Moderating effects of time pressure on the relationship between perceived value, flow experience, and purchase intention in e-commerce live streaming

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Abstract. E-commerce live streaming has become an indispensable way of consumption in contemporary life. However, the psychological change of consumers in the purchase process is complex. Therefore, it is essential to understand the mechanisms at play. This study uses structural equation modeling to explore the emotional and cognitive changes of consumers in the process of e-commerce live shopping from the three perspectives of perceived value, flow experience, and time pressure. The results show that perceived value and flow experience can exert a positive effect on purchase intention directly, and perceived value can also have an indirect effect through flow experience (except for perceived functional value). Time pressure negatively moderates the relationship between flow experience and purchase intention.

Keywords: Perceived value, Time pressure, Flow experience, Purchase intention

1   Introduction

The emergence of E-commerce live streaming in 2016 has replaced traditional E-commerce as the most convenient and efficient marketing method. China's E-commerce live streaming user base has seen significant growth, reaching 515 million users in December 2022, according to a report by China Internet Network Information Center (CNNIC). The reason behind this is that E-commerce live streaming breaks the barriers of traditional E-commerce, bringing new real-time interactive audio-visual experiences, enhancing the communication between consumers and merchants, and providing timely responses to consumer queries. However, E-commerce live streaming also accelerates consumers' purchase decision-making process, leading to rapid changes in

their internal emotions and cognitive states, which further makes the psychological changes of consumers into a black box and influences consumers silently. Therefore, understanding the mechanisms behind these emotional and cognitive changes is crucial, as they play a pivotal role in consumer behavior.

Previous research primarily focused on the influence of external stimuli on the psychological mechanisms and behaviors of consumers in E-commerce live streaming. Further, these external stimuli can be categorized into the following four dimensions. The first is situational factors, including the available time, affordability, sales atmosphere, and service interaction. For example, Chen et al. (2022) explored the relationship between interpersonal interaction factors and the purchase intention of buyers [1]. The second dimension is promotional discounts. Ho et al. (2022) found that promotion has a positive effect on consumers' purchase intention [2]. The third dimension is related to the product in E-commerce live streaming. Shang et al. (2023) probed the relationship among product background fit, purchase intention, and other factors [3]. The last dimension is the live-streamer element. For example, Xu et al. (2022) explored the effect of live-streamers social capital on purchase intention [4]. However, consumer purchase behavior is a complex process, involving cognitive and affective changes that are rarely addressed in detail by research and are worth exploring. Therefore, this paper aims to examine the following affective and cognitive variables to study consumers' purchase intention.

2   Research model and hypotheses

2.1   purchase intention

Purchase intention refers to the subjective probability that consumers want to buy a certain product when they receive external information or stimuli, according to Fishbein and Ajzen (1977) [5]. It can predict consumers' purchase behavior to some extent and serves as the dependent variable in the research model of this paper.

2.2   Flow experience

E-commerce live streaming provides real-time chat services that increase the sense of participation and immersion of consumers. This ability allows consumers to easily enter a state of flow experience, which is described as a state in which individuals lose the sense of space and time when fully engaged in activities. Subsequently, the concept of flow experience has been widely applied in the field of human-computer interaction. For example, Martins et al. (2019) found that flow experience can explain the purchase intention of consumers [6]. In addition, Mustafi and Hosain (2020) proved that flow experience can act as a mediating variable to moderate the relationship between independent variables and purchase intention, and also have a significant positive effect on purchase intention directly [7]. Thus, the following hypothesis is proposed:

H1: Flow experience has a positive effect on purchase intention.

2.3   Perceived value

Perceived value refers to a consumer's overall assessment of the utility of a product or service. Different from the objective value of products or services, consumers' perceived value emphasizes the subjective cognition of value, which plays a significant role in marketing. When the goods or services meet their expectations, they will have a positive perceived value, and then show a positive desire to buy. The existing literature on perceived value argues that it should be viewed as a multidimensional variable to be studied, and this paper classifies perceived value into perceived emotional, functional, and social values, according to Rasoolimanesh (2016) [8]. Furthermore, Chae et al. (2020) concluded that perceived value can influence the limited edition shoe purchase intention of consumers both directly and indirectly [9]. Kim and Thapa verified that perceived value is significantly related to flow positively in a nature-based tourism context [10]. Hence, the following hypothesis is proposed:

H2a: Perceived emotional value has a positive effect on flow experience.

H2b: Perceived emotional value has a positive effect on purchase intention.

H2c: Perceived functional value has a positive effect on flow experience.

H2d: Perceived functional value has a positive effect on purchase intention.

H2e: Perceived social value has a positive effect on flow experience.

H2f: Perceived social value has a positive effect on purchase intention.

2.4   Time pressure

Time pressure is a subjective sense of urgency and anxiety experienced by consumers when they are under time constraints or inventory pressure. On the one hand, time pressure would make consumers produce a strong opportunity cost perception, which may result in purchase behavior [11]. On the other hand, the limited time in perception affects the collection and processing of information [12], ultimately influencing consumers' perceived value and shopping experiences. Therefore, it is important to understand the influence and mechanism of time pressure on consumers' purchase intention. Peng et al. (2019) found that time pressure can negatively moderate the effects of emotional/social values on purchase intention [13]. Moreover, time pressure reduces the hedonic value by reducing the sense of freedom and spontaneity and potentially hinders the formation of flow experience. Hence, the following hypothesis is proposed:

H3a: Time pressure moderates the relationship between flow experience and purchase intention negatively.

H3b: Time pressure moderates the relationship between perceived emotional value and purchase intention negatively.

H3c: Time pressure moderates the relationship between perceived functional value and purchase intention negatively.

H3d: Time pressure moderates the relationship between perceived social value and purchase intention negatively.

2.5   Proposed Research model

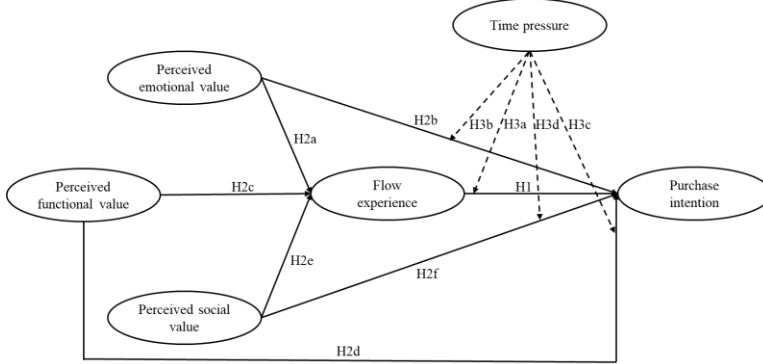The structural modeling diagram proposed in this paper is shown in Fig. 1

Fig. 1. The proposed model

3   Research design

The scale contained three main sections: the background and purpose of this study, socio-demographic information of the participants, and question items about four constructs. The sources referenced in each section were: perceived value mainly draws on the research of Sweeney and Soutar (2001) [14]; flow experience is from the research of Gao (2015) [15], and Chen and Lin (2018) [16]; time pressure primarily refers to the scale of Zhang (2022) [11]; purchase intention adopt the scale of Dodds et al. (1991) and Duffett (2015) [17,18]. This part used a seven-point Likert scale and the content of which was modified according to the research background of this paper. The scale was distributed through a combination of online and offline methods, primarily using WeChat and Xiaohongshu. A total of 422 submissions were received, of which 324 were deemed valid and these participants had live shopping experiences within the past six months. Fig. 2 shows the realistic e-commerce live streaming screenshot.

Fig. 2. Examples of e-commerce live streaming in China

4   Empirical analysis

4.1   Descriptive analysis

The sample data shows that the ratio of male to female is about 1:3; the mean age is 23.5 with a standard deviation of 5.2; the Education background is mainly undergraduate, accounting for 44.3%; the duration of each live viewing is mainly concentrated in 30min-1h, accounting for 89.5%, and 69.4% of consumers will shop 1-5 times per month.

4.2   Measurement model assessment

The measurement model was assessed using Smart PLS 3.0, and the results show that the factor loads are greater than 0.6. The results of descriptive statistics, Cronbach's Alpha, CR, and AVE are shown in Table 1. The discriminative validity is also satisfied that all AVEs, along with their square roots, are greater than their correlation with other constructs. Furthermore, HTMT ratios are below the threshold value of 0.9. And the VIF values of the internal model are between 1.514 and 3.394. These results indicate that the scale has good reliability and validity.

Table 1. The descriptive of the constructs, Cronbach's Alpha, CR, and AVE of the measurement model

Construct	Mean	SD	95%CI	Cronbach's Alpha	CR	AVE
PEV	4.33	1.12	[4.21, 4.46]	0.870	0.920	0.793
PFV	4.65	0.91	[4.55, 4.75]	0.913	0.935	0.744
PSV	4.49	1.17	[4.36, 4.62]	0.914	0.936	0.745
FE	4.20	1.31	[4.05, 4.34]	0.926	0.944	0.772
TP	4.73	1.34	[4.58, 4.88]	0.895	0.924	0.710
PI	4.62	1.04	[4.50, 4.73]	0.906	0.930	0.727

Notes: Perceived Emotional Value = PEV; Perceived Functional Value = PFV; Perceived Social Value = PSV; Flow Experience = FE; Time Pressure = TP; Purchase Intention = PI.

4.3   Structural model assessment

Hypotheses testing.
To examine the structural model, this research applied bootstrapping of 5000 in Smart PLS 3.0. The coefficients of determination of the R^2 in variance in flow experience and purchase intention are 44.3% and 63.2% respectively. As summarized in Table 2, the results show that: flow experience (β = 0.233, p = 0.000), perceived emotional value (β = 0.229, p = 0.000), perceived functional value (β = 0.172, p = 0.002), and perceived social value (β = 0.228, p = 0.000) have significant positive effects on purchase intention; in addition to perceived functional value, perceived emotional value

(β = 0.162, p = 0.012), and perceived social value (β = 0.594, p = 0.000) all contribute positively to the flow experience; furthermore, time pressure only negatively moderates flow experience and purchase intention.

Table 2. Hypothesis testing

Path	Hypothesis	Path coefficient (direct effect)	T-value	Decision
FE -> PI	H1	0.233***	4.048	Supported
PEV->FE	H2a	0.162*	2.508	Supported
PEV->PI	H2b	0.229***	3.765	Supported
PFV->FE	H2c	-0.065	1.065	Reject
PFV->PI	H2d	0.172**	3.095	Supported
PSV->FE	H2e	0.594***	10.29	Supported
PSV->PI	H2f	0.228***	3.655	Supported
TP×FE×PI	H3a	-0.114*	2.011	Supported
TP×PEV×PI	H3b	0.038	0.651	Reject
TP×PFV×PI	H3c	-0.012	0.239	Reject
TP×PSV×PI	H3d	0.067	1.132	Reject

Notes: *$p < 0.05$, **$p<0.01$, ***$p<0.001$; Perceived Emotional Value = PEV; Perceived Functional Value = PFV; Perceived Social Value = PSV; Flow Experience = FE; Time Pressure = TP; Purchase Intention = PI.

Mediation analysis.

In addition to the hypothesis testing, this research also verifies the significance of the mediation test. The results in Table 3 show that two out of three are significant and the types of mediation are classified according to the method of Zhao et al. (2010) [19].

Table 3. Mediation analysis

Path	Path coefficient (direct effect)	Path coefficient (indirect effect)	P-value	Decision	Mediation type
PEV->FE->PI	0.229	0.038	0.033*	Supported	Complementary mediation
PFV->FE->PI	0.172	-0.015	0.310	Reject	No-effect
PSV->FE->PI	0.228	0.139	0.000***	Supported	Complementary mediation

Notes: *$p < 0.05$, **$p<0.01$, ***$p<0.001$; Perceived Emotional Value = PEV; Perceived Functional Value = PFV; Perceived Social Value = PSV; Flow Experience = FE; Time Pressure = TP; Purchase Intention = PI.

5   Conclusion and discussion

5.1   Research conclusion

The empirical results support most of the hypotheses except H2c and H3b-H3d, with the model explaining 44.3% and 63.2% of the variances in flow experience and purchase intention. From the results of the structural model test, it is clear that both perceived emotional value and perceived social can positively influence the flow experience of consumers. In addition, in the mediation test, flow experience moderates the relationship between perceived emotional/ social value and consumer purchase intention. From the direct effects test, it is also found that all the constructs in the model positively contribute to purchase intention. This means that if we want to increase consumers' purchase intention, we need to increase the perceived value of the product in consumers' minds and engage them through interaction and entertainment so that they can quickly enter into a state of forgetful flow experience. Furthermore, the conclusion of the moderating effect shows that time pressure negatively moderates the effect of mind-flow experience on purchase intention, while there is no significant effect on the relationship between the three dimensions of perceived value and purchase intention.

5.2   Research prospects and deficiencies

In a theoretical sense, this paper combines three dimensions of perceived value, flow experience, and time pressure in a live e-commerce environment to study the influence of consumers' emotions and perceptions on their purchase intentions, which can deepen our detailed understanding of the process of forming consumers' purchase behaviors. The results of model hypothesis testing also enrich our knowledge of the relationship among perceived value, flow experience, time pressure, and consumers' purchase intentions.

In a practical sense, the results of this paper can make merchants or live-streamers pay more attention to the enhancement of consumers' perceived value. For example, a more detailed explanation or demonstration of product features. And some entertainment activities should be added to give them a higher level of immersion and pleasure. The study of time pressure needs more attention because it can negatively regulate the relationship between flow experience and purchase intention. For example, setting appropriate time limit thresholds.

However, there are still some shortcomings in this paper, which need to be explored in more depth and detail in subsequent studies. In this paper, when conducting the questionnaire collection, the sample with live shopping experience within six months was preferentially selected, which made the final sample of men who met the requirements smaller. Therefore, in future studies, the proportion of men and women can be balanced in the sample. In addition, this paper focused on the changes in consumer psychology in the study and did not take into account the changes in external factors. Therefore, future studies could also take external stimuli, such as product categories, into consideration.

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