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BIG DATA – ETHICAL CONSUMPTION NEXUS: A MULTI-STUDY APPROACH

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Purpose: This study investigates the interplay between big data and ethical consumption nexus to identify research themes, gaps, and future directions aligned with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production).
Design/methodology/approach: The study adopts a multi-study approach. Study 1 conducts a systematic literature review of 51 articles using the PRISMA framework, complemented by VOSviewer keyword co-occurrence analysis to derive three thematic clusters. Study 2 triangulates these findings through seven problem-centered expert interviews with researchers and practitioners from developed and emerging economies.
Findings: Three thematic clusters emerge. The Red cluster reveals that SDG-focused management decisions, circular economy models, and robust supply chains accelerate ethical consumption. The Green cluster shows that AI and machine learning significantly improve ethical consumption, though cross-country longitudinal evidence and causal links between technology integration and behavioral outcomes are lacking. The Blue cluster demonstrates that dynamic capabilities enable mass ethical consumption via e-commerce platforms, but limited empirical evidence connects analytics-driven reconfiguration to circular economy practices.
Research limitations/implications: The study draws on two databases and a small expert panel; future research should expand data sources and conduct longitudinal experiments across diverse cultural contexts.
Practical implications: Managers should invest in real-time big data analytics, emotion-sensing tools, and Industry 4.0 infrastructure to close the ethical consumption intention–behavior gap and reconfigure supply chains for sustainability.
Social implications: Big data democratizes access to sustainable product information, strengthens supply chain transparency and accountability, and empowers underserved communities to participate in ethical consumption, collectively advancing SDG 9 and SDG 12.
Originality/value: This study is the first to combine a systematic review with problem-centered expert interviews to map the big data–ethical consumption nexus through the dual lens of SDG 9 and SDG 12, producing six actionable research propositions and a validated thematic typology for scholars and practitioners.
Keywords: Big data, ethical consumption, expert interview, SDG 9, SDG 12.
Category of the paper: Literature review.

1. Introduction

Big data (BD) is now an integral part in human decision making and has multifaceted impacts on human behavior (Merendino et al., 2018). BD encompasses massive and diverse datasets produced rapidly to support business decision-making (Fattahi, Ura, Noor-E-Alam, 2022; Ye, Lu, Lu, 2022). It draws on sector-specific analytical tools to identify patterns and relationships with different stakeholders (Jin, Zhao, 2021).

Big data analytics reveals seasonal consumption trends, the impact of promotions on buying habits, and consumer preferences for specific food attributes like organic or locally sourced products (Katare et al., 2025). Researchers also use big data from social media, transaction records, and wearable devices to segment consumers based on behavior and preferences, enabling more targeted and effective interventions (Huang, Sun, Long, 2025; Xia, Lai, Khaskheli, 2025). Also, real-time data from social media and mobile applications allows retailers and policymakers to monitor consumer behavior as it happens and intervene promptly to encourage healthier eating habits (Huo et al., 2024; Zakharova et al., 2025).

Big data analytics identifies consumer preferences, purchasing patterns, and responses to sustainability cues, that push consumers toward more ethical consumption choice (Cochoy et al., 2020). Machine learning (ML) tools mine data from diverse digital platforms to personalize ethical preferences and hold business organizations accountable for promoting ethical consumption (Munir et al., 2025). Big data innovation builds the analytical infrastructure that industries need to drive smarter, resource-efficient production, directly advancing SDG 9's goal of inclusive and sustainable industrialization (Dubey et al., 2018; Yang et al., 2024). Big data equips businesses with real-time consumer insights that accelerate the shift toward responsible consumption and production, placing it at the core of SDG 12 (Arman, 2025; Jiang et al., 2024; Peng et al., 2024). Big data influences multiple SDGs, but it produces its most concentrated impact on SDG 9 and SDG 12 because it directly reshapes industrial innovation processes and consumer decision-making simultaneously, two domains that sit at the structural core of sustainable development (Kristoffersen et al., 2020; Zakharova et al., 2025).

To analyze the interplay, the study adopts a multi study approach, consisting of systematic literature review, followed by problem based expert interviews. While the systematic literature review maps existing knowledge at the intersection of big data and ethical consumption (Arman, Sayeed, Rahman, 2025), it cannot capture emerging, practice-grounded insights that have not yet entered academic discourse. Problem based expert interviews therefore complement the review by drawing on the lived experience of practitioners and domain specialists who navigate these issues in real-world settings (Inês, Moreira, 2025). Together, this multi-method approach strengthens both the theoretical grounding and practical relevance of the study's findings. To achieve this research objective, the study draws the following research questions.

RQ1. What are the major research themes within big data and ethical consumption?

RQ2. What are the research gaps in terms of academic and business perspectives?

RQ2. What are the avenues for future research in addressing SDG 9 and SDG 12?

The study's novelty lies in conducting a multi-study approach, not limited to an SLR; the SLR findings are further validated by experts. This multi-study approach pinpoints the actual research and practice gaps that may hinder implementation of SDG 9 and SDG 12.

The subsequent chapters shall be outlined as follows: Chapter two elaborates on the theoretical background, while chapter three presents the methodology. Chapter four showcases the problem based expert interview process. Following this, chapter five presents discussion, and chapter six concludes the work with theoretical and managerial contributions.

2. Theoretical background

Big data (BD) refers to the enormous volumes of structured, semi-structured, and unstructured data that organizations gather, process, and leverage to facilitate decision-making processes (Kuo, Peng, Kuo, 2024; Munir et al., 2025). The BD concept encompasses five core dimensions: Volume, which captures the sheer scale of data generated; Velocity, which denotes the rate at which data is produced and processed; Variety, which reflects the wide range of data types collected; Veracity, which concerns the reliability and accuracy of the data; and Value, which represents the actionable benefits organizations derive from analyzing it (Naeem et al., 2022). Additionally, BD facilitates identifying market trends and consumer preferences to craft more informed and timely strategic business decisions in line with SDG implementations (Dubey et al., 2018).

Ethical consumption (EC) determines individuals' purchasing decision that account for the social, environmental, and health consequences and willingness to trade off price against the welfare of the society at large (Boman et al., 2026; Arman, Mark-Herbert, 2024). Ethical consumption complies largely with SDG 12, framing individual consumer choices as a moral responsibility toward both present and future generations (Guerra et al., 2022; Ivanov, Seyitoğlu, Webster, 2024). At the same time, ethical consumption also relates to SDG 9 to push industry and innovation toward safer, more inclusive, and socially accountable economic systems (Hoffmann et al., 2026).

Big data strengthens ethical consumption by helping firms identify what ethically minded consumers value, how they behave, and which sustainable offers align with their expectations (Sivashanmugam et al., 2022; Fosso Wamba et al., 2024). This interplay also enables firms to detect demand for eco-friendly products and improve supply chain transparency, which helps consumers turn ethical intentions into actual purchasing decisions (Butt, Ali, Govindan, 2024; Wu et al., 2023). This interaction supports SDG 9 by driving data-based innovation in

production and distribution systems that also advances SDG 12 by encouraging responsible consumption and more sustainable production designs.

3. Methodology

The study adopted the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to conduct the systematic literature review (Page et al., 2021). The study opted Scopus and Web of Science (WoS) to consider papers from curated set of journals, stronger control over source quality, and consistency (Arman, Ahmed, 2021; Martín-Martín et al., 2018). The author incorporates ethical consumption synonyms from his previous publication (Arman, Mark-Herbert, 2024) into its analysis. The document timeline is 2016-2025. The appendix contains the search query.

The study merged both databases' entries, 112 in total. Next, the study considered documents that were published and were written in English. The study considered 58 articles and excluded other scientific documents. Also, 6 more articles were added through the cross-check mechanism of another database and reference section (Paul et al., 2024). The study excluded 13 articles that were out of scope, for example, four of them were review papers, two articles explicitly focused on SDG 13 and did not discuss either big data or ethical consumption, and another paper on medical science applications and did not focus on ethical consumption. The SLR process is given below. The selected paper names present as a supplementary file.

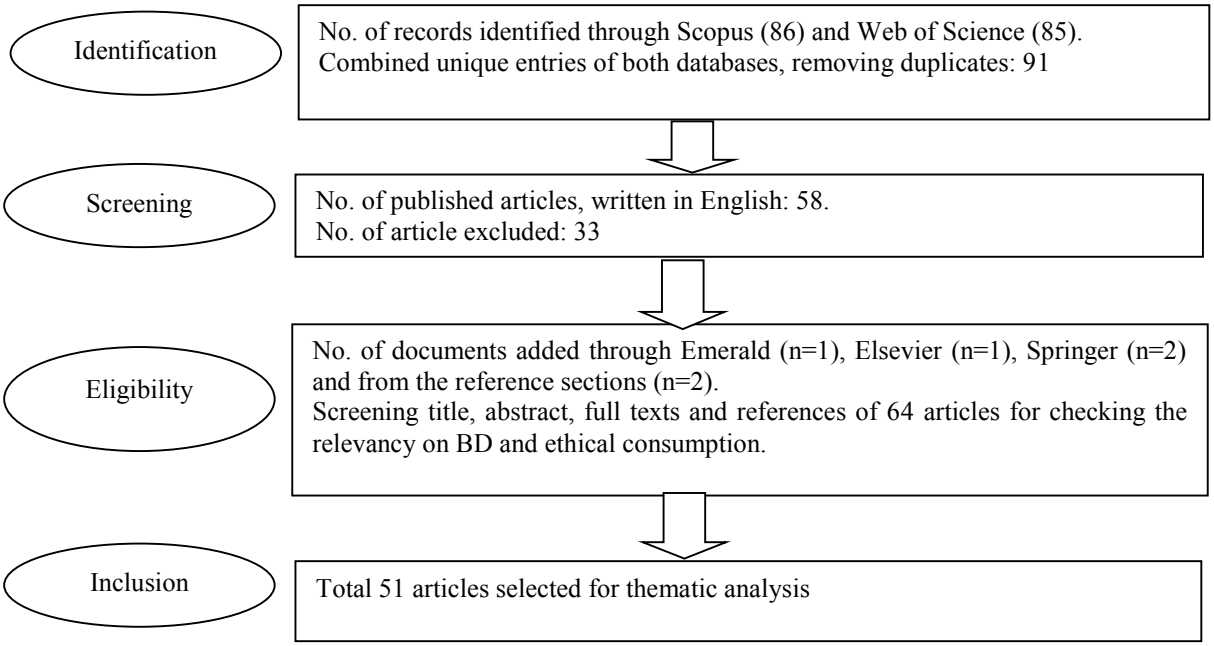

Figure 1. PRISMA protocol for systematic literature review.

Source: Page et al. (2021).

The study availed VOSViewer software to conduct the keyword co-occurrence analysis for portraying research themes. Three themes are emerged from the analysis which will be explained in the discussion section.

4. Expert interview

To triangulate the thematic analysis findings from the published literature on big data and ethical consumption, the study conducted expert interviews using a problem-centered approach (Döringer, 2021). The expert interview enables to collect data directly from individuals who are deeply involved in the concerned research area (Huang, Rust, 2022). such interviews complement the SLR findings with the view of experts in determining research gaps and future research directions (Mergel et al., 2019). The study adopted a multi-dimensional expert selection strategy that provide a balanced, comprehensive assessment of big data applications in ethical consumption for accelerating SDG 9 and SDG 12 (Meng et al., 2025).

The study identified potential interviewees through web searches for relevant publications and by verifying LinkedIn profiles. It recruited additional experts through snowball sampling, including the authors' professional contacts and referrals from earlier interviewees. The researcher approached to 10 individuals contacted by email and phone, 7 agreed to participate anonymously, producing a 70% response rate. The study offered no financial or other incentives. To provide a well-rounded view, the sample included equal representation from developed and emerging economies. This sample size aligns with prior studies that combined expert interviews with systematic literature reviews, including Inês and Moreira (6) (2025) and Meng et al. (7) (2025). Table 1 presents the expert details. In the coding scheme, the first letter indicates stakeholder group (P = Practitioner, R = Researcher), and the second indicates gender (F = Female, M = Male). The sample questions present in the appendix section.

Table 1.
Interviewee profile

Code	Interviewee expertise
RM1	A Big data researcher, with h index 35 and 17 Scopus Q1 publications related to Big Data.
RM2	A consumer behavior researcher, with h index 31 and 7 Scopus Q1 publications related to ethical consumption.
RF3	A business analytics researcher, with h index 27 and 6 Scopus Q1 publications related to big data, ethical consumption and SDG.
PF1	An SDG practitioner, with 5-year experience in big data applications.
PM2	A tech entrepreneur who sells refurbished electronics.
PF3	An IT expert with 6 years of experience in big data applications at a FMCG company.
PM4	A machine learning expert of an online secondhand product platform.

Source*:* Author's creation.

Interviews were conducted between January 20, 2026 to February 06, 2026 via online video meetings. For video interviews, each session lasted on average between 15 min to 20 min. Each interview was audio-recorded with participants' advance permission and subsequently transcribed using a transcription software to guarantee precise data analysis. After getting the transcripts, their views were triangulated with the thematic analysis findings to address research gaps and design future research propositions.

5. Discussion

The keyword co-occurrence diagram presents below.

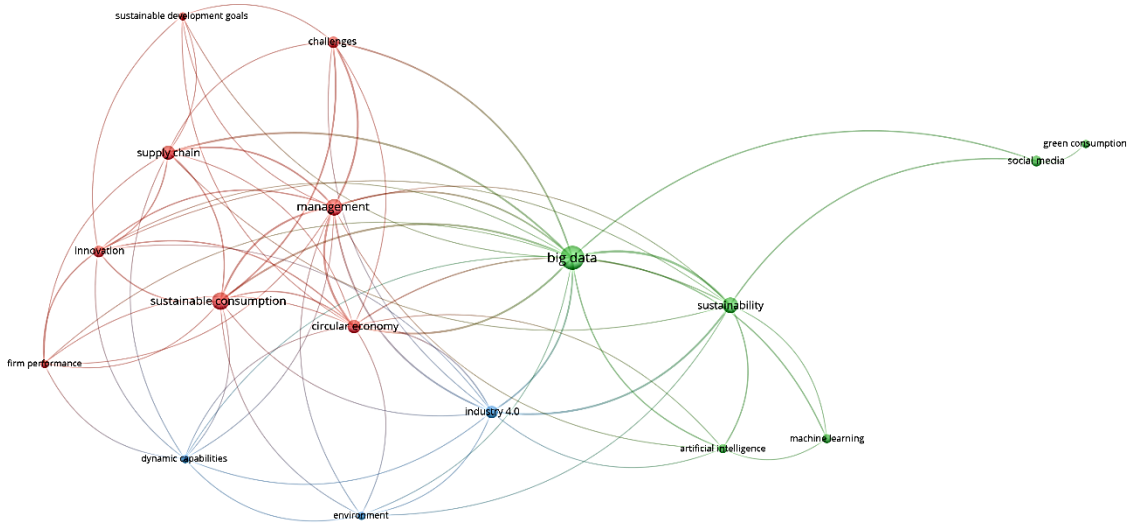

Figure 2. Keyword co-occurrence analysis.

Source: Author.

On the basis of the keyword co-occurrence analysis, the study discusses the major findings and research gaps from each theme, highlighted by the selected 51 articles, presented in Table 2.

Table 2.
Thematic findings and research gaps

Clusters	Major findings	Research gaps
Red	• SDG focused management decisions accelerate ethical consumption through innovation (Ivanov, Seyitoğlu, Webster, 2024; Zeqiri, Ben Youssef, Maherzi Zahar, 2025) • Sustainable farm performance positively influences ethical consumption (Huang, Sun, Long, 2025; Wang et al., 2025) • Business farm effectiveness depends on robust supply chain network (Bag et al., 2022; Cui et al., 2019; Huo et al., 2024) • Circular economy positively transforms ethical consumption intention to behavior in promoting ethical consumer awareness on social media (Bai, Zhou, Sarkis, 2023; Butt, Ali, Govindan, 2024; Xie et al., 2025) • Ethical consumer centric product designs increase consumer trust (Sharma, Singh, Tsagarakis, 2024; Xia, Lai, Khaskheli, 2025) • Management decisions in business innovation differs based on geographical locations and economic status (Moktadir et al., 2019)	• Emotional factors, related to ethical consumption decision making, remain underexplored (Cao, Liu, 2023; Huang, Sun, Long, 2025) • How institutional pressure put constraints in ethical consumption is not addressed (Bag et al., 2022; Moktadir et al., 2019; Sharma, Singh, Tsagarakis, 2024) • Green supply chain designs and its challenges require more research in farm innovation perspectives (Cui et al., 2019; Moktadir et al., 2019; Xia, Lai, Khaskheli, 2025)
Green	• Artificial intelligence capability significantly improves firm performance through data driven culture (Holzinger et al., 2023; Kuo, Peng, Kuo, 2024) • Machine learning reveals strong links between consumption decision and SDGs (Fosso Wamba et al., 2024) • Machine learning and big data management optimize consumer contribution to sustainable development (Dundulienė, Alzbutas, 2025; Katare et al., 2025) • Online communities disseminate practical knowledge and everyday eco-practices, such as recycling, zero-waste lifestyles, and eco-friendly purchasing (Ma et al., 2025; Wu et al., 2023; Zakharova et al., 2025) • Social media platforms produce massive datasets that can be analyzed using big data and AI techniques to understand environmental behaviors and attitudes (Armutcu, Zuferi, Tan, 2023; Xie et al., 2025; Zakharova et al., 2025)	• Limited cross-country and longitudinal studies on artificial intelligence capability (Ye, Lu, Lu, 2022) • Insufficient empirical research linking ethical consumption and technology integration (Fosso Wamba et al., 2024) • The interaction between social media influence, big data analytics, and behavioral outcomes in ethical consumption remains underexplored (Ma et al., 2025; Zakharova et al., 2025)
Blue	• Industry 4.0 technologies are the primary institutional mechanisms enabling mass ethical consumption through e-commerce platforms (Bag et al., 2022; Roszko-Wójtowicz et al., 2024) • Dynamic capabilities mediate the relationship between analytics capability and firm performance in sustainable supply chains (Munir et al., 2025; Peng et al., 2024) • Big data provides the informational foundation for company dynamic capabilities in response to ethical consumption choice by consumers (Huang, Sayed, 2025) • Industry 4.0 converts firms' dynamic capabilities into realizing ethical consumption by enabling circular economy transition (Sharma, Singh, Tsagarakis, 2024)	• There is a limited study on how improved volatility forecasting translates into reconfigured supply chain resources, better risk management, and enhanced sustainable consumption outcomes (Huang, Sayed, 2025; Munir et al., 2025) • Limited empirical evidence exists on how analytics-driven dynamic capabilities specifically enable circular economy practices (Sharma, Singh, Tsagarakis, 2024)

Source: Author.

The critical discussion of each thematic cluster, with triangulation of expert interview opinions, presents below.

Theme 1 - Red cluster: Big data empowers SDG-focused management decisions that accelerate ethical consumption through innovation in product design, supply chain optimization, and circular economy transitions (Ivanov, Seyitoğlu, Webster, 2024). The literature confirms that sustainable farm performance positively drives ethical consumption (Wang et al., 2025), yet business effectiveness hinges on robust, data-enabled supply chain networks (Huo et al., 2024). Such supply chain networks vary sharply across geographies and income levels (Moktadir et al., 2019). Circular economy frameworks, amplified by big data analytics on social media, convert ethical consumption intentions into actual purchasing behavior by raising consumer awareness (Xie et al., 2025). As RF3 noted: *Big data allows managers to track circular economy indicators in real time and redesign supply chains that genuinely promote SDG 12.* However, emotional factors influencing ethical decision-making remain underexplored (Cao, Liu, 2023), leaving a blind spot in understanding why consumers abandon ethical intentions at the point of purchase. Institutional pressures constrain ethical consumption have received almost no empirical attention in big data contexts (Bag et al., 2022). PF1 reinforced this gap: *We still do not understand how institutional pressures in different regulatory environments shape firms' ability to use big data for ethical consumption. This is a critical gap for SDG 9 implementation.* Green supply chain design for farm-level innovation also lacks sufficient research, particularly in emerging economies where SDG 9 infrastructure gaps are there. Ethical consumer-centric product designs increase consumer trust, yet the role of big data in personalizing such designs across different cultural segments remains unclear (Xia, Lai, Khaskheli, 2025). RM2 added: *We have no empirical model showing how big data tailors ethical product features to culturally diverse markets under SDG 12*. PM2 further observed: *In the refurbished electronics market, we see that consumers respond to data-driven trust signals differently in developed versus emerging economies, and no research captures this variation for SDG 9 scaling*. Based on the critical discussion on theme one, the study presents the first two research propositions.

Research Proposition 1: Big data–enabled institutional pressure mapping accelerates green supply chain innovation across diverse economic contexts, advancing SDG 9.

Research Proposition 2: Big data–personalized ethical product design increases consumer trust and purchase conversion across culturally diverse markets, strengthening SDG 12 outcomes.

Theme 2 - Green cluster: Artificial intelligence capability significantly improves firm performance by embedding data-driven culture into sustainability strategy (Fosso Wamba et al., 2024). Additionally, machine learning reveals robust links between consumption decisions and SDG targets. Big data and ML tools optimize consumer contribution by mining digital footprints (Katare et al., 2025). Such footprints derive from diverse online communities that disseminate eco-practices such as recycling, zero-waste lifestyles, and eco-friendly purchasing

(Zakharova et al., 2025). As PM4 observed: *Machine learning models trained on social media data can predict shifts in ethical purchasing.* Additionally, social media platforms produce massive datasets that researchers can analyze using big data and AI techniques to understand environmental behaviors and attitudes (Xie et al., 2025; Zakharova et al., 2025). RF3 pointed out a research gap: *we still lack frameworks that connect consumer sentiments to actual ethical purchasing.* Yet cross-country and longitudinal studies on AI capability remain scarce, and insufficient empirical research links ethical consumption directly to technology integration, leaving the causal pathways between big data tools and actual behavioral change unverified. Moreover, existing studies predominantly discuss AI and machine learning capabilities at a conceptual level without empirically operationalizing how these tools influence specific ethical consumption. The interaction between social media influence, big data analytics, and behavioral outcomes in ethical consumption is still poorly understood. RM1 stressed this concern: *We lack large-scale, cross-country longitudinal evidence on whether AI-driven recommendations actually sustain ethical consumption behavior or just produce short-term spikes.* PF3 echoed a practical concern: *In our FMCG operations, we collect massive consumer data but have no validated methodology to translate AI-generated ethical consumption insights*. On the basis of these insights, the study presents future research propositions three and four.

Research Proposition 3: Longitudinal, cross-country experiments test whether AI-driven personalized recommendations influence ethical consumption behavior over time.

Research Proposition 4: AI-powered social media sentiment analysis frameworks facilitate measurable ethical purchasing outcomes, advancing SDG 9 digital infrastructure goals.

Theme 3 - Blue cluster. Industry 4.0 technologies serve as the primary institutional mechanism enabling mass ethical consumption through e-commerce platforms (Roszko-Wójtowicz et al., 2024). In these platforms, big data provides the informational backbone for firms' dynamic capabilities (Huang, Sayed, 2025). Dynamic capabilities mediate the relationship between analytics capability and firm performance in sustainable supply chains (Munir et al., 2025). It facilitates business firms to sense, seize, and reconfigure big data insights outperform peers in ethically complied product delivery. PM2 and PF3 echoed this finding: *Big data captures consumer ethical preferences, and dynamic capabilities let firms reconfigure production to meet SDG 12 standards.* Industry 4.0 further converts these dynamic capabilities into circular economy transitions that align production with SDG 9 and SDG 12 targets (Sharma, Singh, Tsagarakis, 2024). Yet limited research explains how improved volatility forecasting translates into reconfigured supply chain resources and enhanced ethical consumption outcomes (Munir et al., 2025). Empirical evidence on how analytics-driven dynamic capabilities specifically enable circular economy practices remains thin. RM2 highlighted this shortcoming: *We have theoretical models linking dynamic capabilities to circular economy, but almost no field-level evidence showing how analytics-driven reconfiguration works in practice for SDG 9.* Additionally, RM1 raised: *Industry 4.0 platforms*

generate enormous big data streams, but we still lack standardized metrics to evaluate related to ethical consumption. PF1 also stressed: *From an SDG implementation perspective, we need evidence on how e-commerce platforms in developing countries build dynamic capabilities differently from developed markets. Because the infrastructure gaps under SDG 9 fundamentally change the equation*. On the basis of these discussions, the study presents the final two research propositions.

Research Proposition 5: Firms that integrate big data volatility forecasting into supply chain reconfiguration achieve superior sustainable consumption outcomes under Industry 4.0.

Research Proposition 6: Comparative studies across developed and emerging economies to determine how dynamic capabilities differentially enable circular economy practices.

6. Contributions and implications

This study extends the big data–ethical consumption nexus, from author's previous papers on ethical consumption (Arman, Mark-Herbert, 2024; Arman, 2025; Arman, Sayeed, Rahman, 2025), by introducing a multi-study framework that triangulates systematic literature findings with expert-validated insights. It establishes that circular economy, AI capability, and Industry 4.0 function as three interconnected mechanisms through which big data advances SDG 9 and SDG 12 simultaneously. The research identifies emotional factors and institutional pressures as theoretically underdeveloped constructs in big data–driven ethical consumption literature. It positions dynamic capabilities as a mediating theoretical lens that explains how analytics capability translates into sustainable supply chain performance. The study presents 6 research propositions that maps the intellectual structure of big data and ethical consumption combination for future theory building.

In terms of practical implications, investors should invest in big data analytics platforms that track circular economy indicators in real time to promote ethically complied production operations under SDG 12. Entrepreneurs should deploy machine learning models on social media datasets to predict and respond to emerging ethical consumption trends before competitors. Business development managers should build analytics-driven dynamic capabilities that enable rapid supply chain reconfiguration in response to ethical consumption demands. Organizations should integrate emotion-sensing analytics into customer journey mapping to close the persistent ethical consumption intention–behavior gap. Policymakers should leverage Industry 4.0 e-commerce infrastructure to scale ethical consumption access across developing economies, advancing SDG 9.

For social implication perspective, Big data democratizes access to ethically complied product information, enabling consumers in both developed and emerging economies to make informed ethical choices that advance SDG 12. Data-driven transparency in supply chains holds

businesses publicly accountable for labor practices, environmental footprints, and fair-trade compliance, which strengthens responsible production under SDG 12. Leveraging Industry 4.0 infrastructure to deliver big data insights to underserved communities promotes inclusive and sustainable industrialization at the core of SDG 9. Big data–enabled ethical consumption platforms empower marginalized consumers. This empowerment would reduce information asymmetry, and accelerate the societal shift toward equitable and sustainable development across both SDG 9 and SDG 12.

7. Conclusion

This multi study approach extends the justification of connecting theoretical advancement with practical standpoint. Also, the study triangulated the SLR findings, justifying its value to the company and the society. The study relies on Scopus and Web of Science databases, so future research should incorporate additional sources to capture a broader evidence base. The expert sample, though balanced across economies, remains small; larger, sector-specific interview panels would strengthen the generalizability of findings. Moreover, the study was purely relied on thematic analysis drives to gap analysis on the existing literature. So, it did not include bibliometric quantitative measures (e.g., cluster strength, centrality measures). Additionally, the reviewed studies do not distinguish between the predictive accuracy of machine learning models and actual behavioral change among consumers. Future studies should conduct longitudinal and experimental research to establish causal links between big data interventions and sustained ethical consumption behavior across diverse cultural contexts. Also, these future research methodologies should empirically test whether the predictive accuracy of machine learning models translates into actual ethical consumption behavior to track consumer purchasing decisions over time against algorithmic predictions.

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Appendix

Table 3.
Expert interview questions

Questions	Statements
1	Based on your experience, how does big data influence management decisions related to ethical consumption?
2	What role do emotional and psychological factors play in ethical consumption decision-making, and how can big data analytics address these factors?
3	How do institutional pressures in different regulatory environments shape firms' ability to use big data for promoting ethical consumption?
4	In your view, how effectively do AI and machine learning tools translate social media data into actionable insights for ethical consumption?
5	What are the main barriers to conducting cross-country and longitudinal research on the link between big data technologies and ethical consumption behavior?
6	What and how do Industry 4.0 technologies play role in big data – ethical consumption nexus?
7	From your point of view, what are the key differences between developed and emerging economies in building big data–driven dynamic capabilities for ethical consumption?
8	What specific research/practice gaps do you consider most critical for advancing SDG 9 and SDG 12 through big data applications in ethical consumption?

Source: Author.