A Review of Information Cocoon Research: Post-print

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Abstract

[Purpose/Significance] By reviewing domestic and international research on information cocoons, this study provides systematic reference for advancing related theoretical research and practical development in China.

[Method/Process] Employing content analysis, this paper reviews the current state of research across five dimensions: conceptual evolution of information cocoons, empirical verification of the information cocoon phenomenon, impacts of information cocoons, formation mechanisms of information cocoons, and strategies for breaking information cocoons.

[Results/Conclusion] Domestic and international research exhibits content differences; the existence of information cocoons remains contested; research on the formation patterns of information cocoons lacks sufficient depth; and studies on information cocoon governance remain underdeveloped.

Full Text

Preamble

A Literature Review of Research on Information Cocoons

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Abstract: [Purpose/Significance] By reviewing domestic and international research findings on information cocoons, this paper provides systematic reference for promoting theoretical research and practical development in China. [Method/Process] Using content analysis, this paper reviews the current state of research from five dimensions: conceptual evolution of information cocoons,

empirical studies of the phenomenon, impacts, formation mechanisms, and countermeasures. [Result/Conclusion] The findings reveal that research content differs between domestic and international contexts, the existence of information cocoons remains disputed, research depth on formation mechanisms is insufficient, and governance research is still inadequate.

Keywords: Information cocoons; Conceptual evolution; Formation mechanism; Cocoon-breaking strategies

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Information cocoons represent a phenomenon of information narrowing and polarization among internet users in smart information environments [1], constituting a significant focus in information science research. Against the backdrop of proliferating internet information and rapid information technology development, various media headlines, Facebook, Twitter, and commercial WeChat public accounts—both domestic and international information platforms—pursue "traffic supremacy" as their goal orientation. Their content distribution and information recommendation mechanisms may accelerate the formation of user information cocoons, with trending recommendations across multiple platforms exacerbating negative impacts [2]. Scholars from multiple fields have noted this phenomenon and conducted preliminary research. From an information science perspective, this paper surveys the literature and employs quantitative and qualitative methods to review the current state of domestic and international information cocoon research, analyze content characteristics, evaluate research progress, and propose recommendations to provide reference for further study.

1 Literature Statistics and Analysis

1.1 Temporal and Quantitative Analysis of Publications

Comparative analysis of annual publication volumes can reveal overall development trends in this field domestically and internationally. As 2021 data remains incomplete, this analysis covers publications through 2020.

Domestic literature statistics show (see [Figure 1: see original paper]) that the first Chinese article containing the keyword "information cocoon" appeared in June 2009. From then until 2016, the field remained in its initial research stage, with annual publications under 10 papers. Beginning in 2017, annual output showed a clear upward trend, reaching a peak of 118 papers in 2020.

International research began in 1979, with the 1980s representing the initial stage. From 1990 to 2016, the field experienced steady development with slowly rising annual output. Starting in 2017, annual publications surged dramatically, reaching 531 and 555 papers in 2019 and 2020 respectively.

Domestic literature was retrieved from CNKI, Wanfang, and CQVIP databases using "information cocoon," "information bubble," and "walled garden" as key-

words, yielding 490 papers after deduplication. International literature was retrieved from Web of Science Core Collection using "information cocoons," "echo chamber," or "information bubbles" as topic terms, yielding 6,371 papers after deduplication.

Publication data indicate that domestic information cocoon research began over 20 years later than international research, yet both follow similar trajectories: from emergence to slow development, rapid growth, and finally becoming a current research hotspot. As research content continues to deepen and expand, publication volume is expected to keep rising.

1.2 Literature Source Analysis

Among the 490 domestic papers, 30 were master's theses with no doctoral dissertations. When limited to CSSCI and core journals, the count dropped to 115 papers, indicating that while information cocoon research is gaining attention, systematic and high-quality studies remain limited. Early research concentrated in journalism and communication fields, with publications in *People's Daily* and *Youth Journalist*. Since 2015, library and information science journals such as *Jin Tu Xue Kan*, *Information Science*, and *Information Studies: Theory & Application* have increasingly published relevant articles, showing that LIS scholars are beginning to engage with this topic.

Among the 6,371 international papers, limiting sources to SSCI yielded 1,079 papers (see [Figure 2: see original paper]), distributed across various disciplines, indicating that while information cocoon research attracts attention, content and publication venues remain dispersed. Further limiting to "INFORMATION SCIENCE LIBRARY SCIENCE" reduced the count to 62 papers, demonstrating that the topic has also captured interest in international LIS research.

1.3 Keyword Frequency and Research Hotspot Analysis

Using SATI 3.2 and CiteSpace, we analyzed keywords from 115 domestic papers. After deduplication, synonym merging, and removal of non-specific terms, we extracted 20 standardized keywords (see) and generated a co-occurrence map (see [Figure 3: see original paper]). High-frequency keywords such as "algorithmic recommendation," "news client," "information ecology," "artificial intelligence," and "social media" indicate that domestic research has shifted from conceptual discussions and macro-level countermeasures toward specific issues like algorithmic recommendation and media platforms, as well as empirical studies of their existence.

Similarly, using VOSviewer on 1,079 international papers, we extracted 20 high-frequency keywords (see) and generated a co-occurrence map (see [Figure 4: see original paper]). Keywords like "social media," "media," "polarization," "Internet," and "selective exposure" show that international scholars combine information cocoons with news media and group polarization phenomena. Keywords such as "politics" and "public sphere" indicate a focus on political elections.

1.4 Overview of Research Process and Content

By reviewing publication timelines and content, information cocoon research has roughly progressed through stages of conceptual evolution, empirical verification, impact analysis, formation mechanism investigation, and countermeasure development. Research content concentrates on these five aspects, gradually moving from theory to practice.

2 Research on Conceptual Evolution of Information Cocoons

Tracing the evolution of information cocoon concepts reveals their origins (see). The term "echo chamber" first appeared in the *Times Literary Supplement* in 1980 [3] but lacked detailed explanation. The 1997 concept of "cyberbalkanization" described how virtual networks fragment into subgroups with specific interests, whose members almost exclusively circulate material attracting only fellow subgroup members, creating closed information reception loops [4]—considered a prototype of information cocoons. Subsequently, media ecology's "technological determinism," existentialist philosophy, and totalitarianism in contemporary industrial societies discussed technology's competition with human agency.

The 2002 "walled garden" concept essentially aligns with information cocoons, describing "circle culture" formed through private mobile social interactions [5]. In 2006, Cass Sunstein explicitly defined information cocoons in *Infotopia* as phenomena where personalized information needs lead users to select media content based on personal preferences, eventually confining themselves within silkworm-cocoon-like "cocoons" [6], forming the basis for subsequent research. In 2009, Cheng Shian and Shen Enshao [7] initiated domestic research by interpreting and reconstructing organizational communication theory from the perspective of technological progress and communication evolution, combined with digital-era information aggregation and cocoon phenomena. Later concepts like "filter bubbles" [8] supplemented and corroborated the information cocoon concept.

Experts from various fields interpret information cocoons differently: From journalism and communication, it refers to users hearing only self-selected, pleasing information [9]; communication scholars view it as an information effect creating visual barriers for information seekers [10]; from internet content ecology, it describes how consumer-generated content (CGC) platform audiences experience content "involution" within their interests and social relations [11]; media convergence perspectives see it as a phenomenon where individuals are surrounded by massive information "circles" driven by new media technology when acquiring information and exchanging viewpoints, creating convergent group pressure [12]; LIS discussions mostly follow Sunstein's description of users confining themselves within cocoon-like structures through long-term preference-based media selection [5].

3 Empirical Research on Information Cocoon Phenomenon

Researchers have long debated the existence of information cocoons. Some experts argue it may be a pseudo-concept [14-15], while others believe the phenomenon objectively exists and attempt empirical verification. Research primarily adopts two perspectives: user information behavior and intelligent algorithms.

3.1 Empirical Research Based on User Information Behavior

Since 2012's first domestic empirical study [16], scholars have conducted extensive research. Studies using Sina Weibo examined information narrowing in social media communication, confirming cocoon effects [17]. With algorithmic recommendation development, scholars have investigated various news clients: one study of 77 users' 8,000+ news recommendations on Toutiao identified four user access factors—scenario, content, user preference, and platform priority—confirming cocoon effects, value deviation, and increased vulgar content [18-19]; another using Tencent News client comment data explored cocoon complexity through dynamic reception patterns and attention competition, finding users exhibit sustained and wandering patterns in "hard news" consumption, while "soft news" consumers more easily join hot event discussions when they erupt [20]. Particularly during the 2020 public health emergency, a study based on 146,081 COVID-19 survey data examined how public information attention affects government trust [21], while digital empowerment addressed cocoon issues in grassroots digital governance [22].

International scholars primarily verify existence through platform and user surveys. Representative studies include a two-year Facebook account tracking study confirming that personalized algorithms cause false information spread and social/political polarization [23]; another analyzing over 4 years of web browsing data from a representative panel of nearly 200,000 U.S. adults found platform differences in news selection impacts, increased Facebook users, more diverse information sources, and shifts toward more partisan news [24]. Other studies found scientific recommender systems may isolate scholars in information bubbles [25]; enterprise personnel information acquisition across platforms [26]; and quantitative analysis of user click behavior confirmed cocoon existence and warned against "convenience dominance" in news acquisition [27-28].

3.2 Empirical Research on Intelligent Algorithmic Mechanisms

Domestic scholars focus more on algorithmic mechanisms, while international literature is scarce. Algorithms have changed information production, shifting gatekeeping from human to AI, creating "filter bubble" effects based on user profiling [29] and "reading violence" issues: forced reading causing narrowed vision and cognitive 偏执 (paranoia), homogeneous content causing reading fatigue, and fragmented information causing shallow reading [30]. Research shows different news recommendation algorithms carry different ethical risks,

with content-based recommendations particularly prone to cocoon effects [31]. Recent dissertations have examined cocoons in Toutiao [32-36], Tencent News [37-38], Weibo [39-40], and Douyin [41], confirming that collaborative filtering and user profiling easily induce cocoon effects.

Particularly in LIS research, Wang Yicheng and Wang Ping published four articles within two years to verify how excessive algorithm use traps users in cocoons and seek governance mechanisms. One study using Traditional Chinese Medicine clinical theory to model cocoons noted that intelligent distribution platforms deliver rich content via algorithms but fracture users' access to quality content, as algorithms cannot accurately perceive users' shifting "interest points," causing "information narrowing" [42]. Another using SVM machine learning algorithms identified 12 most relevant sensitive influencing factors concentrated in four dimensions: algorithmic technology and user behavior characteristics [43].

4 Research on the Impact of Information Cocoons

Domestic and international research emphasizes different aspects. International studies focus on political elections, voter awareness, and attitude impacts, confirming existence through empirical research. Scholars view social media as a subaltern public sphere with echo chamber effects potentially detrimental to democracy [44]; personalized reporting prevents users from receiving diverse news, generating negative feelings toward democratic society, though filter bubbles may positively affect political participation in multi-party systems [45]. Current debates on selective exposure and avoidance have extended to Instagram usage [46], with studies of six virtual assistants (Amazon, Apple, etc.) finding they customize responses to create political echo chambers, profoundly affecting political polarization and democracy [47], while political discussion frequency is key for interested citizens and news users to burst filter bubbles [48].

Domestic research covers broader territory but emphasizes negative impacts. Studies examine damage to online public sphere construction [49], negative effects of aggregated media including infringement disputes [50], risks of AI news production (false information, infringement, algorithmic power abuse) causing human-machine conflict and ethical risks [51-52]. From user perspectives, cocoons 固化 (solidify) knowledge structures and identity 认同 (identity), affecting community consciousness transmission [53]. For college students, cocoons cause information reception imbalance, fragmented reading, and intensified group polarization [54], generating self-centered thinking, anomalous hostility, and selective indifference [55], negatively affecting mainstream values dissemination in ideological education [56]. Elderly groups in semi-closed information states are also vulnerable to deception [2].

5 Research on Formation Mechanisms of Information Cocoons

International research concentrates on two dimensions: algorithmic recommendation mechanisms and user information selection behavior. Algorithmic recommendations reinforce existing cognition, reducing desire for heterogeneous information and forming cocoons [57], as platforms like Douyin and Toutiao objectively narrow user choices. Conversely, user selective behavior studies show 43% of conservative Republicans also rely on Democratic-leaning media, and users actively search for information contradicting their positions, with selection and avoidance occurring simultaneously [58].

Domestic research often builds models based on theories to explore mechanisms from different perspectives. Using information ecology theory, Duan Hui et al. propose that value cognition among information actors is the key cocoon-forming factor, followed by information environment and technology [59]. Zhang Hai's S-O-R model identifies user emotion and community environment as important factors [60]; Ren Qiuju et al. find individual cognition dominates cocoon formation while technology only catalyzes it [61]. Studies using Tencent News [62] and Yidian Zixun [63] propose that selective exposure psychology, personalized needs, and push patterns constitute internal and external causes. Li Yanjun's Douyin study identifies subjective information type and format needs as important frameworks [64]. Some empirical research suggests algorithms don't cause cocoons but help guide mainstream values, warning instead that social differences like income and education create information gaps [65]. Quantitative studies originated internationally, but Chinese information communication has particularities; grounded theory qualitative research finds information narrowing, group polarization, information echo, and filter bubbles are key influencing factors [66]. Overall, formation mechanism research remains in exploratory stages without stable theoretical frameworks.

6 Research on Countermeasures to Break Information Cocoons

Current countermeasure research includes two aspects: (1) Technical solutions, such as the TS-ICC algorithm's positive role in alleviating knowledge narrowness and structural imbalance [67]; (2) Multi-angle governance measures. Some scholars argue that personalized recommendations [35] and social media platforms [68] limit information reception, suggesting "sidewalk" models to increase information encountering opportunities [69] or using big data-AI algorithms balanced with content distribution to correct cocoons [70].

Other experts propose preliminary governance from different angles: from the network information ecology chain perspective, users can eliminate cocoon effects through platform interaction [71]; from information movement perspectives, strategies involve information resource organization, user behavior, and movement patterns [72]; for online group polarization, guidance strategies

should enhance positive social effects while reducing negative ones [73]; school education should cultivate macro information structures and rights culture to address student polarization tendencies [74]; in middle school ideological education, good teacher-student relationships form the basis for breaking cocoons, with core being what "information" guides students [75]. For college students, information literacy cultivation should build network parallel spaces, social groups, systematic reading education, and media literacy [76-78], while "three classrooms" strategies [79] and diversified evaluation methods [45] should proceed simultaneously.

7 Conclusions and Future Research

This review systematically examines literature on information cocoons across five dimensions: concept, empirics, impact, mechanism, and countermeasures, drawing conclusions and proposing future directions to attract more scholarly attention.

7.1 Differences in Domestic and International Research Content

Literature review reveals different research scopes and methods. Internationally, research focuses on political integration, election impacts, and voter awareness, confirming existence through empirics. Domestically, research covers multiple domains (library micro-services, self-media, news, e-commerce), different populations, and broader content including cause analysis and solutions, with gradually deepening investigation.

Regarding data collection, international literature tends toward long-term tracking of user and platform data (some spanning 4 years), while domestic research uses both collection and surveys. Longer tracking periods may yield more objective conclusions worth emulating.

7.2 Ongoing Disputes Over Information Cocoon Existence

Despite multiple empirical methods, consensus remains elusive, with ongoing discussions on platforms like Zhihu. Controversy centers on whether recommendation technology creates cocoons. Some experts argue it only improves efficiency and stability, making cocoons a pseudo-concept; others believe it limits choice, reduces information encountering, and habituates users to recommended content, forming cocoons.

Existence cannot be simply dichotomized nor solely blamed on technology. Verification should focus on specific individuals or groups regarding particular events or topics, not broad, undefined research. Researchers should also broaden perspectives for deeper philosophical reflection.

7.3 Insufficient Research Depth on Formation Patterns

Current literature includes commentary and empirical analysis. Commentary discusses phenomena and social impacts; empirics examine: (1) platform algorithms and mechanisms correlated with user access data, and (2) user surveys directly measuring impact. While providing foundations, these approaches haven't touched underlying information movement patterns, necessitating deeper mechanism research.

LIS information movement theories offer new approaches. Based on current findings and platform characteristics, future research should analyze specific elements and causes across information collection, processing, organization, transmission, recommendation, reception, and utilization, exploring mapping relationships between subjective/objective elements and cocoon formation, especially under ubiquitous information environments.

7.4 Incomplete Governance Research

Current governance research mostly remains at the case level, proposing solutions for specific groups (elderly, students) or platforms (Toutiao, Tencent News), lacking complete governance systems or practical applications. Macroscopically, cocoons affect internet information ecology; microscopically, they impact user information scope, potentially affecting values and causing manipulation.

Therefore, macro-level research should explore formation patterns to build multidimensional governance systems encompassing laws, policies, technology, content, and education, regulating subjects, objects, and processes to complete theoretical frameworks for internet policy, order governance, and education.

Microscopically, different user groups (college students, intellectuals, migrant workers, primary/secondary students, youth, rural users, elderly) differ in information discrimination ability, literacy, acquisition purposes, education level, etc., experiencing different cocoon impacts. Under macro governance frameworks, future research should explore associations between group attributes (gender, occupation, age, values, education, interests, personality, literacy, habits) and cocoon formation, advancing targeted research for more effective governance measures.

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Note: Figure translations are in progress. See original paper for figures.