Using Blockchain Technology To Improve Trust In eCommerce Reviews

by Rajesh Ramachandiran
(Advised by Yogesh Joshi, University of Maryland - Robert H. Smith School of Business, Independent Study - Spring 2018)

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Abstract

Consumer ratings play a critical role in making purchase decisions and even affect the trend of future reviews. But there is always a concern on the credibility of these online ratings. Business could provide incentives to the rater or reviewer to provide fraudulent or biased reviews hoping to increase sales and popularity. Blockchain technology is a decentralized electronic platform where records are maintained in an immutable fashion. Business processes are automated on blockchain between different parties where the trust is placed on the technology rather than the benevolence of a party. Current practices and value in influencing reviews are discussed in this study followed by method and benefits of using blockchain technology to dissolve trust issues in the reputation economy.

Introduction

As long as there is a choice for customers, all marketplaces will work on reputation to a large extent. Global eCommerce will be a 4 trillion-dollar industry by 2020. Within that figure, around 60% of consumers read reviews before deciding to buy (Web - emarketer.com | Chen, Y., and Xie, J. 2005). Hence, a case can be made for reviews and ratings to play a pivotal role in directing the flow of over 2 trillion dollars in eCommerce transactions.

All popular online marketplaces like Google, eBay, Airbnb and Amazon include a reputation system that facilitates trust in the vendors and their products. However, the mechanisms for the reputation such as reviews and ratings are locked to the marketplace's own platform, preventing the users/vendors from using the reputation elsewhere. Additionally, the marketplace selects which review is posted to top/front and thereby influences the sales of individual products. The validity of reviews and filtering process is ambiguous and customers cannot distinguish between fake or paid reviews. These shortcomings confuse the customer, harm healthy competition and prevent manufacturers or vendors from making informed product/service improvements.

The need for a universal, transparent, "trust-less" reputation management system is clear. TrustCloud, Confido, Reputate are some of the attempts at managing the reputation economy.

Blockchain at its core is a digital ledger in which transactions made in bitcoin or another cryptocurrency are recorded chronologically in a decentralized manner and are publicly accessible. Blockchains, however, are capable of much more sophisticated tasks. They can be used for recording smart contracts that execute automatically based on certain conditions or events, can interact with external data services for processing records and can selectively reveal data to certain parties by using public-key encryption. This technology could help prevent manipulation of records and is relevant to the problem at hand.

Literature Review

Initial Trust

Trust reflects the willingness of a party to be vulnerable to the actions of another party based on positive expectations regarding the other party's motivation (Hong and Cha, 2013; Malhotra and Lumineau, 2011). The initial trust between unfamiliar parties is established through assumptions or heuristic inferences about the trustee from whatever information is available (McKnight et al., 1998).

In B-to-C e-commerce, a consumer and an online vendor would only be fully familiar after the consumer transacts with the vendor and analyses the outcome (e.g. whether the transaction was as valuable as marketed). When a consumer visits an internet business for the first time and there is no prior experience to fall back on (Li et al., 2014; McKnight et al., 2004). Therefore, it is important for new businesses to create adequate initial trust and convince consumers to use the site for the first time. If the consumer does not form positive belief and intention towards a brand during this initial period, the consumer will probably not be willing to experiment transactions with the brand anymore (Chang et al., 2013; Kim et al., 2008).

Takeaway: Initial trust affects the number of customers who will onboard over the lifetime of the product/service

Effect of customer review

Compared to vendor-specific guarantees, which are self-proclaimed assurances, customer reviews are essentially market-driven reputation systems where customers voice their opinion through quantitative ratings or qualitative feedback about their experience with the product or service (Jeacle and Carter 2011; Pavlou and Gefen, 2004). First-time consumers view these reviews of vendors as credible and honest depictions of not only the capability but also the reliability and integrity of the product/ service (Lim et al., 2006, Utz et al., 2012; Pavlou and Dimoka, 2006).

Takeaway: Customer reviews affect initial trust

Impact of Prior Reviews

Current studies look at the effect of prior reviews on the opinion-formation and opinion-expression phase of subsequent reviews. The formation phase focuses on the diagnostic detail of prior reviews that affects subsequent reviewer's understanding and evaluation of the reviewed product (Godes and Silva, 2012; Li and Hitt, 2008).

The other phase focuses on the effect of prior reviews on the opinion-expression of subsequent reviews from the perspective of social influence, which refers to the modification of an individual's response (attitude and/or behavior) in reaction to those of others (Kuan et al., 2014; Leenders, 2002). Many studies show that subsequent reviewers adjust their personal product evaluations according to prior reviews (Moe and Schweidel, 2012; Schlosser, 2005).

Takeaway: Prior reviews affect quality and attitude of future reviews

Blockchain Technology

A blockchain consists of a distributed database, a decentralized consensus mechanism, and cryptographic algorithms. Transactional data is stored in an infinite sequence of cryptographically interconnected data blocks. These blocks are ordered by a decentralized time stamping algorithm (Gipp et al., 2015), which allows users to vote on the validity of database updates and eventually agree on the correct order of transactions and a shared system state at any given point in time. As a result, the users of a blockchain system can interact without the need for a central authority that resolves conflicting views of the correct order and content of transactions.

Besides decentralization, the advantages of blockchain-based systems include the absence of a central point of failure and the provision of a complete, transparent, and intrinsically valid historical transaction log. These characteristics facilitate cost-efficient micro-transactions (Beck et al., 2016), reduce the complexity of writing contracts (Davidson et al., 2016), and enable information sharing in lemon markets (Notheisen et al., 2017a). Within this scope, blockchains allow the resolution of conflicts by publicly providing an unforgeable record of past transactions.

Smart contracts provide a tool to build on this basic structure and allow the implementation of program logic and decentralized applications that go beyond the transfer of simple monetary values. Eventually, blockchain technology provides a distributed software architecture that enables conflicting agents to engage in cryptographically secured transactions and to interact without the need for a centralized platform or governing authority (Xu et al., 2016).

Takeaway: Blockchains can be operated to run applications in a decentralized manner without a governing authority

Blockchain-based systems and trust

The conceptualization of trust in the blockchain context has received less attention in the field of Information Systems (Hawlitschek, F., 2018 | see Table 1). More specifically, many interdisciplinary studies focus on the impact of cryptocurrencies on traditional economic or commercial structures. Discussed topics include the adoption of cryptocurrencies in the corporate world (Connolly and Kick, 2015; Ingram et al., 2016;

Ingram and Morisse, 2016), Bitcoin-based business models (Kazan et al., 2015), or the usage of Bitcoin as a financial instrument (Baek and Elbeck, 2014; Fuerstenau and Kliewer, 2014; Glaser et al., 2014; Mai et al., 2015). Existing work addressing trust-related issues is mainly centered around the ability of blockchain-based systems to enforce rules and contractual agreements without an arbitrating authority.

Takeaway: Not much work has been done to specifically develop and study the use of blockchain in reputation management

Table 1

Concept matrix of trust-related Information Systems research in the blockchain context.

	Layer					Methodology								Details				
Publication	Behavioral Layer	Agent Layer	Application Layer	Infrastructure Layer	Environment Layer	Framework / Model	Case Study	Survey	Interview	Literature Review	Experiment	Simulation / Empirical	Proof-of-Concept	Journal	Conference	Research in progress	Top IS Outlet	# Participants / Observations
Al Khalil et al. (2017)		×	×			×									×			
Alexopoulos et al. (2017)			×			×									×			
Ahangama and Poo (2016)		×	×			×		×							×			136
Beck et al. (2016)			×										×		×		×	
Bogner et al. (2016)			×										×		×			
Chan et al. (2017)		×				×									×			
Fröwis and Böhme (2017)			×				×					×			×			194,332
Greiner and Wang (2015)		×				×									×	×	×	
Litos and Zindros (2017)		×				×									×			
Lustig and Nardi (2015)		×						×	×						×		×	400/22
Maurer et al. (2013)		×				×								×				
Notheisen et al. (2017a)		×	×				×						×	×				
Roman and Stefano, 2016			×	×		×									×			
Sas and Khairuddin (2015)		×	×			×				×					×			
Sas and Khairuddin (2017)	×	×	×						×						×			20
Zarifis et al. (2015)		×	×					×							×			562
Xu et al. (2017)			×	×									×		×			

Proposed solution

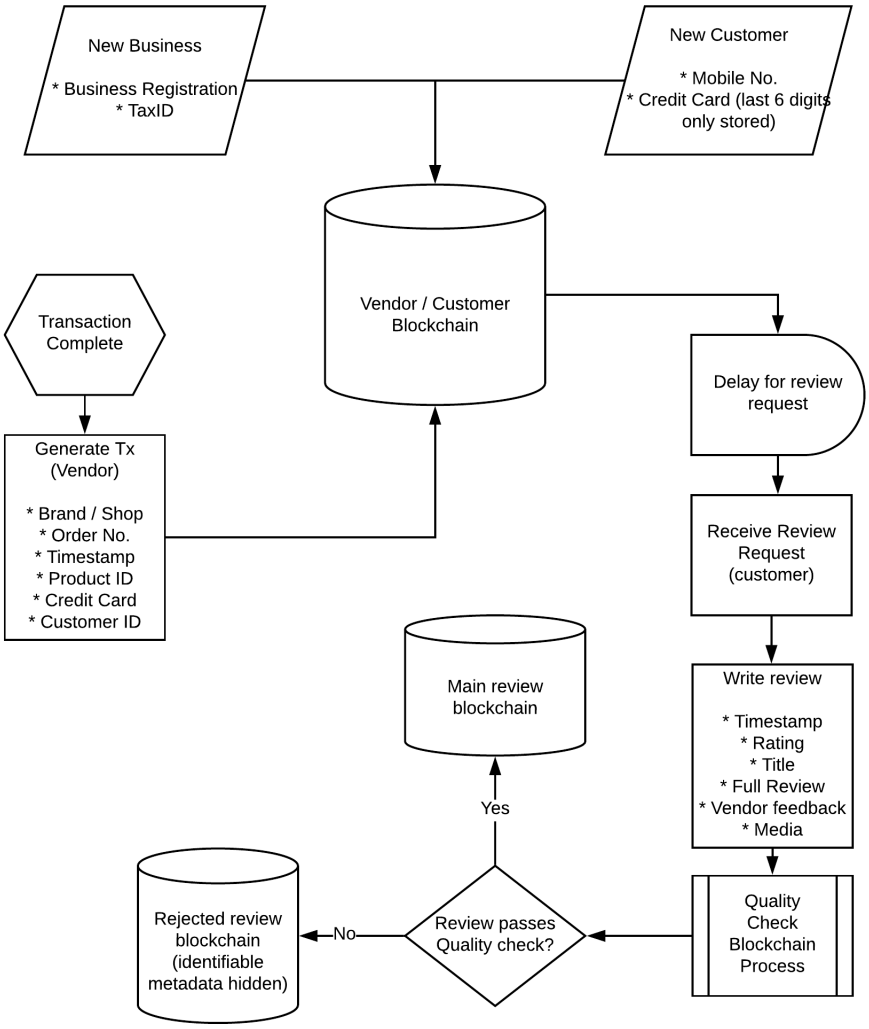
A novel blockchain framework is proposed here to address the challenges the industry faces. The framework is divided into two areas:

1. Generating review blockchain (figure A)
2. Accessing the review blockchain (figure B)

Generating the review blockchain

Figure A

Generating review blockchain



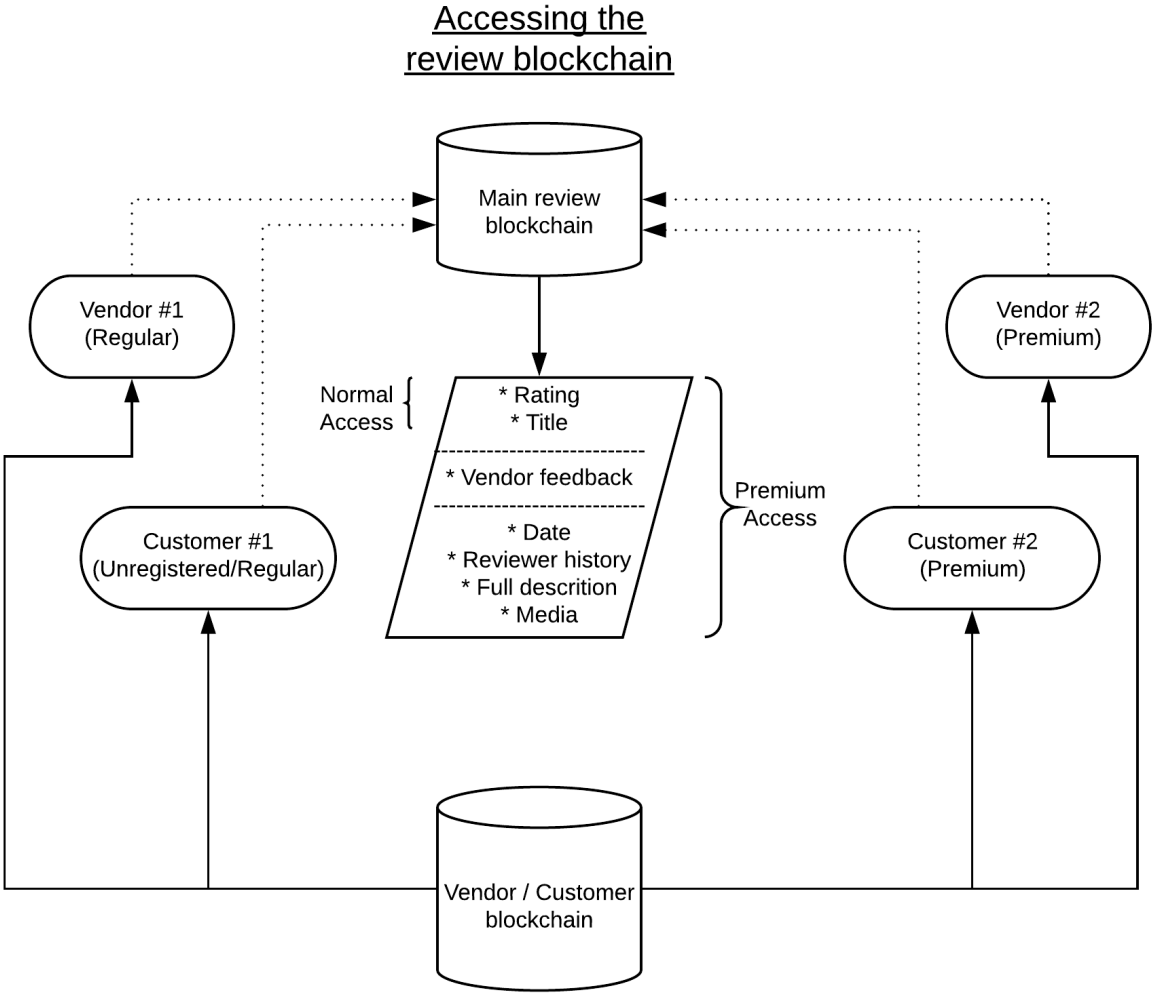
New businesses and customers have to register themselves on the blockchain by providing valid ID documents. Business registration document and taxID is used for businesses whereas mobile number and credit card number is used for customers. These details are stored in a public blockchain but the contents are not visible to external entities.

Once a business transaction is complete the vendor uses its credentials and a metadata stamp containing brand/shop, order no., timestamp, productID, credit card of the customer, customerID to generate a Transaction record (Tx record) and is sent to Vendor/Customer blockchain. The blockchain now matches the customerID and sends the review request to the customer through appropriate channel after a delay. Delay could be based on shipment status, the lifecycle of the product, external trigger etc.

The customer now fills in a review with rating, title, description, media (pictures/video) and vendor-specific feedback and this is pushed to an intermediary blockchain where external services like IBM Watson is used to grade the quality of the review for relevance, profanity level, timeliness of review, etc. After the automated quality check is complete the review is either approved and attached to the Main review blockchain for future use or is stored in a partially hidden Rejected review blockchain to help improve the quality check algorithms.

Accessing the review blockchain

Figure B



Now that the blockchain has the reviews for the products and services its reviews will be made available for the vendors and customers. This framework, however, takes into consideration the cost of operating this system and offers two levels of access to the blockchain data.

Vendors use an API mechanism to access, source and display the reviews, as per usage terms the reviews are to be displayed as a complete package as long as they are not past the preset expiry date (set at product ID level by the vendor at the start).

Normal vendors can access the ratings and feedback title/summary to post in their product listings or ad search extensions.

Premium (paid) vendors can access the normal vendor details and additionally access vendor feedback, date, reviewer helpfulness history, full description, and media.

While the above mechanisms are used by vendors to display their product/service reviews, an individual customer can unlock all data points save the vendor feedback by purchasing a premium account. As long as the user is logged into the blockchain web portal the cookie will instruct all vendor portals (normal and premium) to reveal all the data points to this particular customer.

Discussion

In an eCommerce ecosystem where the proposed blockchain is fully operational, the blockchain controllers can decide the system-wide and product/service-wide parameters combat some of the issues in the above takeaways. The blockchain control board can comprise of popular reviewers, consumer protection officials and representatives from leading companies; regardless of who is in the board the implemented actions are publicly visible, system-wide and data is managed in a decentralized and immutable manner.

Prevent old stale reviews from affecting sales of improved products, some category of products like electronics could have shorter validity compared to categories in healthcare. Validity / Expiry time for a review
Prevent small number of initial reviews from affecting initial trust - Set minimum number of reviews to a statistically or psychologically significant number ~30 (Bradley, 1978)
Consumer must be able to compare meaningful metrics across the product/service category – Rating system (binary, 5-star or 10-point), title and full description lengths, number of chances to edit a published review, media type and size limit and threshold for quality check of content; all these parameters are set such that vendors have to use existing product category codes which have these parameters built into them

With the problem and solution established in the above paragraphs, we now focus on the ease of adoption and usability of the system. The technology required for this system is mature as of 2018 and can be built on bitcoin, altcoins or other tokens in the

cryptocurrency industry. Onboarding of vendors is a matter of one-time upload of existing reviews into the system and using an API code to source and populate the review data form blockchain instead of their internal databases. Customers can signup with a simple $1 credit card hold and a one-time-password sent to verify their mobile number. The value of the whole system results from clearer and trustworthy reviews where the consumer can rest assured that reviews have not been screened, altered or promoted in any way and the reviews can be filtered to exclude suspicious reviewers who have posted too often on a large variety of product (paid reviews) or too less (consumer who might not have sufficient experience in that product/service category)

Conclusion

Before the backdrop of the research question, how “trust-free” systems based on blockchain technology may impact the reputation economy in eCommerce, the study demonstrates that the underlying trust issues can be addressed by modern blockchain technology to promote consumer trust and healthier competition amongst brands.

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Literature Cited

Internet website references

emarketer.com - https://www.emarketer.com/Article/Worldwide-Retail-Ecommerce-Sales-Will-Reach-1915-Trillion-This-Year/1014369

Article References

Baek, C., Elbeck, M., 2014. Bitcoins as an investment or speculative vehicle? A first look. Appl. Econ. Lett., 1–5 https://doi.org/10.1080/13504851.2014.916379

Beck, R., Stenum Czepluch, J., Lollike, N., Malone, S., 2016. Blockchain - The Gateway to trust-free cryptographic Transactions. In: ECIS 2016 Proceedings

Chang, M.K., Cheung, W., Tang, M., 2013. Building trust online: interactions among trust building mechanisms. Inf. Manage. 50 (7), 439–445

Chen, Y., and Xie, J. Third-party product review and firm marketing strategy. Marketing Science, 24, 2 (2005), 218–240

Connolly, A.J., Kick, A., 2015. What differentiates early organization adopters of bitcoin from non-adopters?. In: AMCIS 2015 Proceedings. pp. 1–6. doi:10.13140/RG.2.1.4730.8645

Davidson, S., De Filippi, P., Potts, J., 2016. Economics of Blockchain. Soc. Sci. Res. Netw. 1–23. https://doi.org/10.2139/ssrn.2744751

Hawlitschek, F., Notheisen, B., Teubner, T., The limits of trust-free systems: A literature review on blockchain technology and trust in the sharing economy,Electronic Commerce Research and Applications,Volume 29,2018

Fuerstenau, D., Kliewer, N., 2014. Standard Diffusion in Growing Networks: Modeling Interaction Patterns. In: ECIS 2014 Proceedings. pp. 1–10

Gipp, B., Meuschke, N., Gernandt, A., 2015. Decentralized Trusted Timestamping using the Crypto Currency Bitcoin. In: iConference 2015

Glaser, F., Zimmermann, K., Haferkorn, M., Weber, M.C., Siering, M., 2014. Bitcoin - Asset or Currency? Revealing Users' Hidden Intentions. In: ECIS 2014 Proceedings. doi:10.1007/978-3-319-42448-4_6

Godes, D., Silva, J.C., 2012. Sequential and temporal dynamics of online opinion. Mark. Sci. 31 (3), 448–473

Hong, I.B., Cha, H.S., 2013. The mediating role of consumer trust in an online merchant in predicting purchase intention. Int. J. Inf. Manage. 33 (6), 927–939

Ingram, C.E., Morisse, M., 2016. Almost an MNC: Bitcoin entrepreneurs' Use of collective resources and decoupling to build legitimacy. In: HICSS 2016 Proceedings. pp. 4083–4092. doi:10.1109/HICSS.2016.507

Jeacle, I., Carter, C., 2011. In TripAdvisor we trust: Rankings, calculative regimes and abstract systems. Account. Organ. Soc. 36 (4), 293–309

Kazan, E., Tan, C.-W., Lim, E.T.K., 2015. Value Creation in Cryptocurrency Networks: towards A Taxonomy of Digital Business Models for Bitcoin Companies. In: PACIS 2015 Proceedings

Kuan, K.K., Zhong, Y., Chau, P.Y., 2014. Informational and normative social influence in group-buying: evidence from self-reported and EEG data. J. Manage. Inf. Syst. 30 (4), 151–178

Leenders, R.T.A., 2002. Modeling social influence through network autocorrelation: constructing the weight matrix. Social Networks 24 (1), 21–47

Li, X., Hitt, L.M., 2008. Self-selection and information role of online product reviews. Inf. Syst. Res. 19 (4), 456–474

Mai, F., Bai, Q., Shan, Z., Wang, X. (Shane), Chiang, R.H.L., 2015. The Impacts of Social Media on Bitcoin Performance. In: ICIS 2015 Proceedings

Malhotra, D., Lumineau, F., 2011. Trust and collaboration in the aftermath of conflict: the effects of contract structure. Acad. Manage. J. 54 (5), 981–998

McKnight, D.H., Cummings, L.L., Chervany, N.L., 1998. Initial trust formation in new organizational relationships. Acad. Manage. Rev. 23 (3), 473–490

McKnight, D.H., Kacmar, C.J., Choudhury, V., 2004. Shifting factors and the ineffectiveness of third party assurance seals: a two-stage model of initial trust in a web business. Electron. Markets 14 (3), 252–266

Moe, W.W., Schweidel, D.A., 2012. Online product opinions: incidence, evaluation, and evolution. Mark. Sci. 31 (3), 372–386

Notheisen, B., Cholewa, J.B., Shanmugam, A.P., 2017a. Trading Real-World Assets on Blockchain. Bus. Inf. Syst. Eng. 59, 425–440. https://doi.org/10.1007/s12599-017-0499-8

Pavlou, P.A., Dimoka, A., 2006. The nature and role of feedback text comments in online marketplaces: implications for trust building, price premiums, and seller differentiation. Inf. Syst. Res. 17 (4), 392–414

Pavlou, P.A., Gefen, D., 2004. Building effective online marketplaces with institution-based trust. Inf. Syst. Res. 15 (1), 37–59

Schlosser, A.E., 2005. Posting versus lurking: communicating in a multiple audience context. J. Consum. Res. 32 (2), 260–265

Utz, S., Kerkhof, P., van den Bos, J., 2012. Consumers rule: how consumer reviews influence perceived trustworthiness of online stores. Electron. Commer. Res. Appl. 11 (1), 49–58

Xu, X., Pautasso, C., Zhu, L., Gramoli, V., Ponomarev, A., Tran, A.B., Chen, S., 2016. The blockchain as a software connector. In: WICSA 2016 Proceedings. pp. 182–191. doi: 10.1109/WICSA.2016.21