

## **Blockchain and Business Process Improvement**

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We're in the year of blockchain. Blockchain technology has gained widespread traction and is attracting investments like no other emerging technology [1]. A growing number of use cases are being discussed and tested across a range of industries, including finance, insurance, healthcare, logistics and supply chain management. Gartner recently placed blockchain technology just shy of the "peak of inflated expectations" in their hype cycle for emerging technologies for 2016 [2] with another 5 to 10 years before we see mainstream adoption. But beyond the hype, should BPM practitioners care about it?

Blockchain is perhaps best known as the technology underpinning *bitcoin*, but its potential applications go well beyond enabling digital currencies. Blockchain enables a potentially evolving and open set of parties to maintain a safe, permanent, and tamper-proof digital ledger of transactions, without a central authority. The key to the technology is that transactions are not recorded centrally. Instead, each party maintains a copy of the ledger. A majority of parties need to approve (verify) a new transaction before it can be recorded in the ledger – according to a notion of majority that varies depending on the specific technology. Once a transaction is approved, it is practically impossible to change it or remove it. Hence, blockchain technology can be seen as a replicated append-only transactional data store, and hence it can be used as a substitute for centralized registers maintained by single trusted authorities.

However, we know from history that a mere technology substitution renders relatively limited value. In the 1980s and 1990s, the coming of age of client-server architectures and the Internet made it possible to automate a wide range of processes. Businesses learned however (sometimes the hard way), that process automation *per se* rarely or never produced significant value. Instead, the value of process automation came from the fact that it enabled fundamentally new business process improvement opportunities – such as once-only data capture (using shared data stores), automated business rules validation, and online self-service. Likewise, the business potential for blockchain technology lies not so much in its technology substitution ability, but rather in its ability to enable new business process improvement opportunities.

Therefore, a valid question to ask, in the midst of the hype, is *what business process improvement opportunities does blockchain technology enable?* To answer this question, we use the "value-driven BPM" framework (VBPM) [3]. The VBPM framework (see **Figure 1**) classifies the value that BPM can bring to an organization into seven categories. At the heart of this framework is "transparency" value, which refers to the ability for BPM to help stakeholders in an organization to better understand and monitor their business processes. Once transparency is in place, BPM can deliver value along three axes, each one corresponding to a pair of *values*. The first axis is the efficiency-quality pair that reflects a commonly known dichotomy between fulfilling the needs of the customer effectively (quality) and streamlining the

processes to fulfil these needs efficiently (e.g. at minimum cost). The second axis is the agility-compliance pair and captures the dichotomy between being able to rapidly adapt to a changing business environment (flexibility) vs. safeguarding the processes to ensure that they comply with relevant regulations and standards. The final axis (integration-networking pair) captures the dual imperative for organizations to maintain their internal systems integrated in order to prevent siloes, and to expose these systems to external business partners in order to exploit collaborative business opportunities.

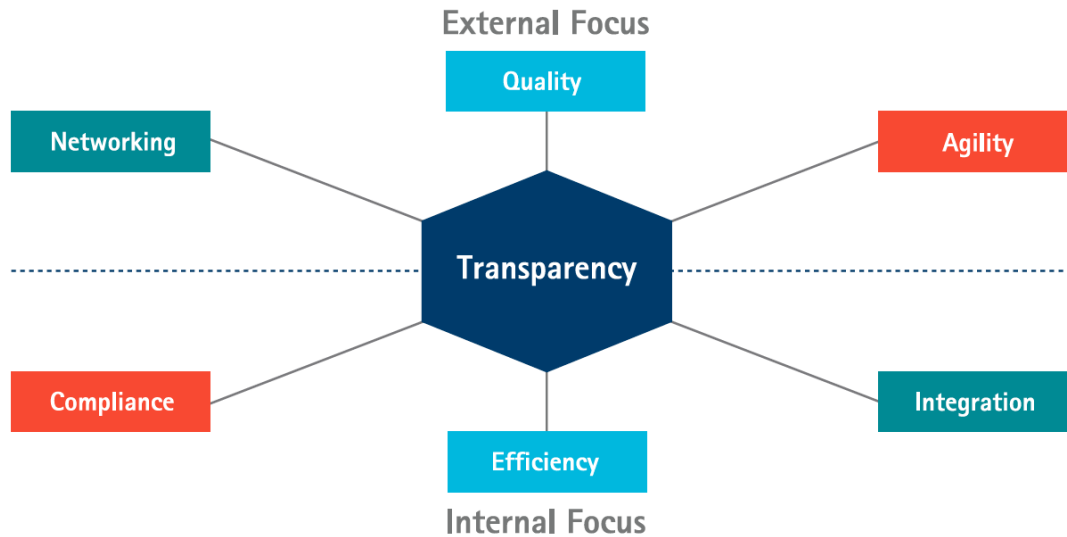


Figure 1: Value Driven BPM [3]

### Efficiency vs. quality

Many use cases proposed for blockchain focus on increasing efficiency by reducing time and costs. The banking industry has invested heavily in blockchain-based start-ups that work with creating new structures for settlement of financial products. R3 has, in collaboration with over 40 banks, introduced the Corda platform [4] that could re-design the current settlement processes by enabling financial agreements to be recorded once and thereby eliminating duplication of data to save time and costs as reconciliation processes become redundant. Settlement of financial instruments can also, for instance in the case of equity, be reduced from the current 3 days (T+3) to intraday (T+1) settlement. In a similar vein, the Australian Stock Exchange (ASX) is actively seeking to replace its long-standing CHES settlement system with a blockchain-based distributed ledger in order to reduce costs and possibly also settlement times [5].

Furthermore, blockchain can improve the quality of the outcome of business processes as well. In the case of supply chains, blockchain based tracking of goods and materials can allow detailed tracking and prevent counterfeit products entering the chain and prevent substitution of higher quality with lower grade materials [6]. Another example comes from the insurance industry, where the quality of the claim handling process can be improved with the use of blockchain technology, since it would provide means to prevent the use erroneous or out-dated data within the process.

## Agility vs. compliance

Agility or flexibility of a business process refers to the speed and ease by which a business process can respond to different changes. The blockchain technology enables “smart contracts” that automatically execute certain activities as defined in its conditions. Such constructs can improve the agility of a process by transferring run-time executions to smart contracts and thereby define the process per contract rather than for the whole system. For instance, the UK government is looking into putting their welfare payment process on blockchain technology [7], with the aim of achieving more secure, auditable, and customized pay-outs.

At the same time, blockchain technology can simplify compliance by allowing sharing of confidential data in a secure manner. Financial firms, who often are subjected to new compliance regulations, could share their data on the blockchain and grant access to financial regulatory agencies. This would, in essence, remove the need of reporting by pushing the work of gathering data to the regulatory agencies. The same principal solution could be applied to the accounting data of firms and their auditors.

## Integration versus Networking

Blockchain can also be used to enable better integration of processes within a company. Blockchain has been proposed [8] for connecting software. This would enable an internal network where the information systems are internally connected to share data. While this usage is not promoted much, the networking aspect of blockchain is more popular.

One of the most promoted use cases for blockchain is its use as a registry of products (physical and digital). As such, the idea is to register, keep records and manage the transfer the ownership of any product on distributed ledgers. The benefits most often mentioned are transparency of records, security, tamper-proof, and circumventing third party central ledgers. However, such a solution enables collaborative processes. In Sweden, an experiment is on-going [9] to register and record land titles on a blockchain solution. This would enable multi-party collaboration where banks, government agencies, buyers, and sellers can interact and track the progress of the process in real-time. A similar blockchain-based land registry initiative has been announced in Georgia [10] while Estonia is experimenting with the use of blockchain to secure healthcare records and enable new forms of cooperation between healthcare actors [11].

In summary, it seems that blockchain technology has the potential to significantly change a wide spectrum of business processes. As this technology is gaining traction and making its presence known in business processes, it will perhaps be role of process experts to ensure that the value created comes from exploring the opportunities this technology can enable in business processes rather than just replacing existing technologies with a new one. We have show via multiple examples that the potential applications of blockchain technology for business process improvement are many, and span all seven values of the VBPM framework.

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## References

1. <http://www.coindesk.com/state-of-blockchain-q1-2016/> (accessed 12<sup>th</sup> of September 2016)
2. <http://www.gartner.com/newsroom/id/3412017> (accessed 9th of September 2016)
3. Franz, Peter, and Mathias Kirchmer. Value-driven business process management: The value-switch for lasting competitive advantage. McGraw Hill Professional, 2012.
4. Brown, Richard Gendal, et al. "Corda: An Introduction." (2016).
5. <http://www.smh.com.au/business/banking-and-finance/asx-builds-blockchain-for-australian-equities-20160121-gmbic0.html>
6. Crosby, Michael, et al. "BlockChain Technology: Beyond Bitcoin." Applied Innovation (2016):
7. <http://www.coindesk.com/uk-government-trials-blockchain-welfare-payments-system/> (accessed 12<sup>th</sup> of September 2016)
8. Xu, Xiwei, et al. "The blockchain as a software connector." Proceedings of the 13th Working IEEE/IFIP Conference on Software Architecture (WICSA). 2016.
9. <http://www.coindesk.com/sweden-blockchain-smart-contracts-land-registry/> (accessed 12<sup>th</sup> of September 2016)
10. <http://www.coindesk.com/bitfury-working-with-georgian-government-on-blockchain-land-registry/> (accessed 14<sup>th</sup> of September)
11. <http://www.coindesk.com/blockchain-startup-aims-to-secure-1-million-estonian-health-records/> (accessed 14<sup>th</sup> of September)

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