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(Full Paper)

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ABSTRACT

Social commerce, with its unique social attributes, has promoted the group-buying mode to become an important marketing tool. Based on the stimulus-organism-response (S-O-R) paradigm, this study constructs a research model of the impact of the social e-commerce platform Pinduoduo group-buying mode on impulse buying, and uses structural equation model (SEM) for empirical analysis. The research results show that under the group-buying mode: perceived price fairness and reciprocity have significant positive influence on satisfaction; source credibility and similarity have positive effects on trust. Trust is positively correlated with satisfaction. Trust significantly affects impulsive buying impulse, but satisfaction has no significant impact on impulsive buying impulse.

Keywords: Group-buying mode, impulse buying, S-O-R paradigm.

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INTRODUCTION

With the increasing development of "Internet +" economic technology, e-commerce has gradually penetrated into our daily life, and media platforms with social properties have continued to be mobile and popularized (Zhang & Xu, 2019). In the context of the disappearance of traditional e-commerce traffic dividends and the rise of social e-commerce, the group-buying mode has gradually become a marketing means to urge consumers to buy impulsively through social interaction between people, among which Pinduoduo platform is the most representative. Pinduoduo platform stimulates consumers' sharing motivation by means of incentive measures, then uses its social resources to form social group-buying and guide group-buying mode to be listed successfully, achieving rapid development in a short period of time and creating commercial miracles. Group-buying mode quickly occupies the new retail market, followed by various platforms, among which the typical ones are "special price version" of Taobao and "jingxi", the group-buying APP of Jingdong, making the group-buying mode become the hot one at present.

The development of group-buying mode originated from Groupon group-buying website of the United States in 2008. During this decade, group-buying in China has experienced birth, decline and revival. Pinduoduo group-buying mode has successfully driven the rise of this mode (Sharma & Klein, 2020). The so-called group-buying refers to a social or collective online shopping community. Due to the aggregation of demand, a large number of consumers focus on buying the same commodity or service, resulting in a substantial price reduction. Not only the buyer gets preferential treatment, but also the seller can expand the customer base to increase product sales (Xiao, 2018). Since 2010, group-buying mode has presented an explosive development trend in China's consumer market with its advantages of low price and profit benefits (Han, 2012). However, along with its continuous development, online group-buying also has a series of problems such as lack of integrity and service quality (Han, 2012). At the same time, in the face of fierce market competition, some scholars have pointed out that the development of group-buying mode is increasingly assimilated and its user growth is gradually slow, so a new breakthrough point needs to be established -- constructing group-buying service scenario to stimulate consumers' purchase intention and thus increase their user stickiness (Gong & Liang, 2015). Pinduoduo mode is mainly composed of group-buying mode. Different from the unified discount price mode provided by traditional group-buying, Pinduoduo group-buying obtains discounts through independent group joining. With the continuous development of social e-commerce, the group-buying mode has been gradually improved. To be specific, Pinduoduo group-buying is a group-buying mode based on users launching group joining to their acquaintances through WeChat circle of friends, aiming to gather the power of more people, buy better products at lower prices and have more fun from it.

As for group-buying mode, most domestic and foreign scholars focus on the research on its own advantages and development (Chou, 2019; Han, 2012; Zheng & Zhang, 2018). Compared with a large number of studies on planned purchase behavior, there are relatively few studies on the antecedents of impulsive purchase from the perspective of online community and product recommendation (Chen *et al.*, 2019; Zhang *et al.*, 2019). Pinduoduo group-buying, as a successful paragon of group-buying mode, has rarely been studied on its impact on impulse buying. Therefore, the study of how Pinduoduo group-buying mode influences consumers' impulse buying is of great significance to both the academic and theoretical circles, and especially has important reference value for the future development trend of social e-commerce group-buying mode.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Impulse Buying

Zafar *et al.* (2019) believed that impulse buying is an unplanned purchase, which is an instantaneous, intense and irresistible complex behavior that lacks cognitive deliberation and reflects a perceptual desire, which may be considered as a purchase intention without any prior planning. Stern (1962) gave full consideration to the influence of different stimulus factors and divided impulse buying into four types, namely pure impulse buying, suggestive impulse buying, reminder impulse buying and planned impulse buying. These four types of impulse buying have the common feature of being unrestrained (Zheng *et al.*, 2019). Since the actual impulse buying behavior is difficult to measure in a controlled environment, this study focuses on the impulse of consumer impulse buying. Chen *et al.* (2019) believed that the impulse buying impulse is a state of desire presented when exposed to environmental stimuli. Zafar *et al.* (2019) pointed out that several studies have shown that impulse buying impulse can replace the real impulse purchase behavior in social business environment, because consumers' impulse buying impulse largely leads to actual impulse buying. In the context of social commerce, social interaction between groups is becoming increasingly popular, and consumers are increasingly using social media platforms for information dissemination, which promotes purchase stimulation -- social factors have a greater impact and are more likely to lead to impulse purchase (Chen *et al.*, 2019).

S-O-R Paradigm

Liu, Li, and Hu (2013) pointed out that the stimulus-organic-response (S-O-R) framework developed based on environmental psychology has been widely used to explain impulse buying, and they believed that environmental stimulus would have a significant and inevitable impact on consumers' purchasing decisions. The S-O-R paradigm indicates that stimulation can induce individual perception and affect their response (Zheng *et al.*, 2019). Price, as the core competitiveness of Pinduoduo group-buying mode, satisfies the consumer demand of price-sensitive groups for low-priced products. Collective purchase can make each group member benefit materially or spiritually and realize true reciprocity. Pinduoduo group-buying link sharing mainly relies on WeChat circle of friends, so social relationship in circle of friends is the key to successful marketing, which ensures the credibility of information source and similarity between individuals to a certain extent. All of the above factors can be used as external stimuli affecting consumers' purchasing psychology (Chen *et al.*, 2019; Shiau & Luo, 2012; Tai *et al.*, 2012). Therefore, in this research model, we regard situational factors (perceived price fairness, reciprocity, source credibility and similarity) as stimuli that affect consumer satisfaction and trust.

The organism is an internal state of the individual, which is the perceptual psychology between stimulus and response, usually manifested as an emotional state and a cognitive state (Zheng *et al.*, 2019). In this study, we regard satisfaction and trust as organism factors, because satisfaction and trust are reflected as an individual's emotional state, representing an individual's experience feeling and trust emotion, and usually acted as positive psychological factors to promote consumers' impulse purchase, which is consistent with the conclusions of earlier studies (Bressolles, Durrieu, & Giraud, 2007; Chen *et al.*, 2019).

Response is considered as the reaction to perception of different situational factors, manifested as approach or avoidance behavior (Wang, Yao, & Ye, 2014). In impulsive purchase process, the consumer response has experienced two stages, the first stage is impulsive purchase impulse, and the second stage is the actual impulse purchase behavior. The experience of the first stage is the necessary basis for the occurrence of the second stage. Only when the impulsive purchase impulse is generated, can the actual impulse purchase behavior occur (Zheng *et al.*, 2019). Therefore, in this study, urge to buy impulsively is adopted as an individual response factor.

Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) is a statistical analysis method based on the covariance matrix of processing variables to analyze the hypothetical relationship between latent variables. It has been widely used in linear modeling in Management, Economics, Sociology, Psychology and other fields (Wang & Chen, 2020). Structural Equation Modeling is divided into measurement model and structural model, which can deal with the relationship between observed variables and latent variables, and between latent variables and latent variables at the same time. It is a kind of confirmatory model analysis. It needs to establish measurement model and structural model according to theory in advance, and then collect data for verification. This research uses AMOS 24.0 to verify and analyze the model.

RESEARCH MODEL AND HYPOTHESIS FORMATION

Perceived Price Fairness and Satisfaction

Konuk (2019), based on the equity theory and the principle of dual rights, regarded perceived price fairness as a reasonable, equitable and acceptable assessment and related emotion for the price of a given product. From the perspective of consumers, the author believed that the price level of products with perceived fair price can bring fair profits to merchants, and proved to be positively correlated with satisfaction. Price is often considered as the key factor affecting consumers' purchase intention. Consumers usually set an acceptable price range for a product based on the comparison of goods or purchase experience. Other conditions being the same, the lower the price, the easier it is for consumers to accept it, and the more impulse they will have to buy impulsively (Tai *et al.*, 2012). The fairer the price perception of the product is, the higher the cost performance evaluation will be, and the more satisfied the consumers will be. Consumers' willingness to buy products will be affected by their perceived price fairness, especially in group- buying. Pinduoduo is popular among consumers because of its low price advantage, especially among low-consumption groups in third-tier and fourth-tier cities. Pinduoduo platform has the advantage

that the price of its products is generally lower than the general group purchase price, which makes consumers satisfied. Therefore, the hypothesis is put forward:

Hypothesis 1. Perceived price fairness has a positive impact on consumer satisfaction.

Reciprocity and Satisfaction

Zhang *et al.* (2019) thought that reciprocity is a kind of voluntary and autonomous behavior. This behavior not only helps those who give help, but also helps other members in the virtual community who need help, and provides corresponding help according to their request. It also belongs to an equal social exchange behavior, namely individuals feel fair when exchanging information, experience and other contents in the community. In Pinduoduo group-buying, the price of products participating in the group purchase is significantly lower than that of single purchase. At this time, the participants feel the benefits of the price reduction; in the invitation assistance, the inviting party can get free or low price discounts, and the invited party can get the gratitude of the inviting party. The next role exchange will be helped by the inviting party in the same way. The gratitude of the other party can be regarded as a social reward, which brings satisfaction to people. The premise of an agreed group purchase is that all parties can benefit and members can achieve mutual benefit. Users who profit from each other through Pinduoduo online group-buying information and link sharing have a positive attitude towards participating in Pinduoduo group-buying, and satisfaction, as an attitude measure, has been confirmed by Shiau and Luo (2012) to be significantly positively affected by reciprocity. Therefore, the hypothesis is put forward:

Hypothesis 2. Reciprocity has a positive impact on consumer satisfaction.

Source Credibility and Trust

Source credibility as the subjective evaluation of information communicator's trust degree to the communication source in the process of information communication. Scholars at home and abroad generally agree that source credibility is a subjective perception of the public. In Pinduoduo group-buying mode, information comes from WeChat circle of friends. WeChat is usually a social platform for acquaintances, while acquaintances always maintain a high relationship strength. People with close relationships are often regarded as reliable and trustworthy. Pinduoduo group-buying is famous for its social sharing through WeChat circle of friends. The viral link sharing of Pinduoduo in WeChat circle of friends has made Pinduoduo widely spread. Therefore, reliable information sources can increase the trust of consumers. Filieri, Alguezaui, and McLeay (2015) pointed out that the credibility of information sources will affect consumers' trust in communication channels, and thus positively affect consumers' trust in products or businesses. Therefore, the hypothesis is put forward:

Hypothesis 3. Source credibility has a positive impact on consumer trust.

Similarity and Trust

Similarity means that there are common values and interests among individuals. In their study, Chen *et al.* (2019) defined similarity as the degree to which followers find interest or experience matching with official accounts. Individuals tend to pay more attention to people with similar attitudes, they tend to trust people who are similar to them, and have more confidence in similar trustees. Prior studies have shown that similarity among individuals affects the development of trust (Chen *et al.*, 2019). For example, Johnson and Grayson (2005) believed that similarity positively affects the emotional trust of consumers. Chen *et al.* (2019) pointed out that similarity is positively correlated with cognitive trust and emotional trust of recommenders. Similarity can shorten the psychological distance between independent individuals. People with common topics and similar interests may feel a closer connection with each other, which can effectively reduce the skepticism and uncertain attitude among people. Therefore, similarity will promote the enhancement of trust. As the main communication channel of Pinduoduo's link sharing, social circle already has its own group attributes to a certain extent, such as similar consumption preferences. In Pinduoduo group-buying mode, consumers tend to trust the initiator when they find similarities between the friends who invite them to group-buying and themselves. Therefore, the hypothesis is put forward:

Hypothesis 4. Similarity has a positive impact on consumer trust.

Satisfaction, Trust and Urge to Buy Impulsively

Trust and Satisfaction

Trust means that consumers in the online environment have full confidence in organizations or sellers, and consumers' trust will produce a good feeling for online shopping; while, satisfaction refers to a pleasant psychological state in which consumers' post-purchase experience meets or even exceeds their expectations. It can also be understood as a good experience in which consumers' needs are satisfied. Namasivayam and Guchait (2013) believed that when consumers lack quality control over products, they tend to pay more attention to the evaluation of trust on suppliers, which will affect consumers' satisfaction with transactions. Shiau and Luo (2012) pointed out that consumers' trust in merchants will have a significant positive impact on their satisfaction, and the stronger the trust, the higher the satisfaction of consumers. In Pinduoduo group-buying, consumers have a sense of trust due to the reliable information source and the similarity between the initiator and the recipient of the group purchase link. Such a strong sense of trust promotes consumers to have positive emotional response to the group purchase products, and then promotes consumers to have a sense of satisfaction. Therefore, the hypothesis is put forward:

Hypothesis 5. Trust has a positive impact on consumer satisfaction.

Satisfaction and Urge to Buy Impulsively

Bressolles, Durrieu, and Giraud (2007) proposed in their study that satisfaction, as a positive emotional state, can reduce rational resistance by stimulating self-indulgence so as to induce impulse buying. Therefore, they proposed that the more satisfied consumers are with online shopping visits, the more likely they will experience online shopping impulse. Self-runaway is the direct cause of impulse buying behavior. When consumers' instant feeling exceeds self-expectation, it will trigger self-runaway, which will lead to impulse purchase. Satisfaction can be used as a measure of exceeding self-expectation. Therefore, in his (her) research, satisfaction was regarded as a key factor to induce consumers' self-runaway, and further demonstrated that satisfaction positively affects consumers' impulse buying behavior. In Pinduoduo group-buying, when consumers evaluate the fair price of group-buying products and predict the benefits after purchase, they will have positive satisfaction with the products, thus increasing the probability of impulse buying behavior. Therefore, the hypothesis is put forward:

Hypothesis 6. Satisfaction has a positive impact on urge to buy impulsively.

Trust and Urge to Buy Impulsively

Chen *et al.* (2019) believed that emotional trust in recommenders can stimulate consumers' impulse purchase intention. In the virtualized situation, consumers are unable to directly experience the products, resulting in consumers' emotional attitudes have a significant impact on their consumption choices (Zhang, Lu, & Yan, 2017). Stern (1962) proposed that the simplicity and convenience of the purchasing decision-making process can significantly improve the possibility of consumers' impulse buying. Trust generally includes cognitive trust and emotional trust, which is a complex psychological state combining individual rationality and sensibility. Trust can reduce the cognitive effort in decision-making, and trust others can reduce the processing of information, reduce the perceived uncertainty in the purchasing process, and thus improve the decision-making efficiency. In Pinduoduo group-buying, when consumers determine that the information they receive is trustworthy and risk-free, especially for product links recommended by acquaintances with emotional trust basis, they may give up the deliberative stage such as careful review, thus simplifying the decision-making process and leading to the increase of impulse buying. Therefore, the hypothesis is put forward:

Hypothesis 7. Trust has a positive impact on urge to buy impulsively.

Based on the above discussion, Figure 1 shows the research model of this paper. Specifically, based on the S-O-R framework, we study how situational factors such as perceived price fairness, reciprocity, source credibility and similarity affect satisfaction and trust, as well as emotional factors -- the internal influence between satisfaction and trust, which ultimately leads to urge to buy impulsively.
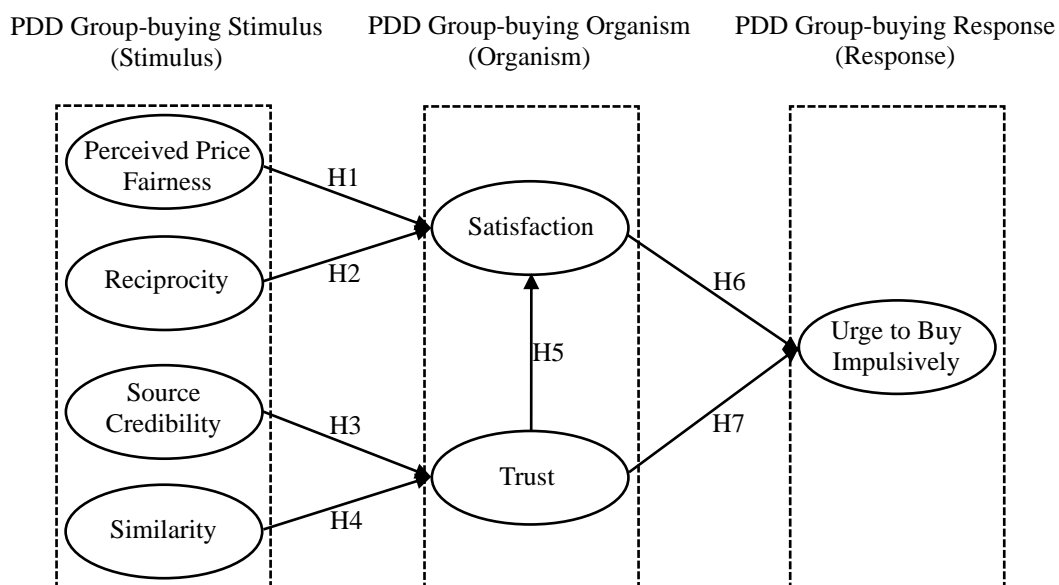

Figure 1: Research model.

RESEARCH METHODOLOGY

Measurement

The questionnaire designed in this study consists of two parts: The first part is the basic information of the respondents, involving: gender, age, education background and income; The second part is to measure all variables in the research model. These variable measure items are all derived from previous studies. For the sake of better adapting to the background of this research, we have made appropriate modifications to the variable items. These items were measured on a 7-point Likert scale (1= "strongly disagree" to 7= "strongly agree"). In order to ensure the validity of the questionnaire, we conducted a prediction test and analyzed the reliability and validity of the 100 valid questionnaires collected, and the analysis results were good. Finally, the wording, content and structure of the questionnaire were slightly modified according to the suggestions of professionals to further ensure the feasibility of the questionnaire. The questionnaire measurement items and their sources are shown in Table 1.

Table 1. Measurement items and sources of each variable.

Constructs	Item	Measure	Source
Perceived Price Fairness (PPF)	PPF1	The price of products is reasonable under the mode of Pinduoduo group-buying.	(Konuk, 2019) (Lu, Fan, & Zhou, 2016)
	PPF2	The price of products is acceptable under the mode of Pinduoduo group-buying.	
	PPF3	The price of products is competitive under the mode of Pinduoduo group-buying.	
Reciprocity (RE)	RE1	I find participating in Pinduoduo group-buying can be mutually helpful.	(Hsu & Lin, 2008)
	RE2	I find participating in Pinduoduo group-buying can be advantageous to me and others.	
	RE3	I think that participating in Pinduoduo group-buying can improve reciprocal benefit.	
Source Credibility (SC)	SC1	The information source of Pinduoduo group-buying is credible.	(Filieri, Alguezaui, & McLeay, 2015)
	SC2	The information source of Pinduoduo group-buying is reliable.	
	SC3	The information source of Pinduoduo group-buying is trustworthy.	
Similarity (SI)	SI1	The initiator of Pinduoduo group-buying has similar interests with me.	(Johnson & Grayson, 2005) (Chen *et al.*, 2019)
	SI2	The initiator of Pinduoduo group-buying has similar values with me.	
	SI3	The initiator of Pinduoduo group-buying has similar experience with me.	
Satisfaction (SAT)	SAT1	I feel very satisfied with the overall shopping experience of Pinduoduo.	(Shiau & Luo, 2012)
	SAT2	I feel very pleased with the overall shopping experience of Pinduoduo.	
	SAT3	I feel very contented with the overall shopping experience of Pinduoduo.	
	SAT4	I feel absolutely delighted with the overall shopping experience of Pinduoduo.	
Trust (TR)	TR1	I think the products recommended by the initiator of Pinduoduo group-buying are reliable.	(Huang, 2015) (Choi & Lee, 2017) (Chen *et al.*, 2019)
	TR2	I feel products of Pinduoduo group-buying can meet my needs and preferences.	
	TR3	I feel comfortable clicking the link of products recommended by the initiator of Pinduoduo group-buying.	
	TR4	In general, I have confidence in the initiator of Pinduoduo's product link.	
Urge to Buy Impulsively (UBI)	UBI1	As I click the Pinduoduo group-buying product link, I had the urge to purchase items other than in addition to my specific shopping goal.	(Chen *et al.*, 2019)
	UBI2	As I click the Pinduoduo group-buying product link, I had a desire to purchase items that did not pertain to my specific shopping goal.	
	UBI3	As I click the Pinduoduo group-buying product link, I had the inclination to purchase items outside of my specific shopping goal.	

Data Collection

This study collects data through online questionnaires and selects Pinduoduo group-buying consumers as the research objects. We created and released online questionnaires on the online survey platform "Sojump", and collected data by sharing questionnaire links through various social channels such as WeChat, QQ and Micro-blog. After three weeks, a total of 343 questionnaires were collected. After strict screening: (1) Eliminate incomplete questionnaires; (2) Eliminate questionnaires with the same answers for all measurement items or questionnaires with obvious random answers; (3) Eliminate the questionnaire with wrong answers to trap questions set in the questionnaire, that is, "strongly disagree" is not selected; (4) Eliminate the questionnaire with "no" in the screening questions, that is, respondents are not consumers of Pinduoduo group-buying mode, invalid questionnaires were removed, and 310 valid questionnaires were finally obtained, with an effective recovery rate of 90.38%. The demographic information of the respondents is shown in Table 2.

Table 2. Sample demographics.

Measure	Item	Frequency	Percentage
Gender	Male	116	37.42%
	Female	194	62.58%

Age	<18	6	1.94%
	18-25	230	74.19%
	26-30	46	14.84%
	31-40	15	4.84%
	>40	13	4.19%
Educational level	High school and below	31	10%
	Specialist	38	12.26%
	Undergraduate	182	58.71%
	Master's degree and above	59	19.03%
Personal income in	No income yet	121	39.03%
RMB (monthly)	<3000	54	17.42%
	3000-5000	73	23.55%
	5001-8000	29	9.36%
	8001-10000	24	7.74%
	>10000	9	2.90%

Common Method Bias

Since this research data comes from a single questionnaire collection channel, there may be methodological bias. Therefore, Harman single factor test was used in this study to test the common method deviation of sample data. The test results showed that there was more than one factor with more than one characteristic root extracted from the non-rotating exploratory factor analysis table, and the maximum factor explaining the total variance was less than 40% of the general standard critical value (Tang & Wen, 2020). The results demonstrated that there was no single factor to control the total variance, which manifested that there was no serious common method bias in this research scale, and further data analysis could be carried out.

DATA ANALYSIS AND RESULTS

Measurement Model Evaluation

When evaluating the measurement model, we carried out reliability and validity analysis, and the analysis results are shown in Table 3. According to the previous analysis and evaluation criteria, firstly, the standardized factor loadings of each variable measurement item were all greater than 0.6, indicating that the measurement problem was highly correlated with the corresponding factors. Secondly, according to the reliability analysis, Cronbach's Alpha (CA) of each construct exceeded 0.8, indicating that the scale had good internal consistency and good reliability level. Then according to the standardized factor loadings, the average variance extracted (AVE) and the composite reliability (CR) were calculated, and AVEs were all more than 0.5, signifying that the measurement model had good convergence validity. CRs were all over 0.7, indicating that the scale had good comprehensive reliability. Finally, the correlation analysis was carried out and the square root of AVE was calculated. The analysis results are shown in Table 4. The square root of AVE of all latent variables were greater than the maximum correlation coefficient between this latent variable and other latent variables, indicating that different factors had a good degree of differentiation, showing that the scale had a good discriminant validity. The above analysis outcomes proved that all the constructs showed good reliability and the validity of the structure was verified.

Table 3. Results of reliability and validity analysis.

Constructs	Items	Standardized factors loading	Cronbach's α	CR	AVE
Perceived	PPF1	0.844	0.798	0.804	0.580
Price Fairness	PPF2	0.786			
(PPF)	PPF3	0.641			
Reciprocity	RE1	0.842	0.875	0.876	0.702
(RE)	RE2	0.860			
	RE3	0.810			
Source	SC1	0.877	0.906	0.907	0.765
Credibility	SC2	0.840			
(SC)	SC3	0.905			
Similarity	SI1	0.801	0.870	0.870	0.690
(SI)	SI2	0.864			
	SI3	0.826			
Satisfaction	SAT1	0.858	0.899	0.899	0.691
(SAT)	SAT2	0.813			
	SAT3	0.835			
	SAT4	0.818			
Trust	TR1	0.738	0.858	0.860	0.605
(TR)	TR2	0.758			

	TR3	0.785				
	TR4	0.828				
Urge to Buy	UBI1	0.784	0.860	0.861	0.675
Impulsively	UBI2	0.789			
(UBI)	UBI3	0.887			

Table 4. Analysis of discriminant validity.

| Constructs	PPF	RE	SC	SI	SAT	TR	UBI
Perceived Price Fairness (PPF)	0.762						
Reciprocity(RE)	0.412	0.838					
Source Credibility(SC)	0.389	0.378	0.874				
Similarity(SI)	0.297	0.370	0.445	0.831			
Satisfaction(SAT)	0.424	0.504	0.520	0.512	0.831		
Trust(TR)	0.364	0.451	0.526	0.446	0.711	0.778	
Urge to Buy Impulsively(UBI)	0.139	0.200	0.335	0.398	0.373	0.415	0.821

Structural Model Evaluation

AMOS 24.0 was used in this study to evaluate the structural model. The fitting degree of the structural model is presented in Table 5. Absolute fitness index: The value of CMIN / DF was 2.154 between the reference value 1 to 3 (Zhang & Wei, 2019), which was in line with the standard; the value of RMSEA was 0.061, greater than 0.05, less than 0.08 (Zhang & Wei, 2019), within the acceptable range; according to the evaluation standard of Huang (2015), the value of GFI and AGFI were 0.885 and 0.853 respectively, both exceeded 0.8, illustrating that the goodness of model fitting was acceptable. The value-added fitness index: the value of NFI, IFI and CFI were 0.901, 0.945 and 0.944, respectively, which were all greater than 0.9, revealing that the model had a good fitness (Zhang, Yang, & Zhang, 2020). these outcomes showed that the overall model had good fitting degree and good modelability.

Table 5. Overall fits of the model.

Fit index	Recommended criteria	This research	Evaluation
CMIN/DF	1~3	2.154	Ideal
GFI	>0.8	0.885	Acceptable
AGFI	>0.8	0.853	Acceptable
NFI	>0.9	0.901	Ideal
IFI	>0.9	0.945	Ideal
CFI	>0.9	0.944	Ideal
RMSEA	<0.05~0.08	0.061	Acceptable

Model Verification

The model verification results are shown in Figure 2, including the coefficients and their significance. With the exception of hypothesis 6 (represented by dashed line), all other assumptions are supported.
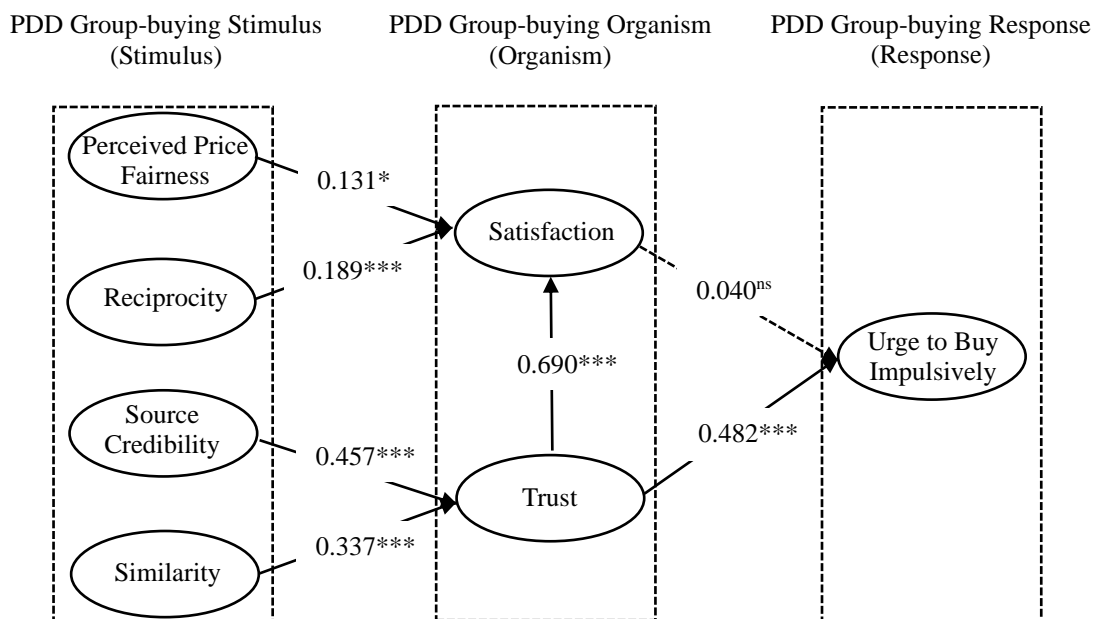
Note: *** $p<0.001$; ** $p<0.01$; * $p<0.05$. ns: non-significant at the 0.05 level.

Figure 2. Research model testing results.

Mediation Analysis

For further probe the impact mechanism of Pinduoduo group-buying mode on impulse buying, this study further tested the significance of the indirect influence involved in the model. The bootstrap method proposed by Preacher and Hayes (2008) was used to test the mediating effect, and the sample size of 5000 were set under the 95% confidence interval, meanwhile, the test was conducted with reference to the intermediary effect test procedure summarized by Zhao *et al.* (2010), the analysis results are presented in Table 6. For the path analysis with satisfaction as the intermediary: satisfaction had a complete mediating effect between perceived price fairness and urge to buy impulsively (the confidence interval of indirect effect was [0.0543,0.2207], excluding 0; the confidence interval of direct effect was [-0.1872,0.1142], including 0); satisfaction had a complete mediating effect in the process of reciprocity stimulating urge to buy impulsively (the confidence interval of indirect effect was [0.0943,0.2675], excluding 0; the confidence interval of direct effect was [-0.1189,0.1756], including 0); the mediating effect of satisfaction on trust and urge to buy impulsively was not significant (the confidence interval of indirect effect was [-0.0524,0.2692], including 0). For the trusting-mediated path analysis: trust completely mediated the impact of source credibility on urge to buy impulsively (the confidence interval of indirect effect was [0.0441,0.2078], excluding 0; the confidence interval of direct effect was [-0.0326,0.2285], including 0); trust has a partial mediating role in the impact of similarity on urge to buy impulsively (the confidence interval of indirect effect was [0.0240,0.1408], excluding 0; the confidence interval of direct effect was [0.1373, 0.3825], excluding 0).

Table 6. Bootstrap mediation test results.

Mediation path	Point estimation	Indirect effect	Direct effect	Result
PPF→SAT→UBI	0.0429	[0.0543,0.2207]	[-0.1872,0.1142]	Complete mediation
RE→SAT→UBI	0.0445	[0.0943,0.2675]	[-0.1189,0.1756]	Complete mediation
SC→TR→UBI	0.0419	[0.0441,0.2078]	[-0.0326,0.2285]	Complete mediation
SI→TR→UBI	0.0303	[0.0240,0.1408]	[0.1373,0.3825]	Partial mediation
TR→SAT→UBI	0.0816	[-0.0524,0.2692]	[0.1800,0.5075]	No mediation

DISCUSSION AND IMPLICATION

Discussion of Results

In this study, a latent variable structural equation model was established to verify the influence path of Pinduoduo group-buying mode on impulse buying. Empirical results showed that all hypotheses were supported by verification except hypothesis 6.

Firstly, the results of this study show that perceived price fairness and reciprocity in group-buying mode both have a significant positive impact on consumer satisfaction ($\beta_{PPF→SAT}$ = 0.131, $P_{PPF→SAT}$ < 0.05; $\beta_{RE→SAT}$ = 0.189, $P_{RE→SAT}$ < 0.001). Among them, reciprocity has a greater impact on satisfaction than perceived price fairness. This is because compared with the personal benefits brought by low prices, people are more inclined to seek the common interests of the group. Only when all parties benefit can they achieve sustainable development, which is also the trend of social development.

Secondly, in the group-buying mode, the credibility of the information source generated by using WeChat social circle as the communication channel and the similarity between group participants have a significant positive impact on consumer trust ($\beta_{SC→TR}$ = 0.457, $P_{SC→TR}$ < 0.001; $\beta_{SI→TR}$ = 0.337, $P_{SI→TR}$ < 0.001). Among them, source credibility is more likely to generate trust among consumers, because the information source is the key determinant of trust, and consumers generally trust the information conveyed by relatives and friends more (Xie, Sheng, & Gong, 2019).

Thirdly, consumer trust positively affects consumer satisfaction (β = 0.690, P < 0.001). Trust in the originator of the Pinduoduo group-buying link can have a significant impact on consumers' attitude. Recipients who trust the group purchase link will emotionally evaluate the information of the initiator of the group purchase, and have a positive emotional response to the product, and then feel satisfied with the product.

Fourthly, consumer trust has a positive impact on urge to buy impulsively (β = 0.482, P < 0.001), but consumer satisfaction has no significant effect on urge to buy impulsively, assuming 6 does not hold. This is because although the products under the Pinduoduo group-buying mode are economical and satisfying, consumer satisfaction is not all the determinants of impulse buying. Consumers will have negative emotions such as perceived risk psychology due to the uncertainty of product quality. When the perception of negative emotions is more than positive emotions, it will hinder consumers' impulse purchase, so this may be the reason for the insignificant results. Future research can further consider the influence of product quality as a stimulus on impulse buying.

Implications

Implications for Theoretical Research

This paper uses S-O-R framework to discuss the influence mechanism of Pinduoduo group-buying model on impulse buying. In the light of the results of empirical analysis, it can be seen that the social-based group-buying mode helps to promote consumer impulse purchase to a large extent. Different from previous studies on impulse buying from a single perspective, this article combines shopping contextual factors (perceived price fairness, reciprocity, source credibility and similarity) and

consumer psychological factors (satisfaction and trust) to reveal the mechanism of Pinduoduo group-buying mode on impulse purchase, and more effectively explains the development process of consumers' impulse buying under the group-buying mode. Taking Pinduoduo platform as the research object, this study comprehensively discusses the influence of its group-buying mode on the formation of consumers' impulsiveness to purchase, which makes up for the lack of research on consumers' irrational behaviors under the mode of social e-commerce group-buying in existing literature. This paper takes the emerging social business as the research context to further enrich the theoretical research of impulse buying.

Implications for Practical Research
The findings of this paper provide some valuable insights for social business enterprises, especially for Pinduoduo operators. In terms of satisfaction and trust, the outcomes of this research display that trust has a significant positive impact on urge to buy impulsively. Therefore, social commerce platforms such as Pinduoduo should pay attention to taking measures to enhance consumers' trust. For example, Pinduoduo operators can enhance the credibility by improving the credibility of group-buying information sources and the similarity of group-buying initiators, that is, the platform should effectively supervise the security of the group purchase link, prevent the intrusion of false virus information, and filter the information shared by the circle of friends; at the same time, Pinduoduo should reasonably distinguish consumer needs and preferences based on historical shopping records, recommend and classify friends lists with similar consumption preferences and needs, and guide customers to share in a targeted way to avoid causing harassment to other users. Pinduoduo should continue and strengthen cooperation with WeChat platform, launch Pinduoduo group purchase link with WeChat circle of friends, so as to achieve promotion, but the degree and quality should be strictly controlled to achieve the goal of moderate promotion and high quality content.

With the increasing number of social business platforms and the rapid development of marketing means, how to improve the competitiveness of Pinduoduo group-buying mode to stimulate consumers to buy on impulse has become an important issue. Marketing innovation is on the one hand, but more depends on the product itself. At present, the biggest problem of Pinduoduo is product quality caused by low prices. Pinduoduo has attracted a large amount of traffic due to its low price and great benefits. However, due to the poor post purchase experience, Pinduoduo has been complained by many buyers, which seriously damaged Pinduoduo's reputation. Therefore, Pinduoduo should strictly control the product quality, and quickly remedy it through measures such as raising the threshold for merchants to enter the platform, monitoring product production processes, and improving after-sales service, so as to improve the consumer experience and promote the impulse purchase of consumers. Pinduoduo should continue to maintain the advantage of low price, identify price-sensitive customer groups, and make personalized recommendations based on demand preferences.

Limitations and Future Research
The limitations and future research directions of this article are as follows. The first is limited to external validity. Our research background is limited to Pinduoduo platform. Therefore, future research can be extended to other social commerce platforms to test our research results. Secondly, our research results cannot be extended to other countries. In future studies, our model can be tested in different cultures, and the differences of test results under different cultures can also be compared for further research. Then, this study only uses the form of online questionnaire to conduct the survey, and there will be some deviation. Future studies can adopt diversified methods or multiple sources to collect data to verify our findings. Finally, this study only focuses on the four situational factors of stimulation, and many other factors are still worth exploring (for example, time pressure, scarcity, etc.), which can be considered in future studies.

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