How Retirement Services Providers Can Tap Blockchain Thinking and Technology

As blockchain enters the mainstream and proves its ability to enable digital trust, improve operational efficiencies, redefine the customer experience and improve business resiliency, companies in the retirement industry are experimenting with simple use cases such as contract management and more innovative ways to engage participants and create new business models.

Executive Summary

The organizers of the World Economic Forum recently published a report[1] on emerging technology trends to support their notion of the role digital is playing in spurring a "fourth industrial revolution." Among the hot button issues referenced by the 800 global executives and experts surveyed – beyond the near zero cost for storage and the unrelenting rise of artificial intelligence (AI) and automation – is the emergence of blockchain technology, which the report predicts will account for 10% of global gross domestic product (GDP) by 2027.

Since its debut in 2009, blockchain has quickly emerged as an integral strategic component for many top financial services institutions. Blockchain is a network of participants that share a replicated ledger to perform peer-to-peer transfer of value without requiring a trusted third party. R3 (R3CEV LLC), a consortium of 42 financial companies (Barclays, Goldman Sachs, JPMorgan Chase, State Street, UBS, etc.), in fact, is playing a key industry role by researching and advancing the use of blockchain technology.

Over the past five years, over $500 million[2] has been invested into blockchain ecosystem development. However, nearly all of these projects remain in the experimental stage. NASDAQ LINQ, a private market exchange,[3] and GYFT block,[4] are among a few of the widely-acclaimed examples of live blockchain implementations. (Note: There are many other examples of Bitcoin and other cryptocurrency exchanges.) Industry insiders expect it to take a few more years for core Bitcoin and blockchain platforms and tools to evolve and be ready for mainstream applications, and for the business application ecosystem to mature.

Given the early stage of blockchain technology's evolution, industry players must question its relevance to a highly regulated marketplace such as retirement services. While that is a reasonable point, we believe it is important to see blockchain adoption in the context of macro-trends that are taking place and also take lessons from the past.

This white paper illustrates, through a few representative use cases, how retirement providers can not only adopt blockchain

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approaches but also be creative in using the technology to help achieve better retirement outcomes, engage participants and address current business challenges. Blockchain is poised to help build digital trust, deliver operational improvements and cost reduction, redefine customer experience and improve business resilience by eliminating single points of failure.

Blockchain's Role in the Retirement Space

The products and services around retirement and annuities were largely shaped by regulations, workforce culture and average life span. Pension plans, which were popular and internally administered by large enterprises between the 1870s and the 1940s, quickly gave way to the sourcing of defined benefits from specialty

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A Blockchain Primer

Blockchain is a ledger distributed across a network (e.g., the Internet) and available to all users in the network to view and edit the transactions in a secure way using cryptography technology. Each transaction is registered in the ledger building the history of that particular transaction, and validated for its authenticity by the users.

Blockchain provides integrity, auditability, governance and transfer of ownership capabilities. This provides businesses with faster and more efficient processing, lower cost of operation and greater resilience against system failure.

Anatomy of One Type of Blockchain Ecosystem

TRANSACTION DEFINITION

- The "buyer" agrees and transmits to the network a transaction message including the details of the "seller," the value of the transaction and a unique digital signature (code) that provides authenticity for the message.

TRANSACTION AUTHENTICATION

- The nodes (computers/users) of the network receive the message and authenticate the validity of the transaction by decrypting the digital signature. The authenticated transaction is virtually placed with other recently authenticated transactions.

BLOCK CREATION

- A node creates a block that contains the list of recently authenticated transactions, a header (reference code to the previous block) and a nonce (a random number).
- The node broadcasts the block to the network as the new block to be registered in the ledger. (This occurs at specific time intervals.)

BLOCK CHAINING

- The first node to find the output value "chains" the block to the blockchain. The extended blockchain is broadcast to the network. (As the process is trial and error, several nodes work simultaneously to find the output value in order to reduce time.)

BLOCK VERIFICATION

- The nodes of the network receive the block and work to validate it through an iteration process called "proof of work" as follows.
- Several nodes individually combine (using a "hash function") three inputs from the block (the transaction list, the header and the nonce) to create output value.
- If the output value is less than a predefined threshold, then the block is validated. Otherwise, each node changes the nonce value and repeats the process until an output value less than the threshold is found.
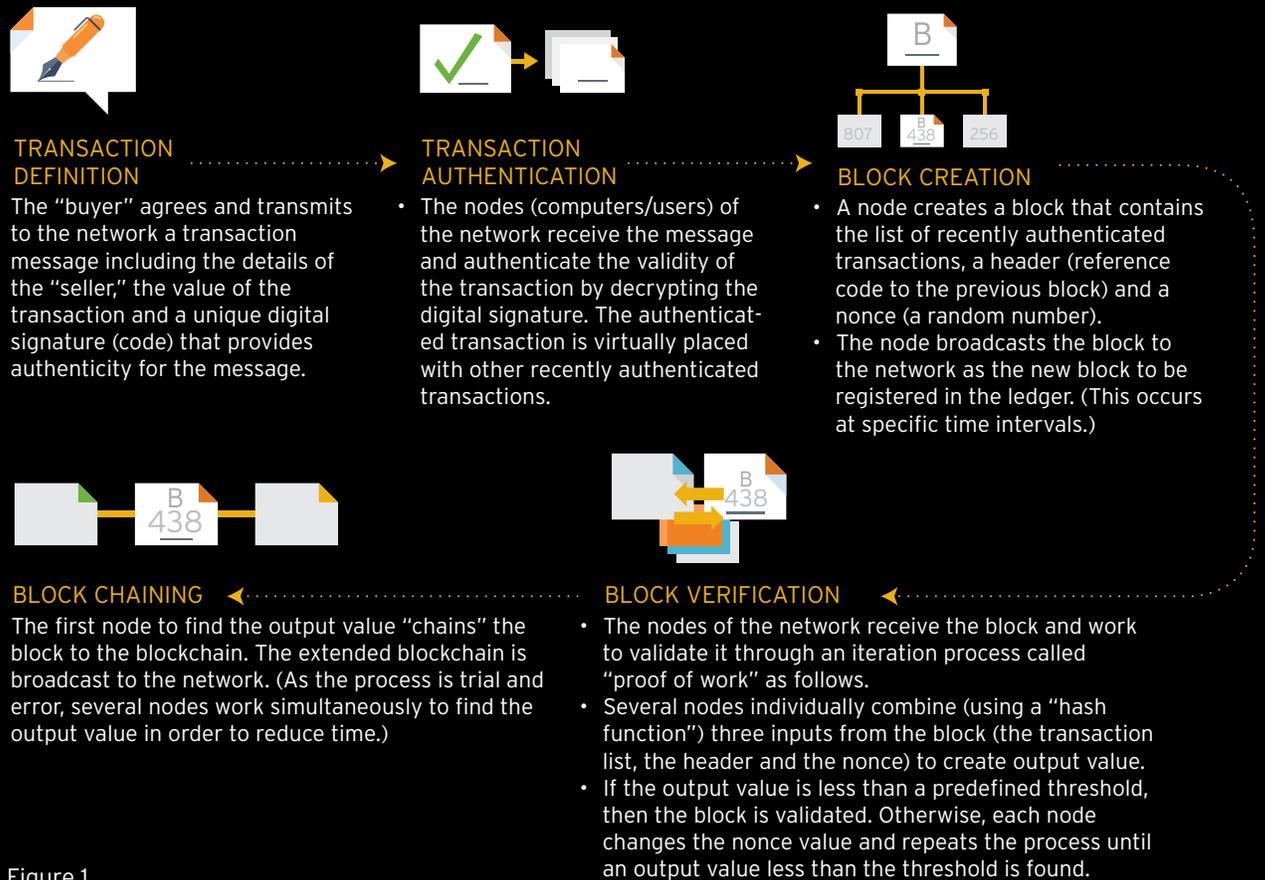
Figure 1

companies. But as the industrial economy began a couple of decades back to give way to a more services-oriented economy, the loyalty of a worker to a single company diminished. The onus of saving for retirement shifted from employers to employees, many of whom did not understand the complexities of the financial system.

Regulations such as the Employee Retirement Income Security Act (ERISA) have helped fiduciaries, participants and other players in the industry abide by rules and guidelines with the objective of better retirements. Market demands made new pension plans (defined benefits) obsolete, and gave way to newer product innovations in defined contributions and IRAs.

Today, the retirement industry is ripe for another disruption. Margin pressures are continuously increasing as competition rises, causing a reduction in provider fees. Increasingly, employers and employees are demanding fee transparency and product simplification. Consumers do not want piecemeal solutions for their retirement plans – they want the providers to look at their retirement holistically and provide an integrated "solution package" instead.

Moreover, digital technologies (aka, social, mobile, analytics and cloud, or the SMAC Stack) are not only changing how consumers interact, consume information and transact, but also how providers develop products, sell them and service them. More stringent regulations – such as the proposed "conflict of interest" ruling by the U.S. Department of Labor (DOL) – have also forced providers to push the envelope further and adjust/develop new business models. From 401(k) exchanges to direct-to-consumer sales, 360-degree financial views of the customers and robo-advice, digital disruption has become the new normal in the industry.

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We believe many areas of blockchain experimentation currently under way in the financial sector will foreshadow innovations that can be applied in the retirement services industry. They will not only improve and simplify interactions between providers and sponsors in the short run, but also drive participant engagement and retirement outcomes as new business models emerge.

Today, most blockchain commentaries are rooted in highly technical language. This is not surprising, given that the bulk of blockchain innovation is occurring at the core infrastructure and platform level.

Blockchain was simply explained in a recent blog posted on the Coindesk[5] website. Consider the case where you share an apple with a child. After the transaction occurs, both you and the child know the apple is not with you. A third party is not needed to validate this physical world transaction. The same holds true for physical money transferred between two individuals. However, in a world where digital currencies (such as credit cards, debit cards, etc.) are increasingly used, there is a need for intermediaries such as banks and clearing houses to perform record-keeping and to validate all transactions.

These intermediaries have come to be expected as foundational elements to the smooth functioning of today's blended physical and digital world economy. Blockchain technologies will help to reduce the need to rely on intermediaries or, perhaps more to the point, will lay out roles that trusted intermediaries will play in verifying the settlement of commercial transactions between parties.

With blockchain, record-keeping is conducted on a distributed network that is not controlled by a central authority. This is remarkably similar to how today's Internet functions today (i.e., a network of networks that communicates seamlessly via the Internet Protocol). In a blockchain world, all records such as a land record – or any financial ledger – can be stored on multiple computers.

The value proposition of developing blockchain-powered solutions is as follows:

- Digital trust through integrity, auditability and tracking.
- Operational improvement and cost reduction through speed, accuracy and increased automation.
- Enhanced customer experience through new business models.
- Business resilience/risk reduction through elimination of single points of failure.

Blockchain: A Potential Game-Changer for the Retirement Industry

The retirement industry is still getting its feet wet with blockchain technology and its value proposition. Nevertheless, we believe it is important for the industry to experiment with a few simple use cases to get comfortable with the technology and understand its value, without losing sight of the art of the possible around business model disruptions that blockchain can deliver.

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As such, we built experimental use cases that can help organizations acclimatize to blockchains. We've also created some more innovative use cases to depict what we believe are achievable business model disruptions.

Experimental Use Cases

Plan Document and Record Management

- **Challenge:** Retirement providers maintain a large number of plan documents such as plan contracts and service agreements. During the preparation, these documents are reviewed by multiple departments within the provider, and are then signed by responsible parties. All plan documents need to be stored securely and shared with relevant external parties such as sponsors.

- **Solution:** Blockchain can assist in the preparing and managing of plan documents. During plan document preparation, blockchain can help in the review process by tracking and time-stamping the document review by each reviewer and ensuring execution against the most recent versions of documents. It also will enable counterparties to easily verify the authenticity of those documents. The final document can be signed digitally by all signing parties. Access to specific documents or data can be controlled within blockchain. These documents can be stored securely and economically in blockchain[6] (see Figure 2).

- **Potential benefits:**
  - Streamline plan document review process.
  - Secure document storage.
  - Controlled sharing of document.

Plan Document Management with Blockchain

Pain points of the current plan document management process

- Inefficient review tracking
- Expensive storage and sharing
- Physical signature

Plan document management with blockchain

- Each review tracked and time-stamped
- Stored securely in a blockchain directory with sharing capability
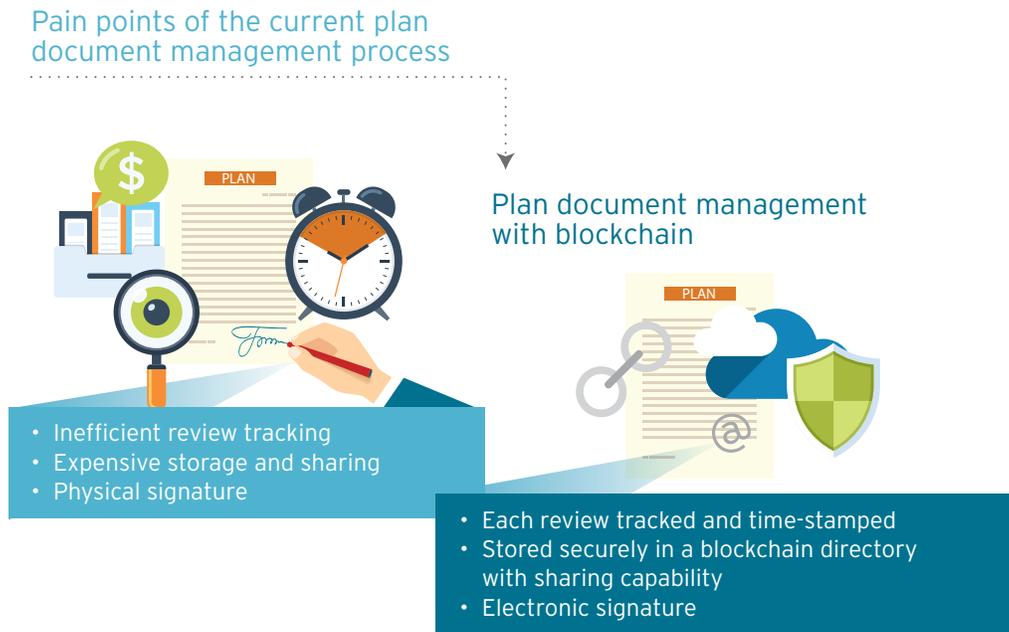- Electronic signature

Figure 2

Participant Proxy Voting

- **Challenge:** All mutual fund shareholders have the right to vote on proposals such as fund mergers and acquisitions, and for changes in the mutual fund structure in a general meeting. Shareholders also have the option of participating in a proxy vote without attending the general meeting. Retirement providers who invest participants' money in mutual funds have the responsibility to collect the proxy votes for all the mutual funds that participants invest in and send the tabulated votes to the mutual fund companies.

  Providers tend to use proxy vote vendors to collect proxy votes through online proxy votes or physical proxy vote cards. The majority of proxy votes are collected through online proxy votes since a physical mailing is an expensive process. But the auditing of online proxy voting is a very cumbersome process since participant votes are processed via a complex software process, which makes it difficult to show the audit trail at the level of individual votes.

- **Solution:** Blockchain technology can be leveraged for proxy voting. If proxy voting is conducted on blockchain, participants can vote electronically, and blockchain will provide end-to-end auditability. Blockchain would also be used to record all the votes for a fraction of the cost. Similar to current online proxy voting, each participant can be sent a control number that allows the participant to vote electronically. As a result, voting records are more private and secure than if they are kept in a central database (see Figure 3).

- **Potential benefits:**
  > Lower the cost for collecting proxy votes.
  > Allow easy auditing of the votes.

More Innovative Use Cases

Tracking and Control over Expenditures

- **Challenge:** The DOL and IRS prefer that participants do not take loans from retirement accounts unless they are really required, since these vehicles are supposed to be used to fund retirement savings. Hence, providers want tighter controls on hardship loans from retirement accounts.

- **Solution:** If loans are provided through cryptocurrency, loan usage can be easily tracked by the provider. Also, consider a 403(b) plan scenario where the participant has retirement accounts with multiple providers. If the loan transactions are in blockchain, providers have easy access to all the participant's loan transactions.
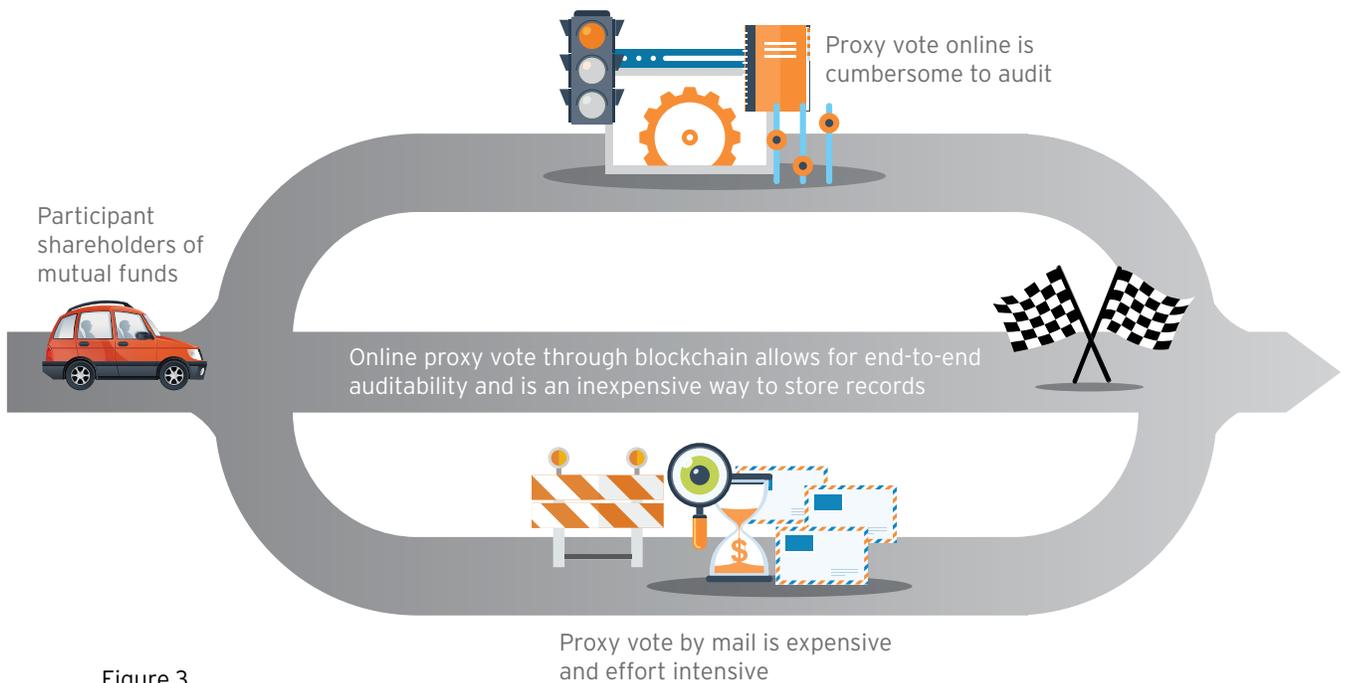
Proxy Voting Via Blockchain

Proxy vote online is cumbersome to audit

Participant shareholders of mutual funds

Online proxy vote through blockchain allows for end-to-end auditability and is an inexpensive way to store records

Proxy vote by mail is expensive and effort intensive

Figure 3

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Maintaining Best Interest Contract Exemption Records Required Under DOL's Conflict of Interest Rule

- **Challenge:** DOL's conflict-of-interest rule has expanded the definition of a fiduciary under ERISA and the Internal Revenue Code to impose fiduciary status on anyone providing retirement advice, thereby requiring advisors to give advice in the "best interest" of clients rather than merely "suitable" recommendations. Advisors and their firms must therefore enter into a best interest contract exemption (BICE) contract with customers/prospects to receive commission or revenue-sharing-based compensation for non-ERISA plans and IRAs. BICE also requires point-of-sale data and Web disclosures indicating the types of fees, percentages and type of revenue-sharing agreements. These records must be retained for DOL audits. If these records are not maintained properly, the advisor/institution might have to pay hefty penalties.

- **Solution:** Blockchain can help maintain these records securely and in a cost-effective manner, along with a transparent data lineage. All the BICE contracts between the advisors and customers/prospects can be hashed and loaded to the blockchain. Blockchains can also contain details of types of fees, percentages and type of revenue-sharing agreements. All these entries can be organized in blocks which will help to pull only the data relevant to the customer and advisor.

- **Potential benefits:**

  > Lower the compliance cost of maintaining BICE contracts required by the DOL's conflict-of-interest rule.

  > Allow secure maintenance and easy retrieval of records.

- **Potential benefits :**

  > Tighter control over participant hardship loan spending.

  > This concept/property of blockchain could be extended to create use cases for other areas such as structured settlements.

Pension Coins as Reward Mechanisms for Participants Performing Desired Behavior

- **Challenge:** Participant engagement is among the key issues sponsors and providers have struggled with. This use case describes a mechanism to drive participants to perform behavior desired by sponsors and providers by incentivizing participants through "pension coins" (such as cryptocurrencies pegged to Bitcoin), thereby also helping them save more for their retirement.

- **Solution:** Take a scenario where the provider wants to reward participants for savings gleaned from their daily lives. For example, providers want to reward participants for saving money through shared economy traveling/lodging options (such as Uber and AirbnB) as part of their travel journeys. Participants use a platform provided by their retirement services provider to perform

shared economy transactions. The retirement provider ties up with these companies, and the companies pay fees to the retirement provider for the transactions. The retirement provider leverages the fees to provide "pension coins" to participants.

Pension coins could be earned by the participant through multiple such transactions that the provider defines as "desired behavior" from the participant. These can be pegged, from an exchange rate perspective, to other cryptocurrencies such as Bitcoins.

Pension coins can be added, for instance, to the participant's Roth IRA account (maybe at a slightly higher exchange rate than if they were redeemed as cash), or just gathered in a reward account maintained by the provider. The approach allows for easy tracking and desired investing options for programmable coins.[7] These coins are pegged to a certain rate to receive returns "in kind" rather than cash. For example, the provider can devise mechanisms where the participant can accumulate 1,000 pension coins that pay towards retirement in the form of one or multiple predefined options. These include annuity payments, retirement home rent payments, health insurance premiums, services from shared economy

organizations or charities that participants can choose up front. These coins can also be shared by participants with each other for services provided within specific groups.

- **Potential benefit:**
  > Incentivize desired behaviors.

Leveraging Smart Contracts for Secure Peer-to-Peer Lending to Increase Retirement Contribution

- **Challenge:** Most young adults don't generate enough savings to invest in a retirement account. Retirement accounts such as IRAs have annual contribution limits of around $5,500. If these levels are not met, participants cannot catch up later when their earning capacity increases. Also, in such cases the participant loses the ability to take advantage of the tax exemptions through IRA account contributions.

- **Solution:** Friends and families use a retirement-provider-based blockchain platform to lend money to the young family member to contribute to his retirement account using "retirement contribution coins," which are programmed to be used only for retirement account contributions. Multiple lenders can lend to a single recipient in a year, but an overall limit is set (so that the loan cannot be more than the annual contribution limit).

  The platform can provide multiple options set by the provider for the interest rate and the loan term. The recipient of the loan contributes the "retirement contribution coins" to an IRA account. The recipient of the loan pays back the loan gain through "repay coins" which can

be redeemed for cash or can also be redeemed to buy goods/services provided in the platform. Part of the loan can be paid back through the annuities by contributing a portion of the payment towards annuities. Similar to pension coins, repay coins can be programmed to be used in multiple options.

- **Potential benefits:**
  > Increase contributions early on, and hence increase retirement savings.
  > Ability for friends/families to invest in their kin for a good cause.
  > Multiple avenues for redeeming coins.
  > Since the loan is not a "gift," this approach instills an appropriate financial ethic into the arrangement − guaranteeing payback for the lending party.

Looking Ahead

Blockchain technology has the potential to disrupt the retirement market. As history has consistently demonstrated, the convergence of mega-trends creates natural tipping points that are difficult to accurately predict.

We recommend organizations take a "test-and-learn" approach to blockchain. Conducting and participating in innovation events such as hack-a-thons is one such approach to stay closer to the technology advancements within this space. Moreover, a prototype is a great communication tool to show/tell/engage in a discussion with various business and technology leaders within the organization.

Footnotes

[1] "Deep Shift: Technology Tipping Points and Societal Impact," World Economic Forum Survey Report, September 2015. http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf

[2] "Distributed Ledger Technology: beyond block chain," UK Government Chief Scientific Advisor report, UK Government Office for Science. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

[3] "Nasdaq Linq Enables First-Ever Private Securities with Blockchain Technologies," press release, December 30, 2015. http://ir.nasdaq.com/releasedetail.cfm?ReleaseID=948326

[4] Building Gift Cards 2.0 on Blockchain Technology. https://block.gyft.com/

[5] "Still Don't Get Bitcoin? Here's an Explanation Even a Five-Year-Old Will Understand," January 2014. http://www.coindesk.com/bitcoin-explained-five-year-old/

[6] Mizuho Financial Group Partners with Cognizant to Develop a Blockchain Solution for Secure Record-Keeping and Improved Customer Experience. http://www.prnewswire.com/news-releases/mizuho-financial-group-partners-with-cognizant-to-develop-a-blockchain-solution-for-secure-record-keeping-and-improved-customer-experience-300219930.html

[7] Programmable coins are digital tokens or assets on top of blockchain similar to the Bitcoin currency but programmed for specific uses.

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