Contents lists available at ScienceDirect

International Journal of Information Management

Case Report

Digital enablement of blockchain: Evidence from HNA group

Wenchi Ying, Suling Jia, Wenyu Du*

School of Economics and Management, Beihang University, China

ARTICLE INFO

ABSTRACT

Blockchain, the distributed ledger underlying bitcoin, has attracted much attention and stimulated rich discussions. However, extant discussions are mostly conceptual expositions, and empirical evidence of how to use the technology is limited. This case analysis fills this gap by conducting a study on Hainan Airlines (HNA) group, a large conglomerate, which has successfully implemented a blockchain-enabled E-commerce platform to offer employees flexible benefits. The case study unveils that blockchain of value in three ways: 1) issuing crypto-currency, 2) protecting sensitive information, and 3) eliminating institutional intermediaries. These findings provide a reference point for IT and general managers who intend to use blockchain to digitally enable their organizations further.

1. Introduction

Blockchain is an emerging digital technology that has the potential to disrupt many industries and organizations, and is forcing these industries and organizations to rethink their strategies and capabilities (Schatsky & Muraskin, 2015). Blockchain originates from bitcoin, a cryptocurrency and a peer-to-peer payment system. Blockchain is the distributed ledger used to record bitcoin transactions. Although blockchain and bitcoin are often used interchangeably, bitcoin is in fact just one of many applications of blockchain. Recently, blockchain has attracted attention in its own right, because people have begun to realize that the potential of blockchain goes beyond bitcoin, and the most significant implications of blockchain are those within the walls of organizations (Schneider et al., 2016).

These implications are afforded by key characteristics of blockchain, such as security, reliability, transparency, and immutability. All these characteristics are underpinned by the technical structure of blockchain (Fig. 1).

A block contains information regarding a transaction. Much of this information is stored in the transaction details section. A block also contains a hash number, which is generated based on the transaction information. Should there be any change to this transaction information, the hash number will be significantly different. Therefore, where data in one block are tampered with, modifications can be easily spotted. A block contains not only its own hash number but also the hash number of the previous block. Because of this link, blocks connect with each other and form a chain.

Blockchain is a distributed database whose duplicates are deployed at multiple computers in the blockchain network, known as nodes. There is no central authority in the network, and the network is maintained by the participating nodes. For example, updating information in the database requires the consensus of the participants. This distributed means of storing and managing information is more secure, because it is not subject to a single point of failure. This distributed approach is also more trustworthy because any change to the ledgers will be known to the public.

Given the revolutionary nature of blockchain, it has attracted much attention and stimulated many discussions. However, existing discussions are mostly theoretical expositions and empirical evidence of how to use the technology is limited (Schneider et al., 2016). An important reason is that although many organizations are aware of the potential of blockchain, few have concrete initiatives to implement this technology (Businesswire, 2016).

Our study adopts a case study approach (Pan and Tan, 2011), we conducted a case analysis of Hainan Airlines (HNA) group, which has successfully implemented a blockchain-enabled E-commerce platform that offers flexible benefits to employees. This study reveals that blockchain enables organizations in three ways: 1) to issue cryptocurrency, 2) to protect sensitive information, and 3) to eliminate institutional intermediaries.

2. Case background

HNA Group was founded in 1993 as a local airline operator in Hainan province, China. In the past two decades, the company has transformed from an airline operator to a multi-national conglomerate

---

* Corresponding author.
 E-mail addresses: yingwenchi@buaa.edu.cn (W. Ying), jiasuling@buaa.edu.cn (S. Jia), duwenyu@buaa.edu.cn (W. Du).
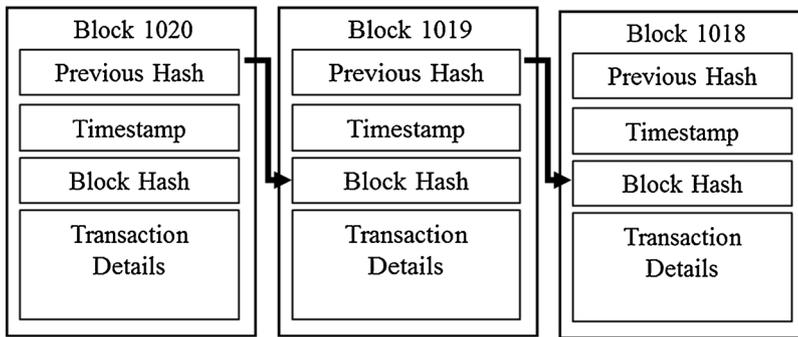
that covers airlines, airports, tourism, hotels, logistics, real estate, and finance. In 2016, the HNA group reaped revenues of over USD 29 billion, placing it 353rd among the 2016 *Fortune 500* Companies.

HNA has over 400 subsidiaries and 180,000 employees. Designing and implementing employee benefit plans that are favored by employees are important tasks for the Human Resource (HR) department. Previously, subsidiaries ran their own employee benefit plans. However, due to the limited scale, these plans often suffered from limited options. For example, some subsidiaries provided employees with gift cards at shopping malls, while others provided employees with certain goods. In both cases, employees did not have many options, and therefore, their experiences were not satisfactory.

Some subsidiaries chose to give employees cash so that employees could have more options. However, when employee benefits were cashed out, 20% would be deducted for tax and this affected the employee experiences as well.

To address this problem, HNA first consolidated employee benefit plans at the headquarters level, and then requested that the headquarters HR launch flexible benefit plans. Flexible benefit plans are a common HR practice among multi-national corporations. A feature of such plans is that employees have more benefit options and do not have to choose from a limited pool of options (Barringer and Milkovich 1997).

To enrich benefit options, the HR department solicited help from the procurement department, which is responsible for managing HNA's 15,000 suppliers. Each supplier offers a set of products that can be sold to HNA employees as an employee benefit. The price will also be competitive, because suppliers can give HNA employees a bulk purchase discount.

At that time, the procurement department was also planning to experiment with blockchain. Managers of the procurement department saw this invitation from the HR department as an opportunity to conduct such an experiment. With the help of blockchain, the procurement department built an internal E-commerce platform, where employees could use their benefit points to purchase a wide range of goods offered by suppliers.

3. Implementation of blockchain-enabled E-commerce platform

With the help of an E-commerce platform, employees had more options to claim their benefits, and suppliers also had an additional channel to sell their products. The implementation of such a win–win arrangement extended across three phases. In the first phase, the procurement department issued digital coins which participants could use to carry out transactions. In the second phase, the procurement department invited suppliers to join the platform. In the third phase, the procurement department integrated the platform with 3rd party E-commence platforms, such as JD.com, to bring in more products from these 3rd parties. Next, we will discuss each of the three phases in further detail, and the roles that blockchain played in these phases.

3.1. Issuing digital coins on the E-commerce platform

To facilitate transactions on the E-commerce platform, the procurement department assigned each participant (i.e. employees and suppliers) a digital wallet. A wallet is an address on the blockchain which can be used to identify the participant and track transactions related to the participant.

When distributing benefits, the HR department deposited digital coins in the employees' digital wallets. These coins were known as benefit coins. Employees could use these coins to purchase goods on the E-commerce platform. After each transaction, the coins were transferred from the employee's wallet to the supplier's wallet. When a supplier withdrew money, coins would be deducted from its wallet and equal amount of money would be sent to its bank account. Currently, one benefit coin equals one RMB.

As compared to the traditional approach of distributing employee benefits, such as gift cards, employees had more options. Moreover, because employees used digital coins instead of cash to make purchases, they did not need to pay tax. Therefore, employee experiences were significantly enhanced.

A primary challenge in issuing digital coins was to build trust around the coins. As Mr. Qin, general manager of the procurement department, noted:

> "How to convince suppliers that our coins are trustworthy is a key challenge. Even for central banks, people may not entirely trust them, because there are risks of excess money being issued or records being tampered with. A. Blockchain provides an alternative approach that can reduce such risks and create trust."

On the blockchain-enabled E-commerce platform, all the transactions were recorded by the blockchain network. The transactions were stored in various nodes, and any update of the transactions required the consensus of all the nodes. In doing so, all the transaction records related to the digital coins became publicly visible and could not be modified by any central authority with ill intentions. Meanwhile, because records were stored in various nodes instead of a single location, the risk of records being tampered with was also reduced.

To ensure that all digital coins on the platform could be redeemed and no excess coins were issued, the HR department, when depositing money to employees' wallets, first deposited an equal amount of RMB in a capital pool. This capital pool was managed by a 3rd party company, designated by the government.

3.2. Inviting suppliers to the E-commerce platform

To enrich the product options on the E-commerce platform, the procurement department invited all the suppliers to join. Many suppliers were interested in joining because this increased their customer base.

To participate in an E-commerce platform and transact with a seller, a customer needs to register his/her information on the platform so that the seller can verify his/her identity. However, subsidiaries were

concerned about releasing their employees' information on the E-commerce platform and to suppliers. As Mr. Wang, the project manager of the E-commerce platform, explained,

"We were looking for a technical solution which protected the sensitive information of the customers from being disclosed while ensuring that suppliers could still verify the authenticity of the customers. Blockchain is the technology."

On the blockchain, every employee was given a pair of keys which consisted of a public key and a private key. The public key was the employee's wallet ID. This ID was known to all participants in the network. When a customer sent a purchase request to a supplier, s/he first encrypted the request using his/her private key.

After receiving the request, suppliers decoded the request using the customer's public key. If the decoding was successful, this meant that the request was genuine, and the customer was who s/he claimed to be. By leveraging this pair of encryption keys, customers could identify themselves on the network without relinquishing any sensitive information about themselves. As Mr. Liu, the technical manager of the procurement department, stated:

"By using this pair of public and private encryption keys, suppliers don't know who is behind each transaction, but they can verify the authentication of the customers."

This internal E-commerce platform went online in February 2015 with 2000 suppliers participating. The initial launch was very successful. In the 7-day spring festival break alone, the platform generated a sales revenue of 130,000 RMB.

3.3. Integrating the E-commerce platform with 3rd party platforms

To further enrich product options on the E-commerce platform, the procurement department intended to partner with 3rd party E-commerce companies, such as JD.com. JD.com is one of the largest B2C online retailers in China by transaction volume and revenue, second only to Alibaba-run Tmall. There are thousands of merchandises being sold on JD.com.

By integrating the internal E-commerce platform with JD.com via standard interfaces, the procurement department brought in merchandises from JD.com. This integration significantly expanded the benefit options and increased the customer experience, making it a truly flexible benefit plan.

JD.com also had the incentive to partner with HNA. First, HNA had a large workforce and purchasing power. Second, customers who purchased using benefit points were less price-sensitive and more profitable than those who purchased using cash.

After logging into the E-commerce platform, employees saw a designated link called JD gate. This link brough employees to a portal developed by JD.com. Shopping experience within that portal was very like that in JD.com, except that customers logged in using their HNA ID, and during payment, customers paid using benefit coins in their digital wallet, instead of money transfer via a 3rd party intermediary.

In a regular E-commerce setting, a transaction between a seller and a customer requires a trusted intermediary. As Mr. Qin, the general manager of the procurement department, described:

"A trusted intermediary, such as AliPay, is necessary for the transaction to be successful, because without the intermediary, the two parties cannot trust each other. But, having a 3rd party in the middle creates additional transaction cost. Moreover, when the 3rd party's central database is tampered, the result is disastrous."

Blockchain provided an alternative solution that eliminated the need for an intermediary, and enabled sellers on JD.com to directly interact with HNA employees. Like HNA's own suppliers, the procurement department assigned digital wallet to sellers on JD.cm.

The reason HNA employees (buyers) and JD sellers trusted each other is that HNA deployed the duplicates of the ledgers across servers (nodes) at JD and HNA, and all the transaction records were available to all the nodes. All the transactions between customers and JD sellers would be tracked and validated by all the participating nodes on the network. Therefore, the transactions and the payment could not be denied. To ensure sellers on JD that all the benefit coins they collected from HNA employees could be claimed, HNA first predicted the money that its employees were about to spend in JD in each month, and then deposited the money at the beginning of the month at JD.

In January 2016, 50,000 items were brought to the E-commerce platform from JD.com. This has successful expanded employees' benefit options and significantly enhanced their experience.

4. Lessons learned

Despite much being written about the implications of blockchain, discussions have remained at the conceptual level and empirical evidence of how to use the technology is limited. While most companies are still waiting for others to test the technology, HNA, as a pioneer, has provided us with an empirical case of blockchain implementation. The company has successfully deployed blockchain to build an internal E-commerce platform, which provides flexible benefits to employees. By analyzing this case, we discover that blockchain enables organizations in three ways.

First, blockchain enables organizations to create their own cryptocurrency. Cryptocurrency is a digital asset designed to work as a medium of exchange using cryptography to secure the transactions. HNA's benefit coins are a good example. Blockchain secures transactions by using distributed ledgers, whereby transactions are recorded and verified by multiple nodes in the network, rather than a central authority. Records are thus not subject to modifications or denial. As the case of HNA has shown, cryptocurrency can significantly improve operational efficiency. The case has also shown that because cryptocurrency is so novel for people to accept, an organization still needs to deposit an equal amount of off-line assets, such as cash deposits.

Second, blockchain enables organizations to protect sensitive information, because participants in blockchain can trust and interact with each other without giving away their sensitive information. In regular E-commerce settings, for example, customers need to register their key information with the website, which the website uses to verify the authentication of the customers. However, sharing data with a central agent is a major concern for many organizations when they participate in a platform. However, to cooperate with others, data sharing is often imperative. Blockchain provides an alternative approach that reconciles this conflict. This is reflected in HNA's cooperation with suppliers on the E-commerce platform. By assigning users a pair of authentication keys, blockchain enables HNA employees to identify themselves to suppliers without disclosing any sensitive information.

Finally, blockchain enables organizations to eliminate institutional intermediaries, in that it replaces institution-based trust with the democratization-based trust. Previously, transaction parties need a trusted intermediary to provide an institutional environment for transactions to occur. Without intermediaries, the two transactional parties may not trust each other. However, intermediaries bring about centralized risk, low efficiency and high cost. In the context of blockchain, trust is not established by a central authority but rather, a crowd of nodes on the blockchain network. This approach is more reliable because it is not subject to a single point of failure.

5. Conclusion

Despite the significant implications of blockchain in the contemporary business environment and the rich discussions on these implications, how this technology enables organizations in practice remains unknown. Our study, based on the empirical evidence of HNA,

suggests three ways that blockchain enables an organization. Today, blockchain has become an emerging digital platform that enables organizational transformation, and some industry analysts have put it on par with the enterprise resource planning (ERP) software in the 90 s (Schatsky & Muraskin, 2015). Our findings are relevant to IT and general managers who intend to use blockchain to enable their organizations.

Acknowledgement

References

Barringer, M. W., & Milkovich, G. T. (1997). A theoretical exploration of the adoption and design of flexible benefit plans: a case of human resource innovation. *Academy of Management Review, 23*(2), 305–324.

Businesswire (2016). *Despite positive outlook, new research from State Street reveals asset owners, managers lack readiness for blockchain.* [Retrieved on 8 Sep 2016 from http://newsroom.statestreet.com/press-release/corporate/despite-positive-outlook-new-research-state-street-reveals-asset-owners-mana].

Pan, S. L., & Tan, B. (2011). Demystifying case research: a structured–pragmatic–situational (SPS) approach to conducting case studies. *Information and Organization, 21*(3), 161–176.

Schatsky, D., & Muraskin, C. (2015). *Beyond bitcoin: blockchain is coming to disrupt your industry.* Deloitee [Retrieved on 8 Sep 2016 from https://dupress.deloitte.com/dup-us-en/focus/signals-for-strategists/trends-blockchain-bitcoin-security-transparency.html].

Schneider, J., Blostein, A., Lee, B., Kent, S., Groer, I., & Beardsley, E. (2016). *Blockchain: putting theory into practice.* Goldman Sachs [Retrieved on 8 Sep 2016 from http://www.businessinsider.com/goldman-blockchain-beyond-the-hype-practical-uses-2016-5/#sharing-economy-building-trust-on-platforms-like-airbnb-1].

Wenchi Ying is a Ph.D. candidate at the School of Economics and Management, Beihang University, China. His research interests include emerging information technology management, IT-project management and other IT-related managerial issues.

Suling Jia is a professor at the School of Economics and Management, Beihang University, China. Her research interests include supply chain management, management information system, complex system simulation, business intelligence and DSS. She is also a standing director in Information System Branch of China Computer Users Association.

Wenyu (Derek), Du is an assistant professor at the School of Economics and Management, Beihang University, China. His research interests include digitally enabled business transformation and innovation. His research has appeared in *IEEE Transactions on Engineering Management* and *MIS Quarterly Executive*.