"We don't need it" - Insights into Blockchain Adoption in the German Pig Value Chain

Research Paper

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Abstract. In this paper, the divergence between perceived benefits of blockchain technology in the food supply chain and actual real-world implementation is investigated. Using the example of the German pig value chain, we conducted eight semi-structured expert interviews to gain insights into factors preventing the usage of blockchain technology. Relying on the well-known and well-used technology-organization-environment (TOE) framework as guidance, we identified that despite blockchains known benefits, the stakeholders perceive their existing technological solutions as sufficient. Furthermore, our findings highlight that organizational trust structures such as the ownership structures of enterprises and long-standing business relations with key actors diminish the trust-building aspect of blockchain. Therefore, we contribute to the existing body of knowledge about blockchain adoption by providing specific industry insights. Our theoretical contribution further outlines that context-specific industry related factors need to be further investigated to complement general blockchain adoption factors and theories.

Keywords: blockchain adoption, TOE, food supply chain

1 Introduction

The usage of novel technologies in the area of Food Supply Chain (FSC) comes a long way and is subject to an active field of research (Ben-Daya et al. 2019, Dabbene et al. 2014, Pal & Kant 2020, Verdouw et al. 2016, Zhu et al. 2018). Considering the enhancement of transparency, similar to general supply chain management, the usage of blockchain technology has been investigated as a promising addition. Blockchain itself is a type of Distributed Ledger Technology (DLT) where transactions are stored in (usually chronological) order in blocks that are cryptographically linked (Sunyaev 2020). A blockchain is categorized based on its access control into public or private blockchain and based on its permission management as permissioned or permissionless (Xu et al. 2017). Blockchain is characterized by being immutable, append-only, ordered, timestamped, open and transparent, secure, and consistent (Drescher 2017). Considering that this technology is researched in a variety of domains, including logistics (Zhang 2022), healthcare (Lu & Tanniru 2023), or finance (Kou & Lu 2025), it is no surprise that its application towards the FSCs has also been widely discussed. For example,

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blockchain integration has been discussed in the context of coffee (Valencia-Payan et al. 2022), beef (Singh et al. 2023) and general FSC applicability (Cao et al. 2023).

In addition, several reviews (e.g. by Vern et al., Pandey et al. or Precht et al.) jointly highlight blockchain's ability to enhance transparency and traceability, reduce food fraud and information asymmetry, and also to improve food safety in the FSC. In parallel, Precision Livestock Farming (PLF) has emerged as a key digitalization trend in the German and European pig value chain, focusing on sensor-based, animal-specific monitoring (Vranken & Berckmans 2017, Maselyne et al. 2017). Yet, concerns about data manipulation and inadequate communication persist (Krampe et al. 2021), which blockchain could help address. In Germany, several government funded research projects are conducted, notably SPECK[1], TiPP[2] or NutriSafe[3] while, for example, the Asian pig value chain is already actively using blockchain in practice to enhance traceability of livestock-based products (Kampan et al. 2022). However, despite the generally agreed on benefits of blockchain technology for the FSCs and conducted research projects in Germany, we observed a lack of implementation in the German pig value chain.

Considering that Germany was the largest producer and second largest exporter of pork in the EU in 2020, the pig value chain is of significant importance. In addition, due to numerous national and international influencing factors, the structures of German pig farming and its upstream and downstream economic sectors have undergone major changes in recent decades(Rohlmann et al. n.d., Weible et al. 2016, Windhorst & Bäurle 2011). Thus, it could have been expected, that technological advances such as blockchain would have moved beyond research character and has already been employed in the industry. Therefore, we raise the research questions *What are the factors preventing blockchain adoption in the German pig value chain?*

While in the before mentioned review studies several challenges have been identified, we aim to gain direct insights and answers from within the industry. Therefore, in this paper, we conducted semi-structured expert interviews with a variety of actors from the German pig value chain, that have the power to push technological innovation. Our results show, that blockchain itself is known and the potential benefits are acknowledged but main drivers such as trust and traceability are already ensured by organizational ownership structures, long-standing business relations as well as existing sufficient systems. Therefore, we contribute to the existing body of literature in the domain of blockchain adoption research, highlighting the potential of context-specific industry characteristics that influence adoption factors beyond generalized adoption models.

The paper remainder is structured as follows: Section 2 and 3 outlines related work and the research methodology. Section 4 presents the results, followed by a discussion of findings in the context of blockchain adoption. The paper concludes with a summary.

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[1] https://www.uni-kassel.de/maschinenbau/en/institute/thermische-energietechnik/fachgebiete/solar-und-anlagentechnik/research/process-heat/project-speck-systemic-optimisation-of-the-meat-value-chain-using-the-example-of-pig-farming-through-the-development-and-embedding-of-digital-tools (accessed on 17.06.2025)

[2] https://projekt-tipp.de/ (accessed on 17.06.2025)

[3] https://www.nutrisafe.de/ (accessed on 17.06.2025)

2 Related Work

Studies presenting prototypes where blockchain technology is applied to the FSC or the agricultural domain in general are plenty (Pandey et al. 2022, Kumar et al. 2022, Vern et al. 2024). In this paper, however, we aim to investigate the factors that prevent blockchain adoption. This is an active field of research in itself, and in this section we roughly outline existing studies with a similar goal. We start by highlighting studies that focus on domain-independent factors and move further down to studies tailored towards the FSC or agricultural domain.

In (AlShamsi et al. 2022) the authors conducted a systematic review of blockchain adoption across different industries. They found, that adoption happened especially in the domain of supply chains (AlShamsi et al. 2022). To identify potential barriers, the authors showed that especially the TOE and technology acceptance model (TAM) frameworks were deployed. AlShamsi et al. identified across the analyzed studies that "[...] trust, perceived cost, social influence, and facilitating conditions were the significant determinants influencing several Blockchain applications."(AlShamsi et al. 2022).

Similar factors are observed by Bernardino et al.. In their study, the authors conducted a questionnaire with employees of different domains and levels and analyzed the responses via Structural Equation Modeling (SEM-PLS) (Bernardino et al. 2025). They highlight, based on their analysis, that especially "[...] Performance Expectancy and Social Influence positively affect the intention to adopt blockchain [...] underscoring the importance of confidence in the technology's reliability and security."(Bernardino et al. 2025). Furthermore, they identified barriers related to the environmental concerns (Bernardino et al. 2025).

Clohessy & Acton conducted a comprehensive literature review as well, also using the TOE framework as guidance with a focus on organizational factors along with case studies of companies in Ireland (Clohessy & Acton 2019). The three main organizational factors they identified are "[...] top management support and organizational readiness [...] and large companies are more likely to adopt blockchain than small to medium-sized enterprises (SMEs)."(Clohessy & Acton 2019).

For the domain of sustainable supply chain, Kouhizadeh et al. identified barriers, following the TOE framework as well as force field theories(Kouhizadeh et al. 2021). They were able to show that especially technological and supply chain inherent barriers are most critical (Kouhizadeh et al. 2021).

Malik et al. carried out a mixed-method study by creating a theoretical model based on the analysis of conducted qualitative interviews followed by a quantitative online survey (Malik et al. 2020). They focus their study on Australian organizations and therefore interviewed blockchain experts and decision makers across different Australian organizations (Malik et al. 2020). They contextualized their findings with the TOE framework. In the context of technological factors, they identified that the organizations intention to adopt blockchain are positively influenced by perceived transparency and compatibility while the perceived complexity and risk are negative influences (Malik et al. 2020). For organizational factors, they identified the "[...] organizational innovativeness, organizational learning capability, and top management support [...]"(Malik et al. 2020) as the main drivers. In terms of environmental factors, they highlight that for adoption

among Australian organizations do not depend of standard uncertainty but rather " [...] competitive intensity, government support,[and] trading partner readiness"(Malik et al. 2020)

A more focused investigation has been carried out in (Yadav et al. 2020). They investigated blockchain adoption barriers in the Indian agricultural supply chain by conducting a comprehensive literature review enhanced by five interviews from domain experts form academia, agricultural organizations and stakeholder (Yadav et al. 2020). As main adoption barrier of blockchain technology in Indian agricultural supply chains, they identified a lack of government regulations as well as a lack of trust from the stakeholder to use blockchain systems (Yadav et al. 2020).

Focused on the FSC, Mohammed et al. carried out a systematic literature review to identify enablers benefits and barriers of blockchain adoption. Their findings highlight, that especially "[...]scalability, interoperability, high cost, lack of expertise, and regulations[...]" (Mohammed et al. 2023) are the most common barriers of blockchain adoption in the FSC. On the other hand, they found that blockchain can aid in the process of product recalls by providing a trustful, transparent, traceable and decentralized system (Mohammed et al. 2023). They further highlighted the importance of additional investigation of why blockchain is used (or rather is not used) in FSCs (Mohammed et al. 2023). As, to the best of the authors knowledge, currently no such study exists with a focus on the German pig value chain, we contribute with our study to the body of knowledge of blockchain adoption in the FSCs.

3 Methodology

To gain insights into the German pig production value chain, we choose to conduct semi-structured expert interviews with actors from within the value chain. While other forms of interviews such as ethnographic interviews or narrative interviews are usually non-structured or open, the expert interviews are typically semi-structured, meaning the researchers define a rough set of guiding questions beforehand that are used to loosely structure the expert interview (Kaiser 2014). Expert interviews allow us further to capture interviewees' knowledge, expertise and insights in a specific domain (Kaiser 2014) that could not be accessed otherwise. The expert or interviewee in the context of an expert interview possesses information in a specialized domain, thus can be considered as a information provider from the interviewers point of view (Bogner et al. 2014). Note, that despite being an actively used methodology in the realm of Information System (IS) research (Myers & Newman 2007, Wilde & Hess 2007), Myers & Newman point out several difficulties when conducting and reporting on expert interviews. They developed guidelines to tackle these difficulties which we are following in this paper.

For each interview, we agreed with the interviewees beforehand if an online/telephone interview or in-person interview is preferred. All participants opted-in for an online interview. The interviews were conducted using Microsoft Teams. Before each interview, we asked the interviewees for their consent to record the interview and for the transcription and analysis of the recording later on, to which all interviewees agreed.

3.1 Development of Guiding Questions

In general, guiding questions will help to roughly structure the interview while maintaining the freedom of the interviewees to express their thoughts on the topic including experiences, ideas or opinions while also enabling follow-up questions or inquiries by the interviewer (Kuckartz et al. 2007). Thus, the guiding questions support the interviewers in their responsibility to create a natural conversation flow without interrupting the interviewees with a scripted sequence of questions (Niebert & Gropengießer 2014). In this context, we paid attention to the sixth guideline defined by Myers & Newman that states that despite having a set of guiding questions (or a script in a dramatic play), the flexibility to take the subject's reposes into account must be kept in mind.

Given the fact the general guidance from the TOE framework has been proven to be beneficial and is widely used (as shown in the related work in section 2) we will also rely on it. Thus, for the development of our guiding questions, we take the dimensions of the TOE framework (Tornatzky & Fleischer 1990) into consideration, too. Our guiding questions start with quick introduction of all participants (interviewers and interviewee) followed by general questions to the organization of the interviewee to "break the ice" and to establish a casual conversation atmosphere. As follow-up questions, we defined question resolving around currently used technologies and how they came into usage. We continue with guiding questions related to general digitalization aspirations in the German pig value chain. From this, we lead over to realm of blockchain with several guiding questions orbiting around potential usage, experiences with the technologies and the interviewees perspective on the technologies and its potential applicability in the German pig value chain.

In order to ensure the readiness of the guiding questions we conducted pre-tests, i.e. we used the guiding questions in test interviews and collected feedback on the structure and nature of the guiding questions. The pre-tests were conduced with two researches from the domain of Business Informatics and Agricultural Sciences.

3.2 Selection of Experts

Derived from our research question, we selected interview partners from different steps along the German pig value chain. We were especially looking for representatives of actors in the value chain that have the power and status to push technologies in the domain. In addition to that, we were also looking for interviewees that represent actors that are currently interfaces with different actors along the chain and currently facilitate data sharing between the different actors. Therefore, we reached out to actors such as slaughterhouses, meat producers but also adjacent actors such as governing bodies, quality assurance organizations or IT Providers. Also, we contacted representatives from food retailers. From out of 17 inquiries, we received 8 positive and 3 negative responses, and 6 times no response. From our inquiries for food retailers, we only received rejections, usually due to time limitations. In the following table 1, we list the eight experts that agreed to an interview along with their occupation and organization as well as the duration of the respective interviews.

In total, we conducted eight expert interviews and collected about 9 hours of audio material that were transcribed for further analysis. We as researchers are aquatinted

Table 1. Occupation and Organizations of Experts that agreed to our interview

#	*Occupation*	*Organization*	*Duration*
1	Research and Public Relations	Slaughterhouse and Meat Producers	00:53:48h
2	Auditoring Meat Classification and Quality Assurance	Service Provider Testing, Inspection and Certification	00:41:08h
3	IT	Service Provider Quality Assurance and Information Management	00:57:42
4	Management	Service Provider Meat Classification and Quality Assurance	01:02:57h
5	Business Development Management	IT Provider, Digital Solutions in Pig Production	00:53:41h
6	Data Management and IT	Service Provider Testing, Inspection and Certification	01:00:14h
7	Sustainability Management	Slaughterhouse and Meat Producers	00:55:00h
8	Technology Management Digital Business	Manufacturer of Feeding Systems and Stable Technology	00:47:56h

with the interviewee one but we did not have any relations with the other participants beforehand.

3.3 Coding Categories and Qualitative Content Analysis

In order to analyze the results from the conducted interviews, we transcribed them. To do so, we made use of the transcription feature of Microsoft Teams during the interviews, with the consent of the respective interviewee. We then anonymised the transcripts to prevent the interviewees and their employers from being recognized. We then revised the automatically generated transcripts, following the transcription guidelines from Kuckartz et al., e.g., we transcribed literally without transcribing dialects and slightly smoothed the language and punctuation. For each interview, a transcription was created and sent back to the respective interviewee for proof and clearance that the transcription can be used for our further analysis and publications. These transcripts are the input for our analysis.

We deployed a qualitative content analysis, following (Mayring 2015). For the coding process, we also relied on the guidelines of Saldaña. We choose a mixture of closed (deductive) and open (inductive) coding. For the deductive coding, we used *operationalization* (Mayring 2015) and derived base codes from our before stated research question. Based on our research question, we base our deductive codes on the *TOE* framework (Tornatzky & Fleischer 1990), that is well-known in the information system community hand as been applied in the space of blockchain adoption research as well (AlShamsi et al. 2022). This means, that we code in the context of *technology*, *organization* and *environment* as defined by Tornatzky & Fleischer. We do this, because these factors are the core that drive adoption of technological innovations. Within these core codes as rough guidelines, we conducted open coding to keep general flexibility allowing us to be able to capture the interviewees own thoughts and opinions. To conduct

the coding, we used the software MAXQDA 24 [4]. We choose to code on a detailed and specific level, the so-called "splitter" coding (also known as micro-coding), in which single sentences and paragraphs are coded, opposed to macro-coding (or "lumper" coding) where usually only whole paragraphs are coded (Saldaña 2021). The micro-coding approach allows for coding with a high level of detail that we later on group and categorize towards concepts (Saldaña 2021). In the first coding cycle (Saldaña 2021), we started to code the first transcript independently. We coded with a mix of pattern coding (identifying similarly coded data) and allow for simultaneous coding (i.e. we allow for multiple different codes for the same datum) (Saldaña 2021). After the coding of the first transcript was finished, we discussed and compared our codes and agreed on a common set of codes to be used for the next coding of transcript in the first coding cycle. For the second coding cycle, we followed through on pattern coding and started to group and abstract, knowing as "coding the codes" (Saldaña 2021).

4 Results

In this section, we highlight our main findings. As stated in our research question, we emphasize on factors preventing blockchain adoption. Therefore, despite having also coded general information about the value chain itself, we limit this results section to existing barriers and related codes to the research questions. A discussion of the results in the context of the existing literature is done in the following section 5.

Overall, we identified n=151 codes and coded a total of 748 segments across the eight transcripts. Note, however, that in this paper we especially focus on potential adoption barriers and reasons why blockchain systems are not present in the German pig value chain. Therefore, we focus on codes, that are directly related to this. This narrows the codes down to approximately n=52 open codes

In the following table 2, the deductive categories along with an excerpt of codes derived from the open coding is presented. Each code from the open coding follows a defined structure. It starts with a prefix, indicating the associated deductive category, i.e. *T_* for technology, *O_* for organization and *E_* for environment. The prefix is followed either by another indicator such as *barrier*, *motivation* or *priorities*, or by a description of the code in snake case.

First, the interviews provide vivid insights into the characteristics and circumstances of the German pig value chain. In general, we found that across all eight analyzed interviews, the number and heterogeneity of stakeholders that are active in the German pig value chain is highlighted, including large differences in the degree of digitalization of business processes among companies. The stakeholder map seems to be characterized furthermore by grown structures and relationships among established actors, as n=5 interviewees name trust in other organizations as an important enabler of collaboration and n=4 describe how they work together with other organizations on industry-related topics. Mentionings on the political circumstances of the value chain suggest that in tendency, companies have to meet a variety of legal requirements (in n=4 interviews), while facing insecurities about future regulation (n=3). Concerning the economic situation of compa-

[4] https://www.maxqda.com/

Table 2. Example of Used Coding Categories

Deductive Category	*Code from open coding*	*Explanation*
Technology	T_blockchain_no _additional_benefit	Coding for statements that indicate that blockchain would not provide additional benefit in the value chain
	T_blockchain_potential _benefit_trust	Coding for statements that point at trust building as a potential benefit of blockchain in the value chain
	T_costs	Coding that describe statements that highlight costs related to usage or introduction of technology
	...	
Organization	O_barrier_missing_slack	Coding that highlights missing slack (e.g. financial) in organization
	O_ownership_structures	Coding that describes statements about the structures of ownership of the organization
	O_priorities_neutrality	Coding that highlights statements that underscore the importance of the organization being neutral
	...	
Environment	E_enabler_ trust_in_organization	Coding describing the role of trust from the value chain in a certain organization as an enabler for technology adoption or sharing of data
	E_barrier_ missing_infrastructure	Coding that describes statements related to missing infrastructure needed for further digitalization
	E_progress_ in_digitalization	Coding that describes progress in terms of digitalization of the pig value chain
	...	

nies, n=5 interviewees point out a lack of financial slack, when it comes to investments for example. Other statements include insecurities about the market prospects of animal husbandry in general (by n=1 interviewee) and a lack of skilled workforce in the industry (n=2).

All interviewees state the importance of data sharing within the value chain. Accordingly, they also point out that already a set of technologies exists that facilitate data exchange. Additionally, several interviewees provided information on what they perceived as demand in the value chain regarding technological features In terms of potential blockchain benefits, 75% (n=6) state that they do not perceive any additional benefits from the technology. Note, that the interviewees were in general familiar with the technology itself.

As we set out to especially identify potential factors preventing blockchain adoption in the German pig value chain, we highlight our finding in the following figure 1. Note, that the interviewees especially highlight the investments that are required to facilitate this technology along the value chain as a main barrier. On a similar scale, missing infrastructure for digitization is an identified factors. Furthermore, required slack (e.g. financial or personnel-wise) is an observed barriers along with the negative attitude towards digitalization. Note, however, that the negative attitude is tightly coupled with a perceived lack of usefulness of blockchain. We found, in general, that the attitude towards digitalization and technological inventions is positive. However, only focusing on barriers does not provide the complete picture of the intricate interconnection of factors that play into blockchain adoption. Thus, we created a concept map in which we

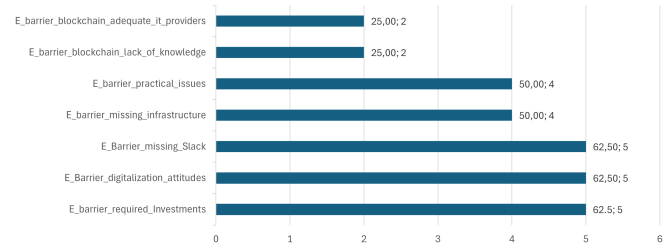

Figure 1. Identified Barriers of Blockchain Adoption in the German Pig Value Chain

build based on our specific codings, bottom up, the reasoning for why blockchain is not needed in the German pig value chain. The concept map itself is shown in figure 2.

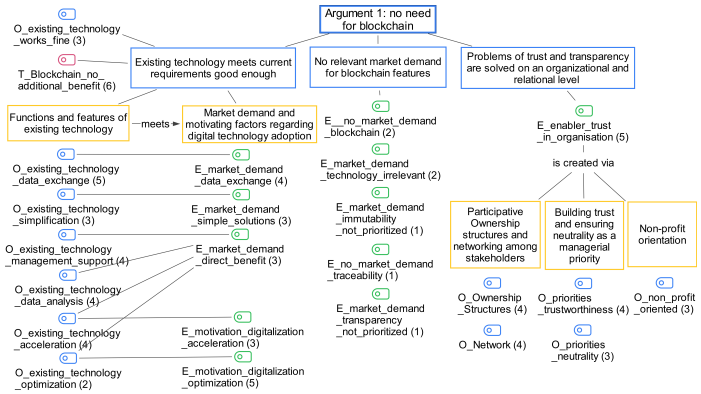

Figure 2. Developed Concept Map

Based on our coding, we identified that, as mentioned, most interviewees do not perceive any benefits from blockchain, which is expressed in n=25 individual nominations in n=6 interviews. At the same time, it is stated in n=3 interviews / n=7 mentions that existing technologies, such as cloud-based systems are sufficient to fulfill current needs. Mentioned features of existing technologies are data analysis, management support and acceleration (mentioned in n=4 interviews), simplification and traceability (n=3), general optimization of processes (n=2) and transparency (n=1). These are mapped to the statements regarding market demand, that is, the demand in the value chain for certain technological features. In n=4 interviews, demand for data exchange as a functionality is described, followed by the demand for sufficient data security, direct financial or operational benefits and simple-to-use solutions (n=3). This can be supplemented with statements about motivating factors for digitalization in general, of which the most often mentioned are optimization (in n=5 interviews) and simplification (n=4) of processes, acceleration and financial incentives (each n=3). It is notable, that the total number for process optimization and for financial incentives lies at n=16 and n=7 respectively, while all other categories concerning motivating factors have n=4 or less mentions.

Combining the codes informing about the features of the technologies in place with the perceived demand for technological features and motivation for technology adoption in the value chain leads to the conclusion that *existing technology meets current requirements well enough*.

Next to market demands in terms of functionality, such as traceability, n=2 interviewees do not perceive a demand for blockchain-based solutions in the value chain. In each one interview, a lack of demand for additional traceability and transparency as well as immutability is identified, since these features are currently not or only low prioritized as the existing technologies provide sufficient solutions. It is notable, that in n=2 interviews it is stated, that especially the end consumer would benefit from a blockchain-based system to gain additional insight and transparency. However, it is also noted that the end consumer currently does not demand such additional transparency (also n=2 interviews). Given the lack of demand from within the value chain as well as from the customer, we defined the concept that there is *no relevant market demand for blockchain features*.

Another observation is that the trust factor that is inherent to blockchain technology, seems to not play a crucial role as well. Based on the analyzed interviews, we observed that in the German Pig value chain trust plays a vital role but is met on an organizational level. For example, four out of eight organizations the interviewees belong to (Nr. 1, 3, 4, 6) are held by different actors of the value chain, enabling direct collaboration and representation of interest. Additionally, No. 3, 4, and 6 state that they are non-profit-oriented. The others emphasize that they are organized in a way that they keep neutrality and work towards trustworthiness, which includes long-standing networks and business relations with other value chain stakeholders. Thus, we can state that by participating ownership structures and networking among stakeholders a general baseline of trust is created in the value chain.

However, we were also able to identify that, in general, blockchain is perceived beneficial when it comes to trust building but at the same time, interviewees stated that the existing systems in place fulfill this purpose as well. Taken these aspects into consideration, the market has established trust structures. Therefore, we derive that *problems of trust and transparency are solved on an organizational level*, making a core aspect of blockchain obsolete.

Combining these identified concepts, we derive the following argument: *Given the existing technologies that already meet the requirements of the market, along with little to no demand for blockchain features and already solved problems of trust and transparency on an organizational and relational level, there is no need for blockchain in the German pig value chain.*

5 Discussion

Despite the the generally agreed on benefits of transparency, traceability and trust of blockchain technology (Bernardino et al. 2025, Malik et al. 2020, AlShamsi et al. 2022), our interview results reveal a divergence within this particular industry. Our analysis shows, that main actors in the German pig value chain do not see additional benefits of blockchain technology in compared to existing systems. In a similar fashion, the literature highlights trust-building as a core advantage of blockchain. We showed that this

advantage does not come into play in the German pig value chain. Instead, trust is built via ownership structures in which actors from within the value chain are stakeholders of, for example, IT service organizations or quality assurance organizations. This indicates that the factor of trust-building by blockchain is less relevant in the German pig value chain. Moving back to earlier stages of blockchain development, the identification of trust relations was highlighted as a vital part when developing blockchain-based systems (Wessling et al. 2018). In this context, Wust & Gervais already pointed out, that the usage of blockchain "only makes sense when multiple mutually mistrusting entities want to interact [...]"(Wust & Gervais 2018). Considering the statements from the interviewees and the organizational setup in the German pig value chain, we can state that there is already a level of trust existing, diminishing the appeal of blockchain technology.

Considering that the interviewees emphasized a general lack of infrastructure for digitization, the required investments play a crucial role. This is consistent with, for example, the findings of Malik et al. and AlShamsi et al., where main barriers orbit around the perceived costs and complexity of blockchain implementation. Therefore, at the moment, the financial and structural demands overshadow the potential benefits blockchain could offer in the German pig value chain. But note that, for example, the usage of a private or permissioned blockchain can lower transaction costs (Kannengießer et al. 2020), thus potentially mitigating the mentioned cost factor. Additionally, we found that the general market demand is declining and political insecurities hinder the willingness for investments.

In addition, the role of the market demand, or rather the identified lack therefore, is tightly coupled with the before mentioned cost structures and shapes the technology adoption decisions. But without an existing market demand, stakeholders are reluctant to allocated financial resources towards the integration of blockchain to, for example, enhance trust and transparency. This can be connected to the findings of Bernardino et al. who found that the perceived necessity is a driver for potential blockchain adoption. However, we found that, generally speaking, the actors in the German pig value chain are open for technological innovation. For example, technologies in the context of PLF are actively investigated and adopted as they allow for process optimization in the farming process by enabling, for example, single animal tracking and management. The perceived usefulness, in this context, is expected to be higher than, for example, blockchain technology. Based on these insights, we derive that in the German pig value chain, the main preventing factors of blockchain adoption are due to the already satisfactory performance of existing technology. Furthermore, existing organizational and relational trust, that, in some cases has been build over several decades, suffice for operational efficiency, diminishing the technological trust capabilities that blockchain offers. In addition, the economic realities faced by the stakeholders in the value chain are misaligned with the potential benefits and required investments. Furthermore, we found that several factors overlap with and between existing studies such as (Mohammed et al. 2023) or (Yadav et al. 2020). However, especially the factors of demand and trust via ownership structures are novel factors , indicating to incorporate more context-specific industry characteristics as generalized adoption models might not capture the nuances and unique aspects of distinct industries.

6 Conclusion

Even though blockchain is able to provide benefits such as transparency, traceability or trust-building, we observed that it is not applied in the German pig value chain. By conducting eight expert interviews with actors from within the value chain that possesses the power to make technological decisions impacting the value chain. Despite the fact that the general benefits of blockchain technology is acknowledged by the interviewees, the common perception is that it does not offer additional value opposed to the existing technologies and organizational setup. We especially emphasize on the organizational ownership structures. Key actors in the German pig value chain are owned by actors and organizations from within the value chain. In addition, quality assurance organizations, for example, are often organized as non-profit organization and emphasize of neutrality within the market. Additionally, the characteristics of trustworthiness is a organizational priorities of these organizations. This leads to our theoretical implications calling for more context-specific industry studies to identify potential adoption factors moving beyond generalized adoption models. However, our study has several limitations. Despite having a cross section across the German pig value chain, the sample size of eight interviews is fairly low. Despite also having interview partners from non-profit oriented organizations, this might lead to a bias in a way that these are established organizations that might have an interest in preserving the status quo in terms of trust and power structures. Given the different focus of the interviewees organizations, not every aspect could have been answered in a similar depth meaning the interviews, despite following the same guidelines and topics, were very heterogeneous. Note, that in this study, we did not include the farmers perspectives, as they are, currently, not in a position to push for a value chain wide technology adoption but rather focus on, for example, PLF systems (Berckmans 2017, Vranken & Berckmans 2017). Since the retailers we contacted rejected a participation in this study, usually due to time constraints, we lack their perspective which is an additional limitation. However, we think the statements that were made by our interviewees on behalf of farmers and retailers are reliable because they have vital relations with a wide range of stakeholders, but it has to be clear that the view on some stakeholders' interests is through the lens of others. But given the power position of retailers in the German pig value chain, their perspective is of utmost importance. Therefore, for future work, we aim to further enhance the study to gather their perspectives and approaches to a potential blockchain adoption as well.

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