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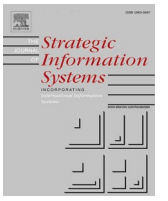

Conceptualizing Echo Chambers and Information Cocoons: A Literature Review and Synthesis of Current Knowledge and Future Directions☆

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ABSTRACT

Echo Chambers and Information Cocoons have become the subject of a multifaceted academic debate – ranging from the proper conceptualization and delineation of related concepts, to questions about their prevalence and uniqueness in the online environment, to arguments about their societal impact and the role of digital technologies. This study presents a systematic literature review that analyzes the existing research to synthesize relevant findings and build the missing foundations of these phenomena. This study follows a hermeneutic analytical approach to the literature to clarify and model the distinction between information cocoons and echo chambers. Furthermore, we summarize the selected literature and identify existing knowledge gaps to outline future research opportunities.

Introduction

In a time of ubiquitous information, there is a growing tendency to be selective in information consumption, with many people favoring sources that affirm preexisting beliefs (French et al., 2023). Along with the finding that exposure to partisan news fosters offline polarization, this trend suggests that there are self-reinforcing information silos that drive ideological divides (Tóth et al., 2023). For instance, social circles formed in religious or political organizations tend to foster interactions that reinforce common beliefs and limit exposure to diverse viewpoints (Cragun, 2022). Partisan media consumption exhibits this selectivity; studies have shown that Republicans primarily watch Fox News while Democrats prefer CNN and MSNBC, further entrenching political divisions (Ash et al., 2024; Broockman & Kalla, 2022; Dejean et al., 2022; Hoewe et al., 2020). These patterns are reflected in social media, where users engage with like-minded others, creating digital spaces that reinforce shared perspectives (Cinelli, Brugnoli, et al., 2020; González-Bailón & Lelkes, 2023). The societal impact of these limited-information environments is profound, as they contribute to increased polarization and threaten democratic discourse, fostering extreme ideological factions and limiting exposure to diverse

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perspectives (Garcia-Bernardo & Pit, 2018; Ludwig et al., 2023).

This limited online information exposure driven by social dynamics is commonly referred to either as *echo chambers* (Cinelli, Brugnoli, et al., 2020) or as *information cocoons* (Yuan & Wang, 2022). While they are conceptually distinct from algorithmically-determined *filter bubbles* (where personalized algorithms curate content to reinforce existing beliefs), a precise understanding of these concepts remains elusive. The lack of distinctions impedes the ability to abstract across contexts. It further supports confusion about the existence (Bruns, 2021; Pariser, 2011) or potential causes (Kitchens et al., 2020) of confined information environments. Researchers thus struggle to inform public discourse or develop accurate design guidelines for content curation algorithms (Berman & Katona, 2020; Risius et al., 2019; Risius et al., 2024) and platform regulation (Cinelli, Morales, et al., 2020; Risius & Blasiak, 2024).

This study aims to clarify and synthesize the concepts of echo chambers and information cocoons. Building on existing research, we differentiate these terms to address the conceptual ambiguity that impedes our understanding of information ecosystems. Thus, our research question is as follows:

***RQ**: What are the differences and interdependencies between echo chambers and information cocoons?*

To address the question, we conceptualize the relationship between echo chambers and information cocoons, and employ a hermeneutic literature review of 136 articles to inform their characteristics and differences. A hermeneutic review is particularly suitable for our study because it facilitates an in-depth, iterative, and interpretive process, enabling us to synthesize diverse perspectives across the literature. Unlike traditional systematic literature reviews, which emphasize the role of literature searches (Okoli & Schabram, 2015), the hermeneutic approach supports the interpretation of literature and the development of understanding through a cyclical dialogue between the reader and text (Boell & Cecez-Kecmanovic, 2014; Geeling et al., 2016; Rowe, 2014). This approach allows for a dynamic, layered understanding of theoretical and empirical perspectives, and enables the capture of subtle differences and intersections between constructs. Through this approach, we aim to establish foundational definitions, propose an integrated framework, and outline future research to address these critical societal issues. Specifically, we find that while *echo chambers* are described as environments where collective beliefs are reinforced by a group's exclusion of dissenting views, information cocoons relate to individual agency in filtering information to align with personal beliefs.

The remainder of this paper is structured as follows. First, we describe the conceptual background and differences between echo chambers and information cocoons. We then describe how we applied the hermeneutic literature review method and present the results from the main research streams. Last, we discuss the findings and summarize the state of research on echo chambers and information cocoons.

Defining the problem context

The emergence of confined online information environments

Before the advent of Internet-enabled personalization technology, confined online information environments like echo chambers and information cocoons began to take shape within social groups where homophily (the inclination to associate with like-minded individuals) led to a limited exposure to diverse viewpoints (Colleoni et al., 2014). As Sunstein (2018) noted, this phenomenon led to confined online information environments where shared values and communicative norms reinforced certain perspectives, making it difficult to bridge differing viewpoints. Our study builds on Sunstein's foundational work, which highlights both the group-driven nature of echo chambers and the individual-driven creation of information cocoons (Sunstein, 2001, 2006). Traditional media played a significant role in fostering echo chambers by curating content tailored to specific audience demographics (Prior, 2007). Not only did this curation cater to the interests of particular groups, but it also contributed to a narrowed scope of information available to individuals, thus limiting the diversity of perspectives encountered (Barberá, 2020).

The advent of social media intensified the debate over the effects of echo chambers (Barberá, 2020). Platforms use algorithms that learn and reinforce preferences to boost user engagement (Gillespie, 2022; Guess et al., 2018), prompting content that aligns with existing beliefs (Bakshy et al., 2015). As highlighted by Del Vicario et al. (2016) and elaborated on Kitchens et al. (2020), this self-

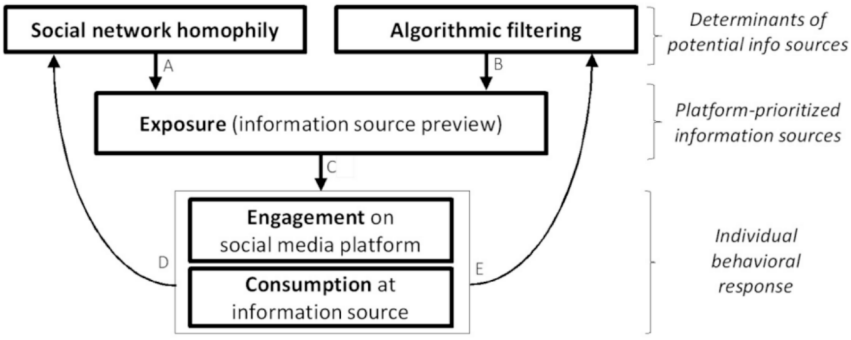

Fig. 1. Information
Source Consumption under Echo Chambers from Kitchens et al. (2020).

reinforcing cycle of engagement can lead to confined online information environments where dissenting opinions are marginalized, limiting user exposure to alternative viewpoints.

The current conceptualization of confined online information environments and their limitations

Kitchens et al. (2020) identified two constitutive characteristics of echo chambers. The first distinctive feature is the limited diversity of information stemming from constraints imposed on information sources. This reduces the variety of perspectives available to individuals within echo chambers (Bakshy et al., 2015; Garrett, 2009a; Kitchens et al., 2020; Shore et al., 2016). The second attribute of echo chambers is ideological segregation. This phenomenon amplifies the tendency for like-minded individuals to congregate and interact, fostering an environment that reinforces prevailing ideological viewpoints while constricting exposure to dissenting opinions (Barberá et al., 2015; Dubois & Blank, 2018; Garrett, 2009a; Kitchens et al., 2020; Shore et al., 2016). Consequently, Kitchens et al. (2020) proposed a general model that lays out the interplay among network homophily, algorithmic filtering, and individual behavioral responses to shape access to information sources (Fig. 1). The model emphasizes that network homophily, the natural tendency of individuals to associate with like-minded peers, forms the foundation. This homophily is exacerbated by algorithmic filtering, where social media platforms tailor content based on user preferences. As a result, individuals are exposed primarily to information that resonates with their existing viewpoints. This curated content promotes individual behavioral responses, reinforcing the preference for similar information and further solidifying network homophily.

While Kitchens et al. (2020) offered a useful model for understanding the dynamics of echo chambers, a significant limitation was its emphasis on algorithmic filtering without fully addressing the role of selective user behavior (Pandey et al., 2023). By focusing predominantly on how algorithms shape content exposure, the model overlooks the agency of users in actively seeking out information that aligns with their beliefs. The current focus on source diversity and source slant underemphasizes user-driven selective exposure, where individuals actively seek content that aligns with their beliefs, and how these intentional choices influence the information environment (Jungherr, 2023; Jungherr & Schroeder, 2023). Shifting the focus to incorporate user-driven selective exposure could reveal other factors that influence information diversity and ideological slant and thereby enrich understanding of how echo chambers work in digital spaces.

Towards a unified model of echo chambers and information cocoons

To address our research question, we first develop a conceptual differentiation between information cocoons and echo chambers. We present a model that illustrates how behavioral and social factors can lead to variation in information source consumption, resulting in the formation of either information cocoons or echo chambers. This process-based view offers two key advantages: (a) it conceptualizes the phenomenon through the lens of information processing flow; and (b) by removing algorithmic filtering from the model, it allows us to consider the role of user agency in creating confined information environments.

As illustrated in Fig. 2, selection homophily and network homophily represent two pivotal forces influencing the information sources a user is exposed to. We begin by describing the processes that lead to the formation of information cocoons. Selection homophily underscores an individual's selective consumption of information. Before the advent of recommender algorithms, the phenomenon of the individual's selective information consumption was already evident. Sunstein (2006) described information cocoons as environments in which individuals lock themselves into "communication universes in which we only hear what we choose and only what comforts us and pleases us" (Sunstein, 2006, p. 9). For instance, based on their preferences and research areas, people subscribe to magazines and select specific academic journals. This active consumption of homogenized information is corroborated by the principles of selective exposure (Freedman & Sears, 1965) and cognitive dissonance (Festinger, 1962) described in academic literature. Individuals show a bias for seeking information that reinforces preexisting opinions while disregarding contradictory information. Moreover, they display a preference for engaging with supportive content (Sears & Freedman, 1967), engage in impulsive information sharing (Arendt et al., 2016), and show information avoidance behaviors (Momsen & Ohndorf, 2022).

As Sunstein (2006) posited, information selection involves two primary categories: topics and viewpoints. The phenomenon of selective exposure to issues of interest is pervasive. To illustrate, vegetarians tend to prioritize news related to vegetarianism (Lueders

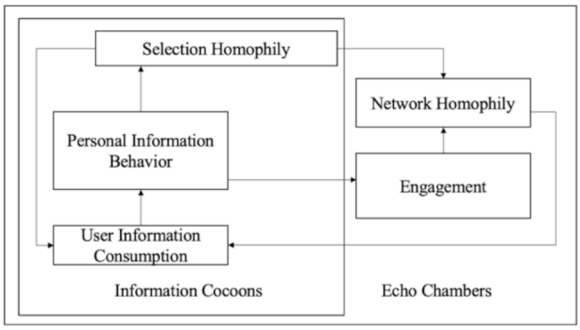

Fig. 2. A Model of Echo Chambers and Information Cocoons.

et al., 2022), and owners of a specific car brand are more inclined to view marketing advertisements for that brand (Sunstein, 2017). Selective exposure to confirmatory information frequently results in suboptimal decision outcomes, and the phenomenon may intensify in the context of the Internet (Fischer & Greitemeyer, 2010). In the contemporary era, individuals have access to vast amounts of information. While they tend to selectively consume information that aligns with their viewpoints, this selectivity is also a practical response to information overload, not just a psychological tendency. This homophily of choice leads to information bias and narrowing, which further leads to individuals becoming siloed in information cocoons. Scholars have posited that even when individuals are exposed to diverse content on the Internet, it only sometimes leads to the consumption of varied perspectives. Bakshy et al. (2015) collected data from over 10 million American Facebook users and compared the news categories that users voluntarily read with the information presented to them through algorithms. Their findings indicate that users are more likely to consume information aligned with their existing viewpoints, leading the authors to conclude that homogenization was occurring. In short, users' selective choices based on their points of view and interests are the driving force behind the formation of information cocoons.

We now turn to the phenomenon of echo chambers. Following the occurrence of selective homophily driven by user choices, there arises the possibility of dynamic group homogeneity. Network homophily, established on the foundation of social interactions, may be fostered through interpersonal diffusion, facilitating the formation and interaction of homogeneous groups (Flaxman et al., 2016; Geiß et al., 2021; Shore et al., 2016). During user-prompted interpersonal communication, individuals seek out others with viewpoints that align with their own (Shore et al., 2016). This can manifest in various contexts, like daily face-to-face interactions or mutual attraction in online settings. Individuals with congruent viewpoints aggregate and form multiple distinct groups. The dissemination of homogenized information within these groups fosters homogeneous perspectives. For example, Röchert et al. (2022) found that in online conspiracy communities, there is a high level of homogeneity in discussions among advocates of these theories. In another study of online discussions about public events, Strauß et al. (2020) found a positive correlation between the frequency of discussions and the level of homogeneity within the group.

Furthermore, heterogeneity between online groups tends to increase. In the context of technology-mediated social interactions, the role of technology is amplified, serving as a potent force in driving information dissemination. One such influence is collaborative recommendation technology, which plays a crucial role in content recommendation. Notably, even users who do not exhibit pronounced viewpoint biases may be exposed to a high frequency of supportive information related to a particular stance. This phenomenon can be attributed to the impact of social algorithms as described by Lazer (2015).

In conclusion, the subjectivity of user preferences enables the construction of personalized, homogenized information environments – referred to as *information cocoons*. Both user-initiated interpersonal diffusion and social interactions demonstrate the existence of perspective heterogeneity between groups and homogeneity within groups. User preferences for homogenized choices can result in echo chambers through iterative dissemination of homogeneous information in human interactions, which can, over time, lead to the emergence of identifiable information cocoons.

Methods for structuring information cocoon and echo chamber developments

Literature search

To address our research questions, we adopted a concept-driven, iterative theoretical literature review based on the methodology proposed by Boell and Cecez-Kecmanovic (2014). This approach is well-suited to synthesizing findings on diverse and poorly defined constructs, like echo chambers and information cocoons. The iterative nature of this method allows for a more nuanced understanding of ill-defined phenomena by continuously refining the scope of literature considered and progressively distilling key insights from a broad body of work. As illustrated in Fig. 3, the research design is structured around an iterative process that alternates between literature search and analysis, enabling continuous engagement with the research as each step leads to others. Each iteration informs and refines the next, allowing for a more dynamic and adaptive literature synthesis. Specifically, the method allows for incremental identification of relevant literature through intersecting cycles of search and analysis (Boell & Cecez-Kecmanovic, 2014). A primary

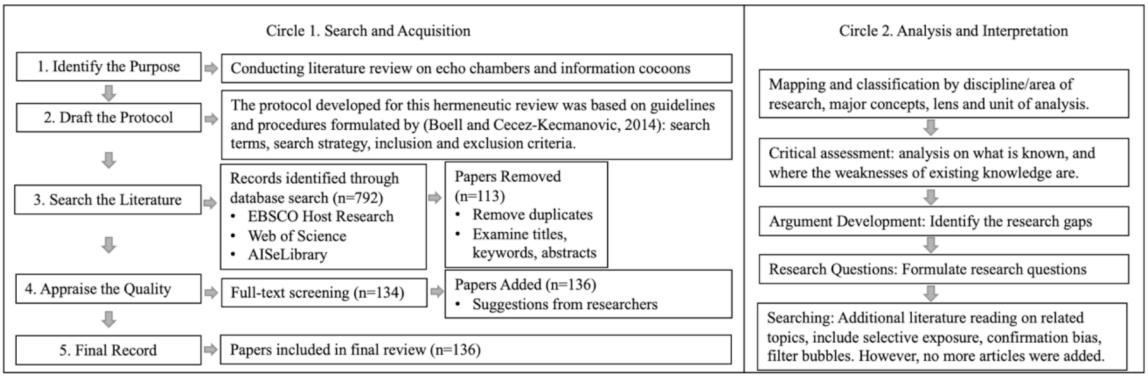

Fig. 3. Methodological Process of the Review.

strength of the hermeneutic review framework is its focus on highly relevant publications, rather than an extensive but potentially less relevant collection of research. By revisiting the literature through each cycle, we ensure that our synthesis not only identifies foundational works but also captures emerging insights and novel perspectives. Furthermore, the emergent nature of the echo chamber effect (Brugnoli et al., 2019), which requires a socio-technical perspective, aligns with the iterative nature of this methodology. This allowed us to identify both foundational and novel insights within the literature.

The iterative search, acquisition, analysis, and interpretation cycles were conducted rigorously. In the initial search, we used the terms "echo chamber", "echo chambers", information cocoon", and "information cocoons," applied to academic databases, including EBSCO Host Research Databases, Web of Science, and AISeLibrary, selected for their coverage of interdisciplinary research, especially in information systems and socio-technical fields. The search process yielded 792 papers, dating from January 2009 to July 2023. We chose to include studies published from 2009 onward, as this period marks a significant shift in social media's impact on information consumption and sharing, with Facebook reaching 350 million users and surpassing Myspace as the most popular social media platform (Baresch et al., 2011). The surge in social media usage marked the beginning of widespread digital information-sharing behaviors that contributed to the formation of echo chambers, as they began shaping users' content exposure. The year 2009 also saw Twitter's (now X) rise in popularity. After removing duplicates, 304 papers remained. A further screening of titles, keywords, abstracts, and introductions resulted in the selection of 134 relevant articles. A second search cycle, guided by recommendations from other researchers in the field, included two additional articles deemed particularly pertinent to our study. This resulted in a final sample size of 136 articles. These articles spanned eight academic fields and employed research methods that include mixed methods, conceptual analyses, literature reviews, simulations, and interviews (Chen & Hirschheim, 2004).

Our survey addresses a critical gap in the literature on social media echo chambers by offering an information systems-based analysis. Existing reviews, while valuable, adopt narrower disciplinary perspectives. For instance, Nguyen (2020) provided a thorough examination of echo chambers and filter bubbles from a philosophical standpoint, whereas Mahmoudi et al. (2024) concentrated on technical contributions within computer science and engineering. Our work synthesizes interdisciplinary insights to deliver a view into the socio-technical dynamics underpinning echo chambers and information cocoons, positioning it as a resource for both scholars and practitioners in the field.

Information search and development of a preliminary definition

The fundamental aspect of our effort to establish a well-rounded understanding of echo chambers and information cocoons is the literature review. Based on this methodology, we gathered explicit definitions of information cocoons and echo chambers. Our analysis shows that these terms are often used interchangeably, requiring clear and consistent definitions to differentiate between them. It is important to provide clear definitions that distinguish the two terms to provide clarity and consistency of usage.

The initial step involved extracting common elements from previously identified definitions of each topic. These were then clustered into separate definitions. The definitions were prepared and cleaned separately for topic modeling analysis using the R program, following the recommendations from Schmiedel et al. (2019). This process revealed that there is no clear definition of information cocoon; instead, all the extant definition-like descriptions were based on Sunstein's description (2006). For echo chambers, multiple definitions emerged from the literature, but there is a notable absence of a standardized definition, as demonstrated by the variations summarized in Table 2. While the lack of standardized definitions may initially seem challenging, it presents opportunities for us to contribute to the ongoing scholarly dialogue by proposing synthesized and contextually relevant definitions. Table 1 presents the most frequently used words in the definitions of Information Cocoon and Echo Chamber.

Table 1
Definition Attributes from Information Cocoons and Echo Chambers.

Keywords on Information Cocoons	Number of Uses	Keywords on Echo Chambers	Number of Uses
information cocoon	4	beliefs	54
public	3	information	44
Silkworm chrysalis cocoon	2	echo chamber	41
cocoon	2	echo	41
information	2	chamber	41
		individuals	39
		pre-existing	33
		exposed	32
		pre-existing beliefs	26
		exposed information	24
		opinions	24
		individuals exposed	23
		perspectives	23
		social	21
		encounter	21
		attitudes	19
		individuals exposed information	18
		alternative	18
		digital	15
		information opinions	14

In the next step, we compared how these elements are distinguished among the papers. Once again, we concluded that information cocoons are like echo chambers, based on analyzing their constituent characteristics. Therefore, our analysis focused on explaining distinctive information cocoon and echo chamber processes. Following Tatarkiewicz (2012), the elements that distinguish information cocoons from echo chambers were identified as differentiation criteria, as they are necessary to define the term. Subsequently, the aforementioned elements are integrated to form a preliminary definition, which will be discussed in greater detail in Section 4.

Deriving research streams and identification of contributions and research gaps

We employed a keyword-based tagging system to identify potential research gaps and categorize each paper according to its predominant theme. This approach allowed us to group papers sharing similar tags to form research streams corresponding to the prevailing topic they collectively addressed. This process yielded three primary research streams: (a) source of information, (b) measuring echo chambers, and (c) implications. We then examined all the identified papers comprehensively to assess their impact on our understanding of the two phenomena. To this end, we employed an iterative open-coding approach (Corbin & Strauss, 2008) to ascertain the extent to which each paper contributed to the discourse surrounding information cocoons and echo chambers and to identify any untapped avenues for further inquiry. The results of this analysis are presented in the following section.

Findings

This section synthesizes the literature on echo chambers and information cocoons. It begins with a definition of information cocoons and echo chambers. It then provides a detailed analysis of the main understanding of each stream in relation to the framework proposed. The distribution of studies related to the stream classification is presented in the Appendix.

Table 2
Existing Definitions of Echo Chambers.

Source	Definitions	Components	Codes
Baumgaertner (2014); Bakshy et al. (2015); Justwan et al. (2018);	Echo chambers in which individuals are exposed only to information from like-minded individuals	social boundaries; information homogeneity;user similarity	engagement; group; information consumption;
Colleoni et al. (2014); Jasny et al. (2015); Jasny et al. (2018); Del Valle and Bravo (2018); Masip et al. (2020); Guo et al. (2020); Wagner and Ylä-Anttila (2020); van Eck et al. (2021);	The echo chamber effect is due to a tendency of individuals to create homogeneous groups and to affiliate with individuals that share their political view.	user similarity; homogeneous groups; share;	engagement; group; information consumption;
Garimella et al. (2018); Marks et al. (2019); Cinelli, Brugnoli, et al. (2020); Baumann et al. (2020); Morales et al. (2021);	Situations where users consume content that expresses the same point of view that the users themselves hold or express.	information homogeneity; consume;	personal information behavior; user information consumption;
Garrett (2009b); Flaxman et al. (2016);	Individuals use the Internet to construct 'echo chambers' in which the only viewpoints they encounter are their own.	information homogeneity with group	engagement; group; information consumption;
Shore et al. (2016)	The fragmentation of users into ideologically narrow groups in which people are only exposed to information that confirms their previously held opinions.	social boundaries, user similarity, information homogeneity	engagement; group; information consumption;
Bessi (2016); Zollo (2019); Xin Wang et al. (2020)	Users interact only with information that conforms with their system of beliefs and ignore other perspectives and opposing information.	information homogeneity; conforms;	information consumption; personal information behavior;
Nguyen (2020); Santos (2021)	An echo chamber is a social epistemic structure in which other relevant voices have been actively discredited.	social boundaries	engagement; group;
Barberá et al. (2015); Geiß et al. (2021)	Such information environments tend to develop among individuals with a homogenous network, fostered by homophily, overall leading to a low salience of challenging information and opinions.	social boundaries, user similarity, information homogeneity	network homophily;
Jamieson and Cappella (2008); Dubois and Blank (2018); Cota et al. (2019); Choi et al. (2020)	Echo chamber is a metaphor for an environment in which a person is exposed only to certain information again and again.	; exposed;	engagement; group; information consumption;
Eady et al. (2019)	Consuming and sharing only information that is consistent with their political beliefs.	information homogeneity	personal information behavior
Bessi et al. (2015); Del Vicario et al. (2016); Karlsen et al. (2017); Bastos et al. (2018)	Echo chambers as a process of self-selection that confines communication to ideologically-aligned cliques.	;	engagement; personal information behavior
Madsen et al. (2018)	Echo chambers can be defined as enclosed epistemic circles where people engage with like-minded others and reinforce their shared pre-existing beliefs.	social boundaries, user similarity	engagement; group;

Stream 1: Definitions of echo chambers and information cocoons

Upon examining the literature, it became evident that there is no unified definition for the term "echo chambers" (Kitchens et al., 2020). Instead, various definitions emerged. Through our analysis, we identified commonalities among the definitions, including social boundaries, information homogeneity, and user similarity (Markgraf & Schoch, 2019). However, we recognize that the definitions could be more consistent if they focused on a more unified set of characteristics. Given the lack of consensus on the definition of echo chambers, the first objective of the study is to provide an unambiguous definition that avoids conflating similar terms while emphasizing the core mechanisms underlying echo chambers and information cocoons.

Echo chambers

The process model of echo chambers suggests that their formation is the result of social communication homophily. Echo chambers arise from a dynamic group effect, where repetitive reinforcement of a singular viewpoint occurs among group members. Jamieson and Cappella (2008) provided the first formal definition of echo chambers as a "bonded, enclosed media space that has the potential to both magnify the messages delivered within it and insulate them from rebuttal." Building on this foundational definition, we articulate a new, process-centric definition of echo chambers that encompasses three fundamental traits: (a) a group effect; (b) information homogeneity and repetition within the group (Colleoni et al., 2014; Del Valle & Bravo, 2018; Garimella et al., 2018); and (c) discrediting outsider content (Nguyen, 2020). Thus, the *echo chamber* is a metaphor for an environment in which a group of like-minded people repeatedly reinforce the same point of view and discredit perspectives and opposing information.

Evidence of echo chambers can be identified through various mechanisms, particularly in the social media context. Social media influencers, supported and respected by their followers, exemplify this phenomenon. The *following* mechanism allows users with different identities and backgrounds to align on preferences and viewpoints, creating a virtual cluster of individuals around a typical influencer. Within distinct clusters of like-minded individuals, a shared set of preferences and viewpoints emerges. These clusters are not random collections of contacts but are formed as followers engage selectively – through commenting, sharing, and interacting primarily with those who echo similar ideas. Over time, these focused interactions reinforce common attitudes and behaviors, creating a feedback loop that increasingly shapes members' perspectives. This dynamic fosters an environment where information circulating within the cluster tends to overpower external, potentially contradictory sources.

Information cocoons

In contrast, information cocoons arise from self-selection processes rather than group engagement (Hou et al., 2023). The *information cocoon* effect is defined as a metaphor for an environment in which users interact only with information consistent with their beliefs and fail to hear other perspectives and opposing information due to self-selection. This definition applies to both offline and online contexts. For instance, social media platforms utilize data analytics and algorithms to curate and amplify content that aligns with user interests (Li et al., 2022). These mechanisms differ from the broader dissemination of information through personalization; instead, they reinforce preexisting user preferences over time. Users thus become increasingly inclined to consume only content that resonates with their past choices (Piao et al., 2023).

This phenomenon, which can be termed information closure (Gossart, 2014), occurs when user exposure to information is restricted to that which reinforces their existing beliefs and opinions. Thus, while individuals' algorithmically reinforced self-selection behaviors give rise to information cocoons, echo chambers result from collective reinforcement among group members (Hou et al., 2023). Both concepts exert a similarly restrictive influence on users, including the limitation of individual vision (Lackey, 2021), polarization of user opinion (Guess et al., 2018), and social fragmentation (Dutton et al., 2017) – all consequences of information homogenization (Guess et al., 2018).

Stream 2: Source of information for selective information acquisition

Research in information processing has explored how individuals engage with information sources and as a consequence shape their understanding of the world. This "source of information stream" investigates mechanisms guiding selective information acquisition, which can lead to the ideologically homogeneous environments described here.

Understanding personal information behavior

Analyzing the individual factors of information behavior illuminates the psychological underpinnings of selective exposure. For instance, Festinger's (1962) cognitive dissonance theory posits that individuals seek information that aligns with their preexisting beliefs to maintain cognitive harmony. Our analysis extends this by demonstrating how motivated biases, as described by Baumgaertner and Justwan (2022), actively reinforce ideological echo chambers. We argue that this selective exposure does not merely reflect individual choices but is also shaped by dynamic interactions with peers, further consolidating group beliefs and values over time (Donkers & Ziegler, 2021).

Our review reveals that selective exposure significantly influences broader behavioral patterns, shaping health perspectives, political ideologies, and decision-making processes. For example, Westerwick et al. (2017) found that selective engagement with health information can shape attitudes toward medical practices, while Sawicki et al. (2013) illustrating how affirmation-seeking behavior reinforces consistent attitudes by favoring information that confirms pre-existing conflicting beliefs. These findings underscore the critical role of social dynamics in sustaining established beliefs, even after pivotal decisions have been made (Festinger, 1962; Pandey et al., 2023).

Moreover, our reading of the underdog effect described by de Arruda et al. (2021) highlights that contrasting opinions may diversify viewpoints, yet individual preferences for similarity remain paramount in establishing echo chambers. This insight contributes to our understanding of how individuals can navigate and potentially liberate themselves from information cocoons, contingent on their agency and decision-making.

The ability of individuals to escape an information cocoon depends on their level of agency. As the number of news sources continues to increase exponentially, consumers must select among them. Early work by Bimber and Davis (2003), which examined the 2000 U.S. election cycle, showed that selective media engagement intensified political polarization (Stroud, 2010). Ideologically aligned outlets, especially when accompanied by social endorsements, have been shown to deepen polarization (Cardenal et al., 2019; Mukerjee & Yang, 2021), illustrating the significant role of selective exposure in creating digital echo chambers (Cinelli, Brugnoli, et al., 2020).

Understanding group information behaviors

Beyond individual choices, group dynamics profoundly impact information-seeking behavior, often reinforcing echo chambers. In examining literature on group dynamics, we find that social homophily – the tendency to associate with like-minded individuals – profoundly impacts information-seeking behavior, reinforcing echo chambers (McPherson et al., 2001). These findings suggest that group conformity (Crutchfield, 1955) strengthens ideological alignment within social networks, creating social feedback loops that fortify shared beliefs. We argue that as group consensus crystallizes, ideologies become increasingly resistant to external challenges, intensifying the echo chamber effect (Colleoni et al., 2014; Nguyen, 2020).

Our review also highlights that echo chamber amplification by social media platforms facilitates connections among ideologically similar users (Bruns, 2017). We show from the literature that in digital environments characterized by local clustering, groups develop self-reinforcing information loops that filter out divergent perspectives (Botte et al., 2022). We also review the role of internet influencers in sustaining echo chambers, as they curate content that resonates within polarized communities, resulting in insulated, ideologically clustered groups (Asatani et al., 2021). In a related study, Donkers and Ziegler (2021) proposed the existence of two types of echo chambers on social media: epistemic echo chambers, which create information gaps primarily through structural design, and ideological echo chambers, which systematically exclude information that contradicts their beliefs. This framework revealed complex social structures that contribute to the persistence of echo chambers.

Understanding digital technology and systems-based causes

As noted before, the evolution of digital technologies offers users unprecedented access to vast information streams mediated by algorithms that tailor content to individual histories (Lin et al., 2015; Y. Wang et al., 2023), creating increasingly personalized information environments that reinforce existing biases (Pariser, 2011).

The debate surrounding the effects of recommender systems on echo chambers is particularly relevant. Some scholars have argued that these systems exacerbate ideological polarization (Fang & Xu, 2022; Grossetti et al., 2021; Krause et al., 2022; Luo et al., 2022; Y. Wang et al., 2023). For instance, Bucher (2012) focused on the path of information recommendation and investigated how algorithms facilitate the formation of echo chambers. He posited that as time passes, algorithmic personalized recommendation mechanisms exacerbate users' specific perceptions of the world around them, reinforce inherent perceptions, and reduce their desire for broader information. Baumgaertner and Justwan (2022) concluded that social media platforms can both facilitate and intensify polarization. Building on their earlier conceptual distinction between epistemic and ideological echo chambers, Donkers and Ziegler (2021) further investigated the characteristics of this dual echo chamber phenomenon using an agent-based model. Their results suggest that addressing these distinct types of echo chambers requires recommender systems to employ fundamentally different diversification strategies.

By contrast, some research suggests that while algorithms play a role in content exposure, individual preferences are the primary factor in shaping personal information ecosystems. For example, Haim et al. (2018) found that Google News, which aggregates diverse sources and perspectives, does not inherently deepen echo chambers.

Stream 3: Measuring echo chambers

The following summary concerns research that tries to detect the presence of echo chambers. Based on the literature analysis, two primary data sources emerge: self-report data and data that track user behaviors. Given that the concepts of information cocoons and echo chambers remain unconceptualized, our findings pertain primarily to the measurement of echo chambers.

Understanding the scaled measurement

Research on this topic has produced scales for measuring echo chambers, divided into single-platform and cross-platform scales. For instance, Vaccari et al. (2016) developed a scale that classifies users based on their agreement with others' political views, revealing a spectrum of echo chamber intensity. This approach focuses primarily on individual platforms.

Our synthesis of this research suggests that while the scales offer valuable insights, it's important to review the complexities of user interactions across multiple platforms. Cross-platform scales like the five-question model developed by Dubois and Blank (2018), show user exposure to diverse viewpoints. However, we propose refining these scales in two distinct ways: first, by adapting them to measure how frequently users encounter differing opinions across various platforms, thereby capturing cross-platform exposure; and second, by expanding them to differentiate between passive exposure and active interaction with these viewpoints. This distinction would move our analysis from isolated platform behaviors to a more comprehensive view of user behavior, ultimately offering deeper insights into

echo chamber dynamics.

Understanding the digital tracing Measures

Digital trace data, as defined by Howison et al. (2011), presents a powerful tool for addressing biases inherent in self-reported measures. Our review shows that much existing research remains focused on single platforms, limiting the generalizability of findings.

By synthesizing studies that employ digital trace data from social media platforms like X (formerly Twitter), Facebook, and YouTube, we identify a critical gap in understanding the interactions between heterogeneous groups. Social network analysis of echo chambers is investigated on two main dimensions:

a) User Structural-based Measures:
   - The degree of network homogeneity within the same group (Asatani et al., 2021; Colleoni et al., 2014; Del Vicario et al., 2016; Garimella et al., 2018; Luo et al., 2021; Villa et al., 2021; Zhu et al., 2021)
   - The degree of network polarization among different groups (Bessi, 2016; Cota et al., 2019; de Arruda et al., 2022; Del Vicario et al., 2016; Garimella et al., 2018; Villa et al., 2021)

b) Information Content-based Measures:
   - Stance detection between news (Lo et al., 2021)
   - Propagation of polarized information (Minici et al., 2022)
   - Modularity (Donkers & Ziegler, 2021; Wolfowicz et al., 2023)

The greater the degree of network homogeneity within the same group, the more likely it is that opinions will circulate in a recurrent pattern, reinforcing the same viewpoints and ideas (Del Vicario et al., 2016). Colleoni et al. (2014) used machine learning to classify Twitter (now X) users as Democrat or Republican supporters based on the political content they share. They then applied network analysis to measure political homophily in two types of networks: the nonsymmetric interest graph, where users follow others without necessarily receiving a follow back; and the symmetric social graph, where follow relationships are reciprocated. In both cases, the degree of homophily is determined by calculating the percentage of a user's connections that share the same political orientation, which serves as an indicator of political cohesion within these networks. Del Vicario et al. (2016) demonstrated that misinformation on Facebook spreads within highly homogenous and polarized groups. Zhu et al. (2021) proposed an influence maximization model, which posited that users are influenced not only by their immediate neighbors but also by the larger social group to which they belong. Their findings showed that the number of activated users was higher when the echo chamber effect was present.

Hayat and Samuel-Azran (2017) developed the Silo index to reflect the proportionality of interactions between members of the same political camp; a Silo index of 1 represents an extreme echo chamber in which people interact only with politically like-minded peers. Luo et al. (2021) conducted a study integrating the composition and structure of like-minded users within groups, leveraging the concept of Markovian processes. Their model, evaluated using Twitter (now X) data from a presidential election, revealed a significant level of polarization, especially around the election period, as evidenced by the proportion of users' retweets to individuals with similar political ideologies.

Villa et al. (2021) examined the structure and semantics of echo chambers by investigating both individual characteristics and the dynamics of group interactions. They identified two key factors contributing to the formation of echo chambers: first, the degree of polarization among groups (reflecting divergent opinions); and second, the homogeneity within groups, which reinforces internal consensus. Del Vicario et al. (2016) developed an opinion dynamic model for social networks that shows echo chambers emerge when group members share highly concentrated, consistent opinions, while distinct groups diverge markedly in their reviews. In their work, echo chamber formation was quantified by comparing the degree of concentration of similar opinions within a group with the extent of divergence between groups or polarization.

Another key aspect of echo chamber measurement is the degree of interaction between heterogeneous groups. The greater the tendency toward homogenization within a group, the greater the polarization across heterogeneous groups, and the lower the degree of interaction between the groups, the more pronounced the "echo chamber effect" becomes.

Barberá et al. (2015) conducted an ideological analysis of Twitter (now X) users, showing that individuals within echo chambers tend to engage in selective contact, ideological segregation, and political polarization. While most research has focused on evaluating internal consistency within ideologically aligned groups, Bessi (2016) compared different types of polarized communities. Villa et al. (2021) measured the degree of disagreement among group members using personal traits, further validating the formation of echo chambers. Garimella et al. (2018) presented and compared various echo chamber measures. One approach to quantifying echo chambers in any network is to partition the conversation graph in order to identify potential sides of the controversy between different groups. Our review indicates that user structural-based measures, such as network homogeneity and polarization, provide insights into how opinions circulate within groups. We propose that integrating user structure and content-based measures can yield a more comprehensive understanding of echo chambers. For instance, by combining stance detection methods with social network analysis, researchers can better capture the dynamics of information propagation in polarized environments.

Online content provides a rich source for semantic analysis, another method for detecting and modeling echo chambers. One such method is to examine the stance of the news posted. Lo et al. (2021) presented two novel methods for investigating the impact of echo chambers: visualizing events alongside their corresponding news pieces; and tracking the distribution of stances across news articles from sources with varying political ideologies. In their methodology, the headline of the highest-ranked news item retrieved by the search engine was identified as the event's *claim*. They deployed a stance classification model to assess the stance of selected news articles about a given event. The authors used Bidirectional Encoder Representations from Transformers to encode the representations

of both the claim and the perspective offered by the news source. These representations were derived based on the content of the claim and the news article, respectively. Subsequently, the cosine was applied to show the consistency between the event claim representation and the perspective representation. Minici et al. (2022) used a hybrid method to detect echo chambers, wherein they measure values for community polarization, social engagement, and polarization parameters. Experimental results confirmed the efficacy of the method in identifying highly polarized communities. The method employed a Graph Convolutional Network (GCN) architecture and stochastic optimization for training, addressing class imbalance through random oversampling of the minority class.

Another approach to measuring echo chambers is modularity, which quantifies how distinctly a network is partitioned into communities that are relatively isolated from the larger network (Bruns, 2017). Wolfowicz et al. (2023) applied modularity as a key measure in their study of echo chambers in radicalization, using it to assess the degree of network polarization.

The synthesis of these research streams not only consolidates our current understanding of echo chambers but also highlights actionable insights for future research. By redefining scales to incorporate cross-platform behaviors and enhancing digital trace methodologies, we can better understand how individuals navigate diverse information landscapes. This approach extends theoretical frameworks and provides practical approaches to address the challenges posed by echo chambers and information cocoons in today's digital media landscape.

Stream 4: Implications of selectively confined information environments

The final research stream addresses the implications and potential effects of individual experiences within echo chambers. Echo chambers limit the diversity of exposure and reinforce established beliefs, increasing insular perspectives.

Understanding personal information consumption (Selection Homophily)

The literature confirms that echo chambers significantly narrow personal information exposure, leading individuals to engage predominantly with content aligned to pre-existing beliefs. This phenomenon of selection homophily results in high levels of information homogeneity that not only reinforces cognitive biases but also diminishes the likelihood of encountering divergent perspectives. The implications of this narrowing of information diversity are profound, influencing everything from political viewpoints to social attitudes.

In synthesizing existing literature, we extend our understanding of selection homophily by highlighting how social networks act as facilitators of ideological entrenchment. Traditionally, news was delivered by a limited number of outlets, such as major newspapers and television channels, which were subject to regulations like the Fairness Doctrine. These constraints ensured that reporting remained fact-based, even if selective biases were present, whereas media outlets that rebranded themselves as "entertainment" were able to bypass such requirements. The subsequent explosion of media channels further eroded traditional standards, and social media has amplified this shift. Research by Bakshy et al. (2015) demonstrated that user preferences for ideologically aligned content on platforms like Facebook contribute to the formation of echo chambers, while Barberá (2020) confirmed that these individual preferences exacerbate political polarization. Similarly, Kitchens et al. (2020) examined partisan engagement on Facebook and found that users gravitate towards news sources aligned with their political leanings, indicating a pronounced shift toward ideologically partisan consumption. Bannister and Connolly (2018) argued that the increasing perception of social media as a democratic threat stems from the way echo chambers reinforce political biases, thereby influencing public discourse.

Understanding group polarization (Network Homophily)

Echo chambers also foster group polarization by facilitating connection primarily with like-minded peers, amplifying ideological divides. Sunstein (2001) highlighted how individuals create self-segregated echo chambers, which intensify psychological tendencies toward homogeneity and the repetition of similar viewpoints. This process not only excludes alternative ideas but also heightens the risk of radicalization, leading to a broader polarization between different ideological groups. Within these communities, influential voices often emerge as opinion leaders, guiding and amplifying group sentiment in social networks centered on contentious topics like gun control, where users tend to avoid direct engagement with opposing views (Merry, 2016).

Research into political discourse on Twitter (now X) reveals comparable dynamics. Conover et al. (2011), like others, found that Twitter users are more likely to engage with content from ideologically similar users, reinforcing segregation within online networks. Barberá also showed that political interactions on Twitter (now X) reveal a strong preference for ideologically aligned information, underscoring the role of social media in echo chamber formation (Barberá et al., 2015; Barberá, 2020). Similarly, Bakshy et al. (2015) found that users primarily shared links corresponding to their ideological affiliations, intensifying the divide between conservative and liberal groups. These findings were supported by cross-national studies, such as Fletcher et al. (2021), which identified a global trend in which online news consumers increasingly inhabit politically partisan echo chambers and limit their exposure to diverse viewpoints.

The evolutionary process and directions for future research

The evolutionary process

The review of information sources significantly enhances our understanding of how individuals acquire and engage with information in the context of echo chambers and information cocoons. Future research must adequately make the distinction between information cocoons and echo chambers. This article takes an initial step in laying the groundwork for future studies with a conceptual analysis and evolutionary approach to information cocoons and echo chambers in order to address their negative effects. The

evolutionary trajectory depicted in Fig. 4, adopting the homophily perspective, delineates the transition from homogenized selection within information cocoons to group homogeneity within echo chambers. This trajectory underscores the intrinsic human inclination towards homogenized selection, the resultant group homogeneity arising from users' inherent group affiliations, and the cumulative impact of interpersonal interactions within the technological context. This progression highlights that information cocoons emerge within a multifaceted and diverse information environment. Consequently, in order to effectively mitigate the adverse effects of information cocoons and echo chambers, a meticulous and contextually tailored deconstruction is necessary based on this developmental trajectory.

Challenges and opportunities for IS research

Research on echo chambers and information cocoon mechanisms and their implications continues to face contradictions yet offers substantial opportunities for advancement. Scholars across disciplines – including communication studies, political science, and computer science – have contributed to the field, often through quantitative analyses that examine patterns of content engagement, network structures, and algorithmic impact on information exposure (Bakshy et al., 2015; Barberá et al., 2015). While quantitative methods provide insights into the prevalence and partisan dynamics of echo chambers, research on the personal nature of information cocoons is better explored with qualitative approaches into user preferences and self-selection behaviors through observation, interviews, or mixed methods (Ruth et al., 2019). Information systems researchers are well-positioned to bridge diverse methodologies, addressing the complex social and technical factors that sustain echo chambers and information cocoons. Advancing our understanding of these will require further exploration of the research area outlined. Table 3 provides a roadmap to guide researchers in formulating meaningful questions and tackling areas in need of deeper investigation. The following sections suggest interdisciplinary, theoretical, and empirical pathways to address current gaps in the literature, which may offer insight into the complex dynamics of selective exposure and group-based information reinforcement.

Interplay between echo chambers and information cocoons

The conceptual evolutionary framework proposed in this study emphasizes the need to distinguish between two closely related but distinct phenomena: information cocoons and echo chambers. The existence of echo chambers is well documented, but it remains unclear whether these and information cocoons are separate mechanisms or two aspects of a singular process (Nguyen, 2020). There is insufficient empirical research addressing the transition from individual-level immersion in information cocoons to the collective dynamics of echo chambers. This gap in understanding evokes the question: how does the transition from individual-level immersion in information cocoons evolve into the collective dynamics of the echo chamber, and what cognitive and social processes drive this shift?

While selective exposure underpins both phenomena, their mechanisms vary across contexts. Research on information cocoons and echo chambers tends to focus on online environments, particularly those shaped by algorithmic content delivery systems (Pariser, 2011). However, less is known about how these mechanisms manifest in offline, face-to-face interactions and traditional social group dynamics. Research is needed on how social interactions and cognitive processes in algorithmically driven digital environments differ from those in face-to-face settings in the formation and persistence of these phenomena.

Additionally, understanding qualitative dimensions of these phenomena, like how individuals experience and describe their immersion in information cocoons or echo chambers, is limited. Qualitative research can offer more nuanced perspectives on how the phenomena intersect and influence individual and collective behaviors.

Given the overlapping yet distinct features of information cocoons and echo chambers, it is essential to explore whether immersion in an information cocoon inherently leads to the collective dynamic of an echo chamber. Notably, the role of online commenting and other forms of digital interaction may be pivotal; individuals who primarily receive information via print or TV—where interactive engagement is limited—might not contribute to a collective echo chamber effect in the same way. The literature provides little clarity on whether these phenomena are sequentially linked or fundamentally separable. Consequently, researchers should investigate whether individual-level immersion in an information cocoon necessarily leads to a collective echo chamber effect, or if these

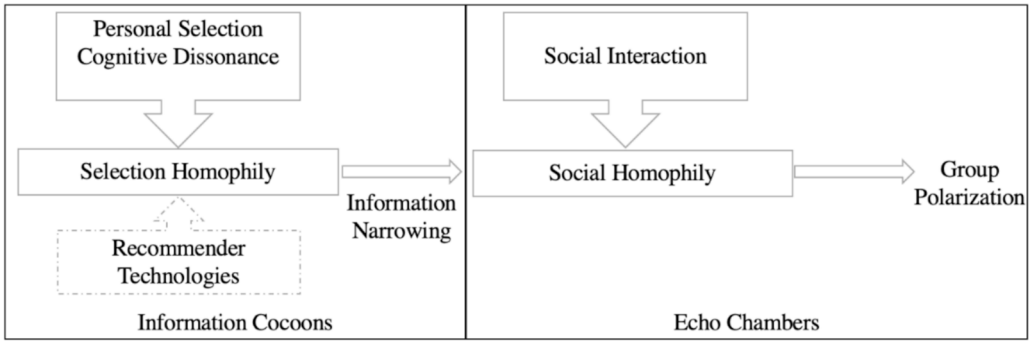

Fig. 4. The Evolutionary Process of Information Cocoons and Echo Chambers.

Table 3
Suggested areas of research to advance knowledge on Echo Chambers and Information Cocoons.

Topics	Proposed Research Questions
Research Stream$_1$: **Interplay Between Echo Chambers and Information Cocoons**	
Evolution of echo chambers and information cocoons	How do individual-level information cocoons evolve into collective echo chamber effects, and do these transitions follow a predictable or uniform pattern? How do social integration and the cognitive processes involved in the formation and persistence of information cocoons and echo chambers differ between online and offline environments? How can one used mixed method to understand factors driving information cocoons and echo chambers? How do information cocoons and echo chambers interact in digital environments and what factors influence their overlap in shaping user behaviors and beliefs across platforms? How do echo chambers evolve as a result of the reinforcement mechanisms within information cocoons, and how do these dynamics vary across different digital ecosystems?
Research Stream$_2$: **Sources of Information for Selective Information Acquisition**	
Personal Information Behavior	How do emotional factors interact with individual preferences for ideologically congruent content, and how do these emotional states amplify selective exposure behaviors? How do emotional states influence information cocoons over time, and to what extent do these states sustain selective information behaviors? What interventions, such as emotional cues, mitigate the formation of information cocoons?
Group Information Behaviors	How do group dynamics shape the persistence of echo chambers, and what are the conditions that lead to their dissolution or intensification? How do strong in-group loyalties correlate with resistance to counter-attitudinal content, and how do social pressures within groups discourage engagement with diverse perspectives? How do users within echo chambers negotiate and reinforce group norms, and how do these processes contribute to the formation of more homogeneous communities?
Digital Technology and systems-based causes	Do personalized recommender algorithms contribute more to individual-level information narrowing (information cocoons) or to group-level polarization (echo chambers), and what factors influence the prevalence of each outcome? How do echo chambers manifest across different messaging platforms (e.g., WhatsApp, WeChat, Telegram), and what are the unique dynamics of information isolation in each medium? How do users modify their information consumption patterns when faced with conflicting perspectives in a highly personalized digital environment?
Research Stream$_3$: **Measuring Echo Chambers and Information Cocoons**	
Scaled Measurement	1.1. How can Structural Equation Modeling (SEM) be utilized to develop and validate a comprehensive scale for measuring echo chamber dynamics across multiple digital platforms? 1.2. What are the key dimensions for measuring information cocoons?
Digital Tracing Measures	Does the formation of echo chambers based on user structure appear consistently across different digital platforms? Does the formation of echo chambers based on information content appear consistently across different digital platforms?
Research Stream$_4$: **Implications of Selectively Confined Information Environments**	
Personal Information Consumption	How do cognitive, emotional, and behavioral dimensions of attitudes interact to shape personal information consumption within echo chambers?
Group Polarization	How do individual emotional, cognitive, and psychological factors influence group polarization in echo chambers?

phenomena remain separate, particularly in contexts with varying levels of user interaction.

Finally, echo chambers are associated with increased polarization, particularly online. However, the conditions under which this polarization arises, and the specific factors that contribute to its intensity, remain underexplored. Hence, researchers should address the conditions and factors linked to increased polarization, particularly online.

Source of information for selective information acquisition

Personal information behavior. Our model, grounded in the notion of homophily, addresses the evolution of communication technologies and how user preferences shape information experiences on digital media. Studies of partisan debates illustrate that individuals across political divides favor information aligned with their existing affiliations, regardless of whether it originates from traditional media or from contemporary platforms like Instagram and X (Bou-Hamad & Yehya, 2020; F. L. Lee & Yin, 2021; Parmelee & Roman, 2020). This pattern of selective engagement highlights the persistent fact that despite the multiplicity of online channels, individuals gravitate toward sources that reinforce preexisting beliefs, fostering environments conducive to information cocoons and echo chambers.

While past studies have focused primarily on selective exposure as the key driver of these phenomena, emotional factors have been largely overlooked. Emotions like anger, fear, and excitement can profoundly shape how individuals engage with information, influencing not only what they select but also how they interpret and retain it (Valentino et al., 2009; Zillmann & Bryant, 2013). For instance, emotions can heighten one's receptivity to ideologically congruent content, amplifying the biases that underlie selective exposure and reinforcing entrenchment in information cocoons (Wollebæk et al., 2019). Therefore, while existing research has laid a foundational understanding of selective exposure, there are still opportunities to examine how emotions contribute to the formation of these information environments. Future research could build on this by investigating how emotional engagement interacts with preferences in ideological content and contributes to selective exposure behaviors. Additionally, emotional engagement could interact

with cognitive biases to amplify tendencies toward selective exposure (Kim, 2010). Therefore, it would be valuable to explore how emotional states influence the salience and retention of ideologically congruent content, further entrenching selective information behaviors over time. Finally, researchers could explore potential interventions, such as exposure to emotionally diverse content, to assess whether these approaches can reduce the tendency toward information cocoons and mitigate their harmful effects. Exploring these emotional dimensions could provide a more nuanced understanding of the psychological mechanisms underlying selective information exposure. This research direction would complement the homophily framework by adding emotional factors that interact with cognitive biases, and extend existing literature (Boutyline & Willer, 2017) to examine how emotions moderate ideological alignment online. Understanding these influences could inform strategies to address the impact of emotional bias in information behaviors.

Group information behavior. While information cocoons primarily manifest as individual-level phenomena driven by selective exposure and personal biases, their potential progression into echo chambers highlights the critical role of group dynamics. Group-level behaviors exacerbate information filtering effects, fostering environments dominated by homogeneous viewpoints while excluding divergent perspectives (Del Vicario et al., 2016). Social relationships within partisan groups or ideological communities intensify these dynamics, often distorting collective understanding (Nguyen, 2020). To understand this process, future research could examine the underlying mechanisms of social influence and collective decision-making to assess how group-level behaviors influence individual decision-making and contribute to the entrenchment of viewpoints across communities. Group identity plays a pivotal role in these processes. Strong in-group affiliations and social loyalties may intensify selective exposure and amplify the dissemination of homogeneous or biased information (Dvir-Gvirsman et al., 2016). Empirical studies could examine how strong in-group loyalties correlate with resistance to contradictory content, and how social pressures within groups discourage engagement with diverse perspectives.

Another meaningful avenue for future research could involve examining how users in echo chambers negotiate and reinforce group norms, which ultimately contribute to the formation of more homogeneous communities. Understanding this dynamic could provide insights into how collective behaviors and shared ideologies are solidified within digital spaces. Researchers might investigate how these groups engage with conflicting perspectives, adapt consumption patterns, and intensify selective exposure within these constrained environments.

Digital technology and Systems-Based causes. The proliferation and technical sophistication of digital technologies have profoundly reshaped how information is disseminated and consumed. While individual preferences historically shaped information environments, personalized recommender algorithms now amplify and filter preferences algorithmically (Berman & Katona, 2020). This shift has intensified individual exposure to content that aligns with preexisting beliefs, creating a cycle of reinforcement that can perpetuate misinformation and deepen ideological divides (Baptista & Gradim, 2021). Although some studies demonstrate that personalized algorithms contribute to echo chambers (Flaxman et al., 2016; Pariser, 2011), there remains an opportunity to investigate whether these personalized algorithms primarily contribute to individual-level information narrowing or group-level polarization. Specifically, the opportunity is to explore whether algorithmic influence is more pronounced for individuals through restricted exploration of new information, or at a group level, where collective ideologies become entrenched.

The existing literature on echo chambers and information cocoons focuses largely on platforms such as Facebook, Instagram, and X (formerly Twitter), which are well documented as facilitating algorithmic personalization (Aydin et al., 2022; Vaccari et al., 2016). However, messaging apps like WhatsApp, WeChat, Signal, and Telegram remain relatively underexplored in this context. Moreover, newer information sources such as Substack – where prominent media figures have shifted to personal podcasts and newsletters – also warrant attention as they are not bound by the same editorial constraints as traditional outlets. These platforms differ from traditional social networking sites, because of their closed-group dynamics and end-to-end encryption, or direct subscription models, which foster highly insulated communication chambers. What remains unclear is whether and how these structural differences influence the formation of echo chambers. Are these platforms equally susceptible to information isolation, or do they foster different echo chamber patterns than traditional social media? In addition to platform-level studies, the literature has explored how algorithmic personalization influences interactions between users with conflicting perspectives. As noted, recommender systems prioritize content congruent with existing user beliefs and reduce exposure to alternative viewpoints (Berman & Katona, 2020). While this dynamic is central to the creation of echo chambers, there is little understanding of how users adapt their consumption patterns when confronted with conflicting perspectives in highly personalized environments. This would include how algorithmic personalization influences user tendencies to avoid or selectively engage with contradictory content, ultimately reinforcing their views and potentially exacerbating echo chamber dynamics.

Measuring echo chambers and information cocoons

As previously discussed, two dominant methods – survey-based self-reports and social network tracing – have been extensively employed in empirical research. The instruments used to gauge echo chambers are predominantly self-report scales, which can be categorized as either platform-specific or cross-platform echo chamber scales. Network analysis of this domain relies primarily on indices that quantify the homogeneity and heterogeneity of user tracking data within a group. These differing methodologies have led to varied conclusions regarding the prevalence and nature of echo chambers. Studies leveraging social media trace data often find strong evidence of echo chambers, identifying homophily as a key driver of insular engagement. Users tend to interact predominantly with those who share their ideological beliefs, reinforcing patterns of selective exposure. Terren and Borge-Bravo (2021) discussed how such studies can provide valuable insights into this phenomenon, but they also emphasized the challenges of generalizing findings

across different platforms or populations. On the other hand, surveys that rely on self-report data and examine patterns of content exposure usually downplay the presence of echo chambers (Cardenal et al., 2019), suggesting that users are exposed to a variety of perspectives. However, surveys have their own limitations. As noted by Boutyline and Willer (2017), self-reports of homophily tend to overstate the degree of ideological alignment among users, since these reports are based on perceptions rather than actual behaviors.

Tracing data is effective in capturing real-time behavioral patterns, as it allows researchers to observe user actions in their natural social media environments. However, this method can't account for the demographic details of users, especially in light of challenges like restricted access to platform APIs (Rusche, 2024). Surveys are better suited for studying users' broader media consumption. They offer insight into how individuals engage with multiple platforms, but are prone to biases like recall inaccuracy and social desirability effects (Barberá et al., 2015).

Another important limitation of social media tracing data is its inability to establish causal relationship correlations. While it can identify associations between users and behaviors, it cannot prove that one factor causes another. As Rusche (2024) and Aruguete et al. (2023) suggested, the polarization observed in social media networks may be driven by broader societal factors rather than by the echo chamber effect itself. This is where experimental studies could offer more clarity, though they are more often challenging to conduct due to ethical concerns and logistical limitations (Brashears & Gladstone, 2020). Additionally, many social media tracing studies are confined to a single platform, limiting their ability to capture the full spectrum of user media habits. Surveys, especially those that track users over time, offer a more complete picture by considering cross-platform behaviors and uncovering phenomena like lurking, where users consume content without posting any (Moe et al., 2023).

Scaled measurement. The current scaled measurements of echo chambers provide a foundation for understanding user exposure to differing viewpoints, but are limited by their simplicity. Existing scales often fall short of capturing the complexities of individual behaviors and group-level dynamics within digital ecosystems. Incorporating approaches such as conversation or discourse analysis of interactions over time may offer a more nuanced understanding by expanding the model to include additional constructs related to both individual and group-level factors. One key direction could involve using Structural Equation Modeling to test the relationship between the constructs. Despite these advancements, a critical gap persists in scaled measurement for information cocoons. Unlike echo chambers, information cocoons are characterized by self-selection and deliberate avoidance of dissonant information, yet no comprehensive scales exist to measure this systematically. A scale for measuring information cocoons would be a contribution.

Digital tracing Measures. Social network tracing methodologies could benefit significantly from the integration of cross-platform data, providing a holistic understanding of user interactions and content exposure. For instance, combining data from multiple platforms would enable researchers to explore how user behaviors and relationships vary across digital environments, offering a richer view of their social network structures. Additionally, cross-platform analyses could address gaps in understanding how algorithmic personalization shapes information cocoons and echo chambers across diverse media ecosystems.

Implications of echo chambers and information cocoons

As revealed by the literature review, echo chambers emphasize the effect of opinion reinforcement and group polarization resulting from homogenized information exchange among similar individuals within a group environment. In contrast, information cocoons place greater emphasis on the effects of individual information selection behavior, leading to the narrowing of information exposure and polarization. Both concepts represent instances of information homogenization at individual and group levels, respectively.

Personal information consumption. Existing research emphasizes the role of selection homophily in echo chambers, where individuals engage primarily with ideologically aligned content, reinforcing biases and limiting exposure to diverse perspectives (Bakshy et al., 2015; Kitchens et al., 2020). Studies on platforms like Facebook highlight how these behaviors amplify political polarization and entrenchment (Barberá, 2020). Moreover, the reinforcement of biases through echo chambers has been linked to challenges for democratic discourse (Bannister & Connolly, 2018). However, while these studies focus on cognitive factors, they often overlook the interaction of emotional and behavioral dimensions in shaping personal information consumption. This gap calls for a deeper investigation into how these dimensions collectively influence user engagement in echo chambers. Given the increasing personalization of online content via algorithms, users are exposed to information that aligns with their existing attitudes while avoiding information that contradicts their beliefs. The attitudes literature encompasses cognitive, emotional, and behavioral dimensions (Ajzen, 1989), which have never been tested. Future research could investigate how different forms of attitudes interact within information cocoons and echo chambers.

Group polarization. Group polarization within echo chambers arises from network homophily, where individuals engage predominantly with like-minded peers, amplifying ideological divides (Fletcher et al., 2021; Sunstein, 2001). Social media platforms like Twitter (now X) reinforce this dynamic by fostering interactions with ideologically aligned content, deepening polarization (Barberá, 2020; Conover et al., 2011). While existing research highlights these patterns, the emotional and psychological factors underpinning group polarization remain underexplored. Employing qualitative methods, such as interviews or focus groups, could illuminate the subjective motivations behind these phenomena.

Conclusion

While these issues have garnered considerable scholarly and societal scrutiny, a consistent and explicit delineation of their fundamental conceptual underpinnings has yet to be discovered, leading to divergent interpretations and substantial debate. This paper aims to inform this debate and answer the research question of "What are the differences and interdependencies between echo chambers and information cocoons"? To this end, we develop a theoretical framework grounded in the homophily perspective to distinguish the link between these two concepts.

Echo chambers reinforce pre-existing beliefs within a group of like-minded individuals, where opposing perspectives and information are actively discredited. Information cocoons, on the other hand, refer to environments where individuals self-select information that aligns with their beliefs, thereby failing to engage with or hear opposing views. Our framework clarifies the distinctions between these concepts while also highlighting their interconnections. Furthermore, the paper provides insights into how these phenomena can be addressed in future research and policy interventions, particularly in relation to content curation algorithms and platform regulation.

Our findings indicate that the echo chambers represent an environment in which a group of like-minded individuals repeatedly reinforce the same point of view while discrediting opposing perspectives and information. In contrast, the information cocoon effect describes a phenomenon where users actively self-select information that aligns with their pre-existing beliefs, thus isolating themselves from alternative viewpoints. The confusion surrounding these concepts arises from the difficulty in distinguishing the nuances between them, as both involve forms of information isolation, but they operate through different mechanisms. On the influence of digital technologies, we find that algorithmic curation plays a critical role in amplifying both effects by feeding individuals information based on their previous interactions, preferences, and behaviors, which reinforces existing beliefs while limiting exposure to diverse or opposing perspectives. We conclude that the confined online information environments differ fundamentally from their offline counterparts in that they are not only shaped by social and behavioral factors but are significantly influenced by algorithm-driven content curation, which further intensifies the isolation of perspectives.

Our analysis and proposed definitions show distinct aspects for each concept. From the perspective of individual behavior, information cocoons underscore how individual information selection behaviors lead to information narrowing and polarization. By contrast, echo chambers show that in a group setting, exchanging homogeneous information among like-minded individuals results in opinion reinforcement and group polarization. Online information cocoons and echo chambers represent manifestations of information homogenization at individual and group levels, respectively. Information cocoons center on information choice within the dimension of information selection. Individuals proactively select information based on their personal preferences. Due to recommender technologies, people passively receive algorithmic suggestions. Under the echo chamber effect, individuals tend to make information choices that align with group preferences, resulting in conformity and clustering.

While this study offers meaningful insights, a few limitations also point to opportunities for future research. First, achieving comprehensive coverage in a literature review is inherently challenging (Brocke et al., 2009). Our selection focused on journal papers from three major databases and expert recommendations, which may have excluded relevant work from other disciplines or formats. Second, although we present a theoretical framework, empirical testing is needed to validate the relationships and distinctions proposed. Developing measurement tools and applying them in longitudinal or experimental studies could help deepen our understanding. Third, individual researcher perspectives may shape the identification of research streams and gaps. Collaborative, interdisciplinary approaches may help address this challenge. Together, these insights lay the groundwork for more precise reseach to the challenges posed by digital discourse.

CRediT authorship contribution statement

Jiaying Liu: Writing – original draft. **Andrew Schwarz:** Writing – review & editing. **Marten Risius:** Writing – review & editing. **Rudy Hirschheim:** Writing – review & editing. **James Van Scotter:** Writing – review & editing.

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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 A:. Studies and their Components of echo chambers

		Studies
Source of Information	Personal Information Behavior	Avnur (2020); Evans and Fu (2018); Justwan et al. (2018); Kuhn et al. (2019); Levy and Razin (2019); Masip et al. (2020); Nguyen (2020); Santos (2021); Sindermann et al. (2020); Xin Wang et al. (2020) Baumgaertner (2014); Baumgaertner and Justwan (2022); Cardenal et al. (2019); Cinelli, Brugnoli, et al. (2020); Currin et al. (2022); de Arruda et al. (2021); Donkers and Ziegler (2021); Fantl (2021); Fränken and Pilditch (2021); Gao et al. (2023); Jasny et al. (2015); Morini et al. (2021); Mukerjee and Yang (2021); Pandey et al. (2023); Salomons (2021); Sasahara et al. (2021); Sheeks (2023); Westerwick et al. (2017); Zollo (2019); Zumofen (2023); БаЖанов (2022)
	Group Information Behaviors	Asatani et al. (2021); Botte et al. (2022); Bruns (2017); Choi et al. (2020); Colleoni et al. (2014); Currin et al. (2022); de Arruda et al. (2021); Donkers and Ziegler (2021); Elzinga (2022); Erickson et al. (2023); Gao et al. (2023); Gupta et al. (2022); Jasny et al. (2015); Kahne et al. (2012); Levy and Razin (2019); Lu et al. (2022); Marks et al. (2019); Morini et al. (2021); Nguyen (2020); Osterbur and Kiel (2021); Tsai et al. (2020); Wagner and Ylä-Anttila (2020); Zhu et al. (2021); БаЖанов (2022)
	Digital Technology and systems-based causes	Bakshy et al. (2015); Baumgaertner and Justwan (2022); Bojic et al. (2023); De Biasio et al. (2023); Donkers and Ziegler (2021); Fang and Xu (2022); Grossetti et al. (2021); Haim et al. (2018); Khritankov (2023); Krause et al. (2022); Luo et al. (2022); Madsen et al. (2018); O'Hara and Stevens (2015); Pinto-Bustamante et al. (2023); Xiaohui Wang and Song (2020); Y. Wang et al. (2023)
Measuring Echo Chambers	Scaled Measurement	Chan et al. (2023); Dubois and Blank (2018); Karlsen et al. (2017); Vaccari et al. (2016)
	Digital Tracing Measures: User Structures	Ackermann and Stadelmann-Steffen (2022); Asatani et al. (2021); Barberá et al. (2015); Baumann et al. (2020); Bessi (2016); Cardenal et al. (2019); Colleoni et al. (2014); Cota et al. (2019); de Arruda et al. (2022); Del Valle and Bravo (2018); Del Vicario et al. (2016); Dvir-Gvirsman et al. (2016); Erickson et al. (2023); Garimella et al. (2018); Grusauskaite et al. (2023); Hayat and Samuel-Azran (2017); Jasny et al. (2018); Jasny and Fisher (2019); Luo et al. (2021); Morales et al. (2021); Müller et al. (2022); Schmidt et al. (2018); Sun et al. (2022); Usher et al. (2018); Villa et al. (2021); D. Wang et al. (2022); Zhu et al. (2021)
	Digital Tracing Measures: Information Content	Aydin et al. (2022); Bastos et al. (2018); Bojic et al. (2023); Bright (2018); Bright et al. (2022); Cookson et al. (2023); Del Valle and Bravo (2018); Donkers and Ziegler (2021); Eady et al. (2019); Erickson et al. (2023); Goldie et al. (2014); Grusauskaite et al. (2023); Han et al. (2023); Hayat and Samuel-Azran (2017); Karlsen et al. (2017); Kratzke (2023); Lo et al. (2021); Minici et al. (2022); Morini et al. (2021); Radu (2023); Schmidt et al. (2018); Sun et al. (2022); Törnberg (2018); Tsai et al. (2020); Villa et al. (2021); D. Wang et al. (2022); Weeks et al. (2016); Wolfowicz et al. (2023)
Implications	Personal Information Consumption	Avnur (2020); Bright (2018); Bright et al. (2022); Cardenal et al. (2019); Cookson et al. (2023); Diaz-Diaz et al. (2022); Dvir-Gvirsman et al. (2016); Geiß et al. (2021); Karlsen et al. (2017); Ranalli and Malcom (2023); Rodrigues da Cunha Palmieri (2023); Schmidt et al. (2018); Usher et al. (2018); van Eck et al. (2021); D. Wang et al. (2022); Weeks et al. (2016); Zollo (2019)
	Group Polarization	Ackermann and Stadelmann-Steffen (2022); Aydin et al. (2022); Bakshy et al. (2015); Bannister and Connolly (2018); Barberá et al. (2015); Bastos et al. (2018); Begby (2022); Bojic et al. (2023); Conover et al. (2011); Cookson et al. (2023); Del Valle and Bravo (2018); Fletcher et al. (2021); Geiß et al. (2021); Guo et al. (2020); Han et al. (2023); Hayat and Samuel-Azran (2017); Jacobson et al. (2016); Jasny et al. (2018); Jasny and Fisher (2019); Kitchens et al. (2020); Kratzke (2023); P. Lee et al. (2018); Levy and Razin (2019); Lu et al. (2022); Merry (2016); Morini et al. (2021); Munroe (2023); Ojeda (2021); Ranalli and Malcom (2023); Schmidt et al. (2018); Törnberg (2018); Törnberg and Törnberg (2022); D. Wang et al. (2022)

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