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BIG DATA-DRIVEN CONSUMER BEHAVIOR PREDICTION AS A BASIS FOR SUSTAINABLE DECISION-MAKING: A STUDY OF GENERATION Z IN EAST KALIMANTAN

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ABSTRACT

This study explores the potential of Big Data Analytics (BDA) to predict consumer behavior among Generation Z (born 1997–2012) in East Kalimantan, Indonesia, as a foundation for sustainable digital decision-making. Although Gen Z constitutes 27.94% of Indonesia's population, digital engagement in East Kalimantan remains below national averages due to infrastructural disparities and cultural distinctiveness. Using a qualitative exploratory design with a multiple case study approach, data were collected from 31 purposively selected participants, justified by Roscoe's (1975) minimum threshold for behavioral research through interviews, focus groups, and digital ethnography. Thematic analysis identified five key behavioral patterns: (1) high reliance on TikTok for localized product reviews; (2) mixed perceptions of personalization features; (3) collectivist-driven, peer-

influenced purchasing behavior; (4) limited awareness and control over data tracking; and (5) a cultural preference for local content creators over algorithmic ads. These findings indicate that predictive accuracy and digital sustainability depend on context-sensitive models that integrate local cultural values and ethical data governance. The study proposes a culturally adaptive framework for BDA to better support inclusive, responsible, and environmentally aware consumer strategies in underrepresented digital regions like East Kalimantan.

Keywords: *Big Data Analytics, Consumer Behavior Prediction, Sustainable Decision-Making*

A. INTRODUCTION

The emergence of the digital era has significantly transformed the way businesses analyze and respond to consumer preferences, especially among Generation Z individuals born between 1997 and 2012 who are inherently fluent in digital technologies and demand real-time, personalized, and technology-driven services. In Indonesia, Generation Z constitutes a substantial portion of the population, representing 27.94% or around 74.93 million individuals (Katadata, 2023), making them a highly influential and strategic market segment for digital commerce and innovation. Despite this demographic advantage, a notable disparity exists in regional digital engagement. In East Kalimantan, for instance, only 45% of Gen Z are active in online shopping, a figure that lags significantly behind the 78% participation rate observed among their counterparts in more digitally developed regions like Java (Katadata, 2024). This contrast indicates not only an underexploited market opportunity in East Kalimantan but also underscores the need to explore the unique consumer behavior patterns in the region. Such patterns are shaped by a complex interplay of geographic limitations, uneven digital infrastructure, and distinctive socio-cultural values, all of which influence how Gen Z in this area interacts with digital platforms and makes purchasing decisions.

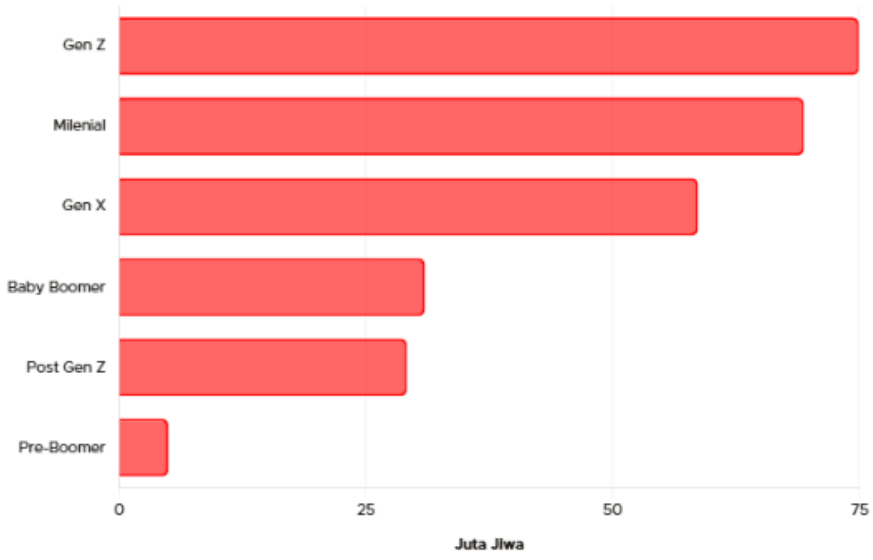

Figure 1. number of gen z in Indonesia (Source : BPS, 2025)

Big Data Analytics (BDA) emerges as a sophisticated approach to interpret and predict consumer patterns by processing digital footprints, including transactional data, social media activity, and user preferences (Andini & Harahap, 2024; Begum, 2024). Approximately 62% of Gen Z in Indonesia rely on social media as their primary product search channel (Andini & Harahap, 2024), creating vast opportunities for machine learning integration in consumer modeling (Chaudhary et al., 2021; Boppiniti, 2019). Despite this, only 30% of retail companies in Indonesia fully utilize BDA, even though it can enhance customer loyalty by 40% and marketing efficiency by 35% (Halawa et al., 2024; Makmur et al., 2025).

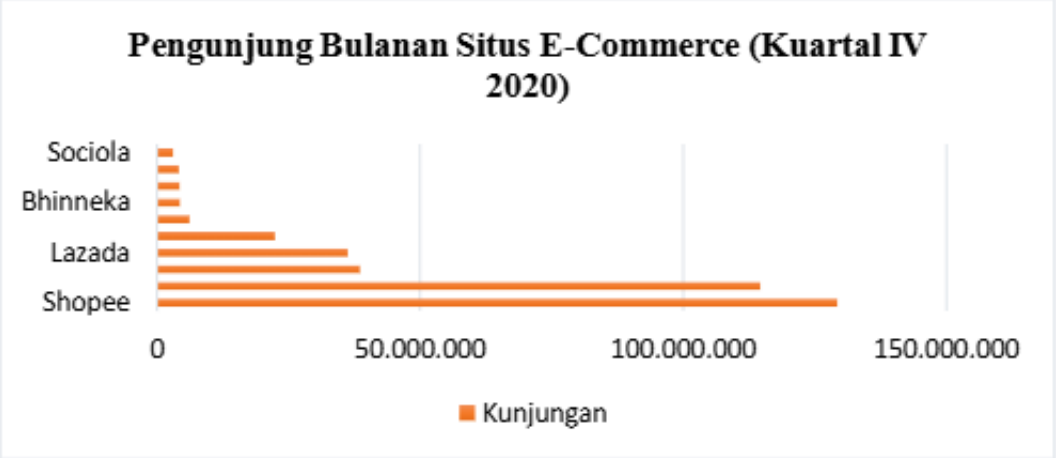

Figure 2. Market Place (Source : Katadata.com, 2025)

In East Kalimantan, these challenges are compounded. Only 22% of local SMEs have adopted even basic data analytics tools (Asrul et al., 2024). The lack of equitable internet access outside major cities like Samarinda and Balikpapan significantly hinders digital adoption. According to BPS (2023), 65% of rural areas in East Kalimantan have internet speeds below 10 Mbps, in contrast to Java, where 85% of regions enjoy high-speed internet. An interactive comparison is available on the official BPS website.

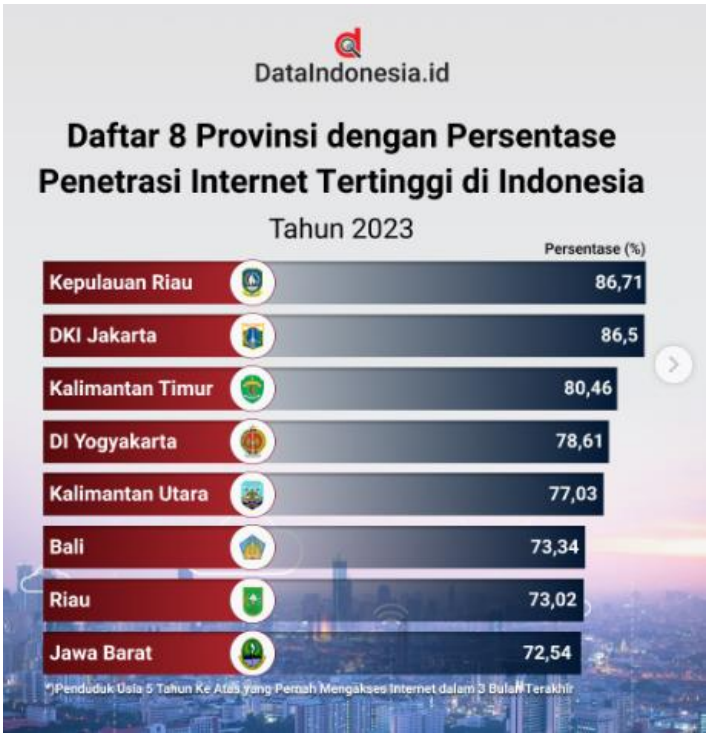

Figure 3. Internet Penetration in Indonesia (Source : Dataindonesia.id, 2023)

This infrastructure disparity contributes to a fragmented digital behavior. Gen Z in East Kalimantan actively engages with product content on platforms like TikTok and Instagram, yet often completes transactions offline due to limited digital payment systems (Pasaribu, 2024). Such behavior creates a data gap that complicates comprehensive behavioral modeling. Moreover, national-level predictive models risk bias if they fail to account for local socio-cultural factors. Juliana et al. (2025) found that neglecting regional context can result in up to 18% prediction bias. Studies by Dubey et al. (2018; 2019) emphasize the need for contextualized analytics to support both social and environmental sustainability. In global best practices, Walmart's integration of demographic and behavioral data improved prediction accuracy by 25% (Reyhan et al., 2024), suggesting that similar adaptations could benefit East Kalimantan's unique consumer landscape.

Strategically, studies such as Adewale et al. (2024) underline the effectiveness of a dual approach combining BDA with behavioral finance insights to enhance decision-making, especially in FMCG and retail sectors. Özemre & Kabadurmus (2020) similarly highlight that big data analytics not only improves operational efficiency but also drives competitive advantage in dynamic markets. These strategies directly align with the objectives of SDG 9 (Industry, Innovation and Infrastructure) by promoting data-driven solutions that address regional development gaps and foster technological inclusion.

Nevertheless, ethical issues must not be overlooked. The absence of specific regulations for consumer data protection in East Kalimantan increases the risk of privacy violations. For instance, the data breach case in East Java in 2023 (Asrul et al., 2024) underscores the urgency for implementing privacy by design principles.

As Fadli et al. (2025) and Nilashi et al. (2021) suggest, ethical governance in BDA is fundamental to building sustainable and trustworthy digital ecosystems. This aligns with SDG 16 (Peace, Justice and Strong Institutions), which advocates for transparent and accountable governance, including digital environments. Additionally, the responsible use of consumer data to support ethical consumption behavior resonates with SDG 12 (Responsible Consumption and Production), ensuring that predictive systems reinforce0020not exploit consumer trust.

B. LITERATURE REVIEW

Big Data Analytics

Big Data Analytics (BDA) has emerged as a strategic asset in modern organizational management, enabling firms to derive actionable insights from massive datasets. Ashari et al. (2024) emphasize that BDA facilitates real-time decision-making and enhances responsiveness to market dynamics. In supply chain contexts, particularly food and FMCG sectors, Adewale et al. (2024) highlight a dual approach integrating behavioral finance and big data to optimize operational decisions. Furthermore, Özemre and Kabadurmus (2020) propose a BDA-based methodology for long-term strategic planning. Asrul et al. (2024) demonstrate that BDA enables accurate demand prediction and technological innovation, though its implementation remains limited among small businesses due to infrastructural and digital literacy barriers. Fadli et al. (2025) support this by identifying BDA as a key enabler of digital business transformation, driving competitive advantage and adaptive business models across industries.

Consumer Behavior Prediction

Predictive modeling of consumer behavior is one of the most widely adopted applications of big data. Andini and Harahap (2024) discuss how organizations leverage user data to predict purchasing intentions and behavioral trends in digital marketplaces. Mubarok et al. (2025) further argue that the integration of machine learning algorithms with BDA enables e-commerce platforms to deliver highly personalized experiences. Begum (2024) confirms the transformative impact of BDA in retail, allowing for anticipatory strategies based on transaction history and customer segmentation. Moreover, Chaudhary et al. (2021) and Boppiniti (2019) emphasize the importance of using social media data for predictive analytics, which offers deeper behavioral insights. Dzakiyyah et al. (2023) illustrate how Shopee successfully utilized big data to enhance customer satisfaction through more accurate targeting. However, Juliana et al. (2025) caution against universal models, stressing that neglecting cultural and regional context can lead to biased predictions, limiting the effectiveness of BDA in diverse populations.

Sustainable Decision-Making

The intersection between BDA and sustainability is increasingly evident in both theoretical and empirical research. Dubey et al. (2018; 2019) argue that predictive analytics can support sustainable production and consumption by minimizing waste, improving efficiency, and aligning decisions with environmental goals. Nilashi et al. (2021) demonstrate that social big data analysis contributes to eco-conscious decision-making in the hospitality sector. In financial markets, Hendra et al. (2025) show how BDA enhances strategic transparency and

investment in sustainable enterprises. From a marketing and operations perspective, Gill et al. (2024) and Halawa et al. (2024) underscore BDA's ability to drive sustainable practices through demand forecasting and inventory optimization. Nonetheless, the ethical implications of big data remain a key concern. Asrul et al. (2024) highlight data privacy risks in the absence of clear regulation, while Fadli et al. (2025) recommend embedding ethical frameworks such as privacy by design to ensure that data-driven strategies align with long-term sustainability and social responsibility.

C. RESEARCH METHOD

This study adopts a qualitative exploratory design with a multiple case study approach to examine the behavioral dynamics of Generation Z in East Kalimantan in the context of big data analytics (Juliana et al., 2025). Due to the unknown size of the population Gen Z individuals aged 18–26 who have made at least five online purchases in the past six months a sample of 31 participants was determined based on Roscoe's (1975) guideline for behavioral research. Participants were selected using purposive and snowball sampling to ensure variation in background (university students, young professionals, local MSME actors) and location (Samarinda, Balikpapan, Bontang). The key variables studied include perceived personalization, data privacy concerns, and cultural responsiveness, which are conceptually grounded in the customer journey framework (Dzakiyyah et al., 2023) and technology acceptance theory (Juliana et al., 2025). Data collection involved three methods: semi-structured in-depth interviews, focus group discussions, and digital observation of participants' social media activity (with ethical approval), referencing approaches by Virgiawan et al. (2025), Hendra et al. (2025), and Pasaribu (2024). The analysis was conducted using both descriptive and thematic techniques: descriptive analysis was used to summarize respondent characteristics and general behavioral trends, while thematic analysis was employed to inductively identify patterns, code responses, and construct meaningful themes through iterative interpretation. Trustworthiness of findings was ensured through triangulation, member checking, and audit trail documentation in accordance with qualitative research rigor (Makmur et al., 2025).

D. RESULTS AND DISCUSSIONS

This study reveals five major themes that describe the dynamics of Gen Z consumer behavior in East Kalimantan, with a focus on optimizing big data analytics (BDA). A total of 31 participants were involved in this research, selected using purposive and snowball sampling, representing diverse digital engagement profiles across Samarinda, Balikpapan, and Bontang.

Table 1. Summary of Respondent Demographics

No	Demographic Variable	Category	Frequency (n)	Percentage (%)
1	**Gender**	Male	12	38.7%
		Female	19	61.3%
2	**Age Group**	18–20 years	10	32.3%

		21–23 years	13	41.9%
		24–26 years	8	25.8%
3	**Education Level**	Senior High School	5	16.1%
		Diploma (D3)	6	19.3%
		Undergraduate (S1)	17	54.8%
		Graduate (S2 ongoing)	3	9.8%
4	**Occupation**	Student	17	54.8%
		Entry-level Professional	9	29.0%
		Local MSME Entrepreneur	5	16.1%
5	**Domicile**	Samarinda	13	41.9%
		Balikpapan	10	32.3%
		Bontang	8	25.8%
6	**E-commerce Usage Frequency**	≥5 times/month	16	51.6%
		2–4 times/month	12	38.7%
		<2 times/month	3	9.7%
7	**Favorite Platforms**	TikTok	28	90.3%
		Shopee	25	80.6%
		Instagram	12	38.7%
		Tokopedia	7	22.6%
		Facebook Marketplace	5	16.1%
		Others	3	9.7%

Source : Data Processed, 2025

Based on the demographic summary of the 31 respondents, the study reveals a digitally active Generation Z population in East Kalimantan, with a majority being female (61.3%) and aged between 18–23 years (74.2%). Most are undergraduate students (54.8%) or early professionals, primarily residing in urban centers like Samarinda, Balikpapan, and Bontang. Over half of the respondents (51.6%) shop online frequently (≥5 times/month), with dominant preferences for TikTok (90.3%) and Shopee (80.6%), followed by Instagram (38.7%), Tokopedia (22.6%), Facebook Marketplace (16.1%), and other platforms such as Lazada or Bukalapak (9.7%). These figures indicate a high level of engagement with visual, short-video-based discovery platforms and established e-commerce services. This demographic profile aligns with the core focus of the study, demonstrating that Gen Z in East Kalimantan represents a digitally literate consumer segment whose behavior is both traceable and predictable via Big Data Analytics (BDA). However, their engagement patterns are closely tied to local cultural and infrastructural contexts, suggesting that sustainable decision-making through BDA must be grounded in region-specific insights, platform preferences, and behavioral nuances rather than relying on generalized national models.

Table 2: Behavioral Indicators of Gen Z in East Kalimantan Related to Big Data Analytics

No	Question Item	Yes (n)	No (n)	Results
1	Do you spend more than 2 hours/day on TikTok?	25	6	TikTok is preferred due to its algorithm showing relatable local content, product reviews from Kaltim creators, and faster access to visual, authentic testimonials.
2	Do you compare product reviews across platforms before purchasing?	28	3	Cross-platform checking (TikTok, Shopee, FB) is seen as necessary to validate information, especially for high-value or fashion items.
3	Do you like location-based product recommendations?	23	8	Location-based suggestions (e.g., "for humid weather") are perceived as more relevant. Offers from nearby sellers also enhance trust and delivery speed.
4	Do you dislike being tracked across multiple platforms?	21	10	Many feel uneasy when ads follow them across apps; it is seen as invasive and manipulative, especially without clear consent.
5	Do you often follow recommendations from friends or community groups?	27	4	Collective trust matters. Gen Z respondents value shared experiences, especially from community-based reviews like Samarinda Facebook groups.
6	Do you actively seek local UMKM products during traditional/cultural events?	24	7	There is cultural pride and preference for supporting local brands, especially during events like Gawai Dayak or religious holidays.
7	Are you aware that apps track your online behavior?	29	2	Almost all respondents are aware of tracking, mainly through sudden targeted ads appearing right after browsing certain items.
8	Do you know how to turn off data tracking manually in the apps?	11	20	Most don’t know how to disable tracking; settings are considered hidden, complex, or rarely explained in simple language.
9	Do you prioritize data privacy over personalized promotions?	19	12	Although privacy is valued, many choose cheaper prices and targeted deals over privacy, showing a trade-off mindset.

No	Question Item	Yes (n)	No (n)	Results
10	Do you trust local content creators more than algorithmic ads?	26	5	Local creators are trusted due to contextualized testing (e.g., showing product use in high-humidity environments, or rural roads), which algorithms don't offer.
11	Do you prefer buying from sellers who show proof of origin (e.g., Kaltim ID)?	22	9	Sellers who display local identifiers (like postal code or dialect) are seen as more credible, especially when combined with video proof like unboxing content.
12	Have you ever rejected a product ad due to lack of cultural relevance?	21	10	Ads showing "urban Jakarta lifestyles" or "dry skin solutions" are often ignored, as they do not reflect East Kalimantan's tropical environment or culture.
13	Do you feel that short-video platforms influence your buying decisions?	26	5	Short videos with storytelling or reviews (especially TikTok and Reels) build stronger emotional connections and speed up purchase decisions.
14	Do you consider ethical aspects (e.g., eco-friendly, local brand) in shopping?	20	11	Many participants value sustainability and ethical branding, especially when promoted by peers or influencers with community ties.
15	Are you concerned about how your data is used by e-commerce platforms?	28	3	There is a high level of concern about data misuse, especially after witnessing unrelated products being advertised due to vague data use permissions.

Source : Author, 2025

In terms of consumer behavior prediction, the reliance on local influencers and community-driven reviews highlights the failure of one-size-fits-all algorithms as warned by Juliana et al. (2025), supporting the argument by Andini & Harahap (2024) that behavioral models must be socially grounded. The preference for culturally relevant messaging over algorithmic suggestions further illustrates Mubarok et al.'s (2025) call for more adaptive machine learning systems. Furthermore, Gen Z's strategic behaviors such as content triangulation, cultural alignment checks, and brand credibility assessment mirror Begum's (2024) notion of empowered consumers shaping data feedback loops. These behaviors are reflected in the digital routines of respondents who predominantly consume product

content through TikTok (90.3%) and validate credibility across platforms like Shopee, Instagram, and Facebook Marketplace. This multi-platform approach also reflects the tendency for socially reinforced decision-making, particularly among younger users in urban East Kalimantan.

From a sustainability standpoint, these behavioral patterns reflect a strong alignment with the principles laid out by Dubey et al. (2018; 2019), where data-driven decisions are filtered through communal norms and environmental consciousness. Participants' prioritization of local brands, resistance to excessive data exploitation, and preference for ethically produced content echo Nilashi et al. (2021) and Hendra et al. (2025), who found that sustainability-driven choices are amplified through socially shared data experiences. In this regard, understanding the influence of brand awareness and perceived quality is also essential in cultivating customer loyalty and satisfaction, particularly among digital-native consumers. This aligns with Ananta et al. (2025), who demonstrated how customer satisfaction acts as a mediating variable between brand perceptions and loyalty in the context of Gen Z consumption. Moreover, the integration of Environmental, Social, and Governance (ESG) principles into business analytics is becoming increasingly critical, especially in gaining stakeholder trust and ensuring long-term resilience. As emphasized by Judijanto & Nurrohman, embedding sustainability frameworks within corporate strategies not only supports ethical compliance but also enhances digital reputation and investor confidence. Notably, more than 60% of participants expressed active concern about data usage ethics, while only a minority knew how to manually disable tracking features in the apps. This further demonstrates that awareness does not automatically translate into technical competence, highlighting the need for clearer data literacy mechanisms tailored to young digital users in semi-peripheral regions.

These findings reinforce the relevance of several Sustainable Development Goals (SDGs), particularly SDG 9 (Industry, Innovation and Infrastructure), by encouraging regionally adapted data innovation; SDG 12 (Responsible Consumption and Production), by promoting ethical and culturally aligned digital purchasing behaviors; and SDG 13 (Climate Action), by reflecting Gen Z's growing sensitivity to environmentally conscious content and decision-making frameworks. Additionally, the reliance on local influencers and peer networks for decision validation embodies the spirit of SDG 17 (Partnerships for the Goals), through which collaborative and community-based digital ecosystems can be strengthened.

The absence of clear privacy mechanisms, as shown in participant responses, reflects the ethical tension discussed by Asrul et al. (2024) and Fadli et al. (2025), reaffirming the urgency of embedding privacy-by-design principles and cultural responsiveness into BDA systems. Thus, this study contributes to the literature by demonstrating that the effectiveness of BDA in predicting and shaping Gen Z consumer behavior lies not solely in data volume or algorithmic sophistication, but in its ability to interpret local cultural signals and sustain ethical, inclusive, and sustainability-oriented decision-making frameworks.

E. CONCLUSION

The study concludes that the application of Big Data Analytics (BDA) in

predicting consumer behavior among Generation Z in East Kalimantan is intricately shaped by local cultural values, digital practices, and perceptions of data ethics. While BDA holds significant potential to inform sustainable decision-making, its effectiveness is highly dependent on contextual factors such as regional infrastructure, trust in data-driven platforms, and cultural alignment with predictive algorithms. Generation Z in this region displays a high degree of digital engagement yet demonstrates ambivalence toward data privacy, preferring personalized content that resonates with their local identity but rejecting intrusive cross-platform surveillance. This paradox highlights the need for businesses and institutions to move beyond generic, one-size-fits-all BDA strategies. As a recommendation, organizations should develop culturally responsive data models that incorporate local behavioral nuances, enhance digital literacy related to privacy management, and involve local influencers as trust agents in promoting ethical data use. Such an approach not only improves the accuracy of behavioral predictions but also ensures alignment with long-term sustainability goals through community-based, inclusive, and ethically grounded analytics practices.

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