12-2-2023

Decentralised Social Media: Scoping Review and Future Research Directions

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Full research paper

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Abstract

Social media platforms such as Facebook, Twitter/X, or TikTok are controlled by and rely on a single service provider. However, repeated controversies around data breaches, algorithmic bias, or misinformation have eroded trust in these centralised platforms. Concurrently, advancements in blockchain technology have opened avenues for decentralised social media that distribute control and data across a network of participants, thereby challenging their centralised counterparts. This study reviews existing literature on the topic and finds that what we know largely focuses on the technological implementation of decentralised social media. Therefore, we surveyed the literature for socio-technical dimensions of the phenomenon and found that control, privacy, operation, security, rewards, adoption, and research are central themes in this regard. We use those themes to derive recommendations for future research in Information Systems (IS) and beyond that aims to unpack individual, organisational, and societal implications of decentralised social media.

Keywords Decentralised social media, decentralised online social networks, decentralised information systems, blockchain.

1   Introduction

Contemporary mainstream social media such as Facebook, Twitter/X, or TikTok are controlled by and rely on single service providers. Consequently, users of these 'centralised' social media platforms give providers a significant advance in trust when ceding control over their data (Smith 2023). In recent years, however, trust towards social media providers has been decreasing because of several controversies (Zuo et al. 2023). The proliferation of hate speech and misinformation on Twitter (now X) (Wendling 2023), Facebook's Cambridge Analytica data scandal (Hinds et al. 2020), or the geopolitical implications of TikTok (Gray 2021) are but three examples for these controversies.

At the same time, advancements in blockchain technology give rise to ways of organising social graphs that do not require a central service provider. By *"cryptographically capturing and storing a consistent, immutable, linear event log of transactions between networked actors"* (Risius and Spohrer 2017, p. 386), blockchain technology provides the basis for decentralised social media. Other than their centralised counterparts, decentralised social media store data across a network of participants as opposed to company-owned servers (Guidi 2020; Samani et al. 2020). Although established social media platforms still count billions of users, decentralised social media steadily enlarge their user base. For example, Mastodon, which is a decentralised micro-blogging platform, recorded more than 10 million users in March of 2023, which is about four times more than six months prior (Dixon 2023).

Decentralised social media promise distinct advantages for their users over established social media such as preserved privacy (De Salve et al. 2018), censorship resistance (Guidi et al. 2021), or fair compensation for content creators (Sharma and Datta 2012). As decentralised social media can potentially disrupt the business models of established technology companies, their growth might have far-reaching implications for private and professional contexts. In pursuit of understanding these implications, however, scientific inquiry is needed to make sense of decentralised social media and their applications. So far, prevailing literature is focused on technological solutions for the design and implementation of decentralised social media (Li et al. 2021; Sarathchandra and Jayawikrama 2021) and has given little attention to a socio-technical view on the phenomenon. In this context, Information Systems (IS) scholarship is needed to provide this perspective and to open the debate on decentralised social media to other disciplines.

To chart the path for IS research on decentralised social media, we set out to answer the following research question:

RQ: *What socio-technical dimensions of decentralised social media can be identified from existing literature?*

To wit, in IS, socio-technical dimensions combine to form a "suprasystem" where the product of the interactions between these subsystems [dimensions] contribute to the suprasystem's overall success (Bostrom and Heinen 1977). Hence, it is imperative to identify these dimensions to understand the 'whole' of decentralised social media. To answer our research question, we conducted a scoping review that involves a literature search on academic databases and a qualitative analysis of the key themes within existing research. In total, we identified 20 relevant articles and present the results of the review in the form of seven semantic themes (Braun and Clarke 2006), which we used to guide the development of a research agenda for decentralised social media in IS.

The salient themes within existing literature are *control*, *privacy*, *operation*, *security*, *rewards*, *adoption*, and *research*. We found that the existing research landscape is primarily focused on solving technological problems when it comes to decentralised social media. In line with this finding, most of the search results were published in computer science (CS) outlets (15) and only a few papers in IS (5). With our research agenda, however, we aim to encourage fellow IS researchers to enter the debate on decentralised social media from a socio-technical point-of-view and explore ways in which this technology can potentially remedy some of the shortcomings of traditional, centralised social media.

2   Background

The body of work on extant social media – hereinafter 'centralised' social media to distinguish them from their decentralised counterparts which is the focus of this paper – has been developing since the turn of the millennium. Many studies have been based on the application of analytics techniques such as social network analysis (Mirbabaie et al. 2020; Wasserman and Faust 1994), sentiment analysis (Risius and Akolk 2015; Stieglitz and Dang-Xuan 2013) or a combination in the form of mixed methods or multi methods research designs (Stieglitz et al. 2018). The data collection for such studies typically relies on the application programming interface (API) of social media platforms. Examples include

Cormode et al. (2010) and Krishnamurthy (2009), who focused on the then-nascent social media sites of Twitter, Facebook, and YouTube.

These social media platforms, coupled with the wealth of empirical information available for study (such as the now-defunct 'free' Twitter API) has attracted the attention of computer and network sciences with studies of, say, topological network properties and information spread (Kwak et al. 2010; Oh et al. 2023). They have also been a popular subject of inquiry for the social sciences, with studies on their impact on communications, society, and culture (Miller 2013; Tarafdar and Ray 2021). Twitter, Facebook, and other centralised platforms have been extensively studied over the past decades, with close to ~7.6 million scholarly articles on Twitter, ~7.1 million on Facebook, ~3.2 million on Instagram, and ~252k on TikTok[1].

The role – and potential – of IS in studying centralised social media have been brought only to the forefront in studies from the mid-2010s. In their MIS Quarterly piece, Kane et al. (2014) proposed a research framework for *"considering how the novel capabilities of social media platforms might affect the underlying theories of [traditional social network analysis… leading to] considerable opportunities for researchers to investigate the theoretical implications introduced by social media"* (p.275).

Almost a decade later, the paradigm of centralised social media is beginning to shift. On conferences and in research meetings, we witness a sentiment along the lines of *'Twitter research is dead'* or 'those days are over'. After engaging in social media research for almost a decade and half a decade respectively, we (the authors) cannot help but to wonder where social media research is headed towards for the next decade to come. Sure, researchers tend to follow the data, which means that openness and easy access to social media data will spur research involving particular platforms and bias the theorization around the architectures of those platforms. In this paper, however, we want to explore an avenue of social media research that involves a much larger paradigm shift, that is, the deplatformisation of social media through decentralisation.

Following the controversies around Twitter, Facebook, and TikTok we described in the introduction, we have seen a surge in attention given to decentralised social media such as Mastodon, Steemit, or Minds. These social media do not rely on a single vendor of the technological infrastructure but decentralise everything from technological workload to governance to content moderation to the user base (Guidi 2020). Decentralised social media are, however, still in their infancy. With exemplars such as Mastodon only emerging in the foreground – in response to issues plaguing Twitter/X – it is vital that IS scholars are leading the way for understanding them, given the 'time lag' in our approach to studying centralised platforms alluded to by Kane et al. (2014).

It is in this vein that we seek to pave the way for IS scholars to investigate the emerging field of decentralised social networks. Inspired by Kane et al.'s (2014) treatment of centralised social networks and approaches to study, we wish to help unpack the "novel capabilities" and "theoretical implications" of their decentralised counterparts.

3 Scoping Review

We decided to perform a scoping review to address our research query. A scoping review can be useful to address broader topics with a variety of research designs and to map existing research (Arksey and O'Malley 2005). As many review articles are often mislabelled as 'systematic', we decided to label our review as a scoping review as it does not exclude literature based on certain research designs or other quality criteria (Paré et al. 2015; Paré et al. 2023). Moreover, we see this scoping review as an effort to test whether a systematic or theoretical review on social media research would be valuable (Arksey and O'Malley 2005; Paré et al. 2015). We contend that the topic of decentralised social media is an emerging field of study that would profit from a coherent conceptual framing and the identification of current themes and potential avenues for future research.

3.1 Review Procedure

For our literature search, we followed the recommendations by vom Brocke et al. (2015). We adopted these guidelines as they provide distinct steps for bibliographic methods and help to build a theoretical foundation for an emerging research field (Webster and Watson 2002). The research aim is to mark a first step towards identifying the socio-technical dimensions of decentralised social media. In accordance with the research question, we proceeded sequentially, following the steps of (1) searching, (2) analysing and synthesising, followed by (3) writing (vom Brocke et al. 2015).

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[1] Google Scholar estimates via https://scholar.google.com.au/, as of 17 August 2023.

Only few disciplines have investigated decentralised social media. For this paper, we use IS outlets as a starting point to understand to what extent IS researchers have engaged with the subject under study. The literature search, in line with the scoping review approach, focused on a comprehensive coverage, meaning that we intended to identify as many relevant articles as possible. To achieve this, we followed a keyword search across titles, keywords, and abstracts but limited the timeframe to papers published later than 2013. Removing the time constraint yielded in too many unwanted hits as "decentralisation" at the time often referred to social media in general.

We decided to include bibliographic databases specified to journals and conference proceedings because in fastmoving fields such as IS, conferences are crucial in the research dissemination process. Consequently, we selected basket "M" on litbaskets.io, which covers 51 journals relevant for IS (Boell and Wang 2019). In addition, we included the Association for Information Systems eLibrary (AISeL) database and limited the search to conferences. We defined the initial keywords by scanning the existing literature using the database Scopus. The preidentified keywords resulted in the following search string: ("decentra* AND "social media" AND "social network"). As suggested by vom Brocke et al. (2015), we were open to add keywords and adjust the search string over the course of our literature search. In a first iteration, we tested the same search query but with an OR operator between "social media" and "social network". However, the results produced too many unwanted hits (e.g., involving all sorts of social media research), which made the dataset unmanageable. Therefore, we decided to narrow down the search string. Table 1 provides an overview of the chosen approach for the literature search.

Process	Sequential		Iterative	
Sources	Citation Indexing Services	Bibliographic data bases	Publications	
Coverage	Comprehensive	Representative	Seminal work	
Technique	Keyword search	Backward search	Forward search	

Table 1. Overview of the literature search approach based on vom Brocke et al. (2015) (applied parameters highlighted in grey)

After the first iteration with our final search string in IS outlets, we obtained 25 hits, with 5 of them being relevant to our research question. To assess an article as relevant, we independently screened titles and abstracts among two researchers and discussed the classification afterwards. If the two researchers came to a different assessment for a paper, we screened the full text of the paper and discussed until we reached an agreement. After this first iteration, we decided to extend our search to the discipline of computer science. Consequently, we added the libraries of the ACM and IEEE to the list of databases and ran the search again. We had 30 hits across both databases and assessed 15 of them as relevant. Figure 1 provides an overview of the literature search results.
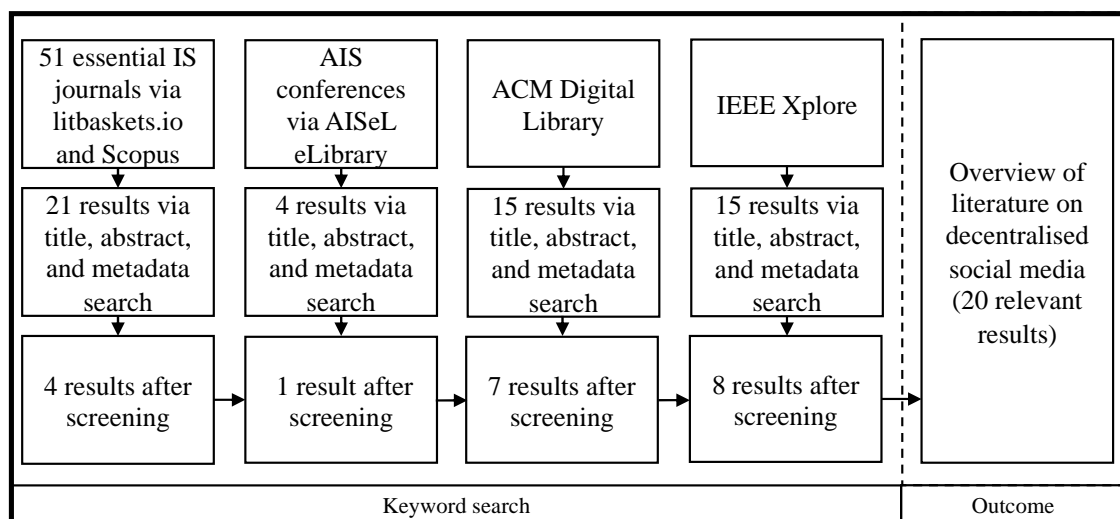

Figure 1: Results of the literature search

We collectively determined several inclusion and exclusion criteria to assess articles as relevant for our research objective. One of the first obvious criteria for exclusion is the discourse on using *centralised*

social media platforms in a decentralised *fashion*. To wit, these involve, e.g., papers on Twitter used as a decentralised method of protest and distributed/crowdsourced 'social searching' on centralised platforms. While these cursorily fulfil both our broad criteria of 'social media' and 'decentralisation', they do *not* meet the *raison d'etre* of this paper. Another exclusion criterion involves any references to decentralisation made in passing without substantive contributions to discourse: a hypothetical example is the passing reference of "*Future work in this area involves looking at decentralised platforms*". As for our inclusion criteria, we are especially interested in literature on the following, amongst others:

- What motivates decentralisation on social media platforms?
- What affordances do decentralised platforms provide, that are hitherto absent in their centralised counterparts?
- Given the discourse on blockchain and its associated technologies with the ethos of decentralisation, how are such technologies leveraged in the construction of social media platforms?
- How can extant problems and research areas in social media (say, voting and verification) be potentially overcome given the affordances of blockchain and related technologies?

To analyse the identified literature (see Appendix for a full list), we performed semantic thematic analysis as described by Braun and Clarke (2006) and (Taylor and Ussher 2001). This means that we identified themes based on explicit surface meanings without looking for anything that goes beyond the data on hand. For the analysis, we distributed the relevant results randomly between the two authors, who read the full texts and coded the papers. Subsequently, we discussed the open codes and developed them into semantic themes. The purpose of the analysis was to organise, show patterns in, summarise, and interpret the identified literature (Braun and Clarke 2006). Based on this analysis, we develop recommendations for further research and chart the path for theorising the emerging phenomenon of decentralised social media.

3.2 Results

In this section, we report the findings of our scoping review along the lines of 7 semantic themes we identified throughout the coding process. The themes are control, privacy, operation, security, rewards, adoption, and research. A broad overview of these findings is provided in Figure 2.

3.2.1 Control

The first recurring theme within the prevalent literature on decentralised social media addresses the problem of user verification and validation. The proliferation of malicious behaviour through fake accounts, social bots, and the increasing capabilities of generative AI pose a problem to the user verification techniques of centralised social media. Platform vendors typically use a combination of community-based reporting functions and algorithmic or manual detection techniques. However, these approaches are reactive, and the damage has already been done before the malicious user is banned. Twitter/X, for example, has introduced a subscription-based, paid option (Twitter Blue) to verify their account with a blue checkmark. Decentralised approaches involve blockchain-based authentication techniques to validate user profiles and content. This involves proof-of-authority protocols based on consensus algorithms that create a credibility score (Walia and Raghwa 2022). In addition, trusted users can become validators that assess the credibility of a user or piece of information and contribute to the score system (Chen et al. 2020). These score and peer moderation mechanisms are particularly important for combatting misinformation and fake news (Shahid et al. 2022). Decentralised social media can reward participation in these activities with tokens, which constitutes an economic incentive (Guidi 2020). Such incentives and validation techniques decentralise control and do not require a centralised entity that charges a fee for user validation and content moderation. Another approach to help users to assess the trustworthiness of a user or piece of content is to provide access to an immutable information history that is validated through entries in the blockchain (Kasnesis et al. 2020). In this case, creating fake profiles is disincentivised because they have no reputation of past content contributions to a network. Once inscribed on the blockchain, a user cannot manipulate their own content history by deleting posts as it is possible in centralised social media.

Another important aspect of decentralised social media under the theme of control is censorship. Centralised social media are banned in certain parts of the world to restrict access to information to the wider public. Decentralised social media address this issue as there is no single entity that can be blocked or cancelled from access. This means that decentralised social media are more resistant to censorship (Palanikkumar et al. 2023). However, whereas the immutability of content on decentralised social media

can increase trustworthiness by making users' information histories more transparent, it also makes it hard to remove malicious contents because those, too, are stored in the blockchain (Guidi 2020).
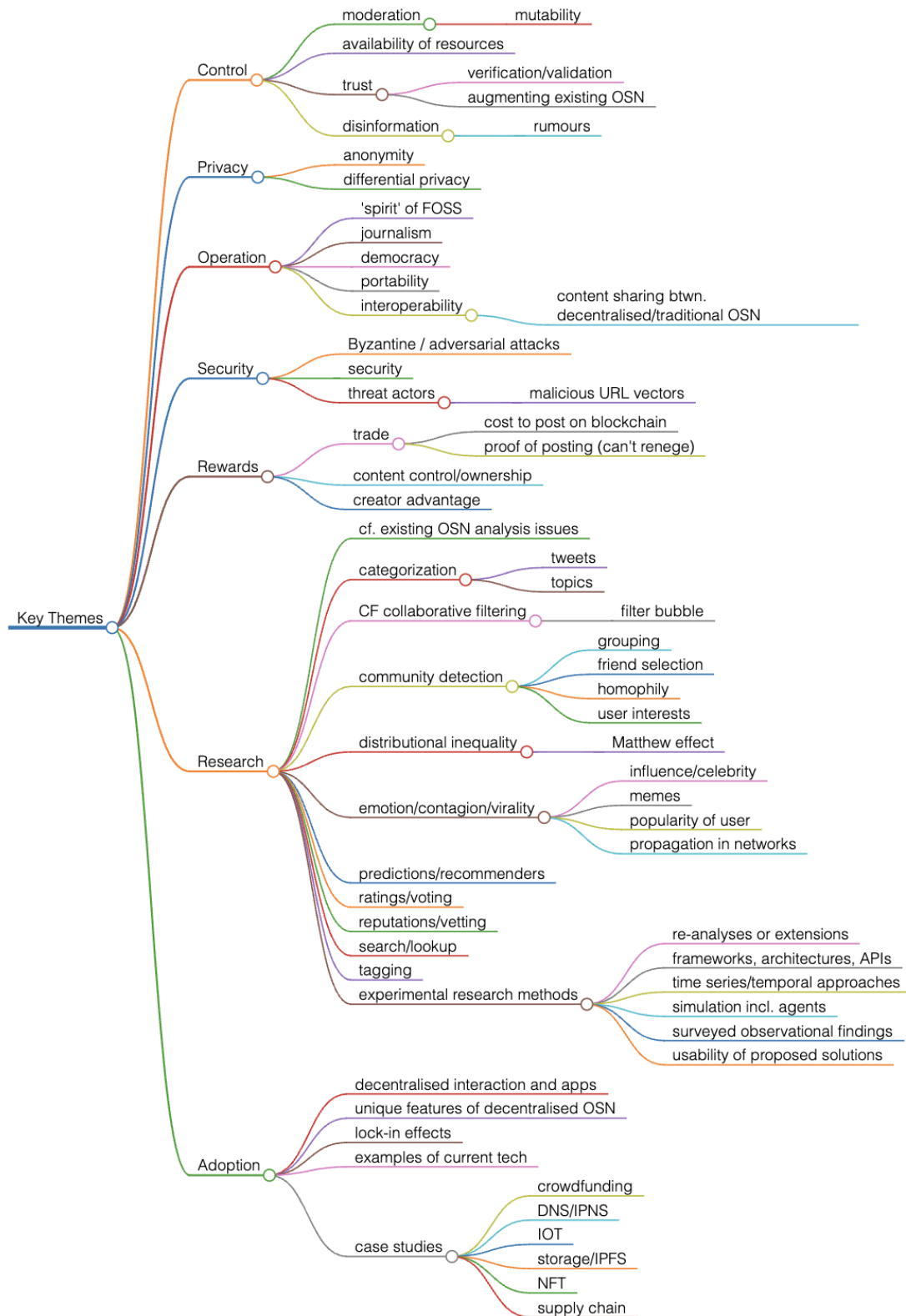

Figure 2: A representative map of semantic themes, subthemes, and examples.

Consequently, decentralised social media face a certain censorship dilemma that involves freedom of use on the one hand and risk of misuse on the other hand. A blockchain-based solution that addresses

the dilemma of user authentication is 'Worldcoin', a company that scans the iris of a user to create a digital proof of identity and humanness. However, this approach is considered highly controversial because of privacy concerns. Aside from Worldcoin, the decentralised social media platforms under study in our literature sample were scrutinised against the backdrop of privacy, which we will elaborate below.

3.2.2 Privacy

Privacy is a major touchstone when talking about decentralised social media platforms, covered (in various levels of detail) in many of the papers we have surveyed. Amongst others: Chen et al. (2020); Guidi (2020); Miranda et al. (2015); Palanikkumar et al. (2023); Riaz et al. 2022 and Sarathchandra and Jayawikrama (2021). In an operative sense of the word, the definition posited by Mason (1986) in the context of information systems holds true, particularly on social media: *"[w]hat information about one's self or one's associations must a person reveal to others, under what conditions and with what safeguards? What things can people keep to themselves and not be forced to reveal to others?"* (p.5)

A common trait shared by traditional and decentralised social media is that privacy of one's data depends on where and how a platform stores it. When it comes to data storage, the centralisation model of social media–as seen in *Control* (Section 3.3.1)–as compared to, say, blockchain-based decentralisation, is viewed as undesirable *qua* user privacy. Per Miranda et al's (2015) argument on *vendors*' roles in facilitating innovation diffusion, vendors (in this case, providers) of decentralised social media platforms use *"the robustness of their products relative to data security...[and] privacy"* (p.10) as a drawcard to promote adoption: as in the case of Worldcoin above, and also others surveyed in our literature such as SocialX[2].

Within this theme, Guidi (2020) offers a comprehensive review of the decentralised approaches to tackling the "privacy problem" on social media, inherent in their centralised counterparts: amongst others, platforms such as Diaspora, LifeSocial, and SocialX have been studied, adopting a myriad of technological approaches (from Distributed Hash Tables to Zero Knowledge Proofs). To complement this, Thakur and Breslin (2022) offered a different focus on the technical aspects–including encryption and privacy-preserving technologies–of extant decentralised social networks. Interestingly, in Guidi's (2020) review, the design ethos behind decentralised platforms–in particular public-vs-private visibility of posts–is also a key consideration in determining its [perceived] privacy levels, as seen in Mastodon (Riaz et al. 2022).

The "content visibility and the privacy issue" is by no means fully solved, per Guidi's (2020) synthesis of the literature. With regards to enhancements of blockchain-based social media platforms, work by Palanikkumar et al. (2023) and Samani et al. (2020) contributes to our understanding of privacy-preserving algorithms and techniques underlying these platforms, including how existing requirements (e.g., of supplying accurate social media metadata/statistics) could coexist with the anonymity and privacy these platforms offer.

3.2.3 Operation

The operational overhead of decentralised social media is minimised because all tasks that are necessary to run the network are outsourced to its users (Bortoli et al. 2011). The work that is necessary to run the network is incentivised by token ownership. These tokens are native to the platform and can be used to perform transactions such as rewarding content creators. The scalability of a decentralised social media platform is not limited by the ability of a central entity to perform operations, but the technological feasibility of the underlying blockchain (Zuo et al. 2023). The number of transactions on the bitcoin blockchain, for example, is limited because of the average time it takes to create a new block and store the information of a transaction. However, decentralised social media do not raise performance issues in terms of benchmarking. Instead, the literature is more concerned with agreeing on protocols that manage and distribute the workload that is necessary to operate a decentralised social media platform. Again, rewarding users via cryptographic tokens is a key mechanism to ensure that the computational workload is carried out.

It is impossible to predict the success of decentralised social media platforms and whether a large enough user base decides to discontinue their use of centralised platforms. Mindel et al. (2018) point out that decentralised approaches to information systems have often resulted in decreasing user engagement because of a lack of sustainable governance frameworks. The authors define several types

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[2] See e.g., the SocialX whitepaper at https://socialx.network/wp-content/uploads/2018/12/Whitepaper-SocialX-v1.2.pdf (last access 17 August, 2023)

of collective action threats. However, those will need to be revisited in the context of decentralised social media as the authors assume the existence of an entity (a company or a group of users) that still has the role of a central provider.

Governance frameworks need to ensure how strategic decisions are made that influence the trajectory of a decentralised social media platform. We found that the literature is concerned with two important principles in this regard: Interoperability and democratisation. The former addresses the tendency of centralised social media to lock-in user data. This means that contents or social graphs cannot be transferred from one platform to another. Decentralised social media attempt to ensure what Riaz et al. (2022) coin "social interoperability", which allows content creators to build cross-platform audiences and users to maintain control over their data independent of a single platform or protocol. The second principle refers to the democratisation of decision-making. In this regard, the concept of decentralised autonomous organisations applies to social media. This means that the members of a network, depending on their stake of platform-native tokens or other scoring mechanisms, get to vote about strategic decisions suggested by the user base.

3.2.4 Security

Similar to their centralised counterparts – and with any information system in general – security is a key consideration for the implementation of decentralised social media. The focus of the IS literature is on the use, adoption, and deployment: including costs to stakeholders (Mindel et al. 2018), and security risks related to an organisation's deployment of decentralised innovations (Miranda et al. 2015); though this represents only a small proportion of the actual literature surveyed.

The technical (CS-oriented) body of research is more concerned with the security considerations 'by-design' of such decentralised systems: the decentralised nature of the *blockchain*, as well as its track record (e.g., in cryptocurrency implementations) led it to be a *de rigeur* standard for the implementation of some, but not all, decentralised social media (Guidi 2020). Examples raised in more technical papers include the impossibility of controlling the blockchain without controlling >50% of the computing power needed for maintaining the blockchain (Sarathchandra & Jayawikrama 2021); and strategies (Chen et al. 2020) to address the Byzantine problem, i.e., nodes not following *"the consensus protocol, either accidentally or maliciously"* (Yang et al. 2021, p. 5). There is some degree of overlap between this theme of ensuring system *security* with the aspect of *control* (Section 3.3.1) required in decentralised networks, particularly as one enables the other: for example, trust and reputation management of nodes (Samani et al, 2020) enables the community to verify the legitimacy of users (as discussed earlier) while at the same time preserving the system's security and robustness (Chen et al. 2020).

With regards to the applied perspective on security, the effects of threat actors vis-à-vis decentralised social media is a main research theme. Not dissimilar to extant social media platforms, the *"potential for violation [by]... opportunistic actors"* (Mindel et al. 2018, p.617) is well documented from our surveyed literature. Proposals for malicious actor identification include exploiting existing properties of the blockchain (Samani et al, 2020); and the detection of the outputs from threat actors: rumours (Walia & Raghwa, 2022; Thakur & Breslin 2022) and malicious content (Zuo et al 2023).

3.2.5 Rewards

A stakeholder group that is often overlooked in understanding the dynamics of social media are (semi) professional content creators. Whereas microblogging platforms such as Twitter do not have a creator reward system, other platforms with higher barriers for content creation, that is, long-form videos, function based on creator-reward systems. For example, YouTube shares approximately 55% of the advertising revenue with creators. This means that for every advertising dollar, 55 Cents go to the creator and 45 to YouTube. These revenue sharing models provide economic incentives to creators to produce content and stay on a particular platform. Given the fact that centralised social media control the social graph (see section 3.2.1) of a creator (Mindel et al. 2018), centralised social media platforms make it difficult for creators to monetise their social graph independent of the platform.

Decentralised social media, in turn, use creator reward systems based on platform native tokens and cryptocurrencies but only take an infinitesimal cut of the reward to operate the network (Delkhosh et al. 2023). The incentive for founding teams of decentralised social media is most often hidden in percentage of tokens they hold themselves that increase in value over time if more users join the service (Zuo et al. 2023). On top of the different revenue sharing model, decentralised social media do not limit the ability of a creator to transfer their social graph, or audience, to a different platform or protocol. Here, the analogy of an e-mail is often used. For e-mail, the ability to broadcast to a list of contacts is not limited by the e-mail provider. A user can simply switch to another provider and take their contact list with them. The lock-in effect of centralised social media, therefore, does not apply (as much) to decentralised

social media. In theory, therefore, the earning potential for creators and organisations relying on digital business models is much higher on decentralised social media. However, the network effects of decentralised social media are not (yet) comparable to the advertising potentials of YouTube, TikTok, and the like.

Decentralised social media, however, implement other creative ways of rewarding users for their engagement (Orman 2015). For example, users are rewarded for reporting fake news, for contributing valuable content (as measured by engagement metrics), or for performing work on the blockchain (Guidi, 2020). On *Steemit*, for example, users are rewarded with *Steem* tokens. These tokens can be used to perform certain actions such as rewarding other users or be traded with other cryptocurrencies (Li et al. 2021; Thakur and Breslin, 2021). We do not know how those reward systems play out at scale, but Guidi (2020) hypothesises that user behaviour changes (in comparison to centralised platforms) if token-based rewarding systems are implemented on social media.

3.2.6 Adoption

One of the biggest challenges in the evolution of decentralised social media is getting a critical mass of users to adopt this technology. The creator reward systems outlined above play a central role in attracting new users. This assumes that on social media, most users are 'lurkers' and only a small percentage are creators. However, if creators with large social graphs adopt decentralised social media for 'selfish' reasons (Miranda et al. 2015), for example based on attractive reward systems, a ripple effect might follow (Riaz et al. 2022).

A technological aspect of adoption is the scalability of blockchain technologies. Decentralising large networks comes with the disadvantage of high overhead costs, because computations need to occur in many different places (Palanikkumar et al. 2023). In this context, blockchain technologies have earned a bad reputation of consuming too many resources relative to the value they provide. From a user perspective, however, innovation based on blockchain technologies promises a decrease in costs for transactions. For example, token-based economies as part of decentralised social media eliminate the need for payment providers or fees centralised platform vendors charge for on-platform purchases (Riaz et al. 2022; Shahriar et al. 2017). Consequently, the adoption of decentralised social media is tightly connected to the technological progression of blockchain technologies.

In addition to that, existing research is concerned with the sustainability (in the sense of longevity) of decentralised social media. By referring to the 'tragedy of the commons', Mindel et al. (2018) point out that decentralised information systems tend to decline in participation over time and become unsustainable. The theory behind the 'tragedy of the commons' posits that unrestricted individual freedoms lead to an over-exploitation of a technology, which eventually leads to its demise. In the long run, decentralised social media will likely be subject to many challenges such as over-exploitation by users, bots, and organizations.

3.2.7 Research

The last major theme we cover in this review is the 'researchability' – extant and open research areas – that decentralised social media platforms offer. Taking a parallel from the study of centralised networks (such as Facebook) which, in turn, borrows from the methods in their offline counterparts (Kane et al 2014), there exist open research topics that are greater than the 'sum of its parts'.

We will synthesise future directions in Section 5, but for this section, it suffices to lay out the areas uncovered from our literature survey. In terms of methodologies, our studies vary in their approaches. Technical methodologies range from models/simulations derived or conjectured from extant techniques (Yang et al 2021; Walia & Raghwa 2022) to the proposal of new architectures and design patterns (Samani et al 2020; Sarathchandra & Jayawikrama 2021; Palanikkumar et al. 2023). Meanwhile, studies focusing on the adoption of decentralised platforms draw upon case studies (Riaz et al 2022; Guidi 2020); theory development (Mindel et al 2018; Miranda et al 2015); and qualitative approaches such as discourse analysis (Miranda et al 2015).

For the former, the variety of existing problems in social media (and social networks, *writ large*), include: searching and recommendation (Orman 2015; Xiao et al. 2019; Xiao et al. 2021); topic categorisation and group/community detection (Zuo et al 2023; Samani et al 2020; Shahriar et al 2017; Li et al. 2021); distributional patterns of content/activity including memes, contagion, and virality (Yang et al 2021; Chen et al 2020; Guidi 2020; Riaz et al 2022; Thakur & Breslin 2020); and others. The papers we surveyed both extend extant methods to the implementation of decentralised platforms and apply existing evaluation methods on the same. As seen in prior sections (in particular, Sections 3.3.1 and 3.3.3), investigations into voting and vetting to establish reputation and trust are also part of the

research agenda on these platforms. Papers usually span several areas, with technical depth ranging from the ground-up implementation details (Palanikkumar et al. 2023; Li et al. 2021) to a broad-based survey of existing platforms (Guidi 2020 being an excellent example).

Based on the seven research themes above, we shall now posit an agenda for future research—with a focus on our IS discipline—given the myriad of themes, methodologies, and impact resulting from just a small set of papers that we surveyed.

4   An Agenda for Future Research

After reviewing a sample of 20 papers on decentralised social media, we were perplexed about the range of research problems, opportunities, and challenges that unfold with the potential rise of decentralised social media. Will this technology replace contemporary centralised social media platforms? Who knows. But the rising user numbers and growing resentment towards Twitter, Facebook, TikTok and the like suggest that decentralised social media will gain in importance. Consequently, if we as (IS) scholars wish to have a voice in the debate, we better pay attention to decentralised social media sooner better than later.

In the vein of Kane et al. (2014), we encourage fellow researchers to contemplate how the novel capabilities of decentralised social media might affect the underlying theories we use to explain centralised social media. Moreover, we need to decide if we treat decentralised social media as an emerging or emerged technology. Does this phenomenon deserve its own cumulative tradition or is it a spinoff of social media, blockchain, or both? As scoping reviews can be seen as a way of validating the idea of a full systematic or theoretical review (Arksey and O'Malley 2005; Paré et al. 2015), we conclude that the scope of existing literature on decentralised social media is still limited but that generative theorizing is needed to guide future (IS) research on this topic. To provide readers with ideas for future research, we list an array of exemplary research questions in Table 2 along the 7 themes we identified in this review.

Theme	Exemplary research question
Control	• What are reliable and ethical user verification techniques on decentralised social media?
	• How can decentralised social media solve the dilemma of providing freedom and a censorship-free environment while not facilitating the spread of misinformation and other malicious contents?
	• What governance mechanisms ensure true decentralisation and prevent individuals or groups of individuals to create just another centralised social media platform 'in disguise'?
Privacy	• What are the implications for individuals, organisations, and society of social media going "dark", meaning the increasing use of direct channels (chats, groups, login barriers) as opposed to open and public channels?
	• How do users perceive information privacy on decentralised social media?
	• How do decentralised social media encode privacy into the architecture of their protocols?
Operation	• What digital business models can be built on top of decentralised social media?
	• Why do certain decentralised social media project fail while others succeed?
	• How do decentralised social media co-exist and form new economic and social ecosystems?
	• How do governance frameworks need to be adapted to guide the operation of decentralised social media and other decentralised information systems?
	• How do decentralised social media become interoperable?
	• How do decentralised social media affect societal and political discourses and democracy?
Security	• What are risks for individuals, organisations, and society if decentralised social media reach the status of mass adoption?
	• How should decentralised social media address the prevention, detection, and

		penalisation of malicious users?
	•	How can human users of decentralised social media identify non-human users (e.g., social bots) and artificially generated content (e.g., deepfakes)
Rewards	•	How does user behaviour change with different reward systems?
	•	How do reward systems affect the adoption of decentralised social media?
	•	How can social media involving blockchain-based economies, tokens, and terminology be made accessible for a non-technical user base?
Adoption	•	How can decentralised social media platforms be adopted by organisations, given its dependence on blockchain technology and others which are not fully embraced?
	•	How do decentralised social media integrate with other emerging technologies such as the Metaverse, artificial intelligence, or synthetic media?
	•	How can decentralised social media platforms become sustainable, from a user adoption and business cost perspective?
Research	•	How can IS scholarship complement the ongoing technological innovations in computer science in addressing extant and latent issues with decentralised social media?
	•	What are data collection techniques to explore social and behavioural phenomena relating to decentralised social media?
	•	How can existing IS methodologies (e.g., social media analytics, qualitative techniques) be adapted to investigate decentralised social media?
	•	With the dearth of accessibility to decentralised social media platforms (compared to the proliferation of data access APIs that have recently been stemmed), how are quantitative studies still possible for such platforms?

Table 2. Exemplary research questions for scholarship about decentralised social media

5 Conclusion

We conducted this scoping review to identify socio-technical dimensions of decentralised social media to chart the path for IS research to engage in research about this emerging technology. Moreover, we wanted to test whether a full systematic or theoretical review on the topic would be of value, given the early phase of adoption and research on decentralised social media. We found that the debate is largely dominated by CS literature with only a few IS works that foreshadowed this development. Nevertheless, a sample that was relatively small still provided a vast array of semantic themes that represent socio-technical dimensions of decentralised social media. We found that control, privacy, operation, security, rewards, adoption, and research are starting points for theorizing the phenomenon from a socio-technical perspective. We contribute to the literature by providing a synthesis of existing knowledge and research opportunities for decentralised social media. Moreover, we developed a research agenda that addresses all the identified dimensions and provides a starting point for researchers interested in investigating this emerging phenomenon.

Our study comes with limitations as we only focused on two disciplines, that is, CS and IS for our literature search. Furthermore, methodological recommendations for scoping reviews suggest focussing on comprehensiveness, which means that we did not exclude papers based on quality checks. If we were to conduct a theoretical review on the topic, the findings concerning the thematic analysis or other coding outputs might look different because some papers would likely be excluded from a quality standpoint. Moreover, a broader search, for example including papers on blockchain, and a forward and backward search might have yielded additional insights about decentralised social media.

Going forward, we encourage fellow scholars to adapt their research portfolios to include decentralised social media as an important phenomenon to investigate. We make the bold claim that the importance of this technology will increase rather than decrease and that we will witness an interesting competition between the established centralised platforms and emerging blockchain-based innovations in the next few years. We hope that this paper will inspire more researchers to join the debate and play their part in shaping the future of social media.

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Appendix

The following is a list of the 20 relevant papers surveyed (full bibliographic data provided in the reference list above).

Author(s)	Year	Title
Chen et al.	2020	An Incentive-Aware Blockchain-Based Solution for Internet of Fake Media Things
Delkosh	2023	Impact of Bot Involvement in an Incentivized Blockchain-Based Online Social Media Platform
Guidi	2020	An Incentive-Aware Blockchain-Based Solution for Internet of Fake Media Things
Kasnesis et al.	2020	A Prototype Deep Learning Paraphrase Identification Service for Discovering Information Cascades in Social Networks
Li et al.	2021	Steemops: Extracting and Analyzing Key Operations in Steemit Blockchain-Based Social Media Platform
Mindel et al.	2018	The Sustainability of Polycentric Information Commons
Miranda et al.	2015	Whose Talk Is Walked? It Decentralizability, Vendor Versus Adopter Discourse, and the Diffusion of Social Media Versus Big Data
Orman	2015	The Design of Trust Networks
Palanikkumar et al.	2023	An Enhanced Decentralized Social Network Based on Web3 and Ipfs Using Blockchain
Riaz et al.	2022	Content Generation in Web 3.0 and Blockchain-Based Decentralized Social Networks: A Theoretical Adoption Framework
Samani et al.	2020	A Semantic Model with Self-Adaptive and Autonomous Relevant Technology for Social Media Applications
Saratchandra and Jayawikrama	2020	A Decentralized Social Network Architecture
Shahid et al.	2022	Authentic Facts: A Blockchain Based Solution for Reducing Fake News in Social Media
Shahriar	2017	Availability in P2p Based Online Social Networks
Thakur and Breslin	2022	Decentralized Content Vetting in Social Network with Blockchain
Walia and Raghwa	2022	Social Networking in an Information-Centric System with Blockchain

Xiao et al.	2019	Beyond Personalization: Social Content Recommendation for Creator Equality and Consumer Satisfaction
Xiao et al.	2021	Social Explorative Attention Based Recommendation for Content Distribution Platforms
Yang et al.	2021	Blockchain and Multi-Agent System for Meme Discovery and Prediction in Social Network
Zuo et al.	2023	Set in Stone: Analysis of an Immutable Web3 Social Media Platform

Table A. Overview of relevant papers included in the review

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