Aug 10th, 12:00 AM

Blockchain: Technical Feasibility for Assessing Organizational Fit

Aaron M. French
University of New Mexico, afrench@unm.edu

Horst Treiblmaier
MODUL University, horst.treiblmaier@modul.ac.at

Marten Risius
University of Queensland, m.risius@business.uq.edu.au

Blockchain: Technical Feasibility for Assessing Organizational Fit

Emergent Research Forum (ERF)

Aaron Michael French
University of New Mexico
afrench@unm.edu

Horst Treiblmaier
Modul University Vienna
horst.treiblmaier@modul.ac.at

Marten Risius
University of Queensland
m.risius@business.uq.edu.au

Abstract

It is a multifaceted technology receiving widespread attention with many companies searching for opportunities while others still scramble to understand what it is and how it can support their business model. The current research evaluates the technical feasibility of blockchain applications in relation to the organization fit within a company. A model composed of environmental and organizational factors as they influence organizational fit dimensions is proposed to create a guide for companies to assess whether blockchain is a suitable solution for their company.

Keywords (Required)

Blockchain, feasibility, technical feasibility, organizational fit.

Introduction

Blockchain can be defined as a "digital, decentralized and distributed ledger in which transactions are logged and added in chronological order with the goal of creating permanent and tamperproof records" (Treiblmaier, 2018, p. 547). It is a multifaceted technology receiving widespread attention with many companies searching for opportunities while others still scramble to understand what it is and how it can support their business model (Risius and Spohrer 2017). In the past several years, numerous research studies have presented theoretical solutions imbuing feelings of hope and dreams of blockchain as a technology with benefits ranging from ending hunger (Pio, 2018) and helping to cure cancer (Caruso, 2018) to decentralizing governments and empowering citizens (Ølnes et al, 2017). While there are high hopes for this emerging technology, many companies are likely to pursue blockchain for practical business solutions as a technology to increase revenue or decrease cost to provide a competitive advantage. When evaluating new technology, design theory presents the last mile research approach used to contribute to scholarly knowledge by evaluating feasibility across three levels related to proof-of-concept, proof-of-value, and proof-of-use (Nunamaker et al, 2015). In line with their recommendations, we identify feasibility types across these three stages to identify feasibility factors critical to blockchain information systems success.

Organizational fit, based on contingency theory to predict successful outcomes, evaluates the critical success factors for information technology implementation success. We extend this literature to assess the feasibility of a system prior to project initiatives to determine factors that will result in proper organizational fit of a blockchain solution. Building on feasibility studies that have been an integral part of systems analysis and design for many decades, we extend these evaluations in relation to a theoretical model evaluating organizational fit in determining future implementation success. Due to the unique nature of blockchain as an emerging technology, we specifically evaluate technology feasibility to identify technological considerations determining the organizational fit of a blockchain solution.

In this study, we first evaluate the academic literature to establish a foundation for the analysis to be conducted. The background literature evaluates the technical feasibility analysis and organizational fit of an information system to develop a research framework integrating these two areas. Next, the relationship between technical feasibility and organizational fit is isolated to identify and assess feasibility factors influencing organizational fit. In continuing this research, we will conduct qualitative interviews with an organization working on blockchain based solutions to identify technical feasibility measures they evaluate and map to the factors identified in the literature. Based on the results, a set of measures will be developed evaluating technical feasibility and validated by conducting a feasibility study on a proposed blockchain project. We conclude with a discussion and then present implications based on the preliminary findings.

Background

Feasibility studies have been used to determine the viability of an information system while organizational fit has been used to determine implementation success. There are technical aspects that are unique to the blockchain environment due to the decentralized nature of blockchain and its public ledger (Pedersen et al. 2019). In the current research we evaluate the technical feasibility of blockchain to assess its organizational fit as an IS solution for an organization. This section will evaluate factors for assessing technical feasibility and review the literature on organizational fit to bridge these two areas into a research model for evaluating blockchain based solutions.

Technical Feasibility

Feasibility is defined as "the quality of being possible and likely to be achieved" (OED, 2020). The interpretation and application of feasibility differs based on the context and field of study. For example, feasibility studies in healthcare are focused on relevance and sustainability to determine the appropriateness of an intervention (Bowen et al, 2009). Managerial research evaluates feasibility regarding motivations to perform a task based on available resources (Klein, 1990). When evaluating information systems, feasibility is assessed according to business problems to determine the suitability of a new project based on a given set of criteria. Based on this view, a feasibility study for an information system involves the evaluation of factors to determine the likelihood of success of the proposed system upon implementation. To create value for an organization, an information system must be technically, economically, and operationally feasible (Nunamaker et al, 2015) with technical and operational feasibility being evaluated most frequently (Prat et al, 2015). The systems analysis and design initiatives for developing a new information system must seek to establish technical feasibility to satisfy the functional ecology that the system will operate in (Bergman et al, 2007). With the unique nature of an innovative information system developed on blockchain, the technical feasibility of the system is critical in determining the fit of the IS solution in the organization and its potential for success.

Organizational Fit

Organizational fit is an important factor for predicting project success (Hung et al, 2013). Much of the research conducted up to the early 1990's focused on the selection process of information systems regarding organizational fit without regard to the IS development or IS effectiveness (Iivari, 1992). In the decades to follow, several research studies evaluated the organizational fit of an information system in regards to implementation success with over 70 percent of research papers citing that contingency factors fitting the business environment resulted in improved organizational performance (Hung et al, 2011). Three dimensions of organizational fit identified as process fit, data fit, and system fit have been shown to improve implementation success of new innovations (Hong and Kim, 2002; Lim and Koh, 2009). While a direct relationship has been demonstrated between organizational fit and project success, this relationship is contingent upon moderating effects of organizational adaptation and project management (Hung et al, 2013). Continual management and adaptation of a project can result in increased performance and benefits or lead to increased cost, time, and eventual project failure.

Research Model

When developing a new artifact (e.g., information system), two essential categories of evaluation include formative versus summative evaluations and ex ante versus ex post evaluations (Venable et al, 2016). Formative and summative evaluation revolve around the development of an information system. The formative approach is iterative, measuring progress as development ensues as opposed to summative evaluations that appraise the situation prior to beginning the development or measure the results after completion. Ex ante and post ante evaluations differentiate based on when the evaluation takes place. Ex ante evaluation is a predictive evaluation used to estimate the impact of future events whereas post ante evaluations measure the results of an event that already occurred. When evaluating new technology, ex ante evaluations consist of feasibility studies to determine the likelihood of success and a positive impact of developing or acquiring an information system. Post ante evaluations revolve around value realized from the implementation of an information system. Organizational fit research consists of summative and post ante evaluations to determine the implementation success of an information system as a result of organizational fit. Research evaluating organizational fit considers the selection of an information system but without consideration of ex ante evaluations. Based on the last mile approach for extending design theory (Nunamaker et al, 2015), economic, technical, and operational feasibility are assessed to determine organizational fit of an information system. Figure 1 incorporates ex ante feasibility evaluation as a determinant of organizational fit when pursuing new information technology. From this model, the relationship between technical feasibility and organization fit will be evaluated for assessing blockchain based solutions.

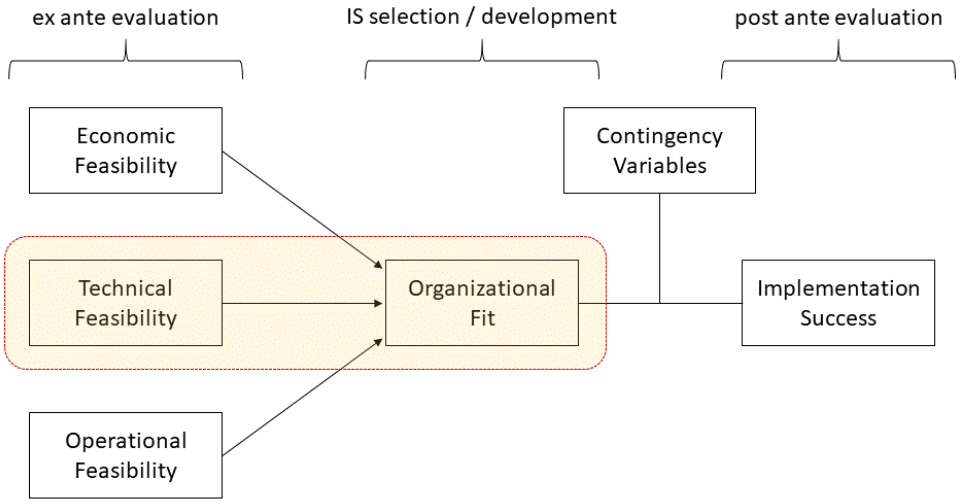

Figure 1. Feasibility Influence on Organizational Fit of Information Systems

As demonstrated in figure 1, ex ante evaluations of feasibility are used to predict organizational fit of a new information system in relation to implementation success. However, each information system has its own distinct features resulting in a feasibility analysis that may be unique to an individual organization, its business environment, and the system they seek to implement. For example, blockchain technology consists of a decentralized immutable ledger storing transactions in blocks validated through consensus mechanisms and secured through cryptographic principles (Treiblmaier, 2019). Based on this description, an evaluation of feasibility for blockchain systems would be unique as compared to other types of information systems. Due to the unique nature of blockchain, the current research isolates the relationship between technical feasibility and organizational fit to identify specific technological requirements and measures for evaluating blockchain technologies. Technical feasibility can be evaluated based on external factors related to the environment in terms of technological and business opportunities (Kim and Ko, 2014) or internal factors related to technical capabilities and resources of the organization to develop the system (Jeddi et al, 2016). Organizational fit can be evaluated across three dimensions identified as process fit, data fit, and system fit (Hong and Kim, 2002; Lim and Koh, 2009). Figure 2 presents the research model integrating ex ante feasibilities categories to assess the three dimensions of organizational fit.

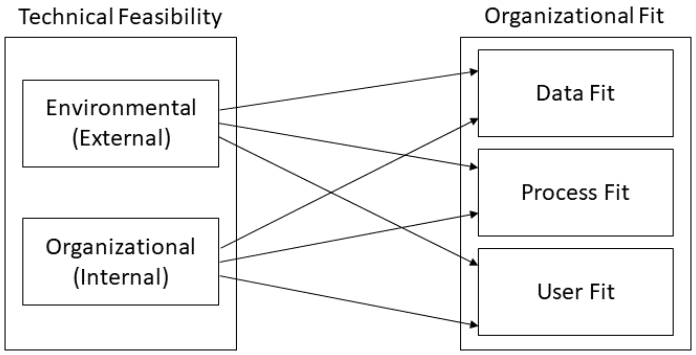

Figure 2. Research Model: Technical Feasibility and its Influence on Organizational Fit

Research Methodology

We will conduct structured interviews to gather requirements to build a tool suitable for evaluating technical feasibility. Based on academic literature and practitioner oriented technical articles, criteria for evaluating technical feasibility from environmental and organization perspectives were identified (see table 1). Based on the evaluation of the literature and analysis of interview data, a feasibility evaluation tool for assessing technical feasibility will be developed. A second round of interviews will then be conducted to provide feedback on the measures and how they map to the three types of organizational fit from the model displayed in figure 2. This will ensure the content validity of the evaluation tool and its appropriateness for blockchain-based solutions.

Environmental (external)		**Organizational (internal)**	
Domain	**Factors**	**Factors**	
Technology	• Attributes • Environment • Competitiveness	• Concepts • Infrastructure • Facilities • Data • Compliance • Platforms & APIs • Components	• Architecture & Design • Tools • Integration • Information Security • Equipment • Procurement • Operations
Business Opportunity	• Market Attributes • Market Environment • Market Competitiveness		

Table 1. Ex ante Technical Feasibility Factors

Analysis and Results

We will analyze the qualitative results of the structured interviews to identify environmental and organizational factors of technical feasibility that are critical to assessing blockchain solutions and their organizational fit. This will result in a tool used for assessing the feasibility of blockchain solutions. A second round of interviews will be conducted to assess the content validity of the measures used to evaluating technical feasibility in the study. The final stage of analysis will consist of applying the feasibility tool to a blockchain project being evaluated by the participating company to assess feasibility and the proposed system's fit within the organization.

Conclusion

With the hype of blockchain and ambition to create blockchain solutions, it is critical that proper analysis be conducted to evaluate the fit and likelihood of success of a blockchain solution. The current research develops a tool for assessing the technical feasibility of blockchain solutions that is designed and tested through qualitative interviews with a participating company working on blockchain solutions. The result will be a tool capable of producing a feasibility study to assess the technical feasibility of a blockchain

solution and its fit within an organization. Future research will seek to apply the feasibility tool to other blockchain development projects in the industry to assess its generalizability and improve its predictability for implementation success.

REFERENCES

Bergman, M., Lyytinen, K., and Mark, G. 2007. "Boundary Objects in Design: An Ecological View of Design Artifacts," *Journal of Management Information Systems*, (8:11), pp. 546-568.

Bowen, D., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., Bakken, S., Kaplan, C., Squiers, L., Fabrizio, C., and Fernandez, M. 2009. "How We Design Feasibility Studies," *American Journal of Preventive Medicine*, (36:5), pp. 452-457.

Caruso, C. 2018. "How Blockchain Could Cure Cancer," *Medium*, Retrieved from https://medium.com/@charliecaruso/how-blockchain-could-cure-cancer-e8afc0f173ef

Hong, K-K., and Kim, Y-G. 2002. "The Critical Success Factors for ERP Implementation: An Organizational Fit Perspective," *Information & Management*, (40:1), pp. 25-40.

Hung, S-Y., Chang, S-I., Yen, D., Kang, T-C., and Kuo, C-P. 2011. "Successful Implementation of Collaborative Product Commerce: An Organizational Fit Perspective," *Decision Support Systems* (50), pp. 501-210.

Hung, S-Y., Yu, W-J., Chen, C., and Hsu, J-C. 2013. "Enhancing Organizational Fit Factors to Achieve ERP Project Success," *Pacific Asia Journal of the Association for Information Systems*, (5:1), pp. 45-64.

Iivari, J. 1992. "The Organizational Fit of Information Systems," *Information Systems Journal*, (2:1), pp. 3-29.

Jeddi, F., Hajbaghery, M., Akbari, H., and Esmaili, S. 2016. "Technological Feasibility of a Nursing Clinical Information System," *Electron Physician*, (8:9), pp. 2942-2949.

Kim, C-H., and Ko, C-R. 2014. "Success and Failure Factors of Technology Commercialization: A Korean Case," *Asian Journal of Innovation and Policy*, (3:1), pp. 25-49.

Klein, J. 1990. "Feasibility Theory: A Resource-Munificence Model of Work Motivation and Behavior," *Academy of Management Review*, (15:4), pp. 646-665.

Lim, S-H., and Koh, C-E. 2009. "RFID Implementation Strategy: Perceived Risks and Organizational Fits," *Industrial Management & Data Systems*, (109:8), pp. 1017-1036.

Nunamaker Jr., J., Briggs, R., Derrick, D., and Schwabe, G. 2015. "The Last Research Mile: Achieving Both Rigor and Relevance in Information Systems Research," *Journal of Management Information Systems*, (32:3), pp. 10-47.

OED. 2020. "Feasibility, n.1." Oxford English Dictionary Online, *Oxford University Press*, Retrieved from https://www.oxfordlearnersdictionaries.com/us/definition/english/feasibility

Ølnes, S., Ubacht, J., and Janssen, M. 2017. "Blockchain in Bovernment: Benefits and Implications of Distributed Ledger Technology for Information Sharing," *Government Information Quarterly*, (34:3), pp. 355-364.

Pedersen, A. B., Risius, M., and Beck, R. 2019. "A Ten-Step Decision Path to Determine When to Use Blockchain Technologies," *MIS Quarterly Executive*, (18:2), pp. 99-115.

Pio, G. 2018. "How Can Blockchain Help to End Hunger?" *World Food Programme*, Retrieved from https://www.unece.org/fileadmin/DAM/cefact/OtherMeetings/2018/BlockChainForTradeFacilitation_Geneva/03_GiovanniPio-Blockchain.pdf

Prat, N., Comyn-Wattiau, I., and Akoka, J. 2015. "A Taxonomy of Evaluation Methods for Information Systems Artifacts," *Journal of Management Information Systems*, (32:3), pp. 229-267.

Risius, M., and Spohrer, K. 2017. "A Blockchain Research Framework: What We (Don't) Know, Where We Go from Here, and How We Will Get There," *Business & Information Systems Engineering*, (59), pp. 385-409.

Spacey, J. 2017. "14 Types of Technical Feasibility," *Simplicable*, Retrieved from https://simplicable.com/new/technical-feasibility

Treiblmaier, H. 2019. "Toward More Rigorous Blockchain Research: Recommendations for Writing Blockchain Case Studies," *Frontiers in Blockchain*, (2:3), pp. 1-15.

Treiblmaier, H. 2019. "The Impact of the Blockchain on the Supply Chain: A Theory-Based Research Framework," *Supply Chain Management: An International Journal*, (23:6), pp. 545-559.