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An Empirical Study of Impulse Purchase in E-commerce Live Streaming from The E-commerce Marketing Mix Perspective

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ABSTRACT

E-commerce live streaming has undergone rapid development in recent years. Technically, it is the combination of traditional e-commerce and live streaming, allowing salespeople to conduct sales operations and interact with and serve customers in real-time to improve their shopping experience. This study uses the e-commerce marketing mix (*product, promotion, place, people, process, physical evidence*) to conceptualize its influences on the shopping experience (product *involvement* and *flow* experience) and the outcome behavior (*impulse buying*). The research model is measured and evaluated by using the PLS-SEM method based on 248 valid questionnaire samples from China. The findings show that *place* has the most effect on product *involvement*, followed by *product, people, process*, and on the *flow* experience, *process* is most effective, followed by *physical evidence, place*, and *people*. In terms of the role of the shopping experience, product *involvement* has a fully mediating effect between *product* and *impulse buying*, and *flow* experience mediates the effect partially between three relationships: *place*, *process*, and *physical evidence* to *impulse buying*. Different from prior studies, we adapted the e-commerce marketing mix to provide empirical evidence for research on impulse purchases via e-commerce live streaming.

Keywords: E-commerce live streaming, Impulse buying, E-commerce marketing mix, Involvement, Flow experience, PLS-SEM.

INTRODUCTION

Also known as the 4Ps and/or 7Ps theory, the original marketing mix proposes four strategic elements for internal management to achieve business goals, named by McCarthy (1964) as product, price, promotion, and place. 7Ps theory proposed by Booms and Bitner (1981) extends strategic focuses from product-centered to service-oriented management. In addition to the 4Ps, three service elements are introduced: people, process, and physical evidence. The three "service Ps" posit that management cannot ignore the needs of customers. As defined by Kotler and Armstrong (1989), marketing mix is "the set of controllable marketing variables that the firm blends to produce the response of wants in the target market." In achieving marketing goals, the combination of 4Ps focuses on the promotion of products, while 7Ps on persuading customers. 4Ps pay more attention to the push strategy, whereas 7Ps adopt the pull strategy to approach more prospective customers and consumers and to identify their needs and perceptions.

Marketing mix elements are means to an end, they pave the way for marketing managers to achieve organizational goals and objectives through proper planning. Regarding information services and trade of online stores, Pogorelova et al. (2016) formulated a 7Ps marketing mix for e-commerce and discussed the significant influence of consumers on the content change of 7Ps. By using the e-commerce marketing mix model, Ghiffarin et al. (2019) analyzed the performance of each "P" on e-commerce utilization from the small and medium enterprises of batik. Concisely in the context of e-commerce, the 7Ps can be referred to as follows: *Product* is an offer in form of texts, graphs, short videos or others. Those forms capture consumers' perception of the characteristics and features of the product and information relevant to product updates; *Price* provides a comparative analysis of price and display of price fluctuations; *Promotion* activities encourage customers to engage in the selling process. Customer reviews and sales promotions such as discounts, coupons, premiums, and so on can incite customers to take targeted actions (approval, registration, download, purchase, recommendation); *Place* of sale should maximize the availability of sales channels for both buyers and sellers; As replaced by technology, *People* is "invisible" during personal selling and customer service, which are implemented in an interface e.g., e-shore; *Process* refers to the standardized operating procedures run by human-computer interactions; *Physical evidence* includes a website, pages in social network, and/or mobile applications.

As a conceptual framework, prior studies have applied the 7Ps marketing mix in various fields such as information service (Liu, 2022), education (Ivy, 2008) and others. Recently, the 7Ps application has been conducted in e-commerce live streaming research. E-commerce live streaming (ECL) is the fastest-growing sales technology tool integrated with live streaming and e-commerce. It offers explosive potential for conducting sales operations and interacting with and serving customers, which in turn gets customers more involved and immersed in ECL's selling (Bu et al., 2023; Arora et al., 2021). Ho et al.(2022) applied the traditional 7Ps concepts to explore the relationship between the 7Ps marketing mix and purchase intention in live streaming platforms. The results revealed that promotion, place, and physical evidence have positive effects on customers' watching and purchase intention. However, to date, no other study that investigated the influence of the 7Ps combination on consumers'

impulse buying. Therefore, the present research aims to fill this research gap and provide an empirical study of impulse purchase in ECL. Different from prior studies using the traditional 7Ps concepts, we take the e-commerce marketing mix as stated above and adapt it for ECL from the consumers' point of view.

Impulse purchase is a common phenomenon in online shopping (Liu et al., 2013). Much empirical research deals with it as a sudden, spontaneous, and immediate purchase with no specific buying intentions, and an urge to buy without much consideration of the buying consequences (Rook, 1987). Chan et al., (2017) conducted a literature analysis on online impulse buying research, proposing that impulse purchase can be an outcome of cognitive and/or affective reactions triggered by the stimuli from website, marketing, situational, or personal characteristics. In line with the prior studies, we focus on impulse purchase in ECL by taking the e-commerce marketing mix as a means to induce consumers' cognitive and affective shopping experience which in turn leads to impulse buying. For doing so, the remainder of this paper is organized as follows. First, we review the theoretical background and then develop a research model and hypotheses. Next, we present the results of model measurement and hypothesis testing by using empirical data. And we conclude by discussing the findings in the end.

THEORETICAL BACKGROUND AND HYPOTHESES

Involvement

Involvement is one of the most important variables in consumers' purchase behavior research (Martin, 1998; Evrard & Aurier, 1996). To date, much research has proposed several definitions, but there is no universal version for the variable. Generally, involvement is conceptualized as an internal cognitive state of the consumer engendered by certain marketing stimuli or tasks or interests in a certain goal or event (Zaichkowsky, 1985; Celsi & Olson, 1988). On the other hand, it is also referred to as a motivational state concerning the relationship between a product and the individual's values built on the product's practicality, symbolic meaning, and hedonic value (Mittal & Lee, 1989). The level of involvement is fundamentally the embodiment of the results of personal internal factors subjected to different types of stimuli and situations and leads to differences in consumers' information processing methods and purchase decision-making processes. It urges consumers to show a series of information processing strategies such as information search and information processing through perception, interest, or motivation evoked by specific stimuli or situations (Mittal, 1989). In addition, the involvement construct has been divided into cognitive and affective involvement (Zaichkowsky, 1994). Cognitive involvement focuses on the functional and utilitarian aspects of the product; affective involvement is caused by value expressions or emotional motivations. Thus, cognitive involvement encompasses reasoning and factual information, whereas affective involvement is associated with emotion and mood (Zaichkowsky, 1994). Overall, involvement includes an assessment of the importance of the stimulus/situations, which in turn produces a certain behavior.

Previous studies have investigated *Involvement* in various cognitive processes. For example, consumers who are involved with a product category tend to devote more attention to relevant marketing stimuli, focus their attention on product-related information, and engage in more elaboration of the product information during comprehension of the information (Celsi & Olson, 1988; Drossos, 2014). In studying online consumer behavior, Koufaris (2002) concluded that the richer the consumer's knowledge about the product, the more impulse buying and revisiting intention to be produced. Chan et al., (2017) indicated that product involvement (cognitive and affective) is one of the main influencing factors of online impulse buying. Gong et al. (2023) examined that product involvement has a positive effect on impulse buying behavior. Therefore, in this study, we propose that involvement (product involvement) has a positive impact on impulse buying.

Flow Experience

Flow theory originated from Csikszentmihalyi's research on games. He defines flow as an overall experience that people feel when they fully engage in an activity. It is believed that flow is an important antecedence of why people continue to participate in a certain behavior (Csikszentmihalyi, 1975). During the flow state, people appear to be drawn in, the focus of consciousness is narrowed down, and the perceptions and thoughts not related to the target are filtered out and/or ignored. That is, when people are immersed in what they are doing, they lose self-awareness, focusing only on the specific goal and/or activity, responding to explicit feedback and feeling a sense of control through manipulation of the environment (Csikszentmihalyi, 1990). The main constructive indicators examined in prior studies for the variable of flow are perceived enjoyment, perceived utility, perceived control, attentional concentration, and time distortion (Koufaris, 2002; Hoffman & Novak,1996).

Flow experience has been applied in an examination of online marketing activities (Hoffman & Novak, 1996), online shopping behavior and human-computer interactions (Donna et al., 2018). Recent studies have adopted flow as a mediator to investigate the influences of marketing stimuli on impulse purchases in the context of ECL. In studying the relationship between atmosphere cue, flow experience and impulse buying in ECL, Gong et al. (2019) examined the impact of flow experience (β =0.742, p $<$.001) on impulse buying intention. Feng et al. (2020) combined trust and flow experience to investigate the influence of social presence on impulse buying. The study showed that flow experience has a positive impact (β = 0.300, p < .001) on impulse purchases via live streaming. Thereby, in this study, we assume that flow experience has a positive effect on impulse buying via live streaming.

The E-Commerce Marketing Mix as a Means

In addition to the functions of traditional e-commerce (e.g., information display, ordering), ECL visualizes salesperson (streamer: *People*) and e-store (livestream room: *Physical evidence*) and sells products with real-time interpersonal interactions (*Process*). In livestream room streamer provides more vivid and comprehensive product information (*Product*) and answers customer questions or concerns (*Process*), allowing customers to better understand product features (including price and/or price comparison), functions, and specifications in real-time and among others (e.g., how to use), increasing consumer awareness and interest in products (*Product*) and desire to buy. Consumer promotion in the livestream room can be multiple options such as limited-time or limited-quantity discounts, coupons, rebates, gifts, or other rewards (*Promotion*) to customers who buy via live product demonstration, which encourages consumer's impulse buying. As ECL combines live streaming with e-commerce, it inherits the functionality of e-commerce and can provide availability of sales channels (*Place*) for both buyers and sellers. Table 1 shows the elements of the e-commerce marketing mix in this study.

Table 1: The marketing mix elements for e-commerce live streaming

Element	Definition
Product	Product[-centered information] presented by streamer
Promotion	Consumer promotion during live streaming e.g., limited-time/quantity discounts, rebates, gifts
Place	Availability of ECL for shopping e.g., method of purchase, information on shipping, logistics
People	Streamer's attractiveness itself
Process	Interactivity [interactions in live streaming] e.g., streamer-customer-viewers, customer participation
Physical evidence	Interface design of livestream room e.g., structure, color, visual display

Source: Adapted from Pogorelova et al. (2016) & Ghiffarin et al. (2019).

Streamer plays an important role in ECL. In addition to the attractiveness of the streamer itself (*People*) which can engender perceived pleasure and induce impulsive intention to buy, several studies have explored whether interactions between streamers and customers (*Process*) during live streaming affect consumers' purchase behavior. For example, Wei et al. (2022) investigated the relationship between the characteristics of the streamer and impulse purchases, showing that the streamer's attractiveness and interactivity have a positive impact on impulse buying intention mediated by flow experience. The study conducted by Liu et al. (2020) suggested that streamer's professionalism can increase consumers' awareness of products or services, and thus affect consumer purchase behavior. Li (2020) pointed out that real-time interactions between streamers and consumers, and opinions exchanged between consumers during live streaming can affect impulse buying behavior positively. As evidenced by Yin & Wang (2022), the professionalism of the streamer can allow consumers to understand the features and functions of the product accurately and comprehensively, thus, generating positive emotions and triggering consumers' impulse buying behavior.

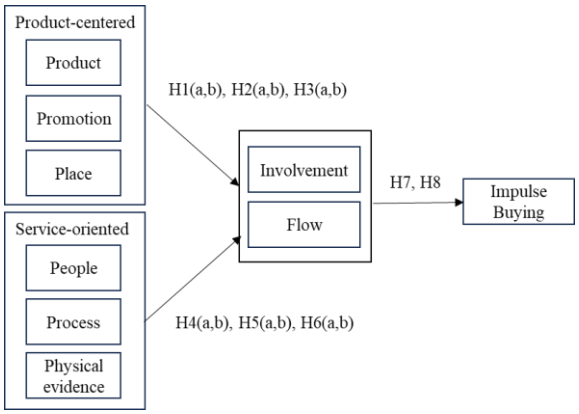
Compared with the shopping environment of traditional e-commerce which delivers information through characters, pictures, and videos, ECL can create a better shopping experience. In the livestream room, customers can see the products and the product-related information presented by a streamer (*Product*) promptly, asking the streamer to introduce the product in more detail, forward comments to consult questions about products, communicate with other consumers, and devote more attention to the product. Moreover, convenient ways of shopping and effective service after ordering (*Place*) relevant to e.g., shipping and logistics are indispensable. These shopping experience can increase consumers' positive emotions and get them involved effectively (Sun et al., 2019) which cause impulse buying. On the other hand, the atmosphere cue engendered in the livestream room makes customers experience flow. For example, Gong et al. (2019) measured atmosphere cue from perspectives of information, ease of use, and interface design of the ECL platform (*Physical evidence*), exploring its relationship with impulse purchase via live streaming based on the mediation of flow experience. The results revealed that flow has a partial mediating effect between atmosphere cues and impulsive buying intention.

In ECL, streamers can direct consumer promotions (*Promotion*) toward customers and viewers who are involved in the livestream room to urge them to buy or enhance their product involvement. In a study investigating impulse buying led by emotional experience, Sun et al. (2022) reported that price discounts, streamer's characteristics and interactions in livestream room are focal factors enhancing perceived pleasure and perceived arousal to induce consumer impulse purchase. In an analysis of impulsive purchase intention of apparel. Xu et al. (2021) also found that price discounts, and other constructs (live interaction, live entertainment, opinion leaders, visibility, merchant services, and value-added content) have a significant positive influence on impulse buying by mediation of perceived pleasure and perceived arousal. In an experimental study that set out to test the role of prospective emotion in the formation mechanism of impulse buying intention in ECL, Yue & Lu (2021) showed that limited-time and limited-quantity discounts can affect consumers' impulse purchase intention via ECL, and future-oriented emotion plays a mediating role. Following the prior research, therefore in this study, we hypothesize that each element of the e-commerce marketing mix (*Product*, *Promotion*, *Place*, *People*, *Process*, *Physical evidence*) affects product involvement and flow experience positively.

RESEARCH MODEL

Figure 1 depicts the research model and shows the hypotheses for this study. As stated above, each element of the e-commerce marketing mix affects product involvement and flow experience, which in turn causes consumers' impulse purchases via ECL. As regards *Price* in the e-commerce marketing mix, since *Price* as a feature of product-related information is presented by

streamers during live streaming, we integrate the *Price* with *Product* from consumers' point of view. Thus, the research model is comprised of 9 constructs in total. The label *Involvement* denotes product involvement.



H1a: Product affects involvement positively
H1b: Product affects flow positively
H2a: Promotion affects involvement positively
H2b: Promotion affects flow positively
H3a: Place affects involvement positively
H3b: Place affects flow positively
H4a: People affects involvement positively
H4b: People affects flow positively
H5a: Process affects involvement positively
H5b: Process affects flow positively
H6a: Physical evidence affects involvement positively
H6b: Physical evidence affects flow positively
H7: Involvement has a positive influence on impulse buying
H8: Flow has a positive influence on impulse buying

Figure 1: Research model and hypotheses

INSTRUMENT DEVELOPMENT

The scale and items for all constructs used in this study were taken from the previous literature, with minor modifications, as needed to customize them to the context of this study. Collectively, it becomes 37 items for all variables, that is, three items for *Product* (Chang et al., 2020; Floh et al., 2013), three items for *Promotion* (Chan, 1997), three items for *Place* (Wu et al., 2016), five items for *People* (Wei et al., 2022), nine items for *Process* (Ming, 2021), three items for *Physical evidence* (Floh et al., 2013), three items for product *Involvement* (Faisal et al., 2021; Gong et al., 2023), four items for *Flow* (Marsh & Jackson, 1996; Hoffman & Novak, 2009) and four items for *Impulse buying* (Rook & Fisher, 1995). All these items are measured by using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Table 2 shows the items of each construct.

Table 2: The items of the constructs

Construct	Code	Item Wording
Product (PROD)	prod_1	In live streaming, the streamer carefully presents the products, services and information that consumers want.
	prod_2	In live streaming, the streamer recommends products and services based on consumers' requirements.
	prod_3	In live streaming, the streamer provides the latest product information in a timely manner.
Promotion (PROM)	prom_1	In live streaming, I am easily tempted by discounts promotion.
	prom_2	In live streaming, the promotion makes me want to buy.
	prom_3	In live streaming, I look or pick out items that are on sales promotion carefully.
Place (PLAC)	plac_1	The convenient and fast ordering method of the livestreaming platform make me want to buy more.
	plac_2	The interface of the livestreaming platform is friendly and easy to use.
	plac_3	The customer service response from the livestreaming platform is efficient.
People (PEOP)	peop_1	The streamer makes me feel kind.
	peop_2	The streamer catches me attention.
	peop_3	The streamer makes me happy.
	peop_4	I approve of the way of life and entertainment demonstrated by the streamer.
	peop_5	I think the streamer is funny and can arouse my interest in shopping.
Process (PROC)	proc_1	In live streaming, the streamer responds to consumers' questions or concerns in a timely manner.
	proc_2	In live streaming, the content presented by the streamer allows consumers to participate effectively.
	proc_3	In live streaming, the content presented by the streamer arouses consumers' interests.
	proc_4	In live streaming, I sometimes comment on the products and share how I feel about them with other viewers.
	proc_5	In live streaming, I sometimes discuss product information and usage experience with other viewers.
	proc_6	In live streaming, I sometimes post some words for entertainment.
	proc_7	In live streaming, other viewers sometimes discuss some entertainment topics with me.
	proc_8	In live streaming, other viewers sometimes share information about the products and how they feel about them.
	proc_9	In live streaming, other viewers sometimes send some words for entertainment.
Physical evidence (PHYC)	phyc_1	The colors used in the livestreaming room are attractive.
	phyc_2	The livestreaming room is visually pleasing to me.
	phyc_3	The layout of the livestreaming room is attractive.
Involvement (INVO)	invo_1	In live streaming, I think the products recommended by the streamer are what I need.
	invo_2	In live streaming, I think the products recommended by the streamer are valuable to me.
	invo_3	In live streaming, I think the products recommended by the streamer are relevant to me.
Flow (FLOW)	flow_1	In live streaming, I often experience pleasure.
	flow_2	In live streaming, the pleasure I experience keeps me watching.
	flow_3	In live streaming, I feel time going so fast.
	flow_4	In live streaming, I am immersed in it and don't pay much attention to other things.
Impulse buying (IMPU)	impu_1	In live streaming, I bought items that I didn't plan to buy.
	impu_2	In live streaming, I bought a lot of items that I won't be using in the coming days.
	impu_3	In live streaming, I bought items without thinking much about them.
	impu_4	In live streaming, I am affected by emotions which make me shopping.

RESEARCH METHOD

Sampling and Data collection

The population selected to carry out this research were individuals residing in China who have experience in online shopping via live streaming. Data was collected in an anonymous online survey form from 23rd May 2023 to 30th May 2023. A total of 256 forms were obtained, whereof 8 forms were excluded due to incomplete responses with missing the questions or aberrant responses lacking justification. Consequently, 248 valid samples are remained and subsequently summarized. Table 3 displays the demographic statistics of respondents in detail.

Table3: Sample profiles (n = 248)

Profile	Catergory	Frequency	Percentage
Gender	Male	118	47.6
	Female	130	52.4
Age	<20	19	7.7
	21-30	86	34.7
	31-40	57	23.0
	41-50	51	20.6
	>50	35	14.1
Education	Diploma/Lower	36	14.5
	Below Graduate	68	27.4
	Graduate	94	37.9
	Post Graduate /Higher	50	20.2
Occupation	Student	38	15.3
	Company employee	108	43.5
	Self-employed	53	21.4
	Others	49	19.8
Controllable money (monthly, CNY*)	<1000	29	11.7
	1000-3000	45	18.1
	3000-5000	99	39.9
	<5000	75	30.2
Viewing time of livestream shopping	<5 hours	63	25.4
	6-10 hours	96	38.7
	11-15 hours	52	21.0
	>15 hours	37	14.9

*CNY = Chinese yuan

DATA ANALYSIS AND RESULTS

For the validation of the model, we used the method of partial least square (PLS) to ensure the reliability and validity of the measurement scales and the structural equation modeling (SEM) with PLS (PLS-SEM) for model and hypothesis testing. Compared with the covariance-based structural equation modeling, PLS-SEM is variance-based and suitable for causal-predictive analysis and theory building, for example, when the objective of the analysis is to predict and identify determinants of consumer behavior (Hair et al., 2012). In addition, it is capable of handling non-normally distributed data, and is less affected by small sample sizes (Henseler et al., 2014). Thus, in recent years, PLS-SEM has been widely used in social science disciplines (Hair et al., 2019). The present study applies R (ver.4.3.0) to run the PLS-SEM analysis and test the proposed hypotheses.

Measurement Model

The goal of this step is to ensure the reliability and validity of construct measures. For each construct, indicator reliability (indicator loadings), internal consistency reliability (Cronbach's alpha coefficients (α) and composite reliability (CR)), convergent validity (average variance extracted (AVE)), and discriminant validity (heterotrait-monotrait ratio (HTMT)) are evaluated respectively by following the guideline of Hair et al. (2017). As can be seen in Table 4, all the indicator loadings are more than 0.707 meaning that more than 50% of each indicator's variance is explained by its construct. As regards internal consistency reliability, the data shows an adequate internal consistency reliability with α ranging in [0.804, 0.920] and CR ranging in [0.884, 0.934]. Convergent validity for all indicators on each construct is evaluated by AVE values. The AVE values in Table 4 for all measures surpassed the recommended value of 0.5 (Hair et al., 2017). Discriminant validity is assessed by using HTMT proposed by Henseler et al. (2015) and calculated by running the bootstrapping routine (5000 samples). The HTMT value should be below 0.90 or 0.85 (Henseler et al., 2015). As shown in Table 5, the HTMT values of all the constructs in the model are lower than 0.85, thereby, discriminant validity across constructs in the model is supported.

Table 4: Evaluation of construct validity and reliability

Constructs	Code	Loadings	Mean	SD	Cronbach's alpha	rhoA	CR	AVE
Product (PROD)	PROD_1	0.915	3.498	1.309	0.857	0.869	0.913	0.777
	PROD_2	0.875	3.279	1.223				
	PROD_3	0.853	3.259	1.147				
Promotion (PROM)	PROM_1	0.882	3.401	1.238	0.833	0.841	0.899	0.749
	PROM_2	0.884	3.316	1.205				
	PROM_3	0.830	3.348	1.133				
Place (PLAC)	PLAC_1	0.883	3.377	1.165	0.804	0.819	0.884	0.718
	PLAC_2	0.85	3.194	1.184				
	PLAC_3	0.808	3.231	1.051				
People (PEOP)	PEOP_1	0.819	3.368	1.157	0.875	0.877	0.909	0.667
	PEOP_2	0.830	3.279	1.158				
	PEOP_3	0.801	3.146	1.138				
	PEOP_4	0.821	3.312	1.061				
	PEOP_5	0.813	3.340	1.114				
Process (PROC)	PROC_1	0.795	3.174	1.118	0.921	0.922	0.934	0.610
	PROC_2	0.796	3.227	1.139				
	PROC_3	0.773	3.130	1.122				
	PROC_4	0.809	3.247	1.155				
	PROC_5	0.744	3.336	1.095				
	PROC_6	0.774	3.267	1.098				
	PROC_7	0.788	3.243	1.125				
	PROC_8	0.794	3.117	1.062				
	PROC_9	0.753	3.142	1.144				
Physical evidence (PHYC)	PHYC_1	0.897	3.150	1.175	0.836	0.838	0.901	0.753
	PHYC_2	0.849	3.296	1.168				
	PHYC_3	0.856	3.138	1.096				
Involvment (INVO)	INVO_1	0.869	3.332	1.170	0.824	0.824	0.895	0.739
	INVO_2	0.847	3.255	1.142				
	INVO_3	0.864	3.117	1.129				
Flow (FLOW)	FLOW_1	0.896	3.393	1.191	0.883	0.885	0.919	0.741
	FLOW_2	0.866	3.433	1.211				
	FLOW_3	0.848	3.312	1.128				
	FLOW_4	0.831	3.344	1.158				
Impulse buying (IMPU)	IMPU_1	0.861	3.223	1.142	0.878	0.878	0.916	0.732
	IMPU_2	0.861	3.215	1.158				
	IMPU_3	0.870	3.069	1.133				
	IMPU_4	0.829	3.093	1.149				

Table 5: Heterotrait-monotrait results (HTMT) for discriminant validity

	PROD	PROM	PLAC	PEOP	PROC	PHYC	INVO	FLOW	IMPU
PROD									
PROM	0.802								
PLAC	0.783	0.750							
PEOP	0.692	0.660	0.690						
PROC	0.670	0.705	0.710	0.699					
PHYC	0.677	0.664	0.652	0.691	0.693				
INVO	0.765	0.753	0.785	0.728	0.721	0.659			
FLOW	0.658	0.697	0.730	0.709	0.792	0.788	0.693		
IMPU	0.553	0.656	0.531	0.589	0.642	0.728	0.581	0.681	

Structural Model

As the constructs were validated as shown above, this step was to assess the structural model and the hypothesized relationships. Before checking the results of hypothesis tests, collinearity was examined by the variance inflation factor (VIF) values of the exogenous constructs with each of the endogenous constructs. Our model has three endogenous constructs, namely, INVO, FLOW, and IMPU. As shown in Table 6, the VIF values ranged from 1.538 to 2.470 were all well below threshold value 3, it is to say that there was no collinearity issue (>= 5) among the six exogenous constructs in this study which might affect the accuracy of the results (Hair et al., 2017). In addition, the R-squared (R^2) values of the endogenous constructs were examined to test the

model's explanatory power. The R^2 of the impulse buying construct was 0.390, indicating that 39% of the variance in the impulse purchase via live streaming could be explained by the predictor constructs. The R^2 of involvement and flow were 0.579 and 0.642, meaning that the antecedents could explain 57.9% and 64.2% of the variances in the construct respectively.

Table 6: The VIF values of predictor constructs

INVO:	PROD	PROM	PLAC	PEOP	PROC	PHYC
VIF	2.470	2.300	2.190	2.097	2.294	1.943
FLOW:	PROD	PROM	PLAC	PEOP	PROC	PHYC
VIF	2.470	2.300	2.190	2.097	2.294	1.943
IMPU:	INVO	FLOW				
VIF	1.538	1.538				

As regards the predictive power of the structural model, we examined the out-of-sample predictive error, comparing root-mean-squared error (RMSE) and mean absolute error (MAE) values produced by PLS-SEM with the values yielded by the linear regression model (LM) for each indicator of the outcome construct (IMPU) by running the PLSpredict procedure with ten repetitions (Shmueli et al., 2016; Shmueli, 2019). As shown in Table 7, the PLS-SEM model has lower values compared to the values of LM for all the indicators of the outcome construct (IMPU) in terms of RMSE and MAE. Accordingly, it is concluded that the model proposed has a high predictive power.

Table 7: The results of PLSpredict procedure

		impu_1	impu_2	impu_3	impu_4
RMSE	PLS	0.969	0.987	0.981	0.999
	LM	1.020	1.042	1.013	1.013
MAE	PLS	0.743	0.788	0.792	0.781
	LM	0.792	0.845	0.817	0.812

Next, the relevance and significance of the structural paths were evaluated by bootstrapping (5000 samples). Table 8 and Figure 2 summarize the results of the bootstrapping of structural paths. H1a to H6a postulate that each of Ps affects *Involvement* positively. Of the six exogenous constructs, PLAC has the strongest positive impact (0.202) on INVO, followed by PROD (0.185), PEOP (0.176), and PROC (0.165). H1b to H6b assume that each of Ps influences *Flow* positively. As can be seen, PROC has the most positive effect (0.328) on FLOW, followed by PHYC (0.282), PLAC (0.152), and PEOP (0.126). Assuming a 5% significance level, the *t*-values estimated from the bootstrapping should exceed 1.960. As shown in Table 8, four exogenous relationships are not statistically significant (H2a: PROM→INVO, t = 1.926; H6a: PHYC→INVO, t = 0.699; H1b: PROD→FLOW, t = -0.264; H2b: PROM→FLOW, t = 1.242). Regarding the endogenous constructs, the results show that INOV and FLOW have a positive effect (0.214) and (0.474) on IMPU with *t*-value of 2.926 and 6.483 respectively, thus both H7 (Involvement has a positive influence on impulse buying) and H8 (*Flow* has a positive influence on impulse buying) were statistically supported at 5% level. In terms of mediation effect, Table 9 shows that INVO has a full mediating effect on the relationships between PROD and IMPU, while FLOW mediates effects partially between three relationships: PLAC and IMPU, PROC and IMPU, PHYC and IMPU.

Table 8: The results of hypothesis testing

Path Relationship	Original sample	Sample Mean	S.D.	T-Statistics	*P* -value	2.5% CI	97.5% CI
H1a: PROD -> INVO	0.185**	0.184	0.07	2.648	0.009	0.054	0.326
H2a: PROM -> INVO	0.145 ns	0.143	0.076	1.926	0.055	-0.002	0.293
H3a: PLAC -> INVO	0.202**	0.205	0.073	2.760	0.006	0.058	0.342
H4a: PEOP -> INVO	0.176**	0.174	0.066	2.661	0.008	0.04	0.302
H5a: PROC -> INVO	0.165*	0.171	0.082	2.025	0.044	0.01	0.327
H6a: PHYC -> INVO	0.047 ns	0.044	0.067	0.699	0.485	-0.082	0.18
H1b: PROD -> FLOW	-0.018 ns	-0.016	0.066	-0.264	0.792	-0.145	0.114
H2b: PROM -> FLOW	0.088 ns	0.092	0.071	1.242	0.215	-0.046	0.229
H3b: PLAC -> FLOW	0.152*	0.145	0.067	2.262	0.025	0.008	0.271
H4b: PEOP -> FLOW	0.126*	0.128	0.063	2.015	0.045	0.008	0.253
H5b: PROC -> FLOW	0.328***	0.325	0.067	4.893	0.000	0.192	0.455
H6b: PHYC -> FLOW	0.282***	0.285	0.070	4.011	0.000	0.149	0.424
H7: INVO -> IMPU	0.214**	0.215	0.073	2.926	0.004	0.073	0.359
H8: FLOW -> IMPU	0.474***	0.475	0.073	6.483	0.000	0.328	0.616

S.D.: Standard Deviation, * p < 0.05, ** p < 0.01, *** p < 0.001, ns-not significant,

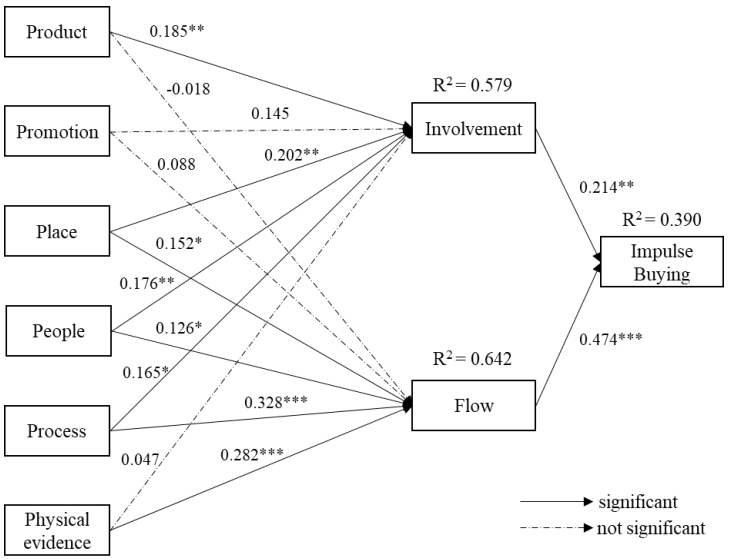


Figure 2: The results of the structural paths

Table 9: The results of mediating effects testing

Mediation Path	Indirect Effect	T-Statistics	*P* -value	Direct Effect	T-Statistics	*P* -value	Mediation
PROD->INVO->IMPU	0.040*	2.124	0.035	0.031	0.789	0.431	full
PROD->FLOW->IMPU	-0.008	-0.259	0.800				no
PROM->INVO->IMPU	0.031	1.416	0.158	0.073*	2.071	0.039	no
PROM->FLOW->IMPU	0.042	1.140	0.255				no
PLAC->INVO->IMPU	0.043	1.934	0.054	0.115**	3.113	0.002	no
PLAC->FLOW->IMPU	0.072*	2.229	0.027				partial
PEOP->INVO->IMPU	0.038	1.909	0.057	0.097**	2.607	0.009	no
PEOP->FLOW->IMPU	0.060	1.900	0.060				no
PROC->INVO->IMPU	0.035	1.572	0.117	0.191***	4.746	0.000	no
PROC->FLOW->IMPU	0.155***	3.938	0.000				partial
PHYC->INVO->IMPU	0.010	0.630	0.525	0.143**	3.090	0.002	no
PHYC->FLOW->IMPU	0.133**	3.045	0.003				partial

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

CONCLUSION

Since ECL enables personal selling through live streaming, the appearance of salespeople in ECL's livestream room allows customers to shop as if they were in a physical store which can enhance customer shopping experience. The primary goal of this study is to investigate the influence of marketing mix on consumers' shopping experience in ECL from consumers' point of view and the outcome behavior of impulse buying. The research model adopted the e-commerce marketing mix for the context of ECL and built on the relationships of the shopping experience (product involvement and flow experience) to impulse purchase, and the e-commerce marketing mix to the shopping experience. Regards the former linkages, the study results revealed that both product involvement and flow experience have a positive effect on impulse buying via ECL, and the influence of flow experience ($\beta = 0.474$, $p < .001$) shows more stronger than product involvement ($\beta = 0.214$, $p < .01$). Therefore, it is advisable for sellers (salespeople) to focus on marketing activities that positively influence the customers' perception of their products and services and those that enhance customers' flow experience in the live streaming.

As regards the latter linkages, the results showed that not all elements of the e-commerce marketing mix have a positive impact on the shopping experience. *Place* (availability of the platform and customer service), *People* (attractiveness of streamer) and *Process* (interpersonal interactions) influence both product involvement and flow experience positively, but *Product* (product information) has a positive impact only on product involvement, and *Physical evidence* (atmosphere of livestream room) only on flow experience. On the contrary, *Promotion* (sales promotions activities) seems not to have a positive impact on product involvement and flow experience. Further, considering the mediating effect produced by the shopping experience, the results indicated that the relationship between *Product* and impulse buying is fully mediated by product involvement, and flow

experience partially mediates the respective effects of *Place, Process, and Physical evidence* on impulse buying. In other words, it is suggested that although *People* may encourage customers to engage in the selling process, it does not affect impulse buying through the experiences in ECL. *Promotion* has no effects on the shopping experience, but not surprisingly, it may direct customers toward purchasing impulsively when much more benefits are provided.

Given that marketing mix elements are means to an end, the study results also suggest that while performing the combination of *Product*, *Place*, *People*, and *Process*, salespeople (streamers) should concentrate their marketing efforts on enhancing their product presentation (*Product*) and providing more comprehensive and customer-needed information to induce them to engage in knowing the product. This will increase their product involvement, which in turn causes impulse buying. On the other hand, it is recognized that the effective combination of *Place* (e.g. kind customer service), *Process* (e.g. joyful interactions), and *Physical evidence* (e.g. pleasant atmosphere) can increase customers' flow experience, which evokes impulse purchase consequently.

Overall, this study has provided empirical evidence of the application of the e-commerce marketing mix on research of impulse purchase in ECL. However, it must be noted that the survey was limited to consumers of ECL in China, and the type of platforms they use was not limited. Therefore, the study can be improved in terms of data sources and research fields in the future. Future studies could consider expanding the sample size to include consumers from other countries and regions.

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