



# Impulsive Buying in Shopee's Flash Sale Program

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**Abstract.** One of the growing trends in e-commerce today is flash sales, which offer deep discounts for a limited time. This phenomenon has attracted the attention of many people, including Gen-Z. This study aims to re-examine Shopee by eliminating the arousal and pleasure variables, enabling researchers to analyze the relationship between scarcity in flash sales, flash sale features, and attitudes toward flash sales on impulsive buying among Gen-Z Shopee users in Yogyakarta. The sample used in this study comprised 150 active Shopee users among Generation Z in the city of Yogyakarta. The study's findings and hypothesis testing showed that the variables of scarcity in flash sales, flash sale features, and attitude toward flash sales had a significant effect on impulsive buying. However, the analysis also showed that flash sale features did not have a significant effect on impulsive buying.

**Keywords:** Flash Sale, Scarcity, Impulsive Buying.

## 1 Introduction

Flash sales in e-commerce, which are promotional activities that offer huge discounts for a limited time. This phenomenon has caught the attention of many people, including Gen-Z. However, this convenience often comes with negative consequences, especially for Gen-Z students living in dormitories. Instead of being a solution to easily and affordably meet their daily needs, flash sales can trigger impulsive shopping and a hedonistic lifestyle [5].

Previous studies have examined the effect of flash sales on impulsive buying. As conducted by [6], the flash sale factor as a stimulus can trigger an internal response that influences impulsive buying behavior. [7] Researched the influence of Brand Ambassadors and Flash Sales on Impulse Buying. The research on the influence of flash sales on impulse buying yielded positive results. This is because flash sale programs can encourage consumers to buy the products offered. Meanwhile, the results of research by [8] on the variable of flash sales on impulsive buying contributed 40.2%, which means that this variable has a significant effect. In the research [9], there is also an indirect effect of attitude on perceived perishability and perceived scarcity on impulsive buying. Although there have been several previous studies that examined the relationship between flash sales and impulsive buying and obtained positive results,

based on a survey conducted by [10], it was found that the effect of flash sales on impulsive buying was not significant. This is because several consumers have complained about Shopee's flash sale program, including the rapid development of technology today, which has led most users to change how they transact, from face-to-face to online. The advent of online transactions has made it easier for consumers to shop practically and easily without having to make face-to-face purchases between sellers and buyers. Shopping without visiting a store but using online commerce, better known as e-commerce, is proof of the development of digitalization.

Flash sales, also known as daily deals or deal-of-the-day, are an e-commerce business model that offers limited products at discounted prices for a short period of time, with transactions usually conducted directly [1]. Initially intending to only look for needed items, a person may be tempted to buy unnecessary products due to instant offers [2]. The increasing tendency for individuals to shop without consideration will encourage impulsive buying.

Impulsive buying is an act of consumers purchasing something without considering the consequences [3]. Purchasing without fully considering the function, purpose, or consequences. This means impulsive buying occurs when people feel an urge to take advantage of a special offer. In addition to impulsive buying, there is also an attitude towards it. Attitude toward is used to evaluate interest in determining actions [4]. Attitude toward refers to an individual's tendency or evaluation of a particular object, person, or situation, which shapes their responses and behavior. This psychological construct includes cognitive, affective, and behavioral components, reflecting beliefs, feelings, and tendencies to act consistently. The digital era has brought various conveniences to the lives of Gen-Z, from communication to socioeconomics, especially in shopping activities. One trend increasingly popular today is sudden errors in the application system and inappropriate timing. In the study by [11], the results showed that scarcity had no effect on impulsive buying.

This study is modified from [6] entitled "Impulse Buying During Flash Sales in the Online Marketplace." The study mentions that scarcity on flash sales, flash sale features, attitude toward flash sales, arousal, and pleasure influence impulsive buying. In this study, the findings remain generalizable across all types of e-commerce in Indonesia. Therefore, the researcher is interested in re-testing on the Shopee platform by modifying the variables, specifically by removing the arousal and pleasure variables. Thus, the researcher will analyze the relationships among scarcity in flash sales, flash sale features, and attitude toward flash sales, and their effects on impulsive buying among Generation Z Shopee users in Yogyakarta.

## **2 Literature Review**

### **2.1 S-O-R**

This study applies the Stimulus-Organism-Response (S-O-R) theory developed by Mehrabian & Russell [12], as the basis for the research. The theory explains that the environment is a stimulus that drives consumers' emotions, which are organisms, and that these emotional reactions influence consumer behavior. Stimulation is one of the

factors that influences consumer psychology. Stimulation can take any form in the environment, such as products, advertisements, stores, and marketing strategies. According to [13], purchasing decisions are a person's positive response to a product. When a person has a positive response, they will decide to buy or use the product or service. This theory was chosen because it explains consumer behavior when shopping online, where the programs offered during sales influence consumer attitudes during online flash sale events, ultimately leading to impulsive buying. The influence of flash sales is used as a stimulus (S) to form an attitude of reward toward flash sales (O), which can influence impulsive buying (R).

## **2.2 Scarcity on Flash Sales**

Scarcity refers to the limited availability of necessary resources while demand continues to exist, but we find it difficult to meet that demand [14]. According to Guo et al. [15], scarcity, manipulated by information technology, creates an online shopping environment that can shape consumers' impulsive buying decisions. According to Wu et al. [16], there are two dimensions of scarcity in flash sales: limited quantity and limited time. Limited quantity scarcity offers are limited to only one purchase and a limited number of units [17]. Limited-time scarcity is a time-based availability that is a primary concern for consumers [16].

## **2.3 Flash Sale Feature**

Features in the context of flash sales refer to the underlying characteristics or traits of flash sale promotions. These characteristics not only describe behavior but also provide a valid and useful explanation of flash sales. According to Liu et al., [18], there are four dimensions to flash sale features, namely information, visuality, entertainment, and economic benefit.

## **2.4 Attitude Towards Flash Sales**

Attitude is a concept that refers to psychological tendencies expressed through evaluations of an entity with a certain level of liking or disliking [1]. Schiffman & Kanuk, [19], mention that there are several indicators that can shape attitude, including knowledge, feelings, and actions.

## **2.5 Impulsive Buying**

Impulsive buying is the act of spending money in an uncontrolled manner, mostly on unnecessary items. Unplanned purchases (impulse buys) are mostly desired but not needed items, often new products at low prices [20]. According to Rook & Fisher, [21], several characteristics of impulsive buying can serve as indicators, including spontaneity, intensity, excitement, and indifference to consequences.

## 2.6 Hypothesis

The conceptual model to be developed for this study is based on previous research and a literature review. The following hypotheses have been developed from the conceptual model:

In a study, scarcity can influence perceptions of goods by increasing their attractiveness and the desire to buy [1]. Perceived perishability and perceived scarcity influence attitudes towards flash sales [9]. In this case, according to the research [22], perceived perishability and perceived scarcity influence attitudes towards flash sales.

H1: Scarcity in flash sales is positively related to attitudes towards flash sales.

Information and visuality have a positive and significant effect on attitude [23]. In line with the research, there is a significant effect on economic benefits on attitude towards [24]. In this case, according to the research, information has a significant effect on attitude towards [25].

H2 Flash sale features are positively related to attitudes towards flash sales. In the research, perceived perishability and perceived scarcity have a significant effect on impulse buying [22].

Research conducted shows that the limited time variable has a direct effect on impulsive buying [26].

H3 Scarcity on flash sales is positively related to impulsive buying. The research shows that information influences impulse buying. Research has found that visuals positively influence impulsive buying [27].

H4 Flash sale features are positively related to impulsive buying.

Research results show that Gen Z's attitude in East Java significantly influences impulsive buying behavior [23]. Meanwhile, research found that attitudes influence impulsive buying [28].

H5 Attitude is positively related to impulsive buying.

## 3 Methodology

This study uses a quantitative approach, utilizing primary data collected through the distribution of questionnaires to respondents. The population in this study consisted of individuals from Generation Z who use the Shopee application. The exact number of Generation Z users of the Shopee application in Yogyakarta City is unknown. Therefore, this study used non-probability sampling, or non-random sampling, which involves the researcher's subjective assessment.

The sample size in this study was determined using the formula (number of indicators + number of latent variables) x (5 to 10), resulting in a minimum sample size of 150. Calculated from  $26 \times 5 = 130$  [29]. In sampling, a 20% reserve sample was added, comprising 26 respondents, to avoid data shortages caused by incomplete or invalid responses, resulting in a maximum sample size of 156. The sample size for this study was 150 active Shopee users among Generation Z in the city of Yogyakarta. The research object is Shopee e-commerce, with the research location focused on the Yogyakarta area.

### 4 Result

In this study, there were a total of 150 respondents. The characteristics of the respondents based on gender were Male (38%), Female (62%). Based on age: 17–18 years old (7.6%), 19–20 years old (23.8%), 21–22 years old (52.4%), 23–24 years old (13.3%), >25 years old (2.9%). Based on university of origin: UII students (19.9%), UAD (16.4%), UPNYK (19.9%), UINSUKA (17.6%), etc. (17.01%). Based on participation in flash sale programs: <5 times (41.9%), and >5 times (58.1%). Based on monthly allowance: <1 million (35.2%), 1-2 million (32.4%), 2-3 million (12.4%), 3-4 million (12.4%), >5 million (7.6%).

The research data is valid and reliable (Table 1). The standardized factor loading is higher Than 0.5. The construct reliability is higher than 0.7, and the extracted variance is higher than 0.5 (Fig 1). The research data is valid and reliable (Table 1). The standardized factor loadings are higher than 0.5. The construct reliability is higher than 0.7, and the extracted variance is higher than 0.5 (Figure 1).

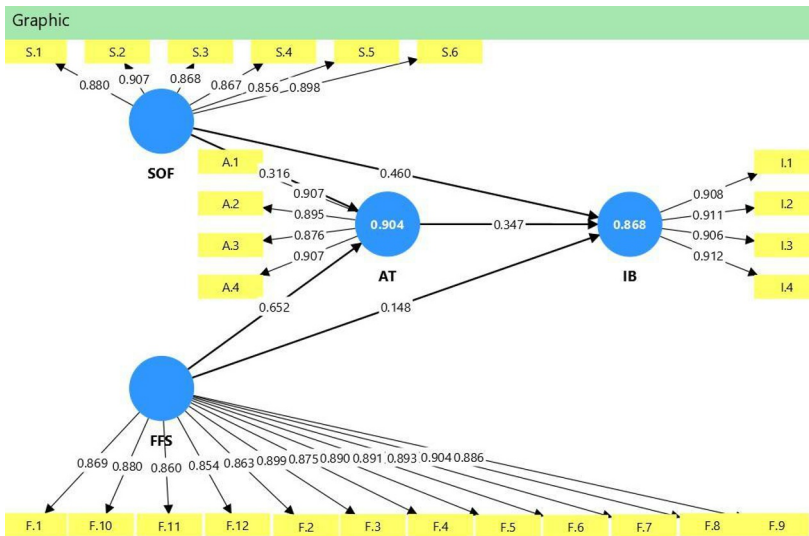


Figure 1. Result

Table 1. Validity, Reliability, and AVE

Variable	Item	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Attitude Towards	AT1	0,907	0,918	0,942	0,804
	AT2	0,895			
	AT3	0,876			
	AT4	0,907			
Fitur Flash	F1	0,869	0,974	0,976	0,775

Variable	Item	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Attitude Towards	AT1	0,907			
	AT2	0,895			
	AT3	0,876			
	AT4	0,907	0,918	0,942	0,804
Sale	F2	0,880			
	F3	0,860			
	F4	0,854			
	F5	0,863			
	F6	0,899			
	F7	0,875			
	F8	0,890			
	F9	0,891			
	F10	0,893			
	F11	0,904			
	F12	0,886			
	Impulsive Buying	IB1	0,908		
IB2		0,911			
IB3		0,906			
IB4		0,912	0,930	0,950	0,826
Scarcity on Flash Sale	S1	0,880			
	S2	0,907			
	S3	0,868			
	S4	0,867			
	S5	0,856			
	S6	0,898	0,942	0,953	0,773

The attitude variable was measured using four valid items, with loadings ranging from 0.876 to 0.907, indicating that the items reflect the attitude construct. The reliability level of the variable is acceptable, as indicated by Cronbach's alpha and composite reliability above 0.70 (reliable). The level of convergent validity is indicated by an AVE value of  $0.804 > 0.50$ , which meets the requirements for good convergent validity. Overall, the variation in measurement items contained by the variable reaches 80.4%.

The scarcity variable in flash sales was also measured using four indicators, which yielded valid results, with outer loadings ranging from 0.856 to 0.907. This indicates that each indicator accurately reflected the concept of product scarcity in flash sale programs. Cronbach's Alpha and Composite Reliability values above 0.70 indicate that this variable has high reliability. Meanwhile, an AVE of  $0.773 > 0.50$  indicates that this variable meets the criteria for convergent validity, explaining 77.3% of the construct variance. In other words, the indicators used have accurately and effectively captured the perception of scarcity among Shopee users.

The flash sale feature variable was measured using four indicators, with outer loadings ranging from 0.856 to 0.904, indicating that all indicators were valid in representing the construct. Cronbach's Alpha, and Composite Reliability values exceeding 0.70 indicate good reliability. Meanwhile, an AVE of  $0.775 > 0.50$  indicates convergent validity, with 77.5% of indicator variance explained by the construct. Thus, the flash sale feature variable is declared valid and reliable for use in this study.

The impulsive buying variable was measured using four indicators, with outer loadings ranging from 0.906 to 0.912, indicating that all indicators were valid in representing the construct. Cronbach's Alpha and Composite Reliability values above 0.70 indicate excellent reliability. In addition, an AVE of  $0.826 > 0.50$  indicates convergent validity, with 82.6% of indicator variance explained by the construct. Thus, the impulsive buying variable is declared valid and reliable for use in this study.

**Table 2.** Hypotheses

	Hypothesis	Hypothesis Result
H1	S-AT	0.002 Support
H2	F-AT	0.000 Support
H3	S-IB	0.001 Support
H4	F-IB	0.337 Not Support
H5	AT-IB	0.002 Support

Hypothesis testing was conducted to determine the effect of each independent variable on the dependent variable in this study. Based on the results of the regression analysis, the following conclusions were drawn:

(H1): Scarcity on Flash Sale affects attitude towards. The test results show that the flash sale variable is significant ( $p < 0.05$ ) and has a positive regression coefficient. This means that the scarcity of products displayed during flash sales significantly affects impulsive buying behavior among Shopee users in Generation Z in Yogyakarta. Thus, H1 is accepted.

(H2): Flash sale features influence impulsive buying. Based on the regression test results, a significance value of less than 0.05 ( $p < 0.05$ ) was obtained, with a positive direction of influence. This means that flash sale features such as time limits, large discounts, and promotion frequency significantly increase impulsive buying behavior. Thus, H2 is accepted.

(H3): Scarcity of flash sales affects impulsive buying. The analysis results show that the scarcity variable in flash sales has a significant effect on impulsive buying ( $p$ -value  $< 0.05$ ). This indicates that the more positive consumers' attitudes toward flash sales are, the higher their tendency to make impulsive purchases. Therefore, H3 is accepted.

(H4): The Flash Sale feature influences impulsive buying. Based on the test results, the significance value for this variable is greater than 0.05 ( $p > 0.05$ ), indicating that the flash sale feature does not have a significant effect on impulsive buying. This means that the perception of product scarcity during a flash sale does not always form

a positive attitude towards consumer behavior. Thus, H4 is rejected.

(H5): Attitude towards impulsive buying. The regression analysis results show that the attitude towards the variable has a p-value  $< 0.05$  and a positive regression coefficient. This indicates that attitude can influence consumer attitudes towards flash sale activities on Shopee. Thus, H5 is accepted.

## 5 Conclusion

The findings of this study indicate that several factors in flash sale promotions significantly influence impulsive buying behavior among Generation Z Shopee users in Yogyakarta. Based on the results of hypothesis testing, the variables of scarcity in flash sales, flash sale features, and attitude toward flash sales have a significant effect on impulsive buying. This indicates that the stronger the perception of product scarcity, the more attractive the promotional characteristics, and the more positive the consumer's attitude toward flash sales, the higher their tendency to make impulsive purchases.

However, the analysis also shows that flash sales do not have a significant effect on impulsive buying. This means that although product scarcity can encourage spontaneous purchasing, it does not necessarily create a positive attitude towards flash sales themselves. Consumers may view this type of promotion as a marketing strategy that creates psychological pressure, rather than an enjoyable shopping experience. Overall, these findings confirm that H1, H2, H3, and H5 are accepted, while H4 is rejected. These results reinforce the view that the most influential factors in impulsive buying behavior are not only perceptions of scarcity but also attractive promotional characteristics and consumers' positive attitudes toward flash sale activities.

This study has limitations: the sample does not fully represent all Shopee users, so the findings should be generalized with caution. In addition, the scope of the variables studied is still limited to the flash sales aspect, so it cannot yet capture all the determinants that could influence impulsive buying behavior more comprehensively.

For future research, it is recommended to re-examine the effect of flash sale features on impulsive buying using a more diverse sample and a more in-depth analytical approach. The measurement of flash sale features should also be separated into several dimensions, such as countdown and stock indicators, to obtain more accurate results.

## References

- [1] I. Renita, "Pengaruh Program Flash Sale Terhadap Pembelian Impulsif Dan Shopping Enjoyment Pada Mahasiswa Pengguna Shopee Di Yogyakarta," *Univ. Islam Indones.*, no. 8.5.2017, pp. 2003–2005, 2022.
- [2] A. Dharmanto, N. S. Komariah, M. Handayani, R. Suminar, and D. T. Untari, "Analysis of tourism preferences in choosing online-base travel agents in Indonesia," *Int. J. Sci. Technol. Res.*, vol. 8, no. 12, pp. 3761–3763, 2019.

- [3] D. W. Rook, "The Buying Impulse," *J. Consum. Res.*, vol. 14, no. 2, p. 189, 1987, doi: 10.1086/209105.
- [4] D. Singasatia and M. Melami, "Pengaruh Perceived Usefulness (PU) Dan Perceived Ease Of Use (PEOU) Terhadap Attitude Toward Using (ATU) Serta Dampaknya Terhadap Behavioral Intention To Use (BITU) (Study Kasus : Pengguna Sistem Pendaftaran Online Lomba Tingkat (LT) IV Kwartir Daerah Ger)," *STT Wastukencana*, pp. 1–8, 2018.
- [5] A. N. Sahirah, "Kecanduan Flash Sale, Fenomena Belanja Implusif Buying di Kalangan Mahasiswa," *Suara Usu*.
- [6] S. F. Lamis, P. W. Handayani, and W. R. Fitriani, "Impulse buying during flash sales in the online marketplace," *Cogent Bus. Manag.*, vol. 9, no. 1, 2022, doi: 10.1080/23311975.2022.2068402.
- [7] L. Galuh Purnama *et al.*, "Pengaruh Brand Ambassador dan Flash Sale Terhadap Impulse Buying Consumer di Marketplace Shopee Pada Generasi Z," vol. 4, no. 2, pp. 138–147, 2024.
- [8] E. R. Leilani and D. Kusnanto, "Al-Kharaj : Jurnal Ekonomi , Keuangan & Bisnis Syariah Al-Kharaj : Jurnal Ekonomi , Keuangan & Bisnis Syariah," *Al-Kharaj J. Ekon. , Keuang. Bisnis Syariah*, vol. 6, no. 2, pp. 2547–2562, 2024, doi: 10.47467/alkharaj.v6i5.2119.
- [9] D. Vannisa, A. Fansuri, and I. M. Ambon, "The effect of flash sale program on shopping enjoyment and impulse buying on flash sale on C2C E-commerce," *Int. J. Sci. Technol. Res.*, vol. 9, no. 4, pp. 2534–2539, 2020.
- [10] F. Desy Fitriana, S. Tinggi Ilmu Ekonomi Surakarta Budi Istiyanto, P. Studi Manajemen, and S. Tinggi Ilmu Ekonomi Surakarta, "PENGGUNA SHOPEE DI SOLORAYA," vol. 2, no. 2, pp. 712–723, 2024, doi: 10.61722/jiem.v2i2.1031.
- [11] Y. Yulianto, A. Sisko, and E. Hendriana, "The Stimulus Of Impulse Buying Behavior On E-Commerce Shopping Festival: A Moderated-Mediated Analysis," *J. Bus. Manag. Rev.*, vol. 2, no. 10, pp. 692–714, 2021, doi: 10.47153/jbmr210.2152021.
- [12] A. Mehrabian and J. A. Russell, "The basic emotional impact of environments," *Percept. Mot. Skills*, vol. 38, no. 1, pp. 283–301, 1974, doi: 10.2466/pms.1974.38.1.283.
- [13] A. Balawera, "Green Marketing Dan Corporate Social Responsibility Pengaruhnya Terhadap Keputusan Pembelian Konsumen Melalui Minat Membeli Produk Organik Di Freshmart Kota Manado," *J. EMBA*, vol. 1, no. 4, pp. 2117–2129, 2013.
- [14] P. angelia Wuisan, "Memahami Scarcity atau Kelangkaan dan Faktor Penyebabnya," *ModalRakyat*.
- [15] J. Guo, L. Xin, and Y. Wu, "Arousal or not? The effects of scarcity messages on online impulsive purchase," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 10294 LNCS, pp. 29–40, 2017, doi: 10.1007/978-3-319-58484-3\_3.
- [16] Y. Wu, L. Xin, D. Li, J. Yu, and J. Guo, "How does scarcity promotion lead to impulse purchase in the online market? A field experiment," *Inf. Manag.*, vol. 58, no. 1, 2021, doi: 10.1016/j.im.2020.103283.
- [17] S. W. Shi and M. Chen, "Would you snap up the deal? A study of consumer behaviour under flash sales," *Int. J. Mark. Res.*, vol. 57, no. 6, pp. 931–958, 2015, doi: 10.2501/IJMR-2015-072.

- [18] Y. Liu, Q. Li, T. Edu, L. Jozsa, and I. C. Negricea, "Mobile shopping platform characteristics as consumer behavior determinants," *Asia Pacific J. Mark. Logist.*, vol. 32, no. 7, pp. 1565–1587, 2019, doi: 10.1108/APJML-05-2019-0308.
- [19] L. G. Schiffman and L. L. Kanuk, *Consumer Behavior*. Pearson Prentice Hall, 2007.
- [20] A. T. Wiranata and A. Hananto, "Do Website Quality, Fashion Consciousness, and Sales Promotion Increase Impulse Buying Behavior of E-Commerce Buyers?," *Indones. J. Bus. Entrep.*, vol. 6, no. 1, pp. 74–85, 2020, doi: 10.17358/ijbe.6.1.74.
- [21] D. W. Rook and R. J. Fisher, "Normative Influences on Impulsive Buying Behavior," *J. Consum. Res.*, vol. 22, no. 3, p. 305, 1995, doi: 10.1086/209452.
- [22] H. Dsilva and N. Elangovan, "Impulsive buying during Flash Sales on ECommerce sites and the Ramification of Flash Sales on Shopping Impulsive buying during Flash Sales on E- Commerce sites and the Ramification of Flash Sales on Shopping," no. October 2021, 2022, doi: 10.12725/ujbm.57.3.
- [23] E. Asadiyah and A. Vania, "Entrepreneurship Bisnis Manajemen Akuntansi Flash sale characteristics and attitude as determinant of impulse buying behavior," vol. 5, no. 2, pp. 257–275.
- [24] J. Santosa, P. M. Bisnis, P. S. Manajemen, F. Bisnis, and J. Siwalankerto, "Pengaruh Economic Benefits , Hedonic Benefits , Moral Judgement , Importance / Exposure To Music , Dan Involvement And Interest Terhadap Attitudes Towards Online Piracy Dan Willingness To Try Sbm Spotify Di Kalangan Mahasiswa Program Studi Manajemen Univ," vol. 8, no. 2, 2020.
- [25] H. Ho Nguyen, B. Nguyen-Viet, Y. T. Hoang Nguyen, and T. Hoang Le, "Understanding online purchase intention: the mediating role of attitude towards advertising," *Cogent Bus. Manag.*, vol. 9, no. 1, 2022, doi: 10.1080/23311975.2022.2095950.
- [26] F. Ghifari, "Pengaruh Limited Quantity Scarcity Dan Limited Time Scarcity Terhadap Impulse Buying Melalui Arousal Sebagai Variabel Intervening," *At-Tawassuth J. Ekon. Islam*, vol. VIII, no. 1, pp. 1–19, 2023.
- [27] Awwaliya Dhiyaus Syamsiyah and Lia Nirawati, "Pengaruh Live Streaming , Flash Sale , dan Cashback Terhadap Perilaku Impulse Buying pada Pengguna E-Commerce Shopee di Surabaya," *Al-Kharaj J. Ekon. Keuang. Bisnis Syariah*, vol. 6, no. 5, pp. 5024–5036, 2024, doi: 10.47467/alkharaj.v6i5.2119.
- [28] F. Y. Dharta and H. Prasetyo, "Influence of attitude on online impulse buying : perspective on marketing communication," vol. 5, no. November, pp. 729–745, 2021, doi: 10.25139/jsk.v5i3.4138.
- [29] J. F. Hair, W. Black, and B. J. Babin, "Multivariate Data Analysis: A Global Perspective," *ResearchGate*, 2010.

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