RESEARCH IN PROGRESS

STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS TO BLOCKCHAIN IN INDUSTRIES BEYOND CRYPTO

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Despite the hype of the blockchain technology, the implementation and execution of blockchain technologies in sectors beyond cryptocurrency is lagging and below par. Understanding the reasons behind this lag is important to enable addressing any voids and enable making maximum use of the technology. We shed light on this void by trying to identify the strengths, weaknesses, opportunities, and threats (SWOT) faced by the use of blockchain technologies in industries beyond crypto, and thereby, draw insights valuable to develop a blockchain platform for healthcare.

Keywords: blockchain, catena-X, healthcare, SWOT Analysis, Bled eConference

University of Maribor Press
DOI https://doi.org/10.18690/um.fov.6.2023.47
ISBN 978-961-286-804-8

1 Introduction

Blockchain is a technology for data sharing and has the key characteristics of transparency, anonymization, and decentralization (Sarmah, 2018). Blockchain was introduced for recording cryptocurrency transactions and today, the millions of crypto transactions being completed presents a solid use-case for blockchain technology. This has led to the exploration of prospects of blockchain technology in other data-driven sectors such as finance (Kahyaoglu & Aksoy, 2021), healthcare (Epiphaniou, et. al., 2019), government (Guarda, et. al., 2021), manufacturing and distribution (Kasten, 2020), and more. However, the implementation and execution of blockchain technologies in other sectors beyond crypto is lagging and is below par in contrast to the hype (Luthra, et. al., 2022). Therefore, understanding the reasons behind this lag is important to enable addressing key voids and thus, making maximum use of the technology. With the aim of serving to this gap, answering the following research question is attempted through this research in progress paper: What are the strengths, weakness, opportunities, and threats, faced by the use of blockchain technology in industries beyond crypto? In particular, we focus on private blockchains.

While there are numerous ways that can be crafted to answer the aforesaid research question, we take a unique approach that would benefit our larger aim of designing, developing, and implementing a blockchain platform for healthcare. This project is currently ongoing, and an approach inspired by the Design Science Research Methodology (DSRM) (Hevner, et. al., 2010), (Hevner & Wickramasinghe, 2018) is followed. The focus of this paper is reporting on the outcomes of the "Problem Identification" phase our DSRM-inspired approach.

Since our focus is towards development and implementation of a blockchain platform, the unique approach we take to answer our research question is by reviewing a commercial data sharing platform that has been recently rolled out and makes use of blockchain technologies. The commercial platform we have chosen for review is Catena-X (Catena-X, 2022). Catena-X is a state-of-the-art collaborative and open data ecosystem utilizing blockchain, that is currently gaining traction in Europe, especially in the automotive sector. Catena-X stands as one of the earliest commercially available data ecosystems of its kind, and it is still in its early years of being rolled out. As such, Catena-X serves as an exemplary use case to understand

the challenges especially pertaining to the implementation and execution of blockchain platforms in different industries. We thus, answer our research question by performing a scoping review about the literature on Catena-X.

2 Method Followed for the Scoping Review

We started by searching the keyword "Catena-X" OR "Catena X" in academic databases such as Scopus and IEEE Xplore. However, a minimal number of results were found. Therefore, we repeated the same keyword search in Google Scholar—a more inclusive database. The search was carried out between 4th and 6th of May 2022. This search resulted in 175 results. These included a mix of peer reviewed academic publications to grey literature such as industry reports and media articles. Since the search was done in Google Scholar, we had limitations in specifying where exactly the searched keywords would appear. For instance, in databases like Scopus, one can search for keywords specifically within the article Titles and Abstract. However, Google Scholar offered limited capability to allow such constriction. This meant that our results could include the keyword Catena-X anywhere in the text, for example even in the reference list or an Acknowledgement. Therefore, we performed an Abstract review to find out which articles were relevant. Our inclusion criteria were to include the items that discussed information systems in the Abstract. Items not related to information systems were excluded. This resulted in 16 articles being relevant, which had Catena-X mentioned within the text body of the article. These articles were taken forward for full text review. From the full text review, five more articles were found to be irrelevant, as some of the articles had the name Catena mentioned for things other than the Catena-X platform. Thus, our review ended up with the 11 Articles. The 11 articles are the following: (Berg, et. al, 2021), (Garrido, et. al., 2022), (Johann, et. al., 2020), (Langdon and Schweichhart, Data Spaces), (Müller, et. al., 2022), (Ramesohl, et. al., 2022), (Sautter, 2021), (Schulz, et. al., 2022), (Staab, et. al., 2022), (Usländer, et. al., 2021) and (Zhongming, et. al., 2021). A flowchart of our search is available in the Results section (Figure 1).

In the following step, we performed a SWOT analysis, i.e., find out the Strengths, Weaknesses, Opportunities, and Threats, related to Catena-X as reported in the available literature. The selected 11 articles were read in search of specific issues regarding Catena-X. The related text segments were tabulated, and themes were

assigned to the main points raised. These themes eventually yielded a list of relevant issues.

Since the rigor of critique was lacking nevertheless as said before, most of the points we found in these articles could be listed as "Opportunities". Few of the issues pointed at "Threats". However, the depth and richness of what we expected as "Strengths" and "Weaknesses" were not explicitly talked about in these articles. Therefore, for the sake of completeness, we went a step further, and looked at some other material for what was missing. Since we set out starting at a lens of fast-track learning for "implementation," we referred to commercial and educational providers that offered Blockchain-related services rather than reading academic research. Thus, we selected IBM (IBM, 2022)—a renowned Blockchain service provider, and 101blockchains (101blockchains, 2022)—an education provider offering courses and training on Blockchain. We referred to the material published by IBM and 101blockcains and selected what they identified as Strengths and Weaknesses, thereby filling gas in our analysis.

3 Results

Shown in Figure 1 is a flowchart of our literature search. The identified Strengths, Weaknesses, Opportunities, and Threats are listed in Table 1 as summary themes. Descriptions of these themes with elaborate meanings and text extracts are presented in Appendix A (provided as an external reference) along with the detailed full text analysis. We list out the Strengths as identified in the IBM article in (Benefits of Blockchain, 2022). The weaknesses are listed as identified in the 101blockchains article in (Disadvantages of Blockchain, 2022), and from the 11 works identified for the full text review. The Opportunities and Threats are listed from the findings of our literature review (i.e., the full text review of the 11 works). The findings are listed in Table 1. The frequency each theme was found in the literature is mentioned within parentheses in front of each theme in Table 1. A detailed analysis of the findings is provided in Appendix A (provided as an external reference).

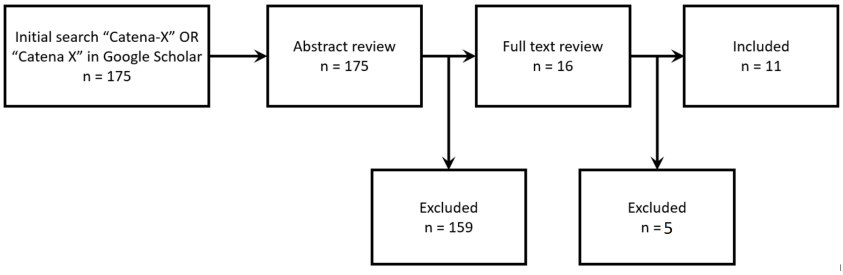

Figure 1: Flowchart depicting the literature search

Table 1: Summary of the SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
• Enhanced security (1) • Greater transparency (1) • Instant traceability (1) • Increased efficiency and speed (1) • Automation (1)	• Node dependent (1) • Scalability challenges (1) • Interoperability issues (1) • Energy consumption (1) • Immutability of data (1) • Not Completely Secure (1) • Responsibility on the users (1) • Cost and implementation struggle (1) • Lack of maturity (1) • Require antitrust laws (1) • Require special corporate models (1)	• Increased efficiency (3) • Environmental friendliness (3) • Enhanced collaboration (6) • Smart factories (2) • Team robotics (1) • Transparent value chain (1) • Optimized production (1) • Increased average productivity (1) • Increased marginal productivity (1) • Increased national product (1) • Increased trust (1) • Digital twins (1) • Increased transparency (1) • Increased security (1) • Increased autonomy (2) • Enhanced interoperability (1) • Enhanced sustainability (1) • Improved infrastructure (1) • Improved guidelines (1) • Improved scalability (1)	• Lack of collaborative thinking (1) • Lack of digital trust (1) • Lack of financial resources (1) • Lack of skills (1) • Lack of reliable technical foundations (1) • Lack of reliable legal foundations (1) • Lack of suitable business models (1) • Requirement of new infrastructure (1) • Requirement of new rules and guidelines (1) • Requirement of IP protection, trade secrets (1)

4 Discussion

This paper contributed by way of a SWOT analysis to the use of blockchain in different industries through reviewing some early works regarding Catena-X. Themes were assigned to the main issues identified and thereby lists were formed

and presented. These themes eventually yielded a list of relevant issues. Although our review contains limited sources, the importance of the results that can be found even at this level, must not be undermined as it does identify and envisage issues at an early stage is extremely important. Therefore, we consider the points found through our review of early articles related to Catena-X as a great starting point for planning the design and development of blockchain platforms for different sectors.

4.1 A Pathway for Healthcare

Today, healthcare operations are generating volumes of critical and highly sensitive data including medical records in EMRs and genomic data. As such, it becomes vital for healthcare organizations and all healthcare stakeholders to consider responsible approaches to best manage these data and ensure appropriate levels of security and privacy to ensure the highest levels of trust between and within all parties involved in the healthcare sector. Becoming proactive in this pursuit is extremely important in this era of rapid digital transformation of healthcare. In this context, we see significant potential in private blockchains to increase data integrity in the healthcare sector. This paper has highlighted the key strengths, weaknesses, opportunities, and threats, of blockchain technologies being used in sectors outside crypto. The identified issues are certainly applicable to the healthcare sector as well.

5 Conclusions

The implementation and execution of blockchain technologies in sectors beyond cryptocurrency is lagging (Luthra, et. al., 2022). The reasons behind this lag must be understood to enable filling any voids to enable making maximum use of the technology. We set out in this paper to fill this void by identifying the strengths, weaknesses, opportunities, and threats (SWOT) faced by the use of blockchain technologies in industries beyond crypto.

We take a unique approach to perform the SWOT analysis to benefit our larger aim of designing, developing, and implementing a blockchain platform for healthcare. The project of designing this blockchain platform is currently ongoing, and a DSRM-inspired approach is followed. This SWOT analysis serves as an outcome of the "Problem Identification" phase our design approach. We also discussed a

pathway suitable for the healthcare sector grounded on the findings of the SWOT analysis.

Our future work will involve carrying out the subsequent steps of DSRM to develop a private blockchain prototype for a hospital and then trial it. The findings of our SWOT analysis will guide our design. Our findings are also generalizable for other industries that may hold interest in developing blockchain platforms or data ecosystems that would serve the unique needs of their sectors. Later, we expect to get the opportunity to review some other commercial data ecosystems as well (e.g., SAP Datasphere) to confirm generality of our findings from Catena-X, or to learn differences. Furthermore, we will attempt to discuss the identified themes in more detail; elaborating on how they relate to healthcare and perhaps other sectors as well. Such attempts would assist in identifying ways to convert the identified weaknesses into strengths and threats into opportunities and thereby help the uptake of the blockchain technology in different sectors.

Aknowledgements

This project was funded by an Alexander von Humboldt award given to the first author.

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Appendix A. Link: https://dit.swin.edu.au/clotsapp/Appendix_A.pdf

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