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Exploring the Serial Mediation of Perceived Usefulness, Ease of Use, and Playfulness in Shaping Purchase Behavior in Live Streaming Commerce among Thai consumers

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Abstract
Despite the growth of Live streaming commerce, existing models, particularly the Technology Acceptance Model (TAM), have not yet captured the complexities of consumer behavior in this interactive environment. This study addresses the gap and aims to extend TAM model and investigate the serial mediation of Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness in shaping purchase behavior among Thai consumers. A quantitative approach was employed, and data from 794 target respondents were collected through convenience sampling. To achieve the study's objectives, the PROCESS Macro by Hayes was employed to analyze the serial mediation effects. The results reveal the existence of serial mediation of streaming features sequentially enhance perceptions of usefulness, ease of use, and playfulness, which ultimately drive consumer attitudes and purchase intentions, and it deepens our understanding of consumer behavior in entertainment-driven shopping environments, offering valuable insights for businesses to optimize live streaming platforms. Enhancing user experience through engaging, interactive, and personalized features can significantly boost consumer satisfaction, engagement, and conversion rates. This research contributes to the literature by refining TAM's applicability in live streaming commerce and providing actionable strategies for businesses to maximize their impact in this market.

Keywords: Live Streaming Commerce, Technology Acceptance Model (TAM), Purchase Behavior, Perceived Usefulness, Perceived Ease of Use, Perceived Playfulness

1. Introduction

Over the past decade, there has been a noticeable evolution in consumer purchasing behavior, with a clear transition from traditional offline shopping to online platforms. Online shopping refers to the process by which consumers purchase goods or services through the Internet, typically utilizing a web browser or a mobile application as the interface (Al-Hattami, 2021). This shift, particularly driven by technological advancements and changing consumer preferences, has been dramatically accelerated by the growth of Live Streaming Commerce. Live streaming commerce leverages the real-time interaction between hosts and viewers, enabling consumers to engage with products in an immersive, personalized manner. Live streaming commerce's integration of real-time interaction and instant purchasing features has driven its widespread adoption in today's digitalized marketplace (Yin, 2023).

This integration of interactive features, combined with the ability to make instant purchases, has led to the widespread adoption of live streaming commerce, particularly in today's increasingly digitalized marketplace. As consumers increasingly demand seamless and engaging online shopping experiences, platforms like Shopee, Lazada, TikTok, Line, and Instagram have embraced live streaming as a powerful tool to drive sales and foster greater customer engagement. These platforms utilize live streaming to offer viewers a sense of exclusivity and urgency, encouraging real-time participation and impulsive buying behavior. This trend is particularly evident among Generation Z, who are more likely to embrace innovative online shopping models due to their comfort with digital technologies and social media platforms. People who had not used online shopping before the pandemic—mainly older adults—often needed help from younger family members or friends who were more familiar with technology. Without this support during the early stages, it would have been difficult for them to shop online (Fuentes et al., 2022). Furthermore, it is noticeable that when online shopping as opposed to in-store, customers feel free to do it online with tendency to turn to impulsive purchases (Chan, 2017). The research has shown that customers who shop online, particularly through live streaming platforms, often experience fewer barriers to making purchases compared to in-store shopping. The convenience of browsing and buying from the comfort of home, coupled with the ability to instantly purchase items during a live stream, reduces the friction associated with traditional shopping experiences.

Most previous studies on Live Streaming Commerce have primarily centered on the Technology Acceptance Model (TAM) proposed by Davis (1989), focusing on how Perceived Usefulness and Perceived Ease of Use influence attitudes towards adopting new technologies. In the context of Live Streaming Commerce, Perceived Usefulness refers to the extent to which consumers believe that engaging in live stream shopping will enhance their purchasing experience, while Perceived Ease of Use addresses how effortlessly consumers perceive the interaction with the live streaming platforms. It is imperative that businesses operating in the realm of online commerce understand the impact of Perceived Usefulness and Perceived Ease of Use on their success (Limna et al., 2023). The role of playfulness in shaping consumer engagement has also been examined by Moon and Kim (2001). They extended TAM by integrating Perceived Playfulness into the model, noting that playfulness serves as a critical factor in motivating user interaction and driving consumer behavior in digital environments. While Perceived Usefulness and Perceived Ease of Use provide a strong foundation for understanding consumer behavior in live streaming commerce, integrating Perceived Playfulness offers a more comprehensive view of how entertainment and engagement can drive user adoption and sustained usage of these platforms.

However, the study of Serial Mediation of Perceived Usefulness, Ease of Use, and Playfulness as research integrating Perceived Playfulness into TAM remains limited, this research aims to bridge this gap by proposing an extended model that examines the role of Live Streaming attributes in shaping consumer behavior among Thai consumers through a serial mediation process. By integrating Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness as mediators, this study explores how these perceptions sequentially influence consumer attitudes and, ultimately, purchase behavior. This research offers a more holistic understanding of the drivers behind consumer attitudes and behaviors in live streaming commerce. Moreover, the findings of this study will help businesses develop strategies for creating more compelling live streaming experiences that balance entertainment with transactional elements, thereby increasing both consumer satisfaction and purchase likelihood. By understanding how perceptions of usefulness, ease of use, and playfulness operate together, businesses can design live streaming commerce strategies that cater to the psychological needs of their target audience, fostering stronger relationships and encouraging more frequent

purchases. Thus, this research contributes not only to advancing theoretical models of consumer behavior in interactive shopping environments but also provides actionable insights for businesses looking to improve their live streaming commerce engagement and conversion rates.

2. Research Objectives

This research aims to extend the Technology Acceptance Model (TAM) by incorporating Perceived Playfulness (PP) alongside Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) to investigate the serial mediation effects on consumer attitudes and purchase behavior in live streaming commerce. Specifically, this study seeks to examine how live streaming shopping attributes influence consumer perceptions and, in turn, shape their attitudes and purchasing decisions. By employing a serial mediation framework, the study explores the sequential role of PU, PEOU, and PP in driving consumer engagement and decision-making in Thai online shoppers. Additionally, the research aims to contribute to existing theories, such as TAM and Flow Theory, by providing a more comprehensive understanding of psychological mechanisms that underlie interactive shopping environments.

3. Literature review

3.1 Live streaming commerce and its impact on purchase behavior

Live Streaming Commerce is a digital broadcast format that integrates real-time product presentations through internet-based live streaming, enabling consumers to make immediate purchases as they watch. This interactive shopping experience combines the advantages of live demonstrations with instant transactional capabilities, allowing viewers to engage with products and complete purchases seamlessly during the broadcast (Pan et al., 2023). Live Streaming Commerce represents an innovative form of social media engagement, such as gaming, selling or broadcasting multimedia content in real-time to an audience of online viewers by streamers (Wu et al., 2021). In contrast to traditional e-commerce, social commerce or Live Streaming Commerce prioritizes engaging with customers through social media platforms and fostering strong, ongoing relationships by emphasizing interactive communication and relationship-building, creating a more personalized and socially driven shopping experience. While e-commerce primarily centers on one-way information dissemination, focusing on transactions and optimizing business efficiency (Praphruetmon, 2022). Consumers' purchase intention is a multifaceted process that is typically influenced by various factors, including their behavior, perceptions, and attitudes (Dastane, 2020). Live streaming attributes are explained as the e-commerce transaction delivery through a real-time streaming platform, creating a virtual space with a highly interaction between streamers and consumers.

For example, seller interactivity, background ambiance, seller politeness, seller humor, broadcast timing announcement and product trendlines, play a vital role in live streaming commerce. The live steaming attribute such as seller interactivity during live streaming creates a significant impact in bolstering the purchasing intention of customers who watch the live stream (Chan,S. & Asni, K., 2022). This complex interaction of cognitive and emotional responses shapes their decision-making process, ultimately guiding their intent to make a purchase. A scarcity-driven sales promotion in Live Streaming Commerce is activated in real time through enhanced platform features, such as increased visibility, authenticity, and interactive engagement between buyers and sellers. These elements work together to influence consumers' purchase intentions and purchase behavior by creating a sense of urgency and immediacy during the live broadcast (Liu & Zhang, 2023). Moreover, live streamers can generate a perception of scarcity, effectively increasing demand and prompting viewers to

make quicker purchasing decisions. By utilizing scarcity-focused promotions, they tap into consumers' inclination for immediate purchases, driving urgency and encouraging faster transactional behavior on consumer's purchase behavior (Qu et al., 2023). Since Live Streaming Commerce is directly related to consumers' purchase behavior and the perception of consumers, it is therefore hypothesized that:
H1: Live streaming attributes have positive effect on purchase behavior.

Extended Technology Adoption model for Live Streaming Commerce

The Technology Acceptance Model (TAM), originally proposed by Fred Davis (1989), remains one of the most influential foundations and frameworks for understanding individuals adopt new technologies. TAM is composed of two key factors, Perceived Usefulness (the degree to which a person believes a technology will enhance their performance) and Perceived Ease of Use (the effort required to use the technology), determine whether users accept or reject a particular technology. According to Akbari et al. (2020), Perceived Ease of Use has a positive influence on both users' trust in the system and their intention to use it.
In 2001, Moon and Kim built upon Davis's earlier work on the Technology Acceptance Model (TAM), which examined the relationship between Perceived Usefulness and Perceived Ease of Use in the context of workplace computer use (Davis, 1992). Expanding TAM, Moon and Kim introduced the concept of "Perceived Playfulness" to account for the motivational factors influencing individuals' behavior during human-computer interactions, particularly in the context of internet usage (Moon & Kim, 2001). Their research aimed to extend TAM by incorporating Playfulness as a key factor in understanding how users interact with the World Wide Web. According to the findings of Moon and Kim, they acknowledged that the modern web environment was no longer driven solely by task efficiency. Their research demonstrated that enjoyment, entertainment, and an individual's intrinsic motivation to engage with web-based technology could significantly affect their behavior, thus extending TAM to consider how Playfulness interacts with users' experiences on the internet.

According to the findings of Koufaris, it further demonstrated that attitudes towards e-commerce, and the subsequent decision to engage in online purchasing, can be effectively analyzed through the TAM lens (Koufaris, 2002). Attitude, which encompasses perceived usefulness (PU) and perceived ease of use (PEOU), reflects and describes how much people like or feel positive about using the system (Zhang et al., 2023).
In 2003, Gefen and Straub made a pivotal contribution to the Technology Acceptance Model (TAM) by extending its application to the domain of e-commerce. Their work acknowledged the fundamental shifts in consumer behavior brought about by the growing reliance on online shopping platforms. At the core of their extension was the recognition that trust plays a critical role in influencing consumer attitudes towards online transactions. Gefen and Straub's research on trust in e-commerce holds particular relevance for live streaming commerce, where real-time interactions between sellers and consumers offer both opportunities and challenges in terms of trust-building (Gefen & Straub, 2003). Interactivity, which is one of the live streaming attributes, indirectly affects purchase intention through perceived ease of use, perceived usefulness, and social presence (Xu, Ch., & Su, J., 2022). Attitude is perceived as the assessment of the consumer about purchasing through online stores (Andrews & Bianchi, 2013). Ease of Use has a positive impact on the attitude of consumers toward e-commerce (Agag & El-Masry, 2016) Moreover, live-streaming atmosphere creates a sense of playfulness among consumers (Chen & Pongpaibool, 2024). Enhancing the playfulness of the live streaming platforms and the product quality can help to obtain loyal consumers and further generate consumer stickiness (Shen et al., 2022).

Purchase intention is influenced and impacted by Perceived Playfulness as another powerful factor (Al-Hadban & Almotairi, 2020). While playfulness has been studied in relation to gaming or entertainment applications, its role in non-entertainment contexts, such as live streaming shopping or e-commerce, remains underexplored. Live Streaming Commerce is supposed to be easy to use and more entertaining with sales promotion support so as to enhance positive attitude towards Live Streaming Commerce to customers (Jirakasemwat, 2024).
Building on these foundations, the current study explores how TAM factor, specifically Perceived Usefulness and Ease of Use, along with Playfulness, mediate purchase behavior in live streaming commerce. By examining these elements in the context of Live Streaming Commerce, this research aims to provide deeper insights into the motivations and attitudes that influence consumers' engagement with this rapidly evolving digital retail platform. Since the Technology Acceptance Model (TAM), which are Perceived Usefulness, Perceived Ease of Use, together with its extended version of Perceived Playfulness play an important role to well adopt Live Streaming Commerce which is considered as new technology, it is therefore hypothesized that:
H2: Live streaming attributes have positive effect on Perceived Usefulness.
H3: Live streaming attributes have positive effect on Perceived Ease of Use.
H4: Live streaming attributes have positive effect on Perceived Playfulness.
H5: Perceived Usefulness has positive effect on Attitude.
H6: Perceived Ease of Use has positive effect on Attitude.
H7: Perceived Playfulness has positive effect on Attitude.
H8: Attitude has positive effect on purchase behavior.

3.2 Serial mediation and proposed conceptual model

The integration of streaming platforms into the online shopping experience has revolutionized consumer interactions with products and services. These platforms provide real-time interaction, immersive product demonstrations, and direct communication with sellers, enhancing the shopping experience. As this innovation continues to evolve, it is important to examine how different streaming shopping attributes influence consumer behavior. Specifically, the role of mediating factors such as Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness in shaping purchase behavior through attitudes towards the platform remains a critical area of investigation. Research has consistently shown that when consumers perceive technology as usefulness, they are more likely to develop favorable attitudes towards using it, which, in turn, boosts their likelihood of making a purchase (Venkatesh & Bala, 2008). Additionally, Perceived Usefulness has been found to significantly impact consumer behavior in the context of e-commerce and mobile shopping platforms (Sun & Zhang, 2006). Moreover, in streaming shopping, attributes such as a user-friendly interface, easy navigation, and intuitive design can enhance the overall shopping experience by making it simpler and less frustrating. Studies have shown that when consumers perceive a platform as easy to use, they are more likely to develop positive attitudes towards it, which increases the likelihood of a purchase (Venkatesh & Davis, 2000). Furthermore, Perceived Ease of Use has been demonstrated to have a significant impact on user satisfaction and behavioral intentions, particularly in mobile and online shopping contexts (Bhattacherjee, 2001).

Recent trends in marketing have aimed to engage customers in social media platform; hence, engaging features such as gamified elements, interactive experiences, and entertaining product presentations can enhance consumer enjoyment, increasing their positive attitude towards the platform. Prior research indicates that Perceived Playfulness contributes to greater consumer satisfaction and engagement, which in turn leads to higher purchase intentions (Lu et al., 2022). Playfulness has been shown to positively affect user experience and satisfaction in various digital environments, including social media platforms and mobile applications

(Alsawaier, 2018). As such, Perceived Playfulness acts as a key mediator between streaming shopping attributes and purchase behavior, facilitating a more enjoyable and ultimately purchase-driven shopping experience. It is therefore hypothesized that:
H9: Perceived Usefulness and Attitude serially mediate the relationship between streaming shopping attributes and purchase behavior.
H10: Perceived Ease of Use and Attitude serially mediate the relationship between streaming shopping attributes and purchase behavior.
H11: Perceived Playfulness and Attitude serially mediate the relationship between streaming shopping attributes and purchase behavior.

This model offers both theoretical and practical contributions to the field of streaming commerce by highlighting the sequential processes through which live streaming attributes affect purchase behavior. By focusing on Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness as mediators, the model not only extends existing theories like TAM and Flow Theory, but also provides actionable insights for platform providers, marketers, and product designers seeking to improve consumer engagement and drive purchasing decisions.

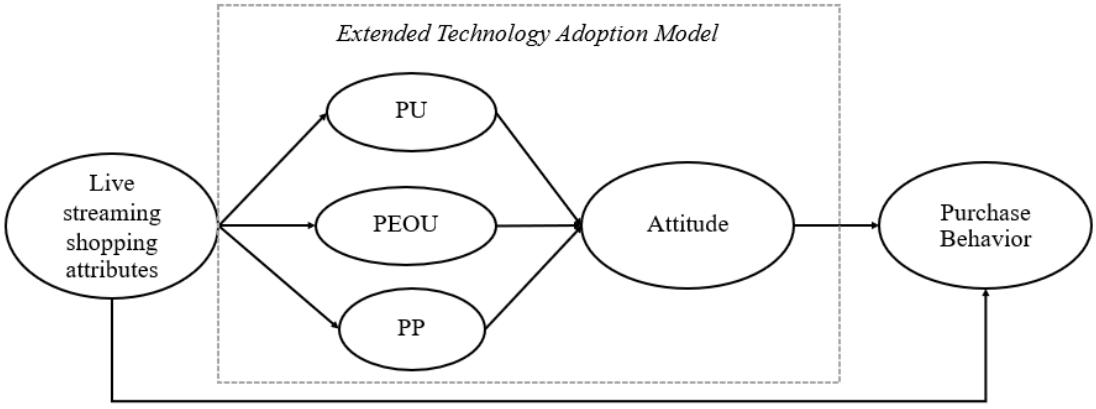

Figure 1: Conceptual Model

4. Methodology

This research adopts a quantitative methodology, using an online survey to gather data. The study applies convenience sampling, which may not fully represent Thai population. This sampling method allows for efficient data collection from a readily accessible group, making it suitable for exploratory research. Since the main objective is to assess the model and test the hypotheses (Taguchi, 2018), this sampling method is considered suitable. The survey targeted individuals living in Bangkok and its surrounding areas (Nonthaburi, Samut Prakan, Pathum Thani, Samut Sakhon, and Nakhon Pathom) in Thailand. To ensure familiarity with digital platforms, the survey was administered online. Participants were required to have prior experience with online shopping on live commerce platforms (Shopee, Lazada, Facebook, Line, and TikTok), either as viewers or buyers. Following Yamane's (1967) formula, a sample size of 400 was calculated to achieve a 5% margin of error for the Thai population of 71.6 million. The study collected 794 responses, surpassing the recommended sample size, which enhances the reliability of the data. This robust response rate further strengthens the validity and generalizability of the findings within the target population. This study adopts previously used measurements and questions.

The questionnaire consists of seven sections: screening questions, experience with Live Commerce, general behavior, factors influencing participation in Live Commerce, attitudes towards Live Commerce, purchasing behavior on live commerce platforms, and personal information. To minimize common method bias, the researchers prioritize confidentiality and anonymity, ensuring that respondents can terminate the questionnaire at any time if they feel uncomfortable. Moreover, additional items were added to check for response consistency, which helped to detect any inattentive responses. The time taken to complete the questionnaire was measured to reduce the reliability of their responses. In the data cleaning process, inconsistencies were flagged when respondents provided contradictory answers to similar questions or when response patterns appeared overly uniform, indicating potential bias or inattention. Additionally, outlier detection was performed to identify and exclude any extreme values that could distort the analysis. These steps were taken to reduce common method bias and ensure the reliability and validity of the data, following recommendations by Podsakoff, MacKenzie, Lee, and Podsakoff (2003).

The measures for Perceived Usefulness, Perceived Ease of Use, and Attitude were adapted from Kim et al. (2023), who conducted a survey on live commerce platforms using the Technology Acceptance Model (TAM) developed by Fred Davis (1989). Respondents rated their agreement with statements on a five-point Likert scale, ranging from "Strongly Disagree = 1" to "Strongly Agree = 5." Examples of Perceived Usefulness items include: “Live commerce platforms help me purchase the right product more efficiently,” “Recommendations on live commerce platforms provide a better understanding of products,” and “Shopping on live commerce platforms enhances my consumption.” For Perceived Ease of Use, sample questions include: “Live commerce platforms adapt quickly without requiring much effort,” “The interface of live commerce platforms simplifies interactions,” and “Making purchases and payments on live commerce platforms is easy.” Additionally, the measure of Perceived Playfulness was also drawn from Moon & Kim (2001), which extends the Technology Acceptance Model to the World Wide Web context, highlighting playfulness as a key belief.
The six measurement items for live streaming shopping attributes were adopted from Chan and Asni (2023), demonstrating an AVE of 0.621 and a CR of 0.907. These items include the impact of seller interactivity on purchase decisions, the role of store ambience in shaping shopping perceptions, and the influence of seller politeness on willingness to buy. Additionally, they highlight how seller humor affects purchasing decisions, how well-timed broadcast announcements can enhance buying intention, and how product trendlines help consumers understand their preferences. Together, these attributes provide as a measurement for streaming attributes. For purchase behavior measure, it was adapted from Venkatesh and Davis (2000) to compare respondents' behavior on live commerce platforms with their behavior on traditional platforms to understand their behavior.

5. Results and Discussion

5.1 Results

The data of 794 target respondents were collected through convenience sampling to complete the purpose and objectives of this research study. The descriptive statistics in Table 1 suggests that the survey's sample is predominantly young, educated, and largely comprised of students, with a strong representation of females. Most respondents have a moderate monthly income, indicating a middle-income group. The majority of respondents were female (66.75%), while 31.23% were male. A small proportion (2.02%) did not specify their gender. The majority of participants (81.36%) were between 15 and 22 years old, indicating a youthful demographic. Most respondents were single (96.73%), while only 3.15% were married. The respondents were highly educated, with the majority holding a bachelor's degree (91.06%). The income

distribution showed that most respondents earned between 10,001 and 30,000 THB per month (47.98%), followed by those earning less than 10,000 THB (46.35%). A small percentage earned between 30,001 and 50,000 THB (3.65%), and even fewer earned higher amounts (0.88%, earned between 50,001 and 100,000 THB, and 1.13% earned more than 100,000 THB). The vast majority of respondents were students (90.30%) which may raise concerns regarding the external validity of using student samples (Ashraf & Merunka, 2017). However, using students as participants helps control variables related to age and education level that could lead to differences in responses (Diamantopoulos, 2006). As noted by Kasser (2022) college students are considered the "backbone of much of academic research in psychology" (p. 7) and have been extensively used in studies published in leading scientific journals (Ashraf & Merunka, 2017). Focusing on this demographic provides a solid foundation for future research, with the potential for comparing findings across more diverse populations. Additionally, these characteristics may reflect the target audience's engagement with online shopping and live commerce platforms.

To ensure compliance with research ethics—especially with participants aged 15–22, additional considerations are built into the survey. Participants are informed that their responses should reflect their genuine thoughts, there are no right or wrong answers, and they may withdraw at any time if uncomfortable. Two screening questions are included at the start to confirm willingness to participate and recent experience with online shopping. If either is answered negatively, the survey ends. These steps help protect participants and uphold ethical research standards.

Table 1: Descriptive Analysis

		Frequency	**Percent (%)**
Gender	Male	248	31.23
	Female	530	66.75
	Not	16	2.02
Age	15 - 22 years old	646	81.36
	23 - 30 years old	107	13.48
	31 - 40 years old	25	3.15
	41 - 50 years old	16	2.02
Marital Status	Single	768	96.73
	Married	25	3.15
	Divorce/ Separated	1	0.13
Education	Secondary school and lower	5	0.63
	High school/ Vocational school	60	7.56
	Bachelor degree	723	91.06
	Master degree and higher	6	0.76
Income	Less than 10,000 THB	368	46.35
	10,001 – 30,000 THB	381	47.98
	30,001 – 50,000 THB	29	3.65
	50,001 – 100,000 THB	7	0.88
	More than 100,000 THB	9	1.13
Occupation	Student	717	90.30
	Employee	69	8.69
	Government officer	1	0.13
	Business owner	5	0.63
	Others	2	0.25

Descriptive statistics and Pearson correlations were conducted as an initial assessment of the data (Table 2). The skewness and kurtosis values, along with the normality test, were within acceptable ranges for serial mediation (>±2) (George, 2003). Multicollinearity has been checked using Variance Inflation Factor (VIF) values, with values above 10 suggesting problematic multicollinearity. The independent variables show values lower than 10 which indicate no multicollinearity. Reliability tests (Cronbach's alpha) were performed for the measurement items: ST (alpha = 0.94), PU (alpha = 0.92), PEOU (alpha = 0.91), PP (alpha = 0.91), ATT (alpha = 0.89), and PB (alpha = 0.93). All results exceeded the 0.7 threshold, which is considered acceptable according to Nunnally and Bernstein (1994).

Table 2: Mean, Standard Deviation, and Correlations

				Correlations					
	Mean	**S.D.**	**Cronbach's Alpha**	**ST**	**PU**	**PEOU**	**PP**	**ATT**	**PB**
ST	3.59	0.81	0.94	1.00	.72**	.70**	.63**	.55**	.47**
PU	3.39	0.76	0.92	.72**	1.00	.80**	.80**	.67**	.61**
PEOU	3.39	0.75	0.91	.70**	.80**	1.00	.78**	.72**	.66**
PP	3.31	0.79	0.91	.63**	.80**	.78**	1.00	.73**	.69**
ATT	3.26	0.76	0.89	.55**	.67**	.72**	.73**	1.00	.83**
PB	3.18	0.82	0.93	.47**	.61**	.66**	.68**	.83**	1.00

Note: **. Correlation is significant at the 0.01 level (2-tailed); ST = streaming shopping attributes, PU = perceived usefulness, PEOU = perceived ease of use; PP = perceived playfulness, ATT = attitude, PB = purchase behavior

For hypothesis testing and serial mediation analysis, this study employs the SPSS statistical software with the PROCESS Macro (Model 80) developed by Hayes (2018). Bootstrap sampling with 5,000 samples and a 95% confidence level was used for the analysis. The total effect of indicates that Streaming shopping attributes (ST) directly influences Purchase Behavior (PB) in a positive and significant manner, explaining about 21.61% of the variance in PB. The Total Effect model reveals F (1, 792) = 218.334, p = 0.000. This indicates that streaming shopping attributes on purchase behavior is strong and significant, demonstrating that while the direct effect is modest, the combined direct and indirect effects have a substantial impact on purchase behavior.

In table 3, the direct effect of ST on PB was negative but significant ($\beta st1 = -0.086$, $p < 0.05$). Despite expectations that streaming features would positively influence purchase behavior, the negative coefficient indicates a slight reduction in purchase behavior due to streaming attributes, which may be explained by other unobserved factors or complex interactions. Therefore, H1 was not supported. However, the direct effect of ST on PU, PEOU and PP was significant and positive ($\beta st2 = 0.719$, $\beta st3 = 0.704$, $\beta st4 = 0.627$; $p < 0.000$), indicating that streaming shopping features strongly enhance the Perceived Usefulness, Perceived Ease of Use and Perceived Playfulness of the platform. Therefore, H2, H3 and H4 were supported. The direct effect of PU on ATT was not significant ($\beta pu = 0.053$, $p > 0.05$), suggesting that Perceived Usefulness does not have a direct influence on purchase behavior in the current model. However, the direct effect of PEOU and PP on ATT was positive ($\beta peou = 0.354$, $\beta pp = 0.408$) and highly significant ($p<0.000$), indicating that ease of use and fun in shopping environment can positively shapes consumer's attitudes. While H5 was not supported, H6 and H7 were supported. The direct effect on ATT to PB was supported as hypothesized (H8) based on the theory ($\beta att = 0.688$, $p<0.000$).

Table 3: Path analysis (Direct effect)

			Bootstrapping 95% (CI)	
Direct effect: PB (R^2=0.702)	**Coefficient**	**Standard Error**	**Lower**	**Upper**
ST → PB	-0.086*	0.030	-0.147	-0.029
PU → PB	0.025ns	0.042	-0.056	0.110
PEOU → PB	0.097*	0.042	0.025	0.189
PP → PB	0.138**	0.039	0.068	0.220
ATT → PB	0.688**	0.033	0.676	0.803
Direct effect: ATT (R^2=0.59)				
ST → ATT	0.007ns	0.033	-0.057	0.071
PU → ATT	0.053ns	0.046	-0.037	0.144
PEOU → ATT	0.354***	0.044	0.276	0.448
PP → ATT	0.408***	0.040	0.318	0.475
Direct effect: PU (R^2=0.516)				
ST → PU	0.719***	0.023	0.627	0.718
Direct effect: PEOU (R^2=0.495)				
ST → PEOU	0.704***	0.023	0.605	0.697
Direct effect: PP (R^2 = 0.393)				
ST → PP	0.627***	0.027	0.558	0.663

Note ***p < 0.000; **p<0.01; * p<0.05; ns = not significant; ST = streaming shopping attributes, PU = perceived usefulness;
PEOU = perceived ease of use; PP = perceived playfulness, ATT = attitude, PB = purchase behavior

The serial mediation analysis was applied to test the mediation of the relationship of streaming attributes and purchase behavior whether it mediates by extended TAM (PU, PEOU, PP and attitude) in the context of live streaming shopping in table 4. The results show that serial mediation as proposed in H9 (ST → PU → ATT → PB) is positive but not significant as the bias-corrected bootstrap interval is intersected zero (βh9=0.027, SE= 0.027, 95%CI [-0.024, 0.081]). Hence, PU and ATT were not mediated the relationship and H9 was not supported.
The causal indirect effects of PEOU and PP and attitude (ATT) as two sequential mediators in the relationship between shopping streaming attributes and purchase behavior as proposed in serial mediation of H10 and H11 were supported. The relationship of PEOU and ATT (ST → PEOU → ATT → PB) was positively significant (β=0.174, SE= 0.027, 95%CI [0.124, 0.230]). Thus, the higher consumers feel easy to use the platform will lead to positive attitude which will complement the relationship of streaming attributes and purchase behavior supporting H10. Similarly, H11 (ST → PP → ATT → PB) was positively significant (β=0.179, SE= 0.025, 95%CI [0.131, 0.228]). The more consumers have fun and engagement with the platform it creates positive attitude and strengthens the relationship towards purchase behavior.

Table 4: Indirect effect, Total effect and mediation evaluation

			Bootstrapping 95% (CI)		
Indirect Effect	**Coefficient**	**Standard Error**	**Lower**	**Upper**	**Conclusion**
ST → ATT → PB	0.005ns	0.030	-0.055	0.064	No mediation
ST → PU → ATT → PB	0.027ns	0.027	-0.024	0.081	No mediation
ST → PEOU → ATT → PB	0.174*	0.027	0.124	0.230	Serial mediation
ST → PP → ATT → PB	0.179*	0.025	0.131	0.228	Serial mediation
Total Effect					
ST → PB	0.465***	0.032	0.410	0.536	

Note ***p < 0.000; **p<0.01; * p<0.05; ns = not significant; ST = streaming shopping attributes, PU = perceived usefulness, PEOU = perceived ease of use; PP = perceived playfulness, ATT = attitude, PB = purchase behavior

5.2 Discussion

This study provides key insights into the influence of streaming shopping attributes on consumer purchase behavior. While streaming features significantly affect Perceived Usefulness, Ease of Use, and Playfulness, Ease of Use and Playfulness play a more dominant role in shaping consumer attitudes and purchase behavior than Perceived Usefulness. The findings offer a more holistic understanding of how mediators interact in live streaming shopping, expanding the traditional focus on isolated mediators like Perceived Usefulness. By using serial mediation, this study sheds light on how consumer perceptions evolve in response to streaming shopping attributes, a perspective often underexplored in consumer behavior research. This sequential process reflects how consumers cognitively and emotionally evaluate a technology-driven shopping experience, where ease of use and usefulness establish a functional foundation, and playfulness enhances engagement, ultimately strengthening purchase intention. By examining this pathway, the study provides a more nuanced explanation of how Live Streaming influences consumer decision-making beyond direct effects.

The results confirm the significant role of streaming features and attributes in driving purchase intentions, aligning with previous research on innovative shopping platforms (Lemon & Verhoef, 2016). However, the direct negative effect of streaming attributes on purchase behavior ($\beta = -0.086$, $p < 0.05$) suggests that unobserved factors, such as platform familiarity, satisfaction with product features, or potential distractions from the streaming experience, might reduce purchase behavior. This finding challenges the assumption that streaming features always lead to increased purchases, highlighting the need for further exploration into the complex dynamics at play. The insignificant support for Perceived Usefulness in shaping attitudes (H5) consistent with earlier e-commerce research (Venkatesh & Davis, 2000), suggesting that consumers may place more importance on entertainment and social interaction than on functional utility in live streaming shopping. Similar to T. Ramayah and Joshua Ignatius research, who also found that Perceived Usefulness (PU) did not significantly influence online shopping intentions (Ramayah & Ignatius, 2005). It is highlighted that the importance of ease of use and playfulness as key factors in engaging consumers in digital environments (Venkatesh et al., 2012).

Entertainment has been identified as a major influence on Facebook Ads, a social media platform, with a significant positive impact on purchase intention (Ho Nguyen et al., 2022). The role of ease of use and playfulness in shaping consumer attitudes and behaviors in live streaming shopping supports the notion that consumer decisions are influenced by both hedonic and utilitarian factors (Van der Heijden, 2004). The significant serial mediation effects of ease of use and playfulness suggest that consumer behavior is shaped not only by functional benefits but also by enjoyable and easy-to-navigate experiences. This highlights how serial mediation can provide deeper insights into consumer decision-making processes and emphasizes the results from previous studies that ease of use and enjoyment significantly influence attitudes and purchase decisions in digital commerce (Venkatesh et al., 2012). By integrating Perceived Playfulness into the Technology Acceptance Model (TAM) and that it shows serial mediation between attributes and purchase behavior. This contributes to expanding TAM's applicability in the context of live streaming shopping since TAM was originally used for adoption in the organization. The adjustment is needed for consumers' adoption. Hence, platforms that cater to both functional and emotional needs are likely to achieve greater consumer engagement and drive conversions (Venkatesh et al., 2012). It was found that key factors influencing customers' intention to continue using online shopping include their attitudes toward the online shopping experience and their overall satisfaction with it. Customers who hold a positive attitude toward online shopping are more likely to engage in it regularly (Završnik, 2024).

6. Conclusion

This study contributes to the deeper understanding of consumer behavior in streaming shopping by expanding the existing frameworks of the Technology Acceptance Model (TAM) and Flow Theory by incorporating Perceived Playfulness (PP) alongside Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) as mediators, offering a more comprehensive understanding of how live streaming attributes influence purchase behavior. By introducing serial mediation, it uncovers the sequence of effects that lead from streaming attributes to attitudes and ultimately purchase behavior, providing valuable insights into the psychological processes driving consumer decisions in streaming commerce. This research contributes to the literature by offering a more nuanced model of consumer behavior in interactive, entertainment-driven shopping environments.

7. Recommendations

The findings of this study emphasize the critical role of live streaming attributes—such as real-time interaction, high-quality video, and personalization—in shaping consumer perceptions of Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness, which ultimately drive purchase behavior. To optimize the shopping experience, streaming commerce platforms should prioritize these elements to enhance engagement and build consumer trust. Real-time interaction allows consumers to actively participate, ask questions, and receive instant responses, fostering a sense of connection and credibility. High-quality video enhances product visualization, enabling more accurate evaluations and boosting confidence in purchase decisions. Additionally, personalized recommendations and tailored content make the shopping experience more relevant and engaging, increasing consumer satisfaction and retention.

From a business perspective, integrating these key attributes into live commerce platforms is essential for improving consumer satisfaction and conversion rates. Businesses should focus on designing platforms that streamline the shopping process while incorporating interactive and entertaining features. Elements such as gamification, social engagement tools, and real-time product demonstrations can significantly enhance the playfulness of the experience, encouraging impulsive purchases and long-term engagement. Platforms that effectively

balance ease of use, seamless transactions, and emotional engagement—through entertainment and social connectivity—are more likely to foster consumer loyalty and drive higher sales. By strategically aligning functionality with entertainment, live streaming commerce platforms can establish themselves as competitive and compelling tools in the evolving digital marketplace.

8. Limitations and Future research

Despite its contributions, this study has certain limitations. First, the research sample primarily consisted of Thai consumers with convenient sampling, which may limit the generalizability of the findings, it is appropriate for the study's goals of testing hypotheses and gathering preliminary insights. Future studies could apply better sampling techniques and expand the sample to include consumers from diverse regions to explore potential cultural differences in live streaming commerce behavior.

Second, there is many respondents were Generation Z as the primary demographic, given their high engagement with digital platforms. While this is considered focusing on understanding the behavior of younger consumers, future research should investigate how other generational cohorts, such as Millennials or Baby Boomers, engage with live streaming commerce. This would provide a more comprehensive view of how different age groups respond to live streaming features and influence business strategies.

Finally, while this study explored the serial mediation of Perceived Usefulness, Perceived Ease of Use, and Perceived Playfulness, other factors such as trust, perceived risk, or social influence were not included in the model. Future research should examine how these additional factors such as AI chatbots and other interact tools with TAM components to further refine our understanding of consumer behavior in live streaming commerce.

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