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Onto the light side of sharing: Using the force of blockchain☆

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ABSTRACT

While the sharing economy has promised to solve a range of problems associated with traditional consumption, the reality is more akin to its inability or even exacerbation of economic and societal issues. We propose that blockchain technology could address these issues. To this end, we explain its potential by elaborating on how blockchain-based sharing services can help solve exploitation, data abuse, financial and legal risks, and the limited accessibility of current sharing practices. Moreover, we conduct a means–end chain analysis to provide a customer's perspective on the motivations and fears related to blockchain-based sharing solutions. We find four motives (trust, self-determination, quality of life, and security) and two fears (mistrust and economic interest) related to blockchain-based sharing. By juxtaposing the potential benefits of blockchain-based shared services with customer insights, we provide an outline of research avenues for promoting blockchain-based sharing to overcome the current dark side of sharing practices.

1. Introduction

The sharing economy, the poster child for the "light side" of novel consumer behavior, is often said to be in crisis. Journalists pronounced the sharing economy "dead" years ago (Kessler, 2015) and scholars in the field have started pointing out that it failed to deliver on many of its initial promises (Schor & Vallas, 2021). While it has become an important market—estimates of the sharing economy's market size range from \$335 billion (PwC, 2015) to \$1.5 trillion (bccResearch, 2020)—the sharing economy, which developed from numerous for-profit platform companies, has failed to meet many of its original expectations. Despite the tremendous economic success of the platforms involved, participants' skepticism and dissatisfaction have increased (Schor & Vallas, 2021). Furthermore, sharing services have been accused of financially exploiting contributors, abusing customer data, offloading financial and legal risks onto service providers and customers, and restricting access to sharing services. These developments stand in stark contrast to the ideal of "true sharing" (Belk, 2010), which emphasizes positive economic, social, and ecological effects and was one of the core promises of the sharing economy (Habibi et al., 2017). Accordingly, users face increasing disillusionment regarding the benefits of sharing assets (Hong et al., 2019).

However, considering the growing pressure to reduce carbon emissions and create socially inclusive markets, alternative consumption forms through sharing seem to have their *raison d'être* now more than ever. With an increased awareness of the problems of today's sharing services, the resulting skepticism may also be the necessary stimulus for a better "sharing economy 2.0." Accordingly, researchers and managers must rethink which forces can bring the sharing economy back to the light side. We propose that blockchain technology seems to have the potential to solve many issues of the sharing economy (Belk et al., 2019). Characterized by trust, reduced costs, accessibility, and safe transactions (Drescher, 2017), it could provide a natural fit, particularly in combination with the peer-to-peer sharing systems of the sharing economy.

Blockchain technology emerged a decade ago after the founding of Bitcoin, the first cryptocurrency, and enthusiasts quickly recognized its potential beyond financial facilitation. Blockchain technology has already transformed parts of the financial industry (Pal et al., 2021) and is expected to be implemented in diverse industries, including health care, logistics, and energy (Hua et al., 2022; Kuo et al., 2017). For example, it could facilitate the high need for trust in transactions among strangers in asset sharing and ensure high levels of security and

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transparency. Still, while anecdotal evidence from companies such as the Golem Network (shared computing resources; Golem Network, 2022) or Dtravel (blockchain-based Airbnb; Dtravel, 2022) point to the technological feasibility of sharing services based on blockchain technology, it remains unknown which of the dark sides of the platform-based sharing economy can be overcome by means of blockchain technology and how customers can be motivated to join blockchain-based sharing to ultimately enable the light side of sharing. The potential of blockchain-based sharing solutions has occasionally been highlighted in the academic discourse (e.g., de Filippi, 2017; Pazaitis et al., 2017), but it has neither been linked to sustainability issues in the sharing economy nor consumer behavior.

Therefore, we seek to investigate the following research questions. First, which dark sides of the sharing economy can be addressed through blockchain technology? Second, what motivates customers to (not) use blockchain-based sharing solutions? Third, how can future research contribute to establishing blockchain-based sharing solutions?

Extending the definition by Eckhardt et al. (2019), we define *blockchain-based sharing services* as platform services based at least in part on blockchain technology in providing users with temporary access to products or services that may be crowdsourced. Further, to make this rather abstract application of blockchain technology more comprehensible, for our empirical investigation, we use the concept of blockchain-based shared services in the mobility sector (referring to it as *blockchain-based shared mobility*) as a relevant use case in the sharing economy (Shaheen et al., 2021).

By investigating this phenomenon, this paper makes the following contributions. First, we provide a novel view on how to overcome the dark sides of current sharing services by introducing blockchain-based sharing services. By exploring the way in which the implementation of blockchain technology can solve current problems in the sharing economy, we add to the nascent literature on how blockchain technology can improve sharing services (de Filippi, 2017; Pazaitis et al., 2017; Tan & Salo, 2023). Second, we provide a customer's perspective on blockchain-based sharing services, which is currently missing in the existing literature. Identifying customers' motivations and fears is essential to understanding how blockchain-based services can be successfully implemented to solve the current problems in the sharing economy. Thus, not only do we contribute to the literature addressing the consumer's perspective on blockchain technology (Albayati et al., 2020; Gleim & Stevens, 2021; Raddatz et al., 2023), we also respond to calls to investigate the role of blockchain technology in facilitating the future of the sharing economy (Eckhardt et al., 2019). Third, while acknowledging that blockchain-based sharing services are a novel research field, we juxtapose the potential solutions of blockchain-based sharing with the customer perspective to outline avenues for future research. We thereby seek to illustrate what still needs to be investigated and better understood to successfully implement blockchain-based sharing services to overcome the dark sides of current sharing practices.

2. Conceptual background

2.1. The sharing economy

The sharing economy is an alternative concept of consumption characterized by temporary access compared to traditional ownership business models in which goods are sold to individual consumers.[1] In the marketing context, Eckhardt et al. (2019, p. 3) defined the *sharing economy* as "a scalable socioeconomic system that employs technology-enabled platforms to provide users with temporary access to tangible and intangible resources that may be crowdsourced." In this context, we can differentiate among the three most common manifestations—"access-based services" (Schaefers et al., 2016), "peer-to-peer asset sharing" (also called *collaborative consumption practices*; Benoit et al., 2017), and "true sharing" (Belk, 2010, 2014)—along the sharing continuum based on their level of focus on commercial exchange versus true sharing (Habibi et al., 2017). In all three models, unlike in a traditional acquisition, the user only gains temporary possession or control, not legal ownership, of the good or service provided (Eckhardt et al., 2019). While access-based services imply professional providers offering temporary access to their assets through a platform (Lehr et al., 2020; Schaefers, Narayanamurthy et al., 2021), peer-to-peer sharing platforms describe a triadic exchange among consumers, peer providers of assets, and the platforms mediating the exchange (Benoit et al., 2017). Both forms are characterized by an element of (financial) reciprocity that is absent in the community-oriented concept of "true sharing" (Belk, 2010, 2014). Critics of the sharing economy highlight that its catch-all terminology allows access-based services to "masquerade" (Belk, 2014, p. 11) as sharing services for marketing purposes and point out that "true sharing" lacks economic feasibility. Peer-to-peer asset sharing enables consumers to provide or use assets in a system that uses commonly idling, privately owned, and usually capacity-constrained assets (Acquier et al., 2017; Frenken & Schor, 2017). As such, it represents the balance between the sharing and commercial exchange characteristics of the sharing economy (Habibi et al., 2017) and has been widely investigated in previous research on sharing (see Wirtz et al., 2019). While we consider the various manifestations of the sharing economy to explain the current problems and the potential solutions that blockchain technology can provide in the sharing economy, we focus on peer-to-peer asset sharing for our empirical investigation.

Sharing practices have become increasingly popular, fueled by digitalization, consumer convenience, and the demand for sustainable consumption (Eckhardt & Bardhi, 2015). Despite their remarkable growth over the last decade, various problems have arisen that have affected how consumers perceive them and, ultimately, their success, including the development of the perception of a dark side of sharing practices that does not align line with the benevolent roots of the sharing economy (Belk, 2010). Various problems of the sharing economy have been highlighted in the academic and managerial literature:

- Problem 1: Exploitation of contributors (users and providers) by sharing platforms (e.g., Botsman, 2018)
- Problem 2: Data privacy risk and data abuse by sharing platforms (e.g., Lutz et al., 2018; Teubner & Flath, 2019).
- Problem 3: Legal and financial risks associated with asset provision on sharing platforms (e.g., Bardhi & Eckhardt, 2012).
- Problem 4: Restrictions regarding access to sharing platforms (e.g., Wong et al., 2020).

To contextualize these issues, we now introduce the key idea of blockchain technology. Subsequently, we elaborate on four problem statements relating to the dark side of the sharing economy and outline how blockchain-based sharing can provide a solution to them.

2.2. Blockchain: An emergent technology

Interest in "blockchain" technology has witnessed exponential growth since 2015 (Google Trends, 2022). The field is very volatile in nature, and perceptions of the technology remain vague. Blockchain, by definition, is a ledger (i.e., a system that collects information) in which data are stored on a distributed system of computers. Data "blocks" are available on many computers, ideally in the form of different owners in different locations (Tandon et al., 2021). Parts or all of the data blocks are saved on each computer, ensuring high redundancy levels and thereby promoting data integrity and a high tolerance against faults (Drescher, 2017). In a public blockchain network, the data and

[1] Synonymously used terms include the platform economy (Acquier et al., 2017), the gig economy (Ravenelle, 2017), lateral exchange markets (Perren & Kozinets, 2018), and the access economy (Belk, 2014), but these concepts have varying foci.

associated transactions can be accessed by all participants in the network, which makes the ledger transparent and verifiable (Ghiro et al., 2021). Once data are written on a block, they are irrevocable and permanently stored on that block, as subsequent blocks on the blockchain have a mathematical reference to previously written blocks (Drescher, 2017). Manipulations on single computers have no effect, as the majority (51 % consensus) overrules the minority in the system. As computing-intensive algorithms are used for the proofing processes, potential attacks on the blockchain are largely technically inviable, and the threat to the data integrity of blockchains is more theoretical than factual (Drescher, 2017; Swan, 2015).

A key benefit of blockchain is "disintermediation," which describes the lack of need for an expensive trust-keeping authority by design (Drescher, 2017). In the current sharing economy, this role must be filled by platforms operated by companies as a central authority, such as Uber or Airbnb. Blockchain-based sharing solutions can supersede these central platforms as authoritative bodies, thereby ensuring transactional trust and security. Nevertheless, blockchain technology still needs to be linked to platforms as user interfaces and facilitate peer matchmaking in sharing. Instead of central authorities, these platforms can be decentralized alternatives that operate on blockchain technology. Moreover, potential extensions of blockchain technology include the idea of running applications, contracts, and whole organizations on the technology, which would enable them to effectively act autonomously and independently of traditional shareholders and even governments (Drescher, 2017; Swan, 2015; Tapscott & Tapscott, 2016).

Smart contracts, as self-executing digital agreements, enable the automation of various administrative and contractual operations, thereby increasing the efficiency and transparency of transactions. Central to the idea of smart contracts is the notion that payments are made in advance by users and "stored" on the blockchain, often through an escrow contract. Escrow contracts are transactions in which the provider and receiver store their compensation for each other on the blockchain (Goldfeder et al., 2017). The associated compensation is forwarded to the parties only if both are satisfied with the outcome of their exchange. Furthermore, smart contracts facilitate an automated, immutable record of the interactions undertaken by participants, enhancing the overall security and collaboration within systems across sectors. The integration of smart contracts in systems can lay the foundation for a more secure and collaborative environment and is viewed as the main application of blockchain technology (Fiorentino & Bartolucci, 2021; Macrinici et al., 2018). To enable dispute management for smart contracts, there are on-chain dispute resolution mechanisms within blockchain networks (e.g., Kleros, Aragon), which are used as decentralized "courts," that employ randomly selected peers to form a decision-making panel. Another alternative for dispute management is provided by enhancing smart contracts with artificial intelligence (AI) and machine learning capabilities. The augmentation with AI has the potential to empower smart contracts in effectively addressing subjective terms. For instance, machine learning algorithms can be trained to assess specific conditions of the asset provided for sharing.

Despite its initial growth, the blockchain industry remains widely scattered, with more than 1,000 blockchains, over 17,000 cryptocurrencies, and numerous (short-lived) trends (CoinMarketCap, 2022). Each of these blockchains has a (slightly) different focus, different properties, and different system requirements, making it difficult to identify the right choice for service implementation. Moreover, the legal framework for blockchain technology is often unclear, as governance efforts to develop a regulatory framework remain nascent. While research has begun consolidating and outlining knowledge of the implementation of blockchain for business solutions, these investigations have mainly focused on payment applications and the finance industry (Loh et al., 2023). Thus, insights into the use of blockchain in marketing in general and sharing services in particular remain scarce (Tan & Salo, 2023). In fact, discussion around the potential benefits of blockchain-based shared services remains fragmented, and we lack a clear outline of which attributes of blockchain technology can actually help overcome the dark sides of sharing services (de Filippi, 2017; Pazaitis et al., 2017). Moreover, in light of public criticism and customer reservations about blockchain technology (Albayati et al., 2020), there is a need for a perspective on customer motivations and fears regarding the adoption of blockchain-based shared. In addressing this fragmentation and the lack of insight into blockchain-based shared services, we seek to (i) outline which dark sides of the platform-based sharing economy can be overcome by blockchain-based sharing services, (ii) provide a customer perspective (i.e., motivation/fears) on blockchain-based sharing, and, based on these findings, (iii) outline avenues for future research on the successful implementation of blockchain-based sharing.

2.3. Blockchain-based sharing as a potential solution to the problems of the sharing economy

In order to facilitate the "lighter side" of the sharing economy, blockchain technology offers many opportunities to overcome existing shortcomings. In particular, we outline how blockchain-based sharing technology can solve four key problems of the sharing economy, potentially becoming a force of light to overcome the dark side of sharing.

2.4. Solution 1: Blockchain can mitigate exploitation and provide fair compensation

A key problem of the sharing economy in its current state is the opportunity to exploit providers (Ravenelle, 2019), which results from the power imbalance between platforms and providers, whereby platforms keep providers' share of earnings low (Botsman, 2018; Schor, 2016). By providers offering their assets or workforce, they are mostly engaged on a pay-per-use basis. As such, platform providers can use their consolidated power to benefit from providers, for example, through exploitative commissions of asset provision below market value (Stocker & Takara, 2019). This is particularly true for sharing services with a monetary-exchange focus on the sharing continuum (Belk, 2014; Habibi et al., 2017). In the case of the ride-hailing service Uber, drivers might make $4 or less per hour, which does not even cover vehicle costs (Zoepf et al., 2018). More generally, providers are key stakeholders in the delivery of the sharing service (e.g., Xiang et al., 2022), not shareholders, yet they lack the power of traditional business partners or employees (Ahsan, 2020). Practices where people contribute to the success of a platform but do not really benefit from its prosperity (Pazaitis et al., 2017) distort the intended distribution of rewards in shared systems (Kostakis & Bauwens, 2014). Over the long run, this threatens the functionality and availability of sharing services, as they are highly dependent on these providers to offer accessible goods or services (Xiang et al., 2022).

A conventional remedy to address this dark side of the sharing economy could involve opting for less dominant platforms. However, less prominent platforms face trust concerns regarding transaction systems among providers and customers alike. Blockchain technology can provide a solution to this dark side, as it allows interaction between providers and consumers by establishing a trustable transaction system without the need for a middleman, such as a dominant platform provider. This not only gives power to providers but also facilitates transactions at lower costs and keeps transaction fees low by avoiding brokerage commissions (Catalini & Gans, 2016); thus, technology can help sharing platform providers facilitate transactions at lower costs (Giungato et al., 2017), which could lead to higher compensation for providers. In this most radical form, a classical intermediary company is replaced by a decentralized autonomous organization (DAO): an organization "operated" by a computer program (Swan, 2015). An example of such a DAO is Decentraland, a metaverse (i.e., a virtual world) that is owned and democratically administered by its users (Decentraland, 2022). Similarly, building on blockchain, the asset-sharing company could then be owned by participants in a modern form of a cooperative, which has been proposed as a potential solution to sharing economy issues in various contexts (e.g., Acquier et al., 2017; Eckhardt & Laamanen, 2022). Carsharing cooperatives have been operating locally for over two decades (Truffer, 2003), but they often remain limited in size and effectiveness. Presently, blockchain technology presents an avenue through which to scale the idea of cooperatives to the dimensions of existing platforms while concurrently establishing a trustworthy transaction framework.

2.5. Solution 2: Blockchain can ensure data privacy

The agglomeration of data on platforms in the sharing economy poses a data privacy risk and the potential for data abuse (Lutz et al., 2018; Richter & Slowinski, 2019; Smichowski, 2016; Teubner & Flath, 2019). Sharing companies have a powerful direct interface with consumers, and the potential for the use and abuse of customer data in the sharing economy has been extensively addressed in the academic literature (Lutz et al., 2018; Teubner & Flath, 2019). While consumer data, in general, contain valuable information, consumer data obtained in the sharing economy is especially intimate (Lutz et al., 2018). For example, within shared mobility services, users are often asked to reveal their real-time locations as well as payment and demographic information. Users are often unaware of the extent to which their data are stored and used; companies view these data as a tradeable good, which they save and sell (Brandtzaeg et al., 2019). Previous cases have demonstrated that companies have misused this power, such as by enabling administrative staff to track providers and users without their knowledge, even while not using the app (Hill, 2014). Furthermore, the vast amount of information possessed by sharing providers poses additional security risks. Historical hacks have indicated that consumer data are not always securely stored and that the magnitude of breaches can be substantial. For example, recent data breaches include sharing economy companies such as Taskrabbit and Airbnb, from whom thousands of consumer datasets were stolen (BBC, 2018; Scroxton, 2020). This lack of trust in data security can have detrimental effects on participation in the sharing economy.

Conventional approaches to solving this dark side of current sharing solutions involve platforms initiating data transparency measures, making the utilization of data more visible and controllable. However, this conventional path fails to address the fundamental issues of centralized data storage and conflicting interests between platforms and users/providers. This is where the decentralized nature of blockchain technology proves advantageous. Blockchain technology can address this problem, as its design features, such as cryptography and distribution, provide a safe data environment (Drescher, 2017). Sharing economy platforms can benefit from the increased safety provided by the strong focus on cryptography and decentralization, making it more difficult for attackers to steal data compared to more traditional storage methods. Further, even if an attacker is successful against blockchain technology, the hack might only obtain data fragments instead of access to all data sources, as in the case of platform providers (Drescher, 2017). Moreover, operating independently of a central authority, such as a platform operator, blockchain implementation shifts the authority over privacy decisions to service contributors (i.e., users and providers). Thus, blockchain-based sharing platforms are independent of a central authority (e.g., a platform operator). With the implementation of blockchain technology, ownership over decisions regarding the privacy strategy of the service lies with the consumers contributing to the service. The community could decide to use only anonymized data for commercial purposes or give up the use of customer data entirely (Kiyomoto et al., 2017). An opt-in system for the use of specific customer information could also be implemented. Storing data in a public chain that is not centrally accessible allows consumers transparency in monitoring and exercising control over their data—the most significant advantage over customer data records on a central platform. To exemplify, the company PingIdentity (2022) offers a blockchain-based solution in which customers can administer their own customer data profiles, which can be forwarded on demand to companies without direct interaction between the customer and the company. While the sharing economy cannot operate without the use of customer data, blockchain technology can give consumers data superiority and the chance to take part in the added-value process of using these data.

2.6. Solution 3: Blockchain can reduce legal & financial risks associated with asset sharing

Sharing requires peers to interact with strangers, and trust is an essential asset to such interactions (Botsman, 2018). Accordingly, one key value proposition of sharing platforms is the trust-creating intermediation of the exchange (Perren & Kozinets, 2018). Enforcing this need for trust-sharing interactions entails a predominant financial risk to the service providers sharing their assets. Shared assets are often costly, particularly in mobility and home sharing. For many people, a car (e.g., Turo), boat (e.g., Boatsetter), or plane (e.g., Wingly) is one of the largest investments they will make in their lifetimes. The desire to protect an asset is natural, and many consumers are understandably reluctant to use shared services due to the perceived risks (Hazée et al., 2017). Consumers will consider and execute a transaction for an unknown return if they trust the seller. Especially in the sharing economy, where transactions must be made and trust must be created with strangers under uncertain conditions, trust is a significant issue (Ert et al., 2016). In this context, the role of governance and social control platform intermediation mechanisms, for example, insurance and peer-rating systems, is crucial to reducing the risk from participation and overcoming participation barriers (Perren & Kozinets, 2018). Relatedly, however, contributors in the sharing economy often depend on company platforms (Möhlmann & Geissinger, 2018) with often opaque and unclear contingency measures in case damage occurs (Ravenelle, 2019).

Reputation systems such as user and provider reviews (e.g., Uber, Airbnb) are currently used to prevent the potential legal and financial risks associated with using sharing solutions. However, blockchain technology offers more sophisticated resolutions to mitigate these risk via smart contracts and advanced dispute management. Smart contracts are automatically executed when certain conditions are met (e.g., in the case of damages). In this context, blockchain could be applied to handle damages to shared assets. By using smart contracts, the actual state of the asset, such as the vehicle, can be recorded prior to lending, and if any damage occurs, the data stored on the blockchain can be used for verification (Swan, 2015). Further, this joint predefinition of the contract elements might lower the subjectivity of agreements and the ensuing dissatisfaction based on self-serving biases (Campbell & Sedikides, 1999). For dispute management, smart contracts might be integrated with an on-chain dispute resolution mechanism that employs blockchain's courts (e.g., Kleros, Aragon) or AI augmentation to assess the specific conditions of the asset provided for sharing.

Moreover, blockchain technology can be used for transactions, such as ownership records to prove the authenticity of a shareable asset, which can prevent fraud by criminals who use foreign property. Peer-to-peer settings bear the risks of consumer retaliation in case of subjectively unjustified reviews (Rifkin et al., 2020). Utilizing smart-contracts to minimize the subjectivity could help to mitigate this risk, reducing the potential for negative word-of-mouth. Especially in the case of platforms whose main value proposition lies within efficient intermediation (as opposed to platforms with high consociality; Perren & Kozinets, 2018), tools such as escrow contracts could lower the need to spread financial risks among participants and, consequently, overall costs. The viability of such a system is demonstrated by the Japanese NEC Corporation (2022), which developed a blockchain for ID management in enterprise environments. Profile verification can be based on an identity that uses blockchain technology, which is often suggested in authentication settings (Harman, 2014; Lee, 2017).

2.7. Solution 4: Blockchain can facilitate universal access to the sharing economy

According to Harman (2014), "the sharing economy is not as open as you might think." While sharing can reduce the costs of mobility (Shaheen et al., 2017) and allows access to assets at the base of the pyramid (Schaefers et al., 2018), supply is often limited to certain consumer groups. There are several barriers to participating in the sharing economy. Research reveals that age, income, and location can drastically reduce access to sharing services (Wong et al., 2020). For example, a credit card is usually a requirement for purchasing services in the sharing economy, and limited access to credit cards has been shown to be a barrier for sharing users (Dillahunt et al., 2017). Low-income populations are often under- or unbanked; according to the Federal Reserve System (FED, 2019), 22 % of the adult US population belong to this group. Despite reducing the costs of, for example, mobility, however, sharing might remain more expensive than other means of transportation (e.g., public transportation), thus pointing to the need for further cost reduction to enable increased accessibility to the wider public.

Addressing access restrictions poses a challenge for conventional solutions, particularly when traditional forms of payment (e.g., credit cards, bank accounts) are needed. However, to overcome barriers that limit access to the sharing economy, blockchain technology can help in two ways. First, with blockchain technology, sharing transactions can be automatically processed using smart contracts based on, for example, a user's biometric features. An example is Worldcoin, a cryptocurrency based entirely on the biometric features of the user (Worldcoin, 2022). This technology could, for example, allow consumers without credit cards to use a sharing service, which would make sharing services much more accessible. Second, blockchain technology lowers the cost of sharing by reducing or excluding the transaction fees of the middleman (as outlined above), thus potentially making sharing more affordable for low-income consumers. In addition, given the transparency of the system, security deposits could also be reduced based on a personal risk score and insurance claims simplified through information saved on the blockchain (Underwood, 2016).

In terms of benefits, blockchain technology has the potential to overcome four key problems of the current sharing economy and thereby fuel its development and bring it closer to its initial ideals (Schor & Vallas, 2021). To make use of these benefits, however, consumers must eventually adopt blockchain technology—which is still a new and controversially discussed technology (Forbes, 2019). Below, we investigate consumers' motivations and fears regarding the usage of blockchain technology in the sharing economy.

3. Empirical investigation

To explore consumers' motivations and fears in relation to the use of blockchain-based sharing services, we use a means–end chain analysis. We then juxtapose the resulting attributes, functional and psychological consequences, and values with the theoretical findings of the previous section in order to propose novel directions for consumer-oriented research in blockchain-based asset sharing.

3.1. Means–end chain analysis

Means–end chain (MEC) analysis is an exploratory research method rooted in expectancy-value theory (Gutman, 1997). Grounded in the premise that consumer actions stem from a collection of motives to achieve certain outcomes (Gutman, 1997; Olson & Reynolds, 2001), this concept posits that consumer behavior is driven by the fundamental desire to attain personal goals. Consequently, consumers purchase products or services with the primary intention of fulfilling these personal goals (Reynolds & Gutman, 1988). These consumer motivations are not always directly observable, as consumers have latent goals (Schaefers, Ruffer et al., 2021). To explore underlying goal structures, the MEC method allows for an in-depth exploration of the association between customers' cognitive motivational patterns and (future) products or services (Merfeld et al., 2019; Walker & Olson, 1991). This process can be elucidated by connecting frameworks of product or service attributes, consequences, and values with corresponding goals and motivations, thereby shedding light on an individual's underlying motives (Pieters et al., 1995; Reynolds & Gutman, 1988). In our case, service attributes serve as a means to desired ends; thus, they do not only describe the defining aspects of the service in general but also inform future service providers about relevant attributes to consider in order to successfully design and market the service to the consumer (Schaefers et al., 2021). We chose the MEC approach over alternative research methods and theories, such as the technology acceptance model (TAM; Davis, 1989), as it offered a more in-depth exploration of the association between customers' cognitive motivational patterns and this new service technology and allowed us to uncover the specific goal structures and motivational patterns that drive the acceptance of blockchain technology. Further benefits of the MEC approach for our research context include the combination of qualitative and quantitative analysis elements (Aurifeille & Valette-Florence, 1995) and its effectiveness in exploring novel phenomena, as theoretical saturation is often reached when relatively small sample sizes are used (e.g., Pieters et al., 1995; Schaefers, 2013). Moreover, the MEC theory has been applied to analyze customer and organizational motivation in various contexts (Bagozzi & Dabholkar, 1994; Pieters et al., 1995; Schaefers, Ruffer et al., 2021), including carsharing services (Schaefers, 2013; Wilhelms et al., 2017). The approach has been extended not only to exploring positive motivational structures but also to investigating the underlying causes of resistance to novel technologies (Kuisma et al., 2007; Merfeld et al., 2019).

The MEC appraoch is organized in a fixed sequence, beginning with attributes (the lowest level) and progressing through functional and psychosocial consequences to values (the highest level). This specific order can be outlined in four steps: (1) a product or service is characterized by distinct attributes, (2) leading to specific functional consequences, which then (3) give rise to psychological consequences that ultimately result in (4) the values that consumers aim to achieve through their consumption decisions. This entire structure is referred to as a "ladder" (Reynolds & Olson, 2001).

MECs are incorporated into a hierarchical value map (HVM), which aggregates the individual chains. HVMs consist of nodes and corresponding links among attributes, consequences, and values. The thickness of the connecting lines represents the number of associations mentioned (see Fig. 6 for details). HVMs provide a visualization to summarize the identified ladders, enabling researchers to identify patterns and clusters within the data (Gengler et al., 1995).

3.2. The case of peer-to-peer carsharing

In our empirical investigation, we focused on carsharing, which has become a key area of research on the sharing economy (e.g., Bardhi & Eckhardt, 2012; Lamberton & Rose, 2012) but also provides a good fit to address blockchain-based technology. Vehicles represent a good of high economic value but are mostly being underutilized and shared without the provider being present. Moreover, in terms of the fit with blockchain-based technology, we focus specifically on peer-to-peer carsharing—where peer providers own and rent out cars to consumers, and platforms mediate the exchange. Several companies operating in the mobility industry have declared an intention to use or invest in blockchain technology. Investors in blockchain technology include DiDi Chuxing, China's largest ridesharing provider (Coleman, 2018). EY developed the platform "Tesseract," which allows for fractional blockchain-based ownership of shared (autonomous) vehicles (Cardell

& Schartau, 2020). Furthermore, the company Share&Charge established a peer-to-peer platform for charging electric vehicles using blockchain technology to process transactions (Energy Web, 2021).

An understanding of the associated technology is essential for research interviewees to be willing disclose their personal attributes, consequences, and values (Reynolds & Gutman, 1988). The context of assessing consumers' perceptions of a hypothetical service is common in the innovation research domain but still difficult for participants. To facilitate the process by which consumers link product and service attributes in service innovation research, we used an integrative approach, combining MEC elements and market information to design and test new services (Søndergaard, 2005). Therefore, we made the context of blockchain-based asset-sharing services accessible to consumers and empirical investigation by adopting a specific asset-sharing context (carsharing) and presenting the participants with a fictional blockchain-based peer-to-peer carsharing provider called "Blockshare" (similar to existing blockchain-based services in the field, e.g., Helbiz, HireGo, and DAV; see Appendix 1). In order to instruct the participants, this information was simplified, freed from suggestive cues, and presented on slides during the interview process.

3.3. Data collection, dataset, and interview techniques

We employed a six-step research process: interviewee recruitment, interviews, interview transcription, content analysis and data coding, establishment of summary score and implication matrices, and HVM construction (Wilhelms et al., 2017). The data were collected by laddering the interviews using a predeveloped interview guide (see Appendix 2; Reynolds & Gutman, 1988). This data collection approach paved the way to link attributes with consequences and values. The laddering interviews formed the foundation for the following steps of the data analysis. Fig. 1 shows the research process.

Data collection. We used a sample of 22 participants. We recruited volunteers based on a snowball sampling through a German university and consequently sent them a screening questionnaire with selection criteria. The participants were purposively sampled based on these predefined selection criteria, such as sociodemographic, geographic, and cultural characteristics (Prieto et al., 2017; Shaheen et al., 2012). The selection criteria were defined by the group that was most likely to use peer-to-peer carsharing services: possession of a driver's license and regular car use, young and well-educated customers (Habibi et al., 2017; Shaheen et al., 2012). We also sought to include both participants who were more versus less technology-focused (i.e., technology open) in general and especially those with varying levels of familiarity with sharing services and basic knowledge of blockchain technology. The participants did not receive compensation for their participation. The sample included 12 males aged 20–34 and 10 females aged 21–32. Table 1 provides an overview of the participants' demographics.

Interview technique. Research suggests the use of the laddering interview technique to gain primary interview data in comfortable surroundings (Grunert & Grunert, 1995; Reynolds & Olson, 2001). Accordingly, a semi-structured interview guide was developed, and no judgments were made on the correctness of the participants' answers. To meet predefined principles, the laddering questions used were open-ended, clear, and neutral (Patton, 2015). As in-person interviews allow the interviewee to remain relaxed and the interviewer to adjust to the reactions of the interviewee, we chose settings accordingly (Sturges & Hanrahan, 2004).

Interview guideline. To acclimate the interviewees, the initial questions had a generic focus and were easy to answer (Reynolds & Gutman, 1988). The interviewer asked the participants for definitions of the concepts to ensure a mutual understanding of blockchain and peer-to-peer carsharing. While this process allowed the interviewees to ask questions, it also paved the way for the interviewer to establish a common understanding and ensure clarity (Patton, 2015). The hypothetical Blockshare scenario was subsequently presented to the interviewees to provide them with a tangible example (Søndergaard, 2005; see Appendix 2 for an overview).

Laddering interviews. After introducing the interviewees to the Blockshare concept, the interviewer applied the direct election method to present relevant product and service attributes by asking them why they would (or would not) use the Blockshare application. The interviewer then iteratively asked why specific elements were essential to the interviewees. Applying this technique allowed the interviewer and interviewee to uncover non-observable motivations and fears (Reynolds & Gutman, 1988; Wagner, 2007). After 22 interviews, no new information was forthcoming, signaling that the point of saturation had been reached (Glaser, 1965) and prompting the conclusion of the interview process. All interviews were audio-recorded and transcribed verbatim. To ensure neutrality, an external team transcribed the interviews using Dresing and Pehl's (2010) transcription model. The transcripts culminated in approximately 194 pages of single-spaced text and over 90,000 words.

3.4. Data analysis, coding, implication matrix, and hierarchal value map

The data analysis followed the standard procedure of a MEC analysis (Grunert & Grunert, 1995). The interviews were coded based on the three-step sequential approach introduced by Wolcott (1994): description, analysis, and interpretation. Therefore, individual ladders for the interviewees were created, and repetitive statements were summarized, aggregated on the coding level, and given numerical identifiers. As the interviewees' statements might have pertained to the same ladder multiple times and then be summarized in the summary score matrix (Wilhelms et al., 2017), redundancies in the interviews were eliminated. Next, we built the implication matrix and visualized it in the HVM (Reynolds & Gutman, 1988; Schaefers et al., 2021). The HVM aims to depict service attributes and functional and psychological consequences and their respective values and connections to overarching motivational structures (Reynolds & Gutman, 1988). As this study analyzed a technology that was also associated with fears in the past, the MEC analysis was split into motive- and fear-related chains (Merfeld et al., 2019).

The HVMs were created based on the implication matrix—as illustrated in Tables 2 and 3—by applying a cutoff value of a minimum of three associations (i.e., elements and associations occurring fewer than three times; Reynolds & Gutman, 1988; Schaefers, 2013). The thickness of the lines represents the strength of the connections, allowing readers to identify dominant motivational structures. The preliminary findings were checked by presenting three participants with the findings and soliciting their feedback (Creswell, 2013). Moreover, by following the guidelines and a redundant coding task and checking for intercoder reliability, high quality was ensured throughout the analysis process (Kassarjian, 1977).

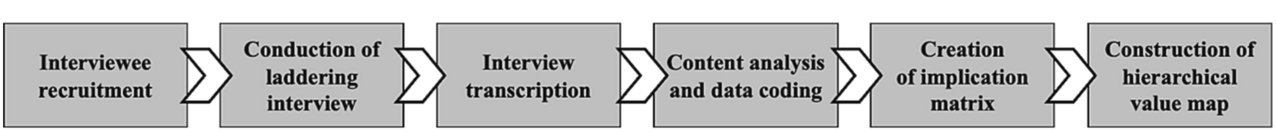

Fig. 1. Research process adapted from Wilhelms et al. (2017).

Table 1
Sample characteristics.

Participant ID	Gender	Age	Place of residence (number of inhabitants)	Highest educational attainment	Occupational situation	Annual income (€)	Technology adoption	Carsharing usage
1	Male	20	100.000–500.000	Abitur	Student	No information	Innovator	Yes
2	Female	21	<20.000	Abitur	Student	<20.000	Early adopter	No
3	Female	23	100.000–500.000	University (Bachelor)	Student	<20.000	Early adopter	Yes
4	Female	24	100.000–500.000	University (Master)	Employee	>60.000	Early adopter	Yes
5	Female	24	<20.000	University (Master)	Employee	20.000–30.000	Early adopter	No
6	Male	24	>500.000	University (Bachelor)	Employee	No information	Innovator	No
7	Female	25	>500.000	University (Master)	Student	<20.000	Innovator	No
8	Male	25	>500.000	University (Bachelor)	Student	<20.000	Early adopter	No
9	Male	25	100.000–500.000	University (Bachelor)	Student	<20.000	Innovator	No
10	Male	26	>500.000	University (Master)	Employee	50.000–60.000	Early adopter	No
11	Male	27	<20.000	University (Master)	Employee	No information	Early adopter	No
12	Female	27	<20.000	University (Master)	Student	<20.000	Late Majority	Yes
13	Male	27	100.000–500.000	University (Master)	Student	<20.000	Early Majority	No
14	Female	27	100.000–500.000	University (Master)	Student	40.000–50.000	Late Majority	Yes
15	Male	28	>500.000	University (Master)	Employee	50.000–60.000	Innovator	Yes
16	Male	29	<20.000	University (Bachelor)	Student	No information	Innovator	No
17	Female	30	100.000–500.000	Ausbildung	Employee	<20.000	Laggard	No
18	Male	32	<20.000	Ausbildung	Employee	>60.000	Early adopter	No
19	Female	32	100.000–500.000	University (PhD)	Employee	>60.000	Late Majority	Yes
20	Female	32	<20.000	University (State Bar)	Student	<20.000	Laggard	No
21	Male	33	100.000–500.000	University (PhD)	Employee	>60.000	Early Majority	Yes
22	Male	34	100.000–500.000	University (Master)	Student	<20.000	Innovator	Yes

4. Findings & discussion

4.1. Means–end chain and hierarchical value map

The MEC analysis revealed 33 elements in the motive-related chain (see Fig. 2) and 31 in the fear-related chain (see Fig. 3). The following sub-sections present the dominant chains and juxtapose them with the blockchain and carsharing literature to identify novel insights in the blockchain-based sharing context.

Figs. 4 and 5 illustrate the HVMs' graphical representation of the aggregated MECs, outlining motivations for blockchain-based peer-to-peer carsharing. The HVMs were simplified to enhance their readability. We included only those elements with at least three associations, which resulted in informative and stable HVMs (Gengler & Reynolds, 1995; Reynolds & Gutman, 1988).

5. Motive-related ladders

5.1. Trust

A key motivation for consumers to use blockchain-based sharing is *trust*. Trust was directly associated with the psychological consequence *transparency* and the functional consequences *no hacking* and *data safety*. These consequences, in turn, were based on the functional attribute *distributed system* of a blockchain. In other words, the interviewees linked *trust* to blockchain technology and its characteristics. The interviewees reported that trust in the sharing process was raised by the integration of blockchain—particularly when it came to the use of personal data and the additional security and transparency associated with the distributed ledger system:

> "Using the blockchain technology, information will be stored in a more secure environment and sharing of information will be more transparent." (ID 7)
> "And for me personally, this means that I feel safer and can have more trust in the app." (ID 15)
> "With the blockchain my data can only be accessed with my authorization" (ID 22)

Similarly, the participants perceived the network structure to be transparent and, as a result, expressed confidence in using a service built on blockchain technology. Therefore, the transparency of blockchain-based systems can act as a trust-building factor. Another interviewee (ID11) emphasized that every transaction was permanently stored in the network, thus perceiving reduced incentives for illegal actions.

These findings regarding trust align with reports in the blockchain technology literature that highlight transparency (Subramanian, 2017) and trust (Christidis & Devetsikiotis, 2016) as crucial advantages. While some authors have argued that the blockchain system is trustworthy by design (Imeri et al., 2019), others have acknowledged that there are limits to these systems (Hawlitschek et al., 20218), including that blockchain technology can only be a supplementary technology in facilitating trust in the provider–user relationship (Secinaro et al., 2021). Insights into combining blockchain technology and sharing services, however, remain scarce; in particular, when it comes to exploring how blockchain can actually help elevate trust in the sharing economy (e.g., Hawlitschek et al., 2018), an integrative research approach remains lacking.

Taking these factors together, there are insights into user perceptions of trust that link blockchain technology to an increase in trust in the sharing economy, thereby supporting the motivation of users to overcome mistrust in the current technology and creating an opportunity to convince them to adopt blockchain technology. It also demonstrates the significance of transparency for users in the sharing economy.

5.2. Self-determination

A strong motive associated with the potential use of blockchain-based sharing was *self-determination*—the motivation to be autonomous and make choices based on one's intrinsic motivations and values. It was characterized by the psychosocial consequences *privacy* and *flexibility*, which in turn built on *data safety*, *replacement for own car*, and *availability*. While *flexibility* and *replacement for own car* were related to the use of sharing services (attributes: *peer-to-peer* and *fleet size*), *privacy* was described as elementary for the service consumption and was directly linked to the functional consequence *data safety* in relation to blockchain technology.

The interviewees' desire to maintain control over their personal data (ID 01; ID 20) and actively manage the use of their data (ID 02; ID 03) was tied to self-determination. They especially criticized the potential commercial use of customer data by sharing platforms:

> "I do not want my private data lying around the world; instead, I want to decide how my data is accessed and used; I see clear benefits of the blockchain here." (ID 2)

Table 2
Implication matrix of promoters depicting the frequency of associations between elements.

	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
(1) Anonymized data	5.0									0.05								0.03	0.02	0.01					
(2) Smart contract	1.0	6.0	1.0								0.06				0.01				0.04	0.02		0.05			
(3) Fleet size				2	3.0	3.0	4.0	6.0			0.03	0.07	0.03	0.04		0.02		0.03	0.02	0.02	0.01	0.09	0.01	0.01	
(4) No intermediary			1.0	13.0				1.0			0.01		0.12			0.02		0.01	0.01	0.02	0.02	0.10	0.01	0.03	
(5) Distributed system	5.0		2.0						3.0	0.03	0.01		0.01		0.05			0.03	0.03	0.01		0.01	0.04		
(6) Peer-to-Peer				1.0			1.0	3.0			0.03		0.01	0.01			0.01		0.01		0.01	0.04			0.01
(7) Digital identity	3.0											0.02			0.01				0.01			0.02			
(8) Instant payment			1.0								0.01											0.01			0.01
(9) Data safety										7.0		2.0			4.0			0.05	0.05	0.01	0.01	0.02			0.01
(10) No legal Issues											6.0								0.03	0.01		0.05	0.01		
(11) Reliability										1.0	4.0		1.0					0.01	0.03	0.02		0.03	0.02		0.01
(12) Affordability												1.0	14.0			1.0		0.02		0.02	0.02	0.12			
(13) Easy to calculate											3.0								0.02	0.01		0.03			
(14) Replacement for own car												3.0						0.03			0.01				
(15) Access without ownership													1.0	3.0		2.0	1.0				0.01	0.05		0.01	
(16) Availability											3.0	4.0		2.0		1.0			0.01			0.08		0.03	
(17) No hacking															3.0				1.0				0.03		
(18) Privacy																		5.0	3.0	1.0					
(19) No worries																			4.0	1.0		8.0	2.0		1.0
(20) Flexibility																		3.0			1.0	4.0		2.0	
(21) Save money																		1.0		3.0	2.0	12.0			
(22) Mobility																					1.0	3.0		2.0	
(23) Transparency																			3.0	1.0			3.0		1.0
(24) Save time																						4.0			
(25) Social Cohesion																					1.0	1.0			
(26) Self-determination																									
(27) Security																									
(28) Financial Efficiency																									
(29) Sustainability																									
(30) Quality of life																									
(31) Trust																									
(32) Freedom																									
(33) Convenience																									

Table 3
Implication matrix of barriers depicting the frequency of associations between elements.

	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
(1) Immature technology		5.0	1.0	3.0	3.0				3.0		1.0			0.09	0.01	0.01	0.01	0.02			0.12	0.01			
(2) Distributed data storage		3.0	1.0										1.0	0.03			0.01		0.01		0.04	0.01			0.01
(3) Computational power						2.0							1.0	0.02					0.01		0.02	0.01	0.01		0.01
(4) No intermediary			3.0		1.0		7.0				1.0			0.06		0.02	0.01	0.02	0.02		0.06	0.05	0.03	0.01	
(5) Peer-to-Peer							1.0	3.0		2.0	2.0				0.02	0.05		0.01			0.05	0.02	0.01		
(6) Fleet size									2.0	3.0					0.01	0.01		0.03				0.04	0.01		
(7) Cryptowallet									1.0			3.0			0.02	0.01				0.02		0.03		0.03	
(8) Hacking														7.0							0.07	0.01			
(9) No control														3.0			1.0	1.0			0.05	0.03			
(10) No experience														3.0							0.03				
(11) Malfunction															1.0	1.0	2.0	1.0			0.04				
(12) Limited scalability														2.0							0.02	0.01	0.01		
(13) No contact person														4.0		2.0		1.0	2.0		0.05	0.02	0.03		
(14) Condition of car																3.0					0.03				
(15) No critical mass														3.0	1.0	2.0					0.03	0.02	0.01	0.01	
(16) Availability																1.0		4.0			0.01	0.03	0.01		
(17) Unclear legal situation														1.0	2.0	1.0		1.0			0.01	0.03		0.01	
(18) Limited payment options															2.0					2.0	0.01	0.01		0.02	
(19) Energy consumption																			2.0			0.01			0.02
(20) Insecurity																					12.0	3.0	1.0		
(21) Financial risk																					1.0	3.0			
(22) Uncertainty																					5.0	2.0	2.0	1.0	
(23) Privacy																					3.0				
(24) Stress																					3.0	4.0			
(25) Responsibility																						1.0	2.0		2.0
(26) Set-up costs																								2.0	
(27) Mistrust																									
(28) Economic interest																									
(29) Less freedom																									
(30) Inconvenience																									
(31) Sustainability																									

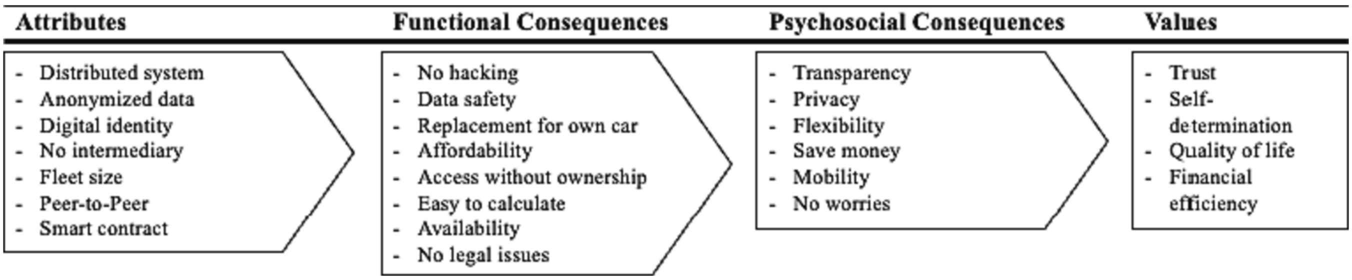

Fig. 2. Elements of the motive-related means–end chain.

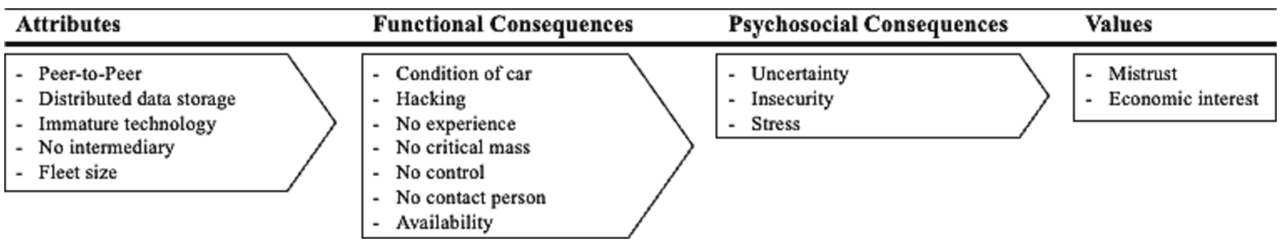

Fig. 3. Elements of the fear-related means–end chain.

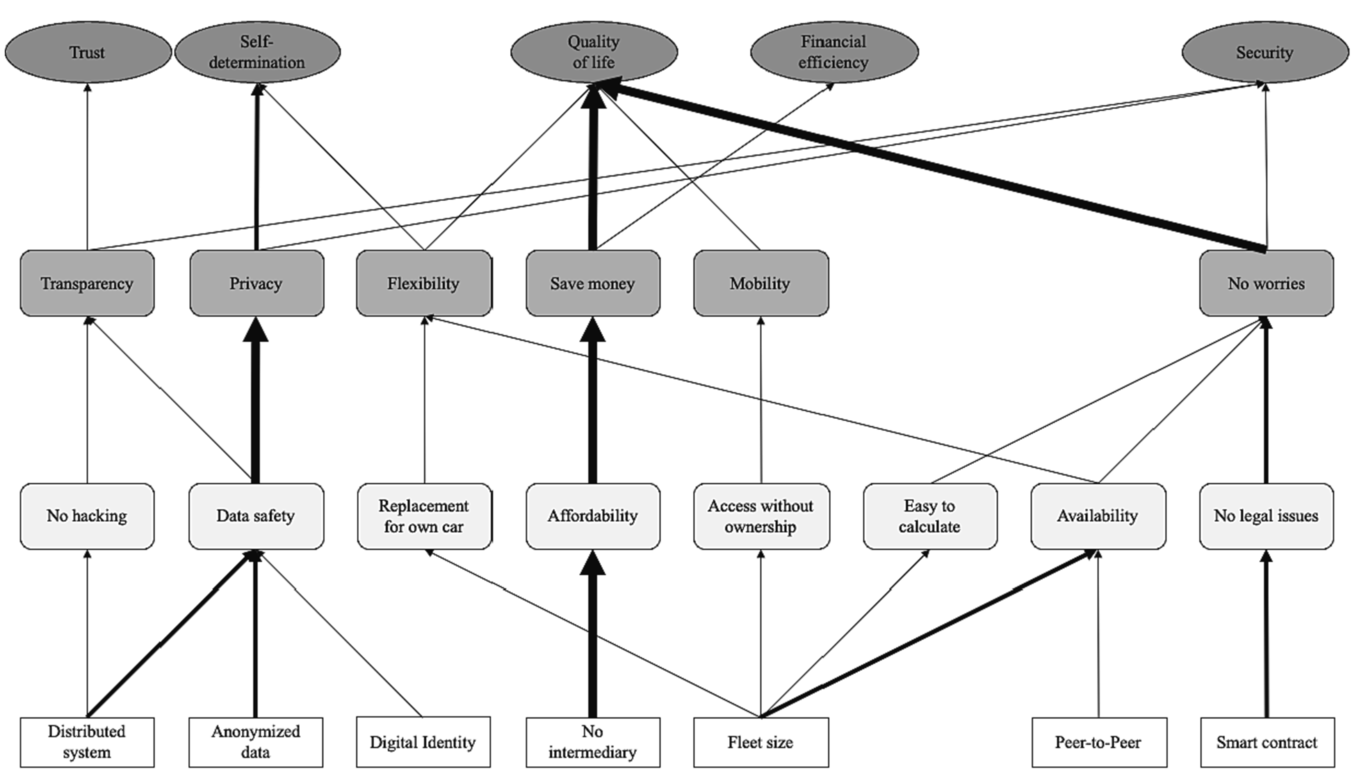

Fig. 4. Hierarchical value map outlining promoters of blockchain-based peer-to-peer sharing.

"It should be ensured that my personal data is not shared among companies." (ID 4)

"I like that blockchain technology promises that my data is anonymous and well protected." (ID 3)

The interviewees highlighted the attributes *distributed system*, *anonymized data*, and having a *digital identity* arising from the integration of blockchain technology. Specifically, they emphasized increased *data safety* due to the distributed character of blockchain and its shared and redundant structure. Other interviewees added the possibility of executing transactions anonymously (ID 20). These ladders highlight how crucial it is for user motivation to increase *data safety* and *privacy* when it comes to the storage and distribution of private data through blockchain technology.

Taken together, we found that the enhanced control and management of private data were primary drivers in consumers' use of blockchain technology. Previous research has affirmed that blockchain technology can maintain high levels of data safety and lower the risks of successful hacks *(no hacking)* compared to existing systems (Mainelli & Smith, 2015). Blockchain-based sharing companies, such as Eva (2022),

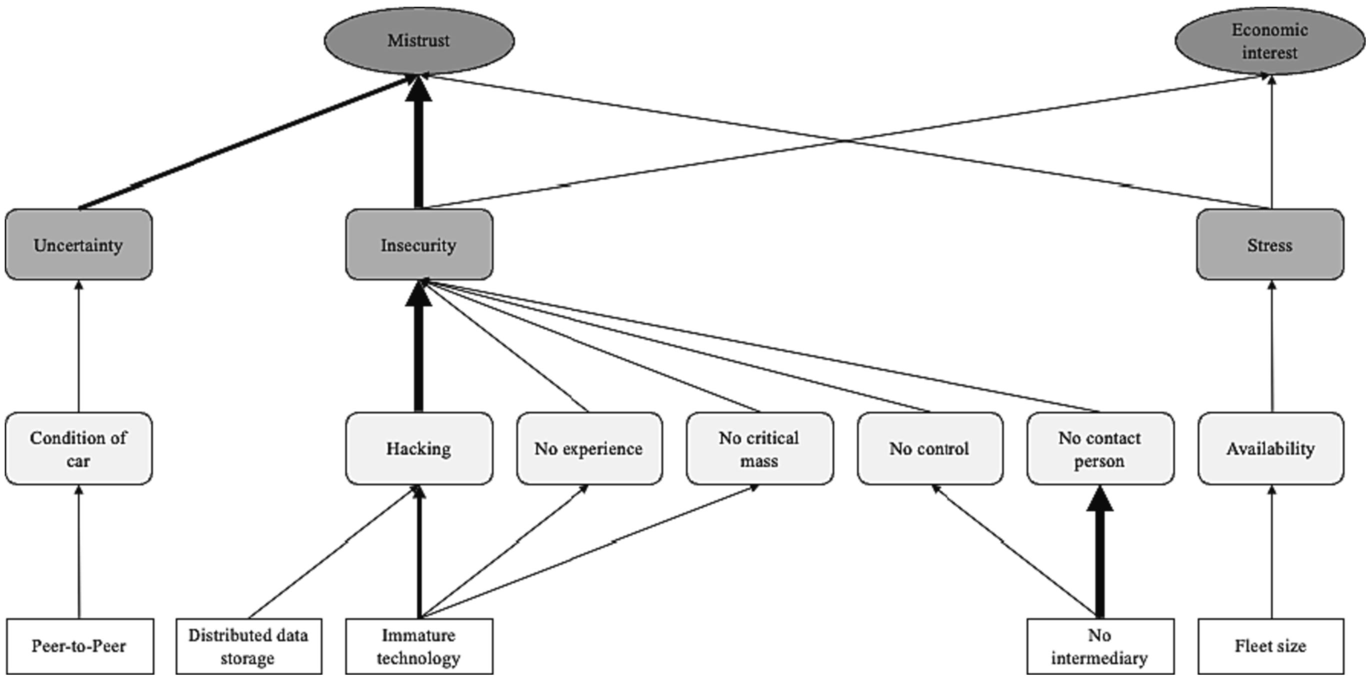

Fig. 5. Hierarchical value map outlining barriers to blockchain-based peer-to-peer sharing.

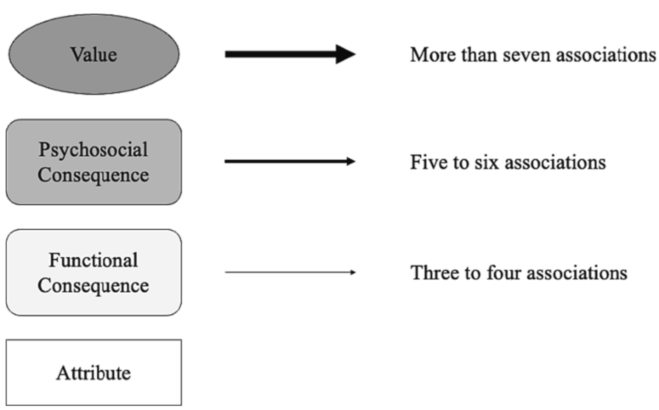

Fig. 6. Legend of symbols ().
adapted from Schaefers, 2013

have begun using this motive in their advertising strategy. In addition, as the interviews indicate, ideas and expectations of safety and privacy vary; thus, the management of expectations regarding the possibilities and limits of blockchain integration seems inevitable.

5.3. *Quality of life and financial efficiency*

The most frequently mentioned motive in our study was *quality of life*. Most respondents imagined an improvement to their lives if they used a blockchain-based sharing platform. This motive was characterized by the psychological consequences *flexibility*, *save money*, *mobility*, and *no worries*. *Saving money* was found to have the strongest link, which was in turn related to the functional consequence *affordability*, itself connected to the attribute *no intermediary*. As a result, the vast majority of the interviewees assumed that the blockchain-based peer-to-peer carsharing network would result in a cheaper service offering.

> "I can imagine using the service as I expect [the blockchain-based sharing service] to be cheaper than existing services because of a lack of brokers and provisions." (ID 9)
> "Compared to the current system, I can hopefully save money when blockchain platforms are offered." (ID 10)
> "If I save some money, I can, of course, spend this on something else, such as food or travel." (ID 5)

Some participants even explicitly associated this strongest ladder to *save money* with the explicit motive of *financial efficiency*: "I would like to save money and get the best offer for the cheapest price" (ID 13). The interviewees also connected the motive *quality of life* to further psychosocial consequences, such as *no worries* and *flexibility*.

> "Blockchain technology might speed up the process of renting a car …I am getting my car faster." (ID 10)
> If it all works … with a guarantee, then I do not have the stress." (ID 9)

They mainly linked the attributes *fleet size* and *smart contract* to the functional consequences *replacement for own car* and *no legal issues*. For example, one participant highlighted that blockchain technology might make more people join the service, increasing the options to choose from: "Well, if more people participate, it certainly becomes easier. (…) When the weather is good, I can then get a convertible when I need it or a car to transport stuff" (ID 17). Interestingly, these two motivations were mentioned comparatively often by participants with less technological affinity based on service design aspects such as safe data and not having an intermediary.

The outcomes are consistent with the idea of efficient processes and benefits for consumers and providers, as there was no need to rely on a middleman. This further supports the notion of a primary promise of blockchain integration to eliminate the intermediary (Drescher, 2017; Nakamoto, 2009). Furthermore, the importance of the psychosocial impact of *quality of life* can be examined in the context of ongoing sharing research. Numerous studies have found that carsharing users are budget-conscious and price-sensitive (Schaefers, 2013; Shaheen et al., 2012), making a blockchain solution even more appealing to this target group. The results in this research highlight the value of cost savings for users when the intermediary is eliminated, which would otherwise receive a commission. The blockchain-based ridesharing service Eva (2022) advertises its service as commission-free. Rather than focusing solely on the company's perspective, this offers a concrete user-focused perspective to the cost-cutting dialogue. *Saving time* is also a relevant motivation. This subject, however, is not currently being addressed in the blockchain technology literature.

5.4. Security

The motive *security* was connected to the psychosocial consequence *no worries*, which was in turn related to the functional consequence *no legal issues*, itself connected to the attribute *smart contract*. Further, it was linked to the *transparency* and *privacy* psychosocial consequences and their ladders. Numerous respondents shared that blockchain-based sharing services reduced the legal risks of using a sharing service, attributing this, in particular, to smart contracts and their fulfillment by both parties[2]:

> "I would appreciate a system in which the terms of the sharing contract are agreed upon, such that there is no potential for a legal disagreement." (ID 9)
> "As providers and users depend on the fulfillment of the contract, a clear contract system based on blockchain would help to avoid problems in case something is damaged." (ID 3)
> "I have the contract and the personal information in the blockchain. (…) I just have the security that it's a real person." (ID 22)

The interviews were motivated by the idea of having more security when using blockchain-based technology, particularly when it comes to avoiding legal issues via smart contracts. Surprisingly, they showed high trust in the technology and only to a minor extent considered the potential additional legal effort of working out contracts; they did not discuss the potential problems of trying to enforce a smart contract. Further, especially the participants with the lowest technological affinity perceived that the technology contributed to their security ("you can't simply change or distort the data" ID 17). Existing studies have examined smart contracts as a tool to be used in the sharing economy to facilitate direct transactions (Belk et al., 2019; Fiorentino & Bartolucci, 2021; Mehrwald et al., 2019). Acceptance studies remain rare in the field, however, even though the interviewees expressed a demand for security and comfort in this respect. Notwithstanding the scholarly focus on the technical and legal viability of the technology, other perspectives, such as consumer behavior studies, remain lacking.

6. Fear-related ladders

6.1. Mistrust

Despite the motivators discussed above, most interviewees stated that they had concerns and reservations about the concept of blockchain-based sharing platforms. One fear revealed in the structure of the HVM was *mistrust*. This value was connected to the psychological consequences *uncertainty* and *insecurity*.

The more prominent ladder through *insecurity* was connected to the functional consequences *no control* and *no contact person* of the attribute *no intermediary*. In other words, not having a platform or similar third-party provider as an intermediary appeared to be a barrier for some interviewees to the adoption of blockchain-based sharing systems:

> "In case of a [blockchain-based service], I fear not being able to contact a human in the event of difficulties; I will just be left with the system." (ID 15)
> "Since there is no legally accountable person … I lack security." (ID 2)

Although less prominent, *insecurity* was also connected to three other functional consequences: *hacking* ("Hackers are always one step ahead of the technology." ID 9), *no experience* ("I have no experience with blockchain yet; this makes it hard for me to trust the technology." ID 18), and *no critical mass* ("Such a platform might have difficulties as there is no critical mass of users yet." ID 6). These functional consequences go back to the attribute of blockchain technology as an *immature technology*, with *hacking* also being connected to *distributed data storage*. Interestingly, the two youngest interviewees, ID 7 and ID 11, did not reveal mistrust in the hypothetical service.

In general, trust issues are a known critical problem for emerging technologies, such as blockchain (Prewett et al., 2020; Saberi et al., 2018), and could become especially prevalent when combined with existing trust issues related to the sharing economy in general (Ert et al., 2016). Special attention should be paid to the ladder, building on the attribute *no intermediary* and the functional consequence *no contact person*. While we know from service research that consumers prefer personal contact when it comes to solving issues (Choi et al., 2021) and that research (e.g., in elderly care) has affirmed the acceptance problem of replacing human interaction with artificial systems (Yusif et al., 2016), this remains an unaddressed problem in blockchain research.

6.2. Economic interest

Another fear emerging from our analysis was *economic interest*. It is described as the optimization of economic factors and is a motive that depended on the psychosocial consequences *insecurity* and *stress*. Through *stress*, the ladder was connected to the functional consequence *availability* and the attribute *fleet size*. In this context, the participants were especially fearful that if blockchain-based technology were to crowd out current platform providers, the accessibility of the service could decrease, which would result in more stress, as fewer cars would be available (ID 22, ID 19). They also related this to the potential fragmentation of providers and, thus, smaller fleet sizes (the number of cars available for sharing) in a given area. Interestingly, they further argued that one of these inconveniences (under the psychosocial consequence *stress*) was related to the prospective loss of money from using an expensive alternative:

> "Availability of carsharing services is already low in more rural areas; this could worsen if [blockchain-based services] have fewer cars available—I might then have to use a more expensive alternative of transportation because I am stuck." (ID 18)
> "If blockchain platforms cannot provide a sufficient number of cars, I cannot plan my trips accordingly—which will cause additional stress." (ID 11)

In another ladder, the interviewees also linked economic interest to the psychosocial consequence *insecurity*. One participant, for example, associated a lower level of security with the lack of a centralized legal authority in *control* and the absence of a *contact person*, such as an *intermediary* ("Because there is no longer a central contact person who, in whatever cases, is available as a contact person for me when there are errors or problems," ID 22), and mentioned the problem of using immature technology and the potential financial loss, for example, additional costs such as legal fees (e.g., "In the end, I might face a financial loss." ID 2). Also, participants with the lowest technological affinity especially emphasized on the motive *economic interest* ("It could consequently be more expensive" ID 17; "I'm just worried that – in the end – I'll have to pay money for service that is not working" ID 20).

The barriers mentioned by the participants—including process and performance risks—are known barriers in sharing economy research. The issue of risk in consumer settings has gone unnoticed in blockchain research, but it is a known issue in commercial implementation settings

[2] In addition to the blockchain-related aspects, this ladder includes carsharing-related components. The findings indicate connections among *no worries*, *stress*, and *large fleet size* in terms of number and quality (ID 1, ID 4), the availability of automobiles (ID 5), the opportunity to use a car without owning it (ID 16), and easily calculable pricing (ID 3). ID 1 and ID 9 stressed the significance of the expanded selection of vehicles.

Table 4
Overview of research avenues to achieve the benefits of blockchain technology (BC) for sharing.

Potential BC solution	Key BC attributes	Related key consumer motivators/ fears	Important RQs to enable BC solution/benefits
Blockchain can mitigate exploitation and provide fair compensation	No intermediary	Save money → Quality of life Insecurity → Mistrust	• How should the profit be shared between providers and consumers of the sharing economy? • How can blockchain-based sharing be governed and operated as a decentralized autonomous organization? • What can we learn from research on cooperatives for blockchain-based sharing? • What are successful business models for cooperative blockchain-based sharing services? • How can we solve the paradox that customers desire the elimination of company platforms but are also worried that there is no intermediary in case of problems?
Blockchain can ensure data privacy.	Distributed system Anonymized data	Transparency → Trust Privacy → Self-determination	• How can blockchain-based services elevate trust in the sharing economy? • How does customer openness toward/prior experience of blockchain technology influence the generation of trust in blockchain-based sharing? • Will there be a potential trade-off between privacy and trust that impedes the development of blockchain-based sharing? • How can blockchain-based services best ensure the transparency of sharing services? • What effect will increased data protection via blockchain have on sharing service adoption rates?
Blockchain can reduce the legal and financial risks associated with asset sharing	Smart contracts	No worries → Security	• How can a system of smart contracts be implemented? • Who will set up the rules for the sharing process if a platform is missing? Will there be standardized or individual contracts for sharing? • How can the potential burden that comes with negotiating smart contracts between providers and consumers be managed, particularly as both lack legal expertise?
Blockchain can facilitate free accessibility to sharing economy	Fleet size	Stress → Economic interest	• How do we address the fears related to blockchain being an immature and volatile technology, which might impede access instead of enabling it? • Will blockchain-based sharing increase the offer of sharing assets and make them more widely available to all customer groups? • If users set up standards for participation, might this also exclude certain customer groups? • Will blockchain-based sharing fragment the sharing market and, thus, reduce accessibility? • How will technology perceptions differ between different age groups?

(Saberi et al., 2018). Overall, compared to the ladder for mistrust, the ladder of economic interest was less pronounced, making this fear less significant.

7. Research agenda

While blockchain-based sharing appears to provide solutions to the pressing problems of the sharing economy, several points remain unclear regarding how this technology can realize the promised benefits. Moreover, despite consumers' motivation to adopt blockchain-based carsharing, our interviews also illustrated fears, inconsistencies, and paradoxes that need to be addressed to fully enable blockchain technology as a benefactor for the sharing economy. Thus, combining our review of the potential solutions of blockchain technology with the insights from our customer interviews, we now derive avenues for future research on blockchain and sharing services. These research avenues seek to illustrate what still needs to be investigated in order to use the force of blockchain to enable the light side of sharing. Below, Table 4 provides an overview of research directions to enable each benefit, and we discuss key research avenues.

By eliminating company-operated platforms as authoritative bodies that ensure transactional trust and security (*no intermediary*), blockchain technology offers the potential to keep transaction fees low by avoiding brokerage commissions, thereby mitigating the exploitation of sharing providers and consumers by sharing platforms. In our interviews, the customers mentioned the associated opportunity to save money (the *quality of life* motivator). This was the most frequently mentioned customer motive, which has also been found in previous research on providers in asset-sharing contexts (e.g., Wilhelms et al., 2017). This leads, however, to a new question regarding how the additional profit from lower brokerage fees should be shared between providers and consumers of the sharing economy, especially considering the need for the sharing economy to better compensate its contributors or providers to grow versus the motivation of lower prices for consumers to join blockchain-based sharing. Thus, the resulting distribution problem and the setting of fair prices to grow the sharing economy are not trivial.

Moreover, having no intermediary could require blockchain-based sharing to operate and be governed as a DAO that is owned and democratically administered by its users (Decentraland, 2022). It is currently unclear what such a governance and operation system would look like, how it could be implemented, and what additional burdens this would place on both providers and consumers. Research on cooperatives in general and carsharing cooperatives in particular might provide a promising starting point (Truffer, 2003). So far, however, these cooperatives have remained limited in size and influence. Therefore, we propose further investigation into how cooperative sharing business models based on blockchain technology could be designed to ensure their successful implementation.

The lack of a centralized legal authority could drive us to a potential intermediary paradox. We found that the blockchain attribute of having *no intermediary* led to both motive- and fear-related values; that is, the same attribute had different functional and psychological consequences and values. On one hand, consumers would like to eliminate the intermediary to save money and improve their quality of life. On the other hand, they feared that the lack of an intermediary would lead to having no contact person and no control, which is associated with insecurity and mistrust. In sharing services, interactions with high consociality and in regular need of human intervention to moderate conflicts based on the subjectivity of peer agreements (Perren & Kozinets, 2019) could worsen customer experiences. These opposite reactions to the same key blockchain attribute lead to a paradox of blockchain-based sharing and provide an interesting question for future research: How can we reconcile the paradox that customers value the elimination of profit-oriented intermediaries in cooperation platforms while simultaneously expressing concern about the lack of an intermediary to handle potential issues?

Research might also investigate how blockchain technology can help elevate trust and self-determination in the sharing economy and, thus, fuel its growth, particularly regarding the increased data privacy and transparency promises of blockchain. Previous research has acknowledged the limits to these systems (Hawlitschek et al., 2018)—implying that blockchain technology could act only as a supplementary technology to facilitate trust in a provider–user relationship (Secinaro et al., 2021). In this context, customers' technology openness and prior experience with blockchain technology might exert influence on how well blockchain technology can facilitate trust in the sharing economy. More precisely, facilitating trust might be challenging if customers are inexperienced with both sharing services and blockchain technology (as blockchain must overcome some mistrust). They fear, for example, economic losses. Thus, depending on customers' prior experience with blockchain technology and general technology openness, different approaches to blockchain-based sharing solutions might be needed for these target groups to ensure successful implementation. As such, technology openness and prior experience with blockchain technology are likely to exert a substantial moderating influence on how blockchain-based services can enhance trust in the sharing economy.

Future research might also investigate the potential trade-off between the need to protect data and the need to generate trust by sharing data, especially as providers and users search for information on one another through screening to minimize perceived transaction risk while simultaneously aiming to disclose as little as possible of their own data (Huang et al., 2020). Thus, how blockchain-based sharing systems could protect data while at also ensuring sufficient data availability to generate enough trust to enable exchange between providers will also be an interesting avenue for future research—particularly as customers are motivated by the additional data privacy offered by blockchain-based systems compared to current solutions.

The potential of smart contracts to reduce financial and legal risk seems fascinating, particularly in addressing the motivator of security. Very little, however, is known about how they could be implemented in blockchain-based service practice (Fiorentino & Bartolucci, 2021). What is particularly unclear is whether such a smart contract system would lead to additional burdens for providers and customers (i.e., cost in terms of effort or time). This concern was also mirrored in our customer interviews, which showed that a central platform to govern and set rules for this exchange was missing and that new rules needed to be established, perhaps on an individual basis with each provider (i.e., there is no governing body). In other words, to enable blockchain-based sharing, more research is needed on how to manage the potential burden that comes with negotiating smart contracts between providers and consumers, particularly as both parties lack legal expertise.

Lastly, it remains unclear whether blockchain-based sharing can fulfill its promise of facilitating universal access and participation, particularly as participants expect blockchain-based technology to crowd out current platform providers and fragment the sharing market, where service accessibility could decrease—as fewer assets will be shared or be easily accessible. Thus, an important question for future research is to examine the conditions under which blockchain-based sharing increases the offer of sharing assets and actually makes them more widely available to all customer groups—that is, the circumstances under which blockchain-based services actually increase pay and enable the implementation of the initial ideas of sharing based on increasing access to the sharing asset in an economically and socially responsible way.

8. Conclusions

8.1. Theoretical implications

In this study, we provide a novel view on how to overcome the dark sides of sharing services through blockchain technology, that is, by introducing blockchain-based sharing services. While scholars have pointed to the potential of implementing blockchain technology in the sharing economy, research on the subject remains limited (Eckhardt et al., 2019). More specifically, we suggest that blockchain-based sharing can solve four key problems of current sharing services: contributor exploitation, customer data abuse, the offloading of financial and legal risks onto service providers and customers, and restricting access to sharing services. We outline how blockchain-based technology can provide a solution to these problems and thus overcome the key dark sides of the sharing economy. We thereby contribute to the nascent literature on how blockchain technology can improve sharing services (de Filippi, 2017; Pazaitis et al., 2017; Tan & Salo, 2021).

While we unveil four solutions of blockchain-based services, their implementation depends on consumers' willingness to actually embrace blockchain-based sharing services. Thus, identifying consumers' motivations and fears is essential to understanding how blockchain can be successful at solving the problem. Therefore, we take a customer perspective to investigate blockchain-based sharing services to shed light on consumers' motivations to adopt and fears about using blockchain technology for sharing services. By identifying four motivators (trust, self-determination, quality of life, and security) and two fears (mistrust, economic interest), we provide foundations for the development of blockchain-based sharing services, particularly by outlining which benefits need to be communicated and which fears need to be addressed to successfully implement blockchain-based sharing services. By providing foundations for the success of blockchain-based carsharing, we contribute to the literature on the consumer's perspective on blockchain technology (Albayati et al., 2020; Gleim & Stevens, 2021; Raddatz et al., 2023). We also respond to calls to investigate the role of blockchain technology in facilitating the future of the sharing economy (Eckhardt et al., 2019).

Juxtaposing the potential solutions of blockchain-based sharing with the customer perspective also provides a foundation for other research avenues. We highlight research implications to enable each solution that blockchain-based sharing provides and encourage further research on blockchain-based services that enable their implementation and guide initiatives that seek to facilitate these services. Our research avenues address not only questions of relevance to the practical implementation of blockchain-based sharing services (e.g., governance of decentralized autonomous organizations, implementation of smart contracts) but also theoretically interesting paradoxes (e.g., seeking to exclude an intermediary while fearing the lack of one) and trade-offs (e.g., between the promise of blockchain for more privacy and the required sharing of data to enable trust between service providers). Thus, we seek to encourage further investigations that will contribute to the success of blockchain-based sharing and, thus, overcome the current dark sides of sharing.

8.2. Practical implications

The research findings present implications for the practical implementation of blockchain-based sharing services. While some blockchain-based solutions are in a prototype state and not yet ready for widespread implementation, others, such as established financial solutions, can be integrated into existing products and services. However, today's companies are unlikely to integrate blockchain in their operations and thereby eliminate themselves as middleman by creating platforms that offer transactions without charging transaction fees. In turn, our research provides guidelines for non-profit organizations or foundations that could play a central role in establishing this form of blockchain-based sharing service; that is, the outline of the benefits of blockchain-based sharing and insights on how to get users to adopt this new sharing service type can provide the basis for open-source blockchain projects. Similarly, cooperative sharing platforms can build on our findings to include blockchain technology in their sharing systems.

At the level of implementation, our findings suggest that trust, self-determination, quality of life, and security are the key motives behind the use of blockchain-based mobility and should be considered when designing and communicating such a service. Thus, an organization or cooperative implementing a blockchain-based sharing solution will need to ensure that their service is perceived as trustworthy and that it provides consumers with a high degree of control over their personal data. Moreover, they need to communicate to potential consumers that the service can improve their quality of life by providing a more secure and convenient way to navigate the integration of blockchain technology. Still, despite the innovative approaches to blockchain-based sharing, organizations need to acknowledge the uncertainty around the technology and that issues around implementation (e.g., price setting, data protection, smart contracts, accessibility) are unclear and require further investigation and practical solutions.

8.3. Limitations

This study represents a first step in understanding blockchain-based sharing services and how they can overcome the dark sides of current practices. Additional research is needed, however, to address the study's limitations and extend its influence. First, we used the specific application of carsharing to make the service more comprehensible to consumers, but this also limits the generalizability of our findings. Therefore, we encourage future research to complement our work by assessing other sharing applications. Second, the MEC analysis aimed to uncover the abstract values that consumers associate with service attributes (Reynolds & Gutman, 1988). As blockchain technology has been a volatile topic with a fluctuating reputation over the last decade, the outcome of our study could be influenced by the current reputation of the technology. While we controlled for the knowledge level of the participants regarding blockchain technology, their perceptions could still vary, and the lack of existing products or services increases this uncertainty. Similarly, the participants' tech-savviness or prior knowledge of blockchain technology could have influenced the results. Thus, we propose a field experiment that assesses actual consumer behavior in blockchain-based service usage in order to identify relevant service characteristics and control for key customer characteristics. Third, as blockchain technology also has important implications for the provider side and our empirical investigation focused on users as one element of the triadic exchange in peer-to-peer asset sharing, we encourage future research to contrast our findings with a complementary study on provider motives and fears. Further, considering the interest of different user groups in sharing services (e.g., eco vs. tech-oriented; Truffer, 2003), a meaningful extension of our MEC analysis would be to investigate an HVM for different user groups to further segment the market. In this context, it would be interesting to see how the perception of blockchain differs among these user groups. Fourth, we acknowledge that our study provides exploratory insights and has limited ability to assess technology acceptance or diffusion. Thus, we encourage further quantification of our exploratory findings through, for example, the application of the technology acceptance model (Davis, 1989). Finally, we acknowledge that the above-discussed benefits for providers and customers are based on an "idealized" implementation of blockchain-based sharing services via non-profit-oriented organizations (e.g., foundations and cooperatives). Despite initial attempts (e.g., the blockchain-based ride sharing Eva), it remains unclear whether blockchain-based sharing will be used by existing platforms to increase efficiency or strengthen marketing activities or by non-profit platforms to address the current problems of the sharing economy services. As our outline of research avenues illustrates, there is a need for future research to fully enable blockchain-based sharing to overcome the dark sides of sharing services and facilitate their implementation in practice.

CRediT authorship contribution statement

Christopher Großmann: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Katrin Merfeld:** Conceptualization, Writing – review & editing, Methodology, Supervision, Project administration. **Jan F. Klein:** Writing – review & editing, Resources, Project administration. **Franziska Föller:** Writing – original draft, Investigation, Formal analysis, Data curation. **Sven Henkel:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1. "Blockshare" instructions

We described the fictional carsharing service Blockshare to our interviewees as follows.

"Blockshare is an established blockchain-based peer-to-peer carsharing platform in Germany, with 50,000 providers offering their private vehicles for sharing with others. The search query for a vehicle, the booking process, and the payment process are fully integrated into the mobile application. The data are stored on a blockchain and are, therefore, immutably distributed across all nodes of the network. Further, Blockshare is designed as a decentralized autonomous organization, which means that no intermediary in the form of a platform operator exists. Bookings are processed by smart contracts, which means that after automatic verification, the contracts are executed. Payments are processed by an in-app payment system built on a cryptocurrency."

The description is based on existing descriptions of respective services. To ensure that the description was comprehensive and free from suggestive cues, a pretest was conducted with the same sampling criteria but with non-participants. The scenario was then modified until comprehensiveness was ensured and biases removed. The final scenario and interview guide were then tested in trial runs to improve clarity and neutrality. After the trial runs, the researcher finalized the interview guide.

Appendix 2. Interview guide

Section	Question	Goal	Yes	No
Introduction	Do you own a car? Do you use a car?	Simple question with a high comfort level to initiate conversation		
		Assess whether the participant wants to be a user on a P2P carsharing platform	What do you use the car for?	Why don't you use a car?
General: private carsharing platform	What do you mean when referring to a private carsharing platform?	Query general understanding and knowledge, possibility to eliminate ambiguities	Clear understanding	Private carsharing refers to the shared use of one or more cars, where the owner makes their car available to other individuals for a limited time. This is facilitated through a digital platform operated by a professional intermediary who manages the booking system and billing for a fee.
	Do you use private carsharing platforms?	Assess general attitude toward private carsharing platforms	Why?	Why not?
General: blockchain technology	What advantages do you associate with blockchain technology in general? What disadvantages do you associate with blockchain technology in general?	Assess general attitude and level of knowledge regarding blockchain technology		

Laddering	Question	Goal	Follow-up question/actions
1st iteration (dis-) advantages	In general, can you imagine using the blockchain-based private car sharing platform "BlockShare" described above?	General acceptance	Why (not)?
	What makes this platform stand out for you?	Explore relevant product/service attributes	*List attributes in mentioned order (A/B/C…)*
	What do you find personally (dis-) advantageous about A/B/C?	Determination of the attributes, functional, psychosocial, and value elements	*List (dis-) advantages (D/E/F…); reiterate until ladder completion*
	Which (dis-)advantage of D/E/F is most important to you? Why		*List (dis-) advantages (G/H/I…); reiterate until ladder completion*
	In addition, e.g., aspect E was important to you, why?	Further inquiries on associations	Why is this relevant to you?
If required, apply direct elicitation method (ranking of associations)			
2nd iteration (dis-) advantages	A service like the blockchain-based private carsharing platform "BlockShare" not only presents (dis-) advantages, but also potential (dis-) advantages. What are they for you?	Switch from advantage to disadvantage perspective (and vice-versa)	*List (dis-) advantages (J/K/L…); reiterate until ladder completion*
	What do you find personally (dis-) advantageous about J/K/L?	Determination of the attributes, functional, psychosocial, and value elements	*List (dis-) advantages (M/N/O…); reiterate until ladder completion*
	Which (dis-)advantage of *M/N/O* is most important to you? Why?		*List (dis-) advantages (Q/R/S…); reiterate until ladder completion*
	In addition, e.g., aspect S was important to you, why?	Further inquiries on associations	Why is this relevant to you?
If required, apply direct elicitation method (ranking of associations)			
Conclusion	Thank you for your participation in this project. (personalize)	Conclude the interview	Anything else you would like to add?

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