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RESEARCH ARTICLE

Exploring Gamification for Live-Streaming Shopping–Influence of Reward, Competition, Presence and Immersion on Purchase Intention

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ABSTRACT As a new form of social commerce, live-streaming shopping (LSS) provides customers with vivid real-time communication/interaction. However, there is limited research investigating the impacts of gamification in LSS. Thus, this study explores the relationships between gamification, customers' engagement and purchase intention in LSS. A research model is formulated, and a questionnaire-based online survey is administrated to LSS viewers for empirically validating the model. Through the analysis of 272 collected questionnaires by using SPSS and AMOS, this study shows that gamification elements (including *reward* and *competition*) can enhance customers' engagement (comprising *sense of presence* and *immersion*) and *purchase intention*. Moreover, *sense of presence* significantly mediates the indirect effects of *reward* and *competition* on *purchase intention*, but *immersion* does not mediate such effects. Stores and brands can design LSS programs with *reward* and *competition* to enhance customers' *sense of presence*, *immersion* and *purchase intention*. Strategically, they should focus more on presence than immersion to better achieve their goals of LSS.

INDEX TERMS Live-streaming shopping, gamification, reward, competition, customer engagement, sense of presence, immersion.

I. INTRODUCTION

Live-streaming is originally a form of entertainment by publicly broadcasting real-time videos on online platforms, and Twitch is now the largest live-streaming game platform in the world since its introduction in 2011 [1], [2]. Live-streaming can be used by anyone, anytime to either stream or watch any streaming video content in real-time, thus making live-streaming more democratic in its nature than traditional media [3]. As an important and prospering business application of live-streaming, live-streaming commerce (LSC) (i.e., the fusion of live-streaming and e-commerce) has significantly expanded traditional e-commerce through the high level of social interaction achieved through virtual face-to-face technology [4]. LSC can bring brands and consumers (hereafter, also referred as customers) close to each other by increasing brand transparency and building customer trust in brands [4], [5]. In traditional online shopping, customers can only learn about products through the pictures and texts provided by brands, whereas brands on LSC can directly show viewers the reality of the seller and various features and appearance of product [6], [7]. Statistics show that live-streaming tends to bring in three times more views than pre-recorded videos, making it one of the best tools for brands to reach loyal customers [8]. Actually, shopping through LSC, namely live-streaming shopping (LSS), is a new form of social commerce that provides customers with more detailed product information, and real-time communication and interaction sessions for question asking/answering among streamers and audiences [5], [6]. However, the influence of LSS on business transactions and consumer behavior has not been fully understood [9].

As one of the most important performance measures indicating a firm's social media presence, Wongkitrungrueng and Assarut [2] define customer engagement as customers' behavioral manifestation toward a brand or firm that involves

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engaging in all consumer-to-firm interactions beyond purchase throughout the customer journey, and consumer-to-consumer communications about the brand. Live-streaming offers audiences with real-time watching experience and valuable opportunities to interactively communicate and socialize among streamers and audiences, and such real-time interaction is considered as a very effective element not only to attract and maintain audiences, but also to promote audience participation in live-streaming events and activities [7]. Extant studies on LSC have suggested that audiences' engagement is associated with their purchase intention [7]. To better understand the effect of live-streaming on consumer purchase behavior, Sun et al. [9] suggest that empirical studies with more rigorous methods are needed to examine the role of live-streaming in improving consumer engagement.

Gamification is the process of enhancing a service by providing a gaming experience that not only supports the overall value creation of users but also changes user behavior [10], [11], [12]. Many scholars and practitioners have worked on the concept of gamification since 2010 [13], [14]. The potential for gamification to motivate people to engage in events and activities has attracted companies in various fields [10], [11]; consequently, many companies and organizations may utilize gamification in the near future [13], [14]. Extant gamification literature focuses mostly in the contexts of education [12], e-learning [14], [15], healthcare [15], [16], and business [17], and there exists little discussion about the impacts of gamification on customer engagement in LSC [10], [13]. Nevertheless, a recent study by Wu et al. [18] also specifically states that how live-streaming engages its viewers and induces purchase behavior on LSS platforms is poorly understood. To fill this research gap, our study aims to explore the impact of gamification on customers' engagement and their subsequent purchase intention in LSS with following four objectives. Firstly, identify and empirically test relevant gamification elements that influence LSS customer engagement with LSS events. Secondly, identify relevant elements/dimensions of customer engagement (in terms of consumer-to-brand interactions and consumer-to-consumer communications) that influence customer purchase intention in LSS. Thirdly, investigate how customer engagement elements mediate the indirect effect of relevant gamification elements on customer purchase intention in LSS. Fourthly, suggest feasible strategies to achieve better customer engagement as well as customer purchase intention in gamified LSS.

The contribution of this study on gamified LSS events is fourfold. First, this study explores and confirms that live-streaming can help stores and brands create a more vivid virtual shopping experience with gamification-enabled activities for achieving desired customer interactions that entertain and encourage customers to buy products on the spot. Second, the study results can be used as reference for stores and brands to design gamified live-streaming programs for strategically increasing customer engagement with LSS events, thereby achieving the desired effect of enhancing customer purchase intention. Third, this study investigates how different customer engagement elements actually mediate the effects of gamification elements on customers' purchase intention in different ways, and then provides suggestions to stores and brands for achieving better performance in designing and implementing their LSS programs. Fourth, limitations of this study and future research directions are outlined in the final part of this article for continuing the efforts of bridging the above mentioned research gap, ultimately for helping stores and brands harvest and broaden the benefits of LSS.

II. RESEARCH BACKGROUND AND HYPOTHESES

A. LIVE-STREAMING, LIVE-STREAMING COMMERCE AND LIVE-STREAMING SHOPPING

The earliest concept of streaming (which refers to the efficient transmission of information via signals over wires to multiple receivers simultaneously) probably dates back to 1920s when broadcast radio was just starting up [19]. Several companies had demonstrated the concept of live-streaming video with prototypes in early 1990s [20]. A few years later, live-streaming video began to become the norm in late 1990s [19]. As a pioneer in offering Internet streaming media delivery software and services, RealNetworks commercialized live-streaming video services in 1997 [21]. While streaming is an evolving concept, major streaming services have emerged since the outgrowth of streaming platforms in 2000s, such as YouTube (the largest video streaming service provider launched in 2005), Netflix (a well-known video streaming service though started as a DVD rental business in 1997), and Spotify (the largest music streaming service provider launched in 2008) [20]. Nowadays, live-streaming video functions as a media by simultaneously recording and broadcasting audio and video signals of an event to audiences at other locations via one or more communication technologies over the Internet in real-time, thus making it more dynamic and more interactive than traditional media and allowing users to perceive presence of the event [1], [3], [5], [6].

We can define LSC, simply and straightforwardly, as the fusion of live-streaming and e-commerce because it integrates traditional e-commerce and live-streaming technologies [4], [7]. Indeed, the coupling of live-streaming and e-commerce is booming [7], making LSC an important branch of live-streaming [4]. LSC has significantly expanded traditional e-commerce through the high level of social interaction achieved through virtual face-to-face communication between sellers and customers [4]. LSC can narrow the distance between brands and consumers by providing real-time interactivity, visualization and personalized services, and achieve the benefit of building customer trust in brands [2], [4]. However, the academic research on LSC is still in its nascent stage, thus deserving further investigation for its better understanding [4], [7], [18].

There are two modes of LSC, namely, live-streaming embedded in e-commerce and e-commerce integrated into

live-streaming [7]. Since streaming is an evolving concept, the strategies and practices of its involved parties are rapidly evolving and shifting, thus making it inappropriate to give strict, set and limited definitions to streaming, live-streaming, LSC, or LSS [20]. Simply referring to shopping through LSC in this study, LSS can happen in two ways as well, i.e., live-streaming embedded in e-commerce, and e-commerce integrated into live-streaming. In this study, we define live-streaming as a new type of synchronous social media featuring real-time broadcast and real-time interaction. In addition, we consider LSS as a new form of shopping that combines live-streaming and e-commerce without distinguishing between the aforementioned two ways of LSS (i.e., live-streaming embedded in e-commerce, and e-commerce integrated into live-streaming). In so doing, our research findings may give insight to the design of both e-commerce and live-streaming systems devoted to achieve the benefits of LSS.

B. CUSTOMER ENGAGEMENT

Referring to an emotional bond established between customers and brands, customer engagement can be generated through customer experience, and it is impacted by customers' expected value [2], [22], [23]. Originally referring to 'the level of a customer's cognitive, emotional and behavioral investment in specific brand interactions', the definition of consumer engagement is extended by Hollebeek et al. [23] to 'a customer's motivationally driven, volitional investment of operant resources (including cognitive, emotional, behavioral, and social knowledge and skills), and operand resources (e.g., equipment) into brand interactions', making it applicable to both online and offline engagement. Implying a psychological state leading to customer proactive behaviors toward the brand, customer engagement in community commerce and social commerce can influence customers' purchase intention, satisfaction and loyalty [18], [22], [23].

To measure customer engagement, prior research emphasizes the need for assessment in various contexts [24], and such measurement should be context-specific [5]. In the context of human–computer interaction (HCI), prior research suggests that immersion, presence and perceived realism constitute engagement [25]. The HCI-specific concept of customer engagement is applicable to LSS because LSS is essentially a form of HCI [5]. Kim et al. [26] consider customer engagement in media engagement as a second-order variable that includes *sense of presence* and *immersion*, and define it as a state of immersion and presence. In the HCI settings specific to LSS, Sun et al. [5] also suggest that the measurement of customer engagement can only comprise immersion and presence because perceived realism is not applicable to LSS environments that are not fictional.

Immersion refers to a state of mind in which a person not just feels surrounded and contained but interacts with an environment that provides continuous stimulus messages and experiences [27]. The vividness of LSS help customers perceive immersion, thus making it easier to attract customers [28]. Users immersed in games tend to have high engagement in such games and continue to play, and in the marketing context, immersion may satisfy basic psychological needs and ultimately result in positive marketing outcomes [10]. Prior research further suggests that immersive feeling and engaging experience perceived by customers are conducive to interpersonal relationship and trust between streamers and audiences in LSS, thus positively influencing their evaluation and behavioral intention [4]. Accordingly, we posit hypothesis H1 as follows.

H1: In LSS, an increase in *immersion* increases customers' *purchase intention*.

Sense of presence is a subjective experience that one feels in a place or environment [27]. In LSS, customers can perceive the person they are communicating with like a real person, which leads them to perceive presence [4]. Prior research also finds that perception of presence may increase website trust, thus contributing to shoppers' decision affirmation [29]. The sense of presence in an online shopping environment can make customers feel comfortable, consequently increasing customers' purchase intention [9], [30]. Therefore, we postulate hypothesis H2 as follows.

H2: In LSS, an increase in *sense of presence* increases customers' *purchase intention*.

C. GAMIFICATION AND GAME DESIGN ELEMENTS

Gamification refers to the use of people's playful nature toward games in making fun processes that attract active participation, and it is defined by Deterding et al. [31] as 'the use of game design elements in non-game contexts'. Such game-design elements implemented in a system can make a user undergo a gameful experience [14], thus making other non-game products and services more enjoyable and more engaging as well [10]. The digital media industry first introduced the term 'gamification' in 2008 [31]. Gamification emphasizes how to engage users and solve problems through game thinking and mechanism [13], [14]. In terms of its business applications, gamification can not only increase customers' desire to create convenient and effective ways to continue their behavior, but also guide and stimulate customers to change their behavior to achieve their long-term goals including the creation of value [10], [11]. Researchers also use game elements in non-game frames to enhance user experience and stimulate their desired behavior such as knowledge sharing and improved learning motivation [14], [32]. Such game elements (hereafter, also referred as gamification elements or game-design elements) help gamification bring exciting and fascinating experiences in a context that attracts target audiences and actively engages customer behavior to achieve predetermined goals [10], [11], [32], [33].

Game elements (such as points, achievements, leader boards, virtual prize, virtual goods, virtual badges, etc.) commonly used in games can increase the motivation of the player/addressee [10], [12], [14], [33], and there exists no clearly defined set of game elements [34]. In business,

game elements such as contests, rewards, point scoring and competition with others can be introduced into marketing content to encourage customer engagement with a product or service [35]. Considering challenges and achievements as two important game elements, Schaffarczyk and Ilhan [16] integrate these two with the Self-Determination Theory (SDT) and the Uses and Gratifications Theory (U&GT) to conduct surveys with results showing that both challenges and achievements can motivate users in a non-game context to engage in desired behavior and enhance such behavior. Schaffarczyk and Ilhan [16] further note that: (1) when users get achievements through gamification settings, they will feel rewarded; (2) users like to receive reward and enjoy the feeling of getting the reward based on achievements; (3) users see achievements as personal reward. In addition to correlating achievements and reward, Schaffarczyk and Ilhan [16] also linked challenge to competition by arguing that challenge and competition are correlated, and challenge may trigger competition against others or oneself. Actually, many scholars consider *reward* and *competition* as relevant game elements that influence customer engagement in various contexts including games [15], [31], HCI [31], [33], LSC [4], education [12], [15], marketing [34], [35], [36], knowledge management [24], mobile application [10], [37], e-commerce [17], sports [16], and so on [14], [32], [38]. As such, our study considers the construct of gamification as a second-order variable consisting of *reward* and *competition* that are two game elements affecting customer engagement in the context of LSS.

Rewards refer to objects, events, situations, or activities that attain positive motivational properties from internal brain processes [39]. It is noted that there are connections among rewards, competition and behavior [15]. If the reward increases then the competition offen becomes more intense in a crowdsourcing contest environment [40]. Kumari and Barge [41] claim that a loyalty-based reward program can enhance employees' internal competition and motivation, thus positively affecting their performance. Banks et al. [42] note that a tournament-style promotion and reward systems help create a competition among employees to align employee behavior for achieving organizationally prescribed goals. Furthermore, Dissanayake et al. [43] assert that competitive reward structures with game elements can induce a sense of competition to help improve team effort and subsequent work performance. Based on the relationships between reward and competition described above, H3 is postulated as follows.

H3: In LSS, an increase in *reward* increases *competition*.

Competition through highly interactive and challenging game interactions positively correlate with emotional and cognitive engagements [44], and it is often practiced in a live-streaming environment [45]. *Reward* is an important factor influencing people's engagement and performance [46]. Following the definition from Sun et al. [5], we define customer engagement as a state of presence and immersion. In this study, we use two game elements, *reward* and *competition*, to represent the concept of gamification. Many scholars consider *reward* and *competition* as relevant game elements influencing customer engagement in various contexts (as described in the second paragraph of this subsection). Therefore, it is plausible that *reward* and *competition* (i.e., the two game elements representing gamification) positive affect *sense of presence* and *immersion* (i.e., the two engagement elements representing customer engagement) in LSS. Accordingly, we posit four more hypotheses as follows.

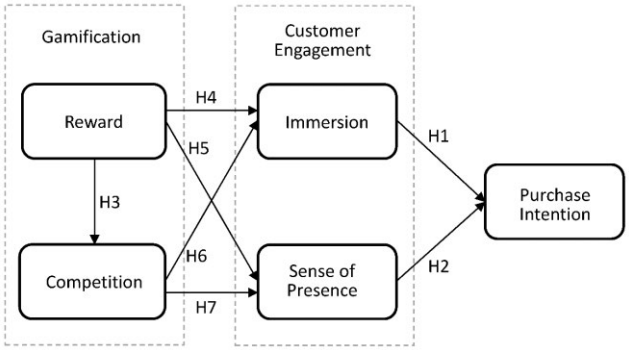


FIGURE 1. The research model together with seven hypotheses formulated in this study.

H4: In LSS, an increase in *reward* increases customers' *immersion*.

H5: In LSS, an increase in *reward* increases customers' *sense of presence*.

H6: In LSS, an increase in *competition* increases customers' *immersion*.

H7: In LSS, an increase in *competition* increases customers' *sense of presence*.

III. METHODOLOGY

A. RESEARCH FRAMEWORK

Based on the afore-described research backgrounds together with seven postulated hypotheses, we derive a research model for investigating how gamification elements influence customer engagement elements, and how customer engagement elements affects customers' purchase intention in LSS. As shown in Figure 1, in the context of LSS, we postulate seven hypotheses based on the concepts including (1) *reward* positively influences *competition*, (2) *reward* and *competition* positively influence customers' *sense of presence* and *immersion*, and (3) customers' *sense of presence* and *immersion* positively influence customers' *purchase intention*.

B. RESEARCH INSTRUMENT AND DATA COLLECTION

Based on the posited seven hypotheses, a questionnaire was developed as the survey instrument to validate the measurement model and test the structural model. We collected survey data through a questionnaire-based online survey, by posting invitations on live-streaming blogs, bulletin board systems, and virtual communities to recruit informants with shopping experience on various live-streaming platforms

TABLE 1. Questionnaire items and their derivation sources.

Reward (RE): **(Source: Yang et al. [36])**	
RE1	I think this type of game activity will get me money or reward.
RE2	I think providing reward for live-streaming shopping will make me enjoy live-streaming even more.
RE3	I would like to spend more time on live-streaming because of the reward offered.
Competition (CP): **(Source: Yang et al. [36])**	
CP1	When watching live-streaming shopping, I interact with other viewers for getting better value/outcome.
CP2	When watching live-streaming shopping, I discuss with other viewers to get more anxious and motivated to compete.
CP3	When watching live-streaming shopping, I compete with other viewers of this type of gamified activities.
Immersion (IM) **(Source: Silic and Lowry [32])**	
IM1	When watching live-streaming shopping, I will not be disturbed by other activities very easily.
IM2	When watching live-streaming shopping, I can concentrate and become absorbed in the activities.
IM3	When watching live-streaming shopping, I can not help putting myself into it and will not be easily distracted.
Sense of Presence (SP): **(Source: Sun et al. [5])**	
SP1	In live-streaming shopping, my interaction with the world created by the host/streamer is natural.
SP2	I feel there is a human sensitivity or human contact in live-streaming shopping.
SP3	When watching live-streaming shopping, I feel more like I am shopping in the 'real world' than shopping in the 'online/computer world'.
Purchase Intention (PI): **(Source: Sun et al. [5])**	
PI1	I intend to purchase goods or services through live-streaming shopping.
PI2	I would like to recommend others purchase goods or services by watching the live-streaming.
PI3	Compared to other shopping channels, I will watch live-streaming to purchase goods or services.

(such as Facebook, Shopee, YouTube, Instagram, LINE, and momoshopping) available in Taiwan.

In order to ensure the validity of scale used in this study, we developed and adapted the questionnaire items from literature reviews and modified them to fit the LSS context. Specifically, measurement items of *reward* (RE) and *competition* (CP) were adapted from Yang et al. [36], measurement items of *immersion* (IM) were derived from Silic and Lowry [32] and questionnaire items for measuring customers' *sense of presence* (SP) and *purchase intention* (PI) were adapted from Sun et al. [5]. We measured each item on a five-point Likert scale, and randomly reordered questionnaire items to reduce the potential ceiling or floor effects in measuring a construct. We also conducted a pretest to ensure that the questionnaire items could be effectively understood and validly measured. According to the obtained pretest results, we refined questionnaire items to improve its readability and reliability before using them for the formal survey. Nevertheless, we further purified the questionnaire instrument by removing items with low corrected item-to-total correlation values and performing exploratory factor analysis to delete items that did not load into appropriate factors. As shown in Table 1, the finalized version of questionnaire used in this study comprises 15 items for measuring five constructs including *reward* (three items), *competition* (three items), *sense of presence*(three items), *immersion*(three items), and *purchase intention*(three items).

C. ANALYSIS METHOD

After identifying the characteristics of respondents using descriptive statistics methods, we analyzed and interpreted the collected samples by using the statistical analysis tools SPSS 20 and AMOS 20. We first tested the scale psychometric characteristics to ensure the reliability and validity of the measurement model, by analyzing collected data to calculate and validate internal consistency, standardized factor loadings, goodness-of-fit statistics, convergent validity, and discriminant validity. Next, we performed the structural equation modeling (SEM) to derive path coefficients and verify the research model. Afterwards, we tested the postulated hypotheses by using the procedures recommended by Anderson and Gerbing [47]. Finally, we conducted multi-mediation analysis to evaluate the mediating effects between gamification elements and customers' purchase intention.

IV. EMPIRICAL RESULTS AND ANALYSIS

After collecting 362 responses, we identified invalid questionnaires by techniques such as reverse questions. Overall, 272 valid questionnaires were used for subsequent analysis. Among the 272 respondents, 96 were male (35.3%) and 176 were female (64.7%). Some respondents frequently visited more than one live-streaming platforms. Most respondents' ages ranged between 24 and 34 years old (45.2%) and between 18 and 24 years old (30.1%). In average, the respondents had about one year LSS experience, viewed and participated LSS events/programs 2∼3 times per month, spent about 1,000 NTD (New Taiwan Dollars) for each viewed and participated LSS event/program, and spent about one hour for each viewed and participated LSS event/program. Table 2 shows the demographic information about those 272 respondents.

Due to the use of self-reported method (i.e., online survey), this study needs to address common method bias (CMB), an issue with potential to invalidate the results derived from subsequent data analyses (e.g., the measurement scales' reliability and validity, and parameter estimates of the relationships among constructs) [48]. As preventive remedies for CMB, we informed all respondents that participation in the survey was voluntary, they should only choose appropriate and correct answers, and their responses would be anonymous. Moreover, we conducted a pretest to refine questionnaire items for avoiding ambiguity and misinterpretation. Additionally, we used two methods to assess CMB. First, we performed Harman's single-factor test and the result showed that CMB was not a concern because the maximum variance explained by a single factor in this study was 47.6%, less than the 50% threshold [48]. Secondly, we assessed CMB by using a marker variable [49], and the result showed no impact on our model, again confirming that CMB was not an issue in this study.

We checked the internal consistency of our measurement model by obtaining Cronbach's alpha values of all five constructs that ranged from 0.717 to 0.937 (see Table 3),

TABLE 2. Demographics of respondents.

Demographics		Number of responses	Percentage of responses (%)
Gender	Female	176	64.7
	Male	96	35.3
Age	< 18 years old	1	0.4
	18~24 years old	82	30.1
	25~34 years old	123	45.2
	35~44 years old	48	17.6
	45~54 years old	11	4.0
	> 54 years old	7	2.6
Education	Middle school or High school	9	3.3
	College/University	162	59.6
	Postgraduate	101	37.1
Occupation	Manufacturing industry	28	10.3
	Service sector	51	18.8
	Information technology	25	9.2
	Student	94	34.6
	Medical and health care	6	2.2
	Financial services	22	8.1
	Freelance	12	4.4
	Education and public services	17	6.3
	Other sectors (Media, Law affairs, Entertainment, Trade, Publication, Housewife, etc.)	17	6.3
Monthly income (in New Taiwan Dollars, NTD)	< 20,000 NTD	104	38.2
	20,000~30,000 NTD	35	12.9
	30,001~40,000 NTD	65	23.9
	40,001~50,000 NTD	44	16.2
	50,001~60,000 NTD	15	5.5
	> 60,000 NTD	9	3.3
Frequently visited live-streaming platforms (*Can check for more than one choices.)	Facebook	205	75.4
	Shopee	103	37.9
	YouTube	61	22.4
	Instagram	90	33.1
	LINE	23	8.5
	Momo Shop	16	5.9
	Others	13	4.8

exceeding the threshold value (0.7) suggested by Nunnally [50].

Afterwards, we not only conducted confirmatory factor analysis (CFA) to check the model fitness (goodness-of-fit), and the convergent validity and discriminant validity of each construct, but also performed path analysis to model the relationships between latent variables. Table 4 shows that all model-fit indices are acceptable, and the measurement model exhibits a good fit with the collected data.

We can assure convergent validity, as long as (1) the study uses different items to measure each construct and their factor loadings are higher than 0.7 on associated constructs; (2) the composite reliability of each construct is around 0.6∼0.8, and

TABLE 3. Measurement model estimation results: factor loading for each questionnaire item, and cronbach's alpha value, composite reliability and ave for each construct.

Construct	Item	Factor Loading (λ)	Composite Reliability	Cronbach's Alpha (α)	AVE
Reward (RE)	RE1	0.772	0.936	0.750	0.672
	RE2	0.851			
	RE3	0.835			
Competition (CP)	IC1	0.908	0.920	0.800	0.715
	IC2	0.902			
	IC3	0.713			
Immersion (IM)	IM1	0.946	0.926	0.937	0.892
	IM2	0.953			
	IM3	0.934			
Sense of Presence (SP)	SP1	0.787	0.957	0.717	0.645
	SP2	0.829			
	SP3	0.794			
Purchase Intention (PI)	WB1	0.892	0.930	0.881	0.808
	WB2	0.920			
	WB3	0.885			

TABLE 4. Goodness-of-fit of the measurement model.

Goodness-of-fit measure	Recommended value (Criterion)	Model statistic
Chi-square/degree of freedom	≦3.00	2.397
Goodness of Fit Index (GFI)	≧0.90	0.910
Adjusted Goodness of Fit Index (AGFI)	≧0.80	0.870
Normed Fit Index (NFI)	≧0.90	0.928
Comparative Fit Index (CFI)	≧0.90	0.956
Root Mean Square Error of Approximation (RMSEA)	≦0.08	0.072

the higher the better; and (3) the average variance extracted (AVE) for each construct is higher than 0.5 [51], [52]. Our CFA results (see Table 3) about factor loading, composite reliability, and AVE meet these criteria, so the convergent validity is assured.

To validate discriminant validity, the square root of the AVE measure on each construct must exceed the estimated correlations shared between the construct and other constructs in the model [51]. Table 5 shows that the discriminant validity in our study is acceptable, since the square root of AVE on each construct is greater than the correlations of the construct with other constructs. The aforementioned analysis results jointly assure adequate internal consistency, convergent validity and discriminant validity of our study.

We examined Hypotheses H1 through H7 postulated in our study by performing path analysis [47], and the results (see Table 6) supported all hypotheses. Specifically, both *immersion* and *sense of presence* positively influence *purchase intention* (thus, supporting H1 and H2), *reward* positively affects *competition* (thus, supporting H3), *reward* positively influences *immersion* and *sense of presence* (thus, supporting H4 and H5), and *competition* positively affects *immersion* and *sense of presence* (thus, supporting H6 and H7). Frankly speaking, while some of the hypotheses

TABLE 5. Inter-Construct correlations and the square root of AVE measure.

Construct	RE	CP	IM	SP	PI
Reward (RE)	***0.886***				
Competition (CP)	0.570	***0.891***			
Immersion (IM)	-0.079	0.107	***0.898***		
Sense of Presence (SP)	-0.012	0.213	0.739	***0.903***	
Purchase Intention (PI)	-0.070	0.165	0.616	0.666	***0.851***

*Notes: The diagonal value is the square root value of each construct's AVE

TABLE 6. The result of hypothesis test.

Hypothesis	Path	Path coefficient	T-value	P-value	Supported?
H1	IM → PI	0.125	1.977	0.048*	Yes
H2	SP → PI	0.837	8.927	***	Yes
H3	RE → CP	0.464	5.312	***	Yes
H4	RE → IM	0.134	2.226	0.026*	Yes
H5	RE → SP	0.484	6.496	***	Yes
H6	CP → IM	0.705	7.827	***	Yes
H7	CP → SP	0.571	6.501	***	Yes

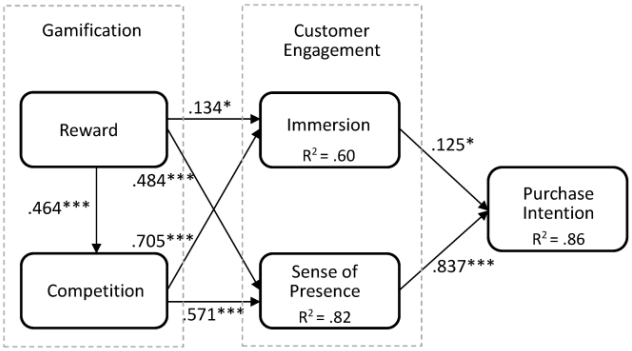
Note: RE=Reward; CP=Competition; IM= Immersion; SP=Sense of Presence; PI=Purchase Intention.
***significant at p<0.001; **significant at p<0.01; *significant at p<0.05

(namely, H1, H2 and H3) are supported by literature, some other hypotheses (H4 to H7) in this study are new and they cannot be explicitly supported in the literature, and as such constitute an important contribution to the advancement of knowledge about LSC and LSS.

Figure 2 shows the derived path coefficients for the endogenous latent variables and R-square statistics. The R-squared value of *immersion* (0.60) indicates that *reward* and *competition* explain approximately 60% of *immersion*, while the R-squared value of *sense of presence* (0.82) reveals that *reward* and *competition* explain approximately 82% of *sense of presence*. Furthermore, the R-squared value of *purchase intention* is 0.86, suggesting that *immersion* and *sense of presence* explain approximately 86% of *purchase intention*. In sum, the results indicate that gamification significantly affects customer engagement and customer engagement significantly affects customers' purchase intention in a LSS environment.

We also analyzed customers' LSS related behavior/habit (in terms of the seniority of viewing experience, viewing frequency per month, viewing time per view, and money spent in each view) against their *purchase intention* in the context of LSS. The preliminary analysis result shows that all of such behavior/habit variables have positive impact on customers' *purchase intention*. However, this preliminary result deserves to be double-checked with more rigorous methods to examine the role of such behavior/habit variables in LSS, particularly in terms of their effects on gamification elements, engagement elements, and purchase intention.

To further explore the mediating effects of customer engagement variables (*sense of presence* and *immersion*)



***significant at p<0.001; **significant at p<0.01; *significant at p<0.05

FIGURE 2. Empirical study results.

TABLE 7. Multi-mediation effect analysis results.

Path	Estimate	Bias-Corrected 95% Confidence Interval			Supported?
		P-value	Lower	Upper	
Indirect Effects:					
RE → IM → PI	0.017	0.122	-0.003	0.071	No
CP → IM → PI	0.088	0.100	-0.021	0.201	No
RE → SP → PI	0.405	0.001	0.270	0.552	Yes
CP → SP → PI	0.478	0.001	0.327	0.651	Yes
Total Effects:					
RE → PI	0.685	0.001	0.559	0.794	Yes
CP → PI	0.567	0.001	0.418	0.688	Yes

Note: RE=Reward; CP=Competition; IM= Immersion; SP=Sense of Presence; PI=Purchase Intention.

on the relationship between gamification variables (*reward* and *competition*) and customers' *purchase intention*, we use the bootstrapping for 95% confidence interval (CI) approach [53], in which the standardized indirect effect of a mediator on the relationship between gamification variables and *purchase intention* is estimated with a bias-corrected 95% confidence interval (CI) and a p-value. According to Lau and Cheung [53], if such CI does not include zero and the p-value is less than 0.05, the indirect effect is significant. Our result (see Table 7) shows that both *reward* and *competition* have significant indirect effects, mediated through *sense of presence*, on *purchase intention*; however, neither *reward* nor *competition* has significant indirect effect, mediated through *immersion*, on *purchase intention*. Simply put, *sense of presence* (instead of *immersion*) in the overall model plays a significant mediating role between these two gamification variables and customers' *purchase intention*. That is, *reward* and *competition* indirectly influence *purchase intention* through the important mediator—*sense of presence*.

V. DISCUSSION

By exploring the relationship among gamification elements, customer engagement elements and customers' purchase intention, we find that *reward* positively affects *competition,*

and this is in line with prior research findings suggesting that *reward* may affect competitive settings among various contexts [41], [42]. Actually, *reward* can induce the act of social interaction that influences customers' hedonic motivation and behavior, resulting in more enthusiasm during the promotion process [54]. Since customers may interpret *reward* either as a signal for engaging a transaction or as a signal of goodwill and appreciation, they tend to see *reward* as a benefit for their LSS, consequently encouraging their participation in live-streaming competition with high perception level of vividness [55].

Our results show that *reward* and *competition* have positive impacts on *sense of presence* and *immersion*. These two gamification elements can promote the motivation of customers to participate in LSS and attract viewers to watch live-streaming broadcasts. This is consistent with prior gamification literature suggesting that *reward* and *competition* may encourage customers to join game based marketing activities [36]. Our study results show that businesses can adopt reward programs to increase customers' engagement. *Competition* creates an environment that sets seller and buyer bargaining power to engage in the shopping process [56]. This study confirms that *reward* and *competition* may influence customers' engagement in the context of LSS.

We find that *sense of presence* and *immersion* positively affect customers' *purchase intention*. By offering reward programs and promoting social interactions with customers, sellers can enforce/re-enforce *immersion* effect, thus making the virtual world feel more like the real world [57]. *Immersion* helps users determine the values/benefits obtained from games; more immersed are the viewers in live-streaming, the easier for them to make purchase decisions. The degree of social interaction and social presence developed between buyers and sellers can reduce uncertainty and increase customers' trust, and such trust has a positive relationship with customer engagement [2]. Our results are consistent with prior research results mentioning that *sense of presence* is positively related to *purchase intention*, because the more transparent the shopping environment is the safer the customers feel [58]. Compared with traditional e-commerce media, live-streaming broadcasts can achieve, through *sense of presence* and *immersion* effects, more vivid forms of products selling process with less pre-purchase uncertainty problems, thus facilitating customers' *purchase intention*.

Our research further find that *sense of presence* significantly mediates the effects of *reward* and *competition* on customers' *purchase intention*, while *immersion* does not have such significant mediating effect. Such results are consistent with findings from Bogicevic et al. [59] revealing that *sense of presence* has significant mediating effect on brand experience in virtual space. *Sense of presence* may create an illusion of 'being there' in technology-mediated environment, thus influencing people to act/behave as in real life [60]. We find that customers experiencing *sense of presence* in LSS may act/behave the same as they shop in reality, echoing the results from Van Kerrebroeck et al. [55] suggesting that *sense of presence* may provide 'being there' scene as a marketing strategy to influence customers' purchasing behavior. In sum, *sense of presence* significantly mediates the indirect effects of *reward* and *competition* on customers' *purchase intention* in LSS environment.

VI. MANAGERIAL AND ACADEMIC IMPLICATIONS

Our study results provide several implications and recommendations for practitioners and academics in terms of LSS and LSC. Firstly, live-streaming can create a virtual shopping experience by demonstrating how to understand and use products. It helps show different products' perspectives, answer customer questions in real-time, and organize live activities that entertain and encourage customers to buy products on the spot [18], [45]. Business managers can consider the adoption of LSC by the fusion of live-streaming and e-commerce and incorporate LSC into their business practice. In doing so, they may choose either one of two modes/approaches (namely, live-streaming embedded in e-commerce and e-commerce integrated into live-streaming) that is deemed more practical and more appropriate for them. E-business may consider using live-streaming to promote sales, produce desired customer interaction, improve customer experience, increase the number of views, and enhance customers' purchase intention.

Secondly, stores and brands can design LSS programs with gamification elements, *reward* and *competition,* in a strategic way to enforce/enhance customer engagement, so that sellers can create a more vivid shopping environment with advantageous effects of *sense of presence* and *immersion* to increase customers' *purchase intention*. In recent years, live-streaming is becoming a new social model with a high degree of human-computer interaction, and the sale of goods via LSS is an emerging trend in LSC [5]. Despite only promoting sellers' products by describing or showing the product items, stores and brands can still provide reward to make customers stay and move customers from being satisfied to delighted in ways that competitors find hard to copy [61]. In addition, competition is the essence of game play, because players compete not only with others but also with themselves. In LSS, it is essential for stores and brands to integrate the competition elements with a higher number of intrinsic motivations, thus achieving a higher level of immersion as suggested by Silic and Lowry [32]. Indeed, both *reward* and *competition* are two important game elements for enhancing customer engagement in LSS, and this is consistent with the findings from prior research showing that *reward* and *competition* significantly influence users' engagement in gamified information systems and mobile apps [33], [38]. After all, with higher levels of *sense of presence* and *immersion* facilitated by *reward* and *competition* in gamified LSS, stores and brands will be able to induce and enhance customers' purchase intention.

Thirdly, while *sense of presence* significantly mediates the indirect effects of *reward* and *competition* on customers' *purchase intention*, *immersion* does not have such mediating

effect. This result suggests that stores and brands should pay more attentions to *sense of presence*, instead of *immersion*, for achieving customer engagement in designing and implementing their LSS programs. The aforementioned research findings and suggestions provide practical implications to e-stores and brands managers.

While live-streaming is a new social networking medium but its applications in e-commerce are mostly limited to the perspective of social and technological factors in studies [62], this research provides a new perspective to study LSC by understanding why gamification can be employed in LSS. In live-streaming e-commerce, how to attract customers' attention and gain visibility in fierce competition is an unprecedented challenge, undoubtedly deserving more follow-up research. While constantly looking for the most practical and quickest incentives to attract customers, researchers of LSC may have considered many factors including online reputation, customer loyalty, live-streaming charm, and various hedonic and utilitarian aspects to affect customers' purchase-decision. However, there exists little literature exploring the marketing impacts of gamification in LSS, although gamification is an important factor to increase the quality of e-commerce experience and produce desired interaction [63]. Nevertheless, limited live-streaming e-commerce literature mainly focuses on exploring the motivations and purposes of user participation in live-streaming [64]. To bridge the gap, we explore and confirm not only the influence of gamification elements (specifically, *reward* and *competition*) on customer engagement elements (specifically, *sense of presence* and *immersion*) but also the influence of *sense of presence* and *immersion* on customers' purchase intention in LSS.

For the purpose of advancing knowledge on gamification in business contexts, Krath et al. [14] argue that adding game mechanics/elements, such as reward and loyalty programs, can increase user enjoyment, but we still need to gain a deeper understanding of how users respond to game elements (such as reward and others) that impact users' engagement. Accordingly, our study formulate a research model by incorporating constructs about game elements (including *reward*), customers' engagement and purchase intention, and we find that *reward* could enhance customers' engagement and purchase intention in LSS. In addition, Bitrián et al. [10] claim that there is a need to understand better the mechanisms that explain how gamification can increase user engagement and how user engagement can foster positive outcomes. In responding to this need, this study uses two game elements (*reward* and *competition*) to represent the concept of gamification in our research model (see Figure 1), and the research findings show that both *reward* and *competition* could enhance customers' engagement and purchase intention in LSS.

VII. CONCLUSION, LIMITATION AND FUTURE WORK

This study explores how gamification elements, *reward* and *competition,* affect customers' engagement and purchase intention in LSS. We first construct a research model by postulating the relationships among gamification elements, customer engagement and purchase intention. Afterwards, we explore whether live-streaming sellers offering competitive games with reward would affect customer engagement and consequently increase customers' purchase intention while viewing LSS programs. Our study results show that in LSS those two gamification elements have significant impacts on customer engagement elements, *sense of presence* and *immersion*. Moreover, we also find that *sense of presence* and *immersion* would significantly affect customers' *purchase intention* in live-streaming shopping. Additionally, our study results also reveal that *sense of presence* significantly mediates the indirect effects of *gamification* elements on customers' *purchase intention*, but *immersion* does not have such mediating effect.

This research does not address the issues of the design and implementation of various LSS programs; however, different programs with various design philosophies and implementation approaches might influence customers' perception, engagement, and purchase behavior differently during viewing LSS programs. Indeed, to study various design and implementation issues in follow-up LSS research is worth trying. Marketing products and services via live-streaming is an exciting business arena with valuable research and application potentials. Research into detailed design of commercially applicable and valuable live-streaming services is hopefully not only to broaden the scope of its practical applications but also to shed light on developing LSS theories in terms of enhancing applicable marketing services and applications.

Given that, this LSS study has demonstrated how *reward* and *competition* influence customers' purchase intention, we suggest future studies to consider and incorporate other gamification elements, such as badges, leader boards, levels, socialization, achievement and progression, virtual prizes, virtual goods, among others [10], [12], into our research model to suit various application domains. Due to time and budget constraints, this research inevitably suffers from limitations. Since we only considered and analyzed data collected from participants in Taiwan, the results might not be directly applicable to other contexts because the culture, custom, lifestyle, and/or habit in other regions might not be the same. Therefore, we strongly recommend future studies to replicate this research in other regions to reconfirm our results before adopting its general implications.

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