getting the ecosystem of an industry to decide together how to implement blockchain will be a difficult obstacle to overcome," says Rod Roman, Tax Leader, Financial Services EMEA Digital, Analytics and Cyber Solutions, Ernst & Young LLP.

Key takeaways

- ▶ Blockchain adoption must overcome negative association with bitcoin.
- ▶ It also faces technical, operational and workforce issues.
- ▶ Blockchain raises new tax, legal and regulatory questions.

"In a B2B environment, there might be a disconnect between the transparent openness of blockchain and a company's desire to keep sensitive commercial information private."

Anne Freden
Indirect Tax Services
Ernst & Young LLP (US)



"We recommend companies not focus on how this technology fits into their current business, but instead look at what their products and services look like in a blockchain-enabled world."

Angus Champion de Crespigny

Financial Services Blockchain and Distributed Infrastructure Strategy Leader
Ernst & Young LLP (US)

"Today's business leaders should be asking, 'What investments will I need to make in capital, technology and new skills – whether through training or hiring – to leverage and scale blockchain in a way that gives me a distinct competitive advantage?'"

Barak Ravid

Managing Director, Co-head of Technology
Parthenon-EY

Preparing for critical mass

Why is it important for companies to start considering their place in a blockchain world?

Assume for a moment that blockchain technology overcomes all obstacles and becomes a new foundational platform for digital business interactions in multiple industries.

Ask yourself: how will my company make money in a market where all transactions are transparent, secure and validated; industrial assets are shared among market participants; customers have even more information than they do today; and regulatory compliance and tax collection occur in real time, at the moment transactions take place?

"We recommend companies not focus on how this technology fits into their current business, but instead look at what their products and services look like in a blockchain-enabled world," says EY's Champion de Crespigny.

As Champion de Crespigny suggests, the question companies must ask themselves as they frame their blockchain analyses is not "What is my blockchain strategy?" Instead, they should ask, "What is my business strategy in a blockchain-enabled world? How will my business operate and make money?"

Prep sooner, not later

"Achieve readiness early" is perhaps the most important lesson from the high price so many tech companies paid for being slow to join the cloud and mobile disruptions.

We expect blockchain progress to be relatively slow during the next couple of years, as standards and protocols are worked out, industry by industry, and tax, legal and regulatory questions are explored, discussed and, ultimately, answered.

However, should critical mass be reached, blockchain's impact will be felt far, wide and fast. That's the pattern set by smart mobility and the cloud. And everything moves even faster now.

Engage tax team early

Critical to your ability to move fast: keeping your tax team closely involved in blockchain strategy development and engaging early with policymakers to help align evolving digital policy and taxation with this new technology's promise for business innovation. "Companies trying to operate at the speed of innovation will find that ignoring the tax implications of their investment and operational decisions until late in the game could force them into a last-minute rethink," says Flynn.

"If most of the benefits accrue to tax administrations and not to businesses, getting the ecosystem of an industry to decide together how to implement blockchain will be a difficult obstacle to overcome."

Rod Roman

Tax Leader, Financial Services EMEA Digital, Analytics and Cyber Solutions
Ernst & Young LLP (UK)

Considerations

The following questions will help technology company executives think through the implications of blockchain technology for their businesses.

Opportunity assessment

- ▶ Do we have an opportunity to host a digital rights marketplace in our industry?
- ▶ Can we host blockchain-powered digital marketplaces for previously underserved customers?
- ▶ Can we increase total revenue via pay-for-performance pricing models powered by smart contracts?
- ▶ How can blockchain technology help make our business operations more efficient and automated? Or raise the efficiency of my supply chain?
- ▶ How do we partner with customers in blockchain experiments, and be ready if the technology takes hold?
- ▶ What new business opportunities can our organization pursue through “mash-ups” with partners?
- ▶ Does “embedded finance” open up new business opportunities for us?
- ▶ How can blockchain technology help improve customer interactions and satisfaction?
- ▶ Where can we use blockchain technology to reduce or eliminate the role of intermediaries in our business ecosystems?

Risk assessment

- ▶ Where does blockchain threaten our current business? Are we operating as an intermediary in a function that is a candidate for blockchain-based automation?
- ▶ Should we disrupt ourselves by operating an asset-sharing marketplace to withstand a potential “supply shock”?
- ▶ How will real-time tax collection impact my business operations?
- ▶ How do we develop a tax-efficient strategy for a blockchain world where we pay tax in real time, with total transaction transparency?
- ▶ Given the speed of blockchain development, how soon must I begin to think about reporting taxable events via blockchain technology?
- ▶ How might sharing revenue with supply chain partners in real time impact my organization’s financial profile?

Key takeaways

- ▶ Ask not, “What is my blockchain strategy?” Instead ask, “How will my business operate and make money in a blockchain-enabled world?”
- ▶ Achieve readiness early.

What's next?

Looking ahead, what might blockchain bring?

The following quotations from EY contributors to this report capture the essence of blockchain's remarkable potential.

"If blockchains disrupt an industry, the challenge for companies is to use blockchain technology to put those businesses back together leaner, meaner and better than they were before."

Edwina Fitzmaurice

EY Global Business Development Leader, Advisory

"Blockchain is profound for business because it enables trust among entities that have no other basis for trust. While it may impact financial services first and most visibly, ultimately it's going to impact all industries."

David Jensen

EY Americas Advisory, Disruptive Innovation Leader

"With the blockchain, if you are able to see all the different suppliers and transactions within an industry, this reduces the remaining information asymmetry in that industry. What happens to the market power of established companies?"

Daniel Krauss

EY Global Advisory Innovation Leader

"Blockchain represents a fundamental shift in how complete industries or economies will function. The regulations we have today probably won't fit the business model of tomorrow."

Matthew Hatch

EY Americas FinTech Leader

"Of all the emerging technologies we are looking to leverage within the end-to-end supply chain, blockchain is the least well understood, but the one that could have the greatest impact."

Andrew Caveney

EY Global Supply Chain and Operations Leader

"You've got to understand your North Star when it comes to these disruptive technologies; the wind won't always be at your back as industry transformations occur, and clarity of the end goal is critical."

Greg Cudahy
EY Global Leader – TMT

"Blockchains could become the perfect engine to power industrial mash-ups, the emerging practice of fluid partnerships that replace 'physical' vertical integration with 'virtual' integration of collaborating partners to bring new business ideas to market."

Jeff Liu
EY Global Technology Sector Leader
Transaction Advisory Services

"It's time to think through, in a logical, strategic way, how to effectively disrupt yourself before others do it to you. Companies should identify new blockchain-enabled opportunities, assess the risks and time their entries to capture and build competitive positions."

Angus Champion de Crespigny
Financial Services Blockchain and Distributed
Infrastructure Strategy Leader
Ernst & Young LLP (US)

"Blockchain shifts cybersecurity from depending on one to depending on many, and a large volume of people are much more trustworthy than any one individual."

Paul Brody
EY Americas Strategy Leader
Technology Sector

"Markets will need a global body to establish standards and verify that the blockchain is doing what it is supposed to. Perhaps something like the International Monetary Fund or the United Nations. Until that happens, the global adoptability of blockchain remains in doubt."

Channing Flynn
EY Global Technology Sector Leader
Tax Services

"Because a few people misused bitcoin, many see blockchain as bad instead of thinking it's good for the economy because it reduces inefficiencies posed by intermediaries."

David Golden
EY Americas Director, Capital Markets Tax

"The impact of blockchain will be measured at the start and at some point it will then rise exponentially because the technology becomes far more useful as more people add themselves to the network. The risk is that if companies aren't thinking about this now, there will suddenly come an inflection point, and then it will be too late."

Jeff Wong
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