# Mock Blockchain Use Case Analysis and Proposal for RBC

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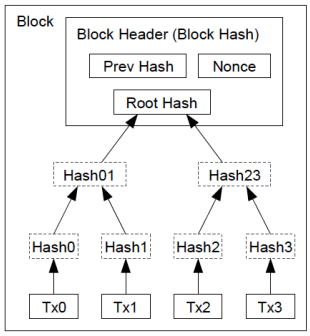
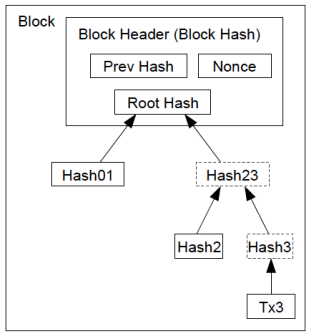
Blockchain technology has the potential to dramatically transform the way financial institutions initiate, create, update and maintain transactions and related records. This innovation has already created much turbulence in several industries with likely game changing evolutionary effects on the financial sector in the near future.

**What is Blockchain Technology?**

As per widely available definitions… "A blockchain is a distributed database that maintains a continuously growing list of ordered records called blocks. Each block contains a timestamp and a link to a previous block. By design, blockchains are inherently resistant to modification of the data. Once recorded, the data in a block cannot be altered retroactively. Blockchains are an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way. The ledger itself can also be programmed to trigger transactions automatically (called smart contracts)."




Transactions Hashed in a Merkle Tree

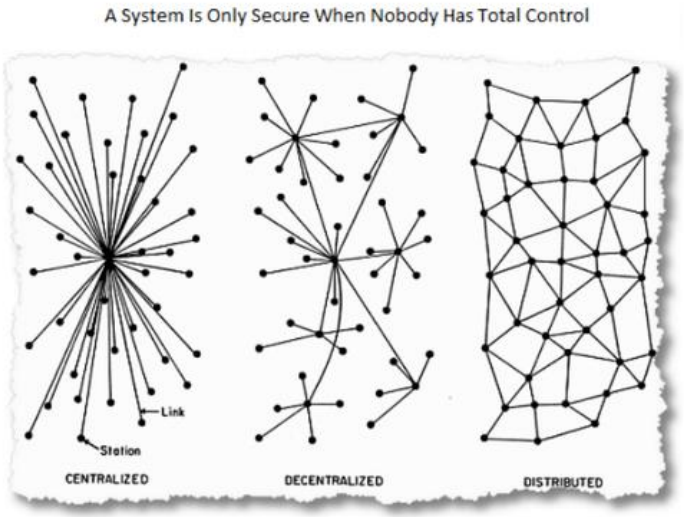



After Pruning Tx0-2 from the Block

By using cryptographic algorithms, mining by multiple network nodes/members and computing resource intensive proof-of-work system, it appears to-date, that blockchains are a secure mechanism to authenticate and record mass transactions and provide for security against alteration of data (immutability) in near real-time.

**Analytical Approach and Assessment Methodology**

The following 4 step analytical approach and assessment process was used for this proposal. Carried out SWOT analysis with focus on current threats to RBC. Identified specific areas within RBC where pre-emptive change is most needed. Aligned shortlisted blockchain initiatives and use cases with RBC strategy, business plans and Bank of Canada and regulatory direction. We then looked for opportunities to build RBC capabilities and teams with focus on optimizing execution capabilities and positioning to yield longer-term competitive success.




**RBC Use Cases**

The following shortlisted RBC use cases have been identified as having the greatest potential to yield successful lessons learned and real-world implementation outcomes, industry, fintech and regulatory collaboration opportunities, along with building RBC internal capabilities and positioning for competitive advantage.

1) **RBC Rewards Loyalty Program**. This will be a proof of concept initiative to experiment with utilizing blockchain technology to better deliver on our existing loyalty value proposition to our consumer customers. This will be a rare consumer play for RBC while most industry players are focusing on B2B applications. It has the potential to further bolster our 'your points, your money' philosophy and partner with merchants like Best Buy to offer greater flexibility so we don't lock-in customers to the reward store. With this we will be able to more effectively enforce rules around payments, improve interoperability with partners and give us enhanced control over the use of blockchain technology within our own ecosystem.

2) **Cross Border Payments**. With 16 million customers worldwide and operations in 36 countries we execute large volumes of daily cross-border payment transactions including bank-to-bank, business-to-business, and peer-to-peer remittances. Our current processes are cumbersome often involving multiple intermediaries, customer fees and lengthy reconciliation processes. After researching several blockchain technology options we are proposing to partner with Ripple. This will be a private blockchain production pilot aimed at establishing "trust in real-time" while validating scalability, reliability, security and performance factors prior to any large-scale deployment opportunity. This new approach to cross-border transactions has the potential to increase RBC internal efficiency and reduce operational costs.

3) **Bank of Canada Project Jasper**. It is the Canadian flagship distributed ledger technology experiment which is a joint initiative between Payments Canada, Bank of Canada and major Canadian banks and R3 a fintech company. Its mandate is to build and test drive a simulated blockchain based wholesale payment system with the goal to evaluate ability to meet international standards for payments infrastructure (PFMI) and impacts to Canadian and international regulatory agenda, monetary policy and financial stability. Other important proof of concept goals and lessons learned would be in consensus mechanisms, legal issues, data privacy and transparency, scalability and cybersecurity.

4) **Identity Management and Smart Contracts**. Smart contracts are simple repetitive contracts that can be automated for computer processing, which can be triggered by specified conditions. These two distinct use cases, which can be independently classified, have the potential to be incorporated as elements and production tested within the first 3 use cases scenarios discussed above.

**5) Anti-Money Laundering (AML) and Know Your Client (KYC).** These two related regulatory requirements and banking guidelines and practices have a strong potential for adoption and implementation using blockchain technology. Currently, RBC performs labour intensive multi-step processes for each customer,

periodically to satisfy AML and KYC requirements. Use of blockchain can potentially reduce operational costs through coordinated cross-institutional verification, and at the same time increase cross-institutional fraud monitoring and analytical effectiveness through availability of larger, diverse and shared datasets.

**Challenges, Risks and External Dependencies**

While there has been much hype surrounding blockchain there is also great potential. Like other financial institutions, RBC needs to embrace and experiment with the new technology or risk missing out on potential applications. If you look historically, there is always hype in most new technology and advancements. Typically, eighty percent of the investment won't yield results, but the returns and benefits from the remaining twenty percent can be huge and transformative.

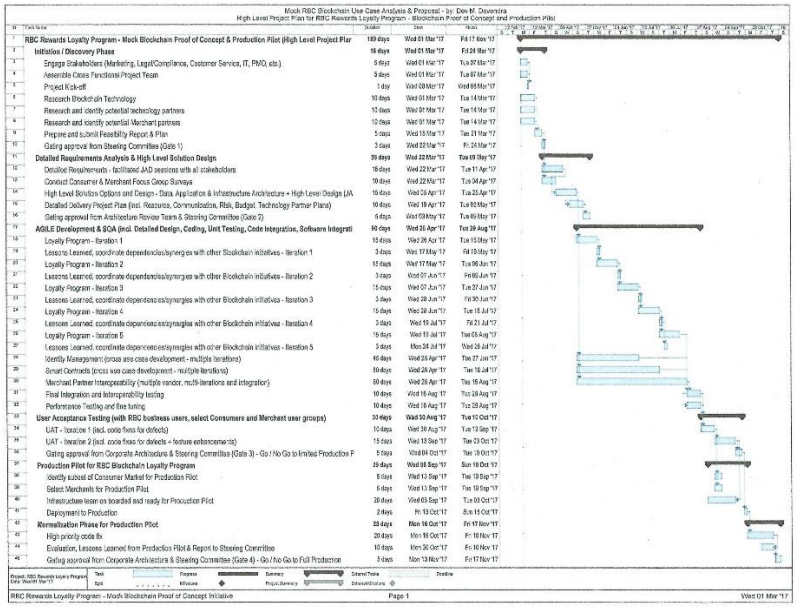
It is also not clear how to treat ledger discrepancies should they arise, although blockchain data is claimed to be verified and validated in a joint effort by participating entities prior to posting, and deemed immutable. There is also the issue of how to change a ledger entry in response to legal challenges and decisions about entries. Accenture has recently announced a patent application for an editable blockchain. However, it is not clear how a blockchain that can be amended will fit into the broader regulatory scheme and if it would further go to undermine the core principle of an immutable blockchain database.

While RBC and other financial institutions pursue and experiment with blockchain technology, there are still many regulatory and legal issue that need to be addressed along with policy framework and related legislations. A recent study and commentary by the Canadian think tank, C.D. Howe Institute offers a possible roadmap for Canada's policy makers. C.D. Howe makes three suggestions, advising policymakers to design a "principle-based regulation regime", ensure the technology achieves "end-user cost efficiencies", and determine the role for government as a facilitator or direct operator of blockchain-based platforms. RBC's participation in Project Jasper will ensure our own regulatory and compliance teams will have a voice in Canada's policy evolution.

**Benefits**

While there are many challenges, risks and unknowns, with investments in the right blockchain initiatives by RBC, there is much potential for the emergence of innovative new financial products and services, reduced transactional processing times, cost savings that can benefit both the customer and RBC, increased transparency and enhanced customer control that translate to better customer satisfaction and retention that provides a competitive advantage to RBC.

**High Level Project Plan for Rewards Loyalty Program - Proof of Concept and Production Pilot**



**Recommendations and Concluding Remarks**

RBC should simultaneously move forward with Rewards Loyalty Program, Cross Broder Payments and Project Jasper taking a well-diversified investment approach, while considering bringing on board other use cases as our capabilities, blockchain technology and regulatory frameworks mature. Similarly, RBC should consider delegating blockchain project work to internal "innovation labs" at multiple locations like Toronto, Orlando, London, while also setting up a lab in the Silicon Valley to leverage the brightest talent and fintech startups there to develop internal capabilities. RBC should also partner with select fintech firms like R3 and Ripple on blockchain initiatives, and consider setting up innovation labs in emerging markets like China and India which offer further diversification potential and cost arbitrage, along with unique market specific use case perspectives.

**References**:


[1] An in-depth guide by BlockGeeks: **What is Blockchain Technology? A Step-by-Step Guide For Beginners**, https://blockgeeks.com/guides/what-is-blockchain-technology/

[2] Tibert van der Loop, Capgemini: **Introduction to Proof of Work or Stake in the Blockchain**, https://www.capgemini.com/blog/capping-it-off/2016/04/introduction-to-proof-of-work-or-stake-in-the-blockchain

[3] Pete Rizzo, CoinDesk: **Royal Bank of Canada Expands Blockchain Testing Beyond Loyalty,** http://www.coindesk.com/royal-bank-of-canada-expands-blockchain-testing-beyond-loyalty/

[4] Matt Scuffham, Reuters:|**Royal Bank of Canada eyes new tech talent with 'innovation lab' launch in Silicon Valley**, http://business.financialpost.com/news/fp-street/royal-bank-of-canada-eyes-tech-talent-by-opening-innovation-lab-in-silicon-valley

[5] Deloitte Center for Financial Services: **Making blockchain real for customer loyalty rewards programs**, https://www.finextra.com/finextra-downloads/newsdocs/us-fsi-making-blockchain-real-for-loyalty-rewards-programs.pdf

[6] Carolyn Wilkins, CoinDesk: **Project Jasper - Lessons From Bank of Canada's First Blockchain Project**, http://www.coindesk.com/project-jasper-lessons-bank-of-canada-blockchain-project/

[7] Carolyn A. Wilkins - Senior Deputy Governor, Payments Canada, Bank of Canada: **Fintech and the Financial Ecosystem - Evolution or Revolution?** http://www.bankofcanada.ca/2016/06/fintech-financial-ecosystem-evolution-revolution/

[8] Pete Rizzo, CoinDesk: **Canadian Think Tank Proposes 3 Priorities for Blockchain Policy**, http://www.coindesk.com/canadian-think-tank-proposes-3-priorities-blockchain-policy/

[9] C.D. HOWE Institute, commentary NO. 468: **Blockchain Technology – What's in Store for Canada's Economy and Financial Markets?** https://www.cdhowe.org/sites/default/files/attachments/research_papers/mixed/Commentary_468_0.pdf

[10] Ana Badour, D.J. Lynde and Jessica Firestone, Fintech: **Partnerships between Banks and Fintech Companies: A Continuing Trend for 2017**, http://www.canadiantechlawblog.com/2017/02/22/partnerships-between-banks-and-fintech-companies-a-continuing-trend-for-2017/

[11] Amanda Reaume, MoneyWise: **How Canada's Big Five Banks Are Investing in FinTech**, https://www.ratesupermarket.ca/blog/how-canadas-big-five-banks-are-investing-in-fintech/

[12] PRESS RELEASE: **R3's distributed ledger initiative adds 13 additional bank members**, Initiative to advance state-of-the-art technology in global financial markets now comprises 22 banks, http://static1.squarespace.com/static/55f73743e4b051cfcc0b02cf/t/560a9988e4b0fd75c4407a3c/1443535240611/R3+Press+Release+-+09292015.pdf

[13] IT Examination Handbook Presentation: **Wholesale Payment Systems**, http://ithandbook.ffiec.gov/media/3093/whole_presntation.pdf

[14] Diana Ngo, CoinJournal: **Accenture - Blockchain to Reduce Banks' Infrastructure Costs by 30%**, https://coinjournal.net/accenture-blockchain-reduce-banks-infrastructure-costs/

Web 3.0

The blockchain gives internet users the ability to create value and authenticate digital information. What new business applications will result?

**Smart contracts**

Distributed ledgers enable the coding of simple contracts that will execute when specified conditions are met.

**The sharing economy**

By enabling peer-to-peer payments, the blockchain opens the door to direct interaction between parties — a truly decentralized sharing economy results.

**Crowd funding**

Blockchains take this interest to the next level, potentially creating crowd-sourced venture capital funds.

**Governance**

By making the results fully transparent and publically accessible, distributed database technology could bring full transparency to elections or any other kind of poll taking.

**Supply chain auditing**

Distributed ledgers provide an easy way to certify that the backstories of the things we buy are genuine. Transparency comes with blockchain-based timestamping of a date and location — on ethical diamonds, for instance — that corresponds to a product number.

**File storage**

Decentralizing file storage on the internet brings clear benefits. Distributing data throughout the network protects files from getting hacked or lost.

**Prediction markets**

Prediction markets that pay out according to event outcomes are already active. Blockchains are a "wisdom of the crowd" technology that will no doubt find other applications in the years to come.

**Protection of intellectual property**

Smart contracts can protect copyright and automate the sale of creative works online, eliminating the risk of file copying and redistribution.

**Internet of Things (IoT)**

Smart contracts make the automation of remote systems management possible. A combination of software, sensors, and the network facilitates an exchange of data between objects and mechanisms.

**NeighbourhoodMicrogrids**

Blockchain technology enables the buying and selling of the renewable energy generated by neighbourhoodmicrogrids.

**Identity management**

Distributed ledgers offer enhanced methods for proving who you are, along with the possibility to digitize personal documents. Having a secure identity will also be important for online interactions — for instance, in the sharing economy.

**AML and KYC**

Anti-money laundering (AML) and know your customer (KYC) practices have a strong potential for being adapted to the blockchain. Currently, financial institutions must perform a labour intensive multi-step process for each new customer. KYC costs could be reduced through cross-institution client verification, and at the same time increase monitoring and analysis effectiveness.

**Data management**

In the future, users will have the ability to manage and sell the data their online activity generates. Because it can be easily distributed in small fractional amounts, Bitcoin — or something like it.

**Land title registration**

AsPublicly-accessible ledgers, blockchains can make all kinds of record-keeping more efficient. Property titles are a case in point. They tend to be susceptible to fraud, as well as costly and labour intensive to administer.

**Stock trading**

When executed peer-to-peer, trade confirmations become almost instantaneous. This means intermediaries — such as the clearing house, auditors and custodians — get removed from the process.

Blockgeeks