An empirical study on the influencing factors of learning through knowledge sharing live streaming
- Based on live streaming platform in China

Yi Liu[1], Young-Hwan Pan[2*]
[1]Ph. D. Course, Dept. of Experience Design, TED, Kookmin University
[2]Professor, Dept. of Experience Design, TED, Kookmin University

지식 공유 라방 학습 영향요인에 대한 실증 연구
- 중국 라이브 방송 플랫폼을 기반으로 하여

류이[1], 반영환[2*]
[1]국민대학교 테크노디자인전문대학원 경험디자인학과 박사과정, [2]국민대학교 테크노디자인전문대학원 경험디자인학과 교수

Abstract The emergence of knowledge-sharing live streamers provides more diversified content to the live streaming platform. Analysis of the factors affecting the intention to use knowledge sharing live streaming users can allow the live streaming platform to understand better the adoption characteristics of users who follow this type of content. Help platform operators provide better services and help live streaming platforms innovate. Based on the TAM model, this research uses questionnaire surveys and structural equation models to construct a conceptual model of the influencing factors of users' intentions in the knowledge sharing live streaming and conduct an empirical analysis on the influencing factor models. The results of data analysis show that a significant influence of users' attitudes of knowledge sharing live streaming is perceived usefulness, followed by flow experience; perceived value has a positive impact on users' attitudes and intention to use, and the positive influence of users attitude significantly affect the user's intention.

Key Words : Knowledge sharing live streaming, TAM model, Perceived value, Flow experience, Attitude, Intention

요 약 지식 공유 라이브 방송의 출현은 라이브 방송 플랫폼에 더 많은 다원화적인 내용을 제공하였다. 지식 공유 라이브 방송 사용자의 사용 의향에 대한 영향 요인을 분석하면 인터넷 라이브 방송 플랫폼으로 하여금 이러한 내용에 관심을 가지는 사용자의 사용 특징을 더 잘 이해하게 할 수 있다. 또한 플랫폼 운영업체에 더 좋은 서비스를 제공하여 라이브 방송 플랫폼의 혁신에 도움을 줄 수 있다. 본 연구는 TAM모델을 기반으로 설문조사와 구조방정식 모형을 이용해 지식 공유 라이브 방송 중 사용자 의향에 대한 영향 요인에 관한 개념 모형을 구축하고 지식 사용자의 영향 요인 모형에 대해 실증 분석을 진행한다. 데이터 분석 결과에 따르면, 사용자가 지식 공유 라이브 방송 태도에 미치는 유의한 영향은 지각된 유용성이고 다음은 몰입 체험이며, 지각된 가치는 사용자 태도와 사용 의향에 긍정적 영향을 미치고 사용자 태도의 긍정적 영향은 사용자의 사용 의향에 유의한 영향을 미치는 것으로 나타났다.

주제어 : 지식 공유 라이브 방송, TAM모델, 지각된 가치, 몰입 체험, 태도, 의향

1. INTRODUCTION

Live streaming is a new social media that allows people to share their lives in real-time through their own devices [1] and socialize with others, profoundly impacting users' daily lives. The average data of Twitch, the world's leading online broadcast platform, in 2021 shows that there are 140 million monthly active users worldwide[2]. Related studies have found that live streaming is diverse, often focusing on video games, live events, civic content, live performances, or merchandising [3]. Moreover, live streaming breaks through the limitation of the field, WIFI environment coupled with intelligent mobile phones can broadcast live anytime and anywhere, and it makes the elite culture and grassroots culture stand on the same platform, through the infectious power of video to attract the relevant people, thus building the connection between people.

In China, live streaming and video sharing apps are top-rated. According to the data released by China Internet Network Information Center, as of December 2020, the scale of Chinese live streaming users reached 617 million, accounting for 62.4% of the overall Internet users [4] Due to the popularity of Chinese live-streaming platforms, many knowledge sharing live streamers and cultural practice sharing live streamers have emerged. Their emergence provides new opportunities and possibilities for people who previously had no access to knowledge [5]. Knowledge sharing live streaming, where hosts provide new knowledge and skills through live "classes," offers new opportunities and possibilities for people who previously did not have access to knowledge. Compared with offline knowledge sharing and other online learning platforms (e.g., MOOC), the advantages of live knowledge sharing are low information density, real-time,

and intense scenario, during which users can carry out real-time open discussions with live broadcasters and other users [6]. Thus, it breaks the space limitation and bringing users a more interactive knowledge learning platform. China's major Internet platforms also began to layout knowledge field live project, gradually improve the construction of knowledge content ecology, realize the "knowledge sharing live streaming" entire layout, provide more people with the opportunity to obtain knowledge without threshold, and provide a new engine for the innovation of the live streaming industry.

In the related study, Lu [7] pointed out that content and form of the Stream, aesthetics, communication with others, and emotional reactions are essential factors to viewers' engagement in non-gaming live streaming. Chiu [8] demonstrated that fun and fairness significantly influence users' continuous knowledge sharing through satisfaction in virtual community knowledge-sharing activities. Scheibe [9] compared synchronous streaming social media such as live streaming and asynchronous streaming, social media such as WeChat and Weibo from two perspectives of information behavior and user motivation. He illustrated that the primary information behavior of live streaming includes watching, live streaming, chatting, and gift-giving and verified that perceived ease of use is the primary motivation for using live streaming. Payne [10] tested the learning effect of live teaching on Twitch through an experimental method and found that learners fully interact with the system, and the streamers led to more efficient learning. Existing studies reveal factors that influence people's behavior in knowledge sharing or live streaming, but there are relatively fewer results on factors influencing live streaming users' usage behavior around a

distinct group (knowledge sharing).

This study argues that knowledge sharing live streaming is a "disruptive innovation" to traditional knowledge sharing. What factors affect users' intention to learn through live streaming is essential for the sustainable development of knowledge-sharing live streaming in the future. The technology acceptance model (TAM) is a standard model used to study new technology acceptance behavior and can effectively explain user behavior. This study introduces TAM to knowledge sharing live streaming platform, and on this basis, considers live streaming platform (perceived ease of use, perceived usefulness), user experience (flow experience, perceived value). Introduces perceived value and flow experience and proposes an extended model based on TAM to study the factors influencing intention learning through knowledge sharing live streaming. In addition, this study examines the influence of live streaming scene characteristics on users' learning by knowledge sharing live streaming from the perspective of flow experience. This study can provide user usage characteristics for live streaming platforms to build knowledge-sharing live-streaming communities in the future to establish a better knowledge-sharing service with live streaming as a medium.

2. THEORETICAL BACKGROUND

2.1 Research object

Knowledge sharing live streaming, live streamers share knowledge and interact with the community through the medium of live streaming. Live streaming does not define the content, so knowledge sharing live streaming requires users to watch and participate in forming a mechanism for content co-construction. Fig. 1.
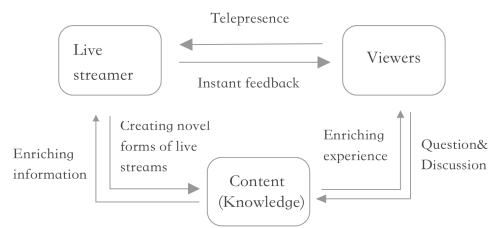

Fig. 1. Content Co-construction

Knowledge sharing live streams allow users to ask relevant questions that the streamers will answer during the stream. These live streams are more like lectures or training sessions where the host uses slides or other media to talk about the topic, present the process or basic information, and answer questions from the audience. Knowledge sharing topics usually include formal knowledge (e.g., language learning, graduate school entrance exam preparation, math, psychology, finance and investing, traditional Chinese culture or technology, et al.) or informal knowledge (e.g., cooking, interview skills, pick-up tips, antique evaluation, skincare, personal health, baby care, fitness, DIY, et al.)[3]. Watching knowledge sharing live streaming is random, and users can enter and exit at any time. So compared to other online learning platforms, users watching knowledge-sharing live streaming are more focused on the targeted search for answers, can acquire knowledge in a lively and exciting way, and can carry out real-time open discussions[11].

Among Chinese live-streaming platforms, besides Douyin and Kuaishou, which are very popular in streaming, the instant messenger Wechat, knowledge-sharing platforms: Zhihu, Dedao, and Bilibili all have live streaming features, and compared to Douyin and Kuaishou, which are more entertainment live streaming, the knowledge sharing platforms provide users with more, For example, the

"voice call" feature increases user engagement, and questions and discussions provide classroom discussion and sedimentation. Fig. 2.

Fig. 2. Knowledge sharing live streaming in Douyin,Wechat and Zhihu

2.2 TAM model

The technology acceptance model (TAM) is a research model proposed by F. D. Davis in 1989 based on rational behavior, combined with self-efficacy theory and expectation confirmation theory [12]. In 2001, J. W. Moon et al. introduced perceived usefulness into the TAM model and conducted an empirical study on users' intention to use the World Wide Web to verify the model's validity [13]. The correctness of the model was verified [14]. Perceived usefulness and perceived ease of use have been shown to have significant positive effects on users' intention to use new technologies [15]. As a medium for knowledge sharing, the live streaming platform positively influences users' intention to use knowledge sharing live streaming to acquire knowledge when they perceive that watching knowledge sharing live streaming using a live streaming platform can effectively help them acquire knowledge. Also, in the TAM model, intention to use predicts and influences usage behavior, and a higher intention to use is likely to lead to actual behavior [30].

2.3 Flow experience

Csikszentmihalyi [16], who focused on consumer experience, first introduced the concept of "flow experience" by focusing on the psychological satisfaction of online consumers during online shopping, i.e., when individuals are in a state of flow experience, they are wholly absorbed by what they are doing, are very happy and feel that time passes quickly. Ghani and Deshpande [17] outlined two essential manifestations of flow experience: complete engagement in an activity and pleasure from the activity, and the outcome of the flow experience causes participants to focus on the process of the experience and thus lose the sense of time. Xiong[18] demonstrated a positive and significant effect of perceived usefulness on the flow experience of mobile social users. Judy's [19] study on portals found that the flow experience affects users' persistent website usage behavior. For example, Lee (20) combined the expectancy confirmation model, technology acceptance model, theory of planned behavior, and theory of flow experience and found that online learners' concentration on learning was positively related to their intention to continue learning. Therefore, the experience of feeling happy and engaged within the user when using knowledge sharing live learning would be an influential factor in the user's intention to use.

2.4 Live streaming charactericstics and flow experience

Combining the factors that significantly affect users' flow experience of online learning [21] and the characteristics of the live streaming scenario [22], we suggest that telepresence and instant feedback effectively affect the flow experience of learning through knowledge sharing live streaming. Telepresence is a sense of immersion in an environment shaped by a

medium and a sense of reality, commonly referred to as "being there" (23). In live streaming, the co-construction of content between the user and the live streamer makes them feel like they are part of the live streaming and gives them the feeling of being in a physical classroom rather than a virtual classroom. Previous studies have also demonstrated that the sense of telepresence can lead to a flow experience , Similar conclusions have been obtained in 3D virtual worlds by Nah et al[24]..Therefore, this study makes the following hypothesis.

Instant feedback is referred to as media synchronicity [25]. In knowledge sharing live streaming, instant feedback denotes real-time communication between the live streamer and the user. Csikszentmihalyi [26,27]states that instant feedback is a conditional factor for flow experience. Moreover, frequent, open communication with students in knowledge sharing is key to enhancing student learning and building mutual respect and belonging , and promotes student engagement and interest in online learning [26].

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2.5 Perceived value

Initially, perceived value originated from equity theory, which is an assessment of the expected expenditure of a product or service by the user versus the expected gain of the provider [18], based on which Zeithaml [28] extended the equity theory to consider perceived value as a comparison between the perceived gain and the perceived cost of a product after consumption. Holbrook [29] et al. argue that perceived value should be understood from the practical and user's experience perspective. Sheth [30] et al. proposed the "five dimensions" of perceived value from the perspective of consumption based on the theory of Zeithaml. Perceived value includes two dimensions of perceived functional value and difficulty expectation in knowledge sharing live streaming. This study considers perceived functional value as the content value of knowledge sharing live streaming, which refers to users' perceptions of knowledge availability and expertise when watching knowledge sharing live streaming. Difficulty expectation takes as the cost paid for watching live streaming, referring to users' perceptions of the difficulty of learning through live streaming platforms [31]. Previous studies have empirically investigated the factors influencing users' intention to interact with information in the new media environment and found that users' perceived value positively influenced their intention to interact with information [32].

3. Conceptual model, hypotheses and research method

3.1 Conceptual model

Fig. 3 illustrates the conceptual model for this study, based on the TAM model, which assumes that intention to learn through knowledge live streaming is influenced by several factors: personal perceived ease of use, perceived usefulness, flow experience, perceived value,

and attitude. The intention is the extent to which users want to continue to learn through knowledge-sharing live streaming in the future. Perceived value is defined as the user's perception of the value of the live content. Perceived value was assumed in the assumptions of the research model to be directly related to the intention to learn through knowledge sharing live streaming. Flow experience is defined as how users focus, enjoy, and delight in learning through live streaming. In addition, perceived ease of use and usefulness indicates the ease with which users can improve the efficiency of acquiring knowledge through knowledge sharing live streaming. In addition, the attitude towards learning through knowledge live streaming is used as a mediating variable, and this variable is influenced by perceived ease of use, perceived usefulness, flow experience, and perceived value. We also propose that perceived usefulness, telepresence, and instant feedback directly affect the flow experience.
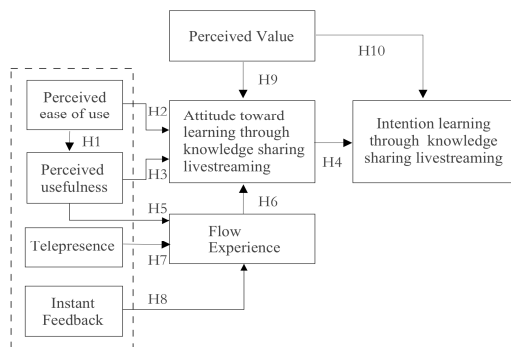

Fig. 3. Theoretical model of user intention to learn through knowledge sharing live streaming

3.2 Hypotheses

In order to analyze the factors that influence users' intention to learn through knowledge sharing live streaming, based on the above theoretical background and research model, this study proposes the following hypotheses.

Table 1. Hypothetical Relations of factors

No.	Hypotheses	Hypothesis Content
1	H1	Perceived ease-of-use is positively related to perceived usefulness
2	H2	Perceived ease-of-use is positively related to attitude toward learning through knowledge sharing live streaming
3	H3	Perceived usefulness is positively related to attitude toward learning through knowledge sharing live streaming
4	H4	Attitude is positively related to intention to learn knowledge sharing live streaming.
5	H5	Perceived usefulness is positively related to flow experience
6	H6	Flow experience is positively related to attitude toward learning through knowledge sharing live streaming
7	H7	Telepresence is positively related to flow experience
8	H8	Instant feedback is positively related to flow experience.
9	H9	Perceived value is positively related to attitude toward learning through knowledge sharing live streaming
10	H10	Perceived value is positively related to intention to watch knowledge sharing live streaming.

3.3 Research method

The data collection method of this study adopts a questionnaire, which is divided into two parts. The first part is a survey of users' basic conditions, with 8 questions, including gender, age, education background, occupation, city, whether they have seen knowledge sharing live streaming, the live streaming platform they use, the length of time they have used the live streaming platform, and all 6 questions are single choice except for "city" and the live streaming platform they use, which are fill-in-the-blank and multiple choice. After the initial questionnaire was formed, users with experience in knowledge sharing live streaming were invited to pre-test the initial questionnaire,

and the corresponding questions were adjusted according to the feedback from the pre-testers to ensure that the respondents could better understand the questions and fill them out accurately in the formal survey. Finally, 23 questions were identified for measurement. The perceived value is based on Sweeney and Soutar's research[33] The scale items for perceived ease-of-use, perceived usefulness, attitude, and behavioral intention to play were developed from the study of Davis[12] , which has been validated in numerous studies, and the Flow Experience scale was primarily referenced from Sweetser [34]. Variables were measured on a 5-point Likert scale: 1 for "strongly disagree", 2 for "disagree", 3 for "average", 4 for 1 means "strongly disagree", 2 means "disagree", 3 means "average", 4 means "agree", and 5 means "strongly agree".

3.4 Data collection

The survey target of this study is users who learn through knowledge sharing live streaming. The survey is divided into two stages, the first stage was a pre-survey, mainly for the employees of an Internet company, and 86 questionnaires were collected. After the exploratory factor analysis and validation factor analysis, some questions were modified and deleted, and the official questionnaire with 23 items was obtained. The second stage of the formal survey, through the Questionnaire Star online questionnaire platform directly issued questionnaire link to collect data, the formal survey is not limited to the Internet company employees, in order to ensure the heterogeneity of this formal survey sample, the survey respondents were selected from different attributes, different ages. 313 questionnaires were finally collected. After removing invalid questionnaires, a total of 266 valid data were

collected. As shown in Table 1. Descriptive analysis of the valid data, from the gender perspective, men accounted for 50.4%, women accounted for 49.6%, the distribution of men and women is relatively even; from the age perspective, the subjects were primarily distributed in the age group of 20-25 years old, the proportion of 32%, followed by 26-30 years old accounted for 27.8%, the least under 20 years old, accounting for 4.9%; from the education level, the subjects' education The level of education is generally high, including 41% of bachelor's degree, high school or less than 6%, the subjects have high cultural quality, making the questionnaire more persuasive; from the perspective of occupation, students accounted for the majority of 34.2%, followed by corporate employees accounted for 22.9%; sample data involves more types, with good representation; finally, from the live platform use time, the respondents Finally, from the viewpoint of the length of use of live streaming platform, the respondents mainly focus on 6 months-1 year and 1-2 years, of which 6 months-1 year accounts for 25.6% and 1-2 years accounts for 35.7%. Table 2.

Table 2. Demographic profile of respondents (N=266)

Measure	Items	Frequency	Percentages
Gender	male	134	50.4
	female	132	49.6
Age	<20	13	4.9
	20-25	85	32
	26-30	74	27.8
	31-35	48	18
	36-40	18	6.8
	>40	28	10.5
Educational Background	High school or below	16	6

	specialized subject	100	37.6
	undergraduate (adjective)	109	41
	Master's degree or higher	41	15.4
Occupation	No regular occupation for the time being	29	10.9
	Students	91	34.2
	company employee	61	22.9
	government official	38	14.3
	freelancer	47	17.7
Length of use of the live streaming platform	Less than 3 months	28	10.5
	3–6 months	34	12.8
	6 months – 1 year	68	25.6
	1–2 years	95	35.7
	More than 2 years	41	15.4

4. Result

4.1 Reliability and validity

Cronbach's a coefficient and combined reliability were used to determine the validity and reliability of the questionnaire. As shown in Table 3: the reliability coefficient Cronbach's α values of each study variable are above 0.7, thus indicating good quality of reliability of the study data, indicating high reliability of the study.[35]

As can be seen from Table 3, the average variance extracted (AVE) for each variable and its dimensions are above 0.5 and the combined reliability (CR) is above 0.7, showing an adequate convergence validity.

Table 3. Results of reliability and validity analysis

Construct	Items	Factor loading	T	CR	AVE	Cronbach's Alpha
Attitude (A)	A1	0.745***	12.579	0.783	0.644	0.774
	A2	0.856***	14.633			
Intention (I)	I1	0.922***	18.300	0.877	0.781	0.875
	I2	0.844***	16.130			
Flow Experience(FE)	FE1	0.840***	16.409	0.900	0.693	0.899
	FE2	0.814***	15.638			
	FE3	0.836***	16.290			
	FE4	0.840***	16.417			
Instant feedback(IF)	IF1	0.881***	17.419	0.894	0.738	0.891
	IF2	0.835***	16.112			
	IF3	0.860***	16.812			
Perceived ease of use(PE)	PE1	0.88***	17.555	0.904	0.759	0.903
	PE2	0.869***	17.21			
	PE3	0.864***	17.073			
Perceived usefulness(PF)	PU1	0.829***	15.964	0.889	0.727	0.887
	PU2	0.884***	17.564			
	PU3	0.844***	16.379			
Perceived value(PV)	PV1	0.839***	16.17	0.882	0.714	0.881
	PV2	0.836***	16.083			
	PV3	0.859***	16.740			
Telepresence (T)	T1	0.725***	13.200	0.876	0.704	0.870
	T2	0.928***	18.692			
	T3	0.852***	16.452			

The fit indices for the measurement model Table 4 as follows: c2/df=1.541 is below 3, RMSEA=0.045 is below 0.08, SRMR=0.039 is below 0.08, GFI=0.909 is above 0.9, AGFI=0.875 is above 0.8, IFI =0.973 is above 0.9, NFI=0.927 is above 0.9, TLI= 0.966 is above 0.9, CFI = 0.973 is above 0.9。Consequently, all the measures indicated that the model fit the data.

Table 4. Recommended and actual values of model fit indices

Measures	Recommended Criteria	Measurement Model
c2		311.201
df		202
c2/df	〈3	1.541
AGFI	〉0.8	0.875
GFI	〉0.8	0.909
SRMR	〈0.08	0.039
RMSEA	〈0.08	0.045
IFI	〉0.9	0.973
NFI	〉0.9	0.927
TLI (NNFI)	〉0.9	0.966
CFI	〉0.9	0.973

As shown in Table 4, there is a significant correlation between the variables except that there is no correlation between perceived ease of use and telepresence and timely feedback (p < 0.05) In addition, the correlation coefficient of each latent variable is less than 0.6 and the correlation coefficients between the latent variables are less than the square root of AVE, indicating that each latent variable has some correlation with each other and some differentiation between them, indicating that the latent variables have good discriminant validity.

In addition, a one-factor model (with the correlation coefficient between any two factors set to 1) was assumed and compared with a two-factor model in order to freely estimate the correlation coefficient. The results showed that the cardinality of the one-factor model was significantly worse than that of the two-factor model, with sufficient discriminant validity. Table 5.

Table 5. Correlations Between Latent Constructs.

|	Mean	SD	1	2		4	5	6	7	8
Perceived Value	3.709	0.856	0.845							
Perceived ease of use	2.754	1.145	0.190**	0.871						
Perceived Usefulness	3.667	0.875	0.484**	0.315**	0.853					
Telepresence	2.853	1.134	0.366**	0.091	0.267**	0.839				
Instant Feedback	2.484	1.088	0.171**	0.034	0.187**	0.348**	0.859			
Flow Experience	3.110	1.184	0.493**	0.286**	0.489**	0.424**	0.349**	0.832		
Attitude	3.282	1.146	0.455**	0.280**	0.485**	0.383**	0.280**	0.458**	0.802	
Intention	3.795	0.923	0.522**	0.350**	0.508**	0.446**	0.362**	0.560**	0.520**	0.884

4.2 Hypothesis testing
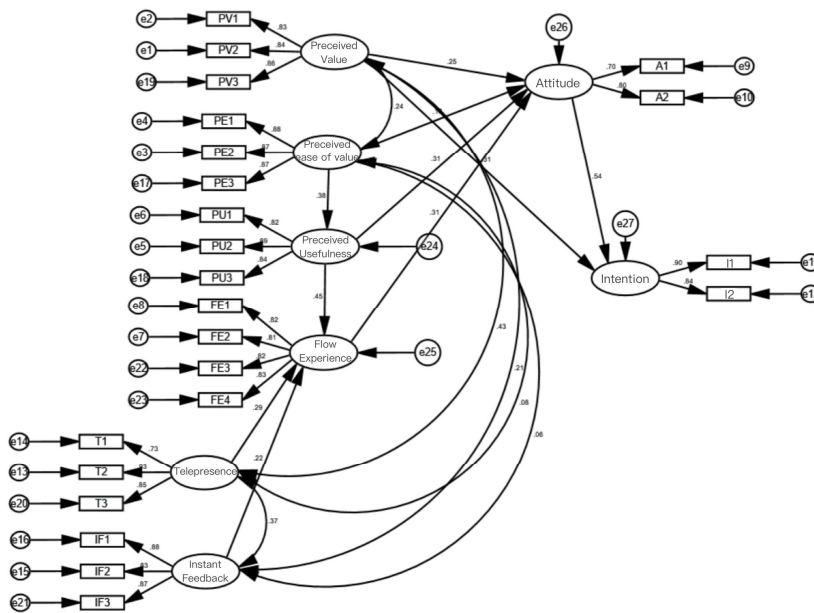
Fig. 4. Illustration of the Model

Hypothesis testing of the structural equation model was performed using Amos24.0 software, and Figure 4, Table 6 shows the results of the direct effects. The results show that perceived ease of use significantly impacts perceived usefulness, and H1 is supported. Perceived ease of use, perceived usefulness, flow experience, and perceived value all have a significant impact on user attitudes. H2, H3, H6, and H9 are supported. Telepresence, instant feedback, and perceived usefulness have a significant positive impact on the flow experience.

H5, H7, and H8 are supported. Perceived value has a significant influence on attitude and intention . H9 and H10 are supported.

Table 6. Result of direct effect

Hypoth esis	Path	Standardi zed Estimate	T-valu e	P	Suppo rt
H1	Perceived ease of use→Perceived usefulness	0.379	5.718	***	Yes
H2	Perceived ease of use→Attitude	0.159	2.301	0.021	Yes
H3	Perceived usefulness→Attitude	0.311	3.942	***	Yes
H4	Attitude→Intention	0.54	6.989	***	Yes
H5	Perceived usefulness→Flow Experience	0.449	7.288	***	Yes
H6	Flow Experience→Attitude	0.306	4.048	***	Yes
H7	Telepresence→Flow Experience	0.289	4.55	***	Yes
H8	Instant Feedback→Flow Experience	0.224	3.532	***	Yes
H9	Perceived Value→Attitude	0.249	3.624	***	Yes
H10	Perceived Value→Intention	0.314	4.84	***	Yes

We further employs the Bootstrap method to test the significance of mediating effect of attitudes by repeating random sampling 2000 times in the original data and calculating 95% confidence intervals. The standardized mediating effect values and confidence intervals are shown in Table 6. It is clear that there is a mediating effect of attitudes in the relationship between perceived value and intention, in the relationship between perceived usefulness and intention, and the relationship between flow experience and intention. In addition, attitudes do not mediate the perceived ease of use and intention relationship.

Table 7. Results of the test for intermediate effects

Hypothetical path	standardization Intermediary effect value	95% confidence interval	
		Boot-CI lower	Boot-CI upper
Perceived value → Attitude → Intention	0.135	0.027	0.366
Perceived ease of use → Attitude → Intention	0.086	−0.001	0.213
Perceived usefulness → Attitude → Intention	0.168	0.060	0.319
Flow experience → Attitude → Intention	0.165	0.062	0.36

4.3 Analysis

This study examined the effects of perceived value, perceived ease of use, perceived usefulness, and flow experience on users' attitude and behavior to learn through knowledge sharing live streaming based on TAM. After empirical testing, all the hypotheses are supported. The impact of these factors is discussed below.

The analysis results in Table 6 show that perceived usefulness effectively influences users' attitudes towards learning through knowledge sharing live streaming. This result is consistent with the findings of J. W. Moon [12], who verified that perceived usefulness rows positively influence users' attitudes towards using the World Wide Web. In this study on the scale of perceived usefulness, the main focus is on whether users can acquire knowledge more

efficiently through knowledge sharing live streaming. The more efficient users can acquire knowledge through knowledge sharing live streaming, the higher their recognition and preference for knowledge sharing live streaming, and the more positive their attitudes towards using knowledge sharing live streaming. Therefore, the focus should be on designing the platform's functional framework to help users acquire knowledge more efficiently. From the perspective of the functions of the live streaming platform, an easy operation process and a simple interface design can bring great convenience to users in screening live content and watching live streaming in a targeted manner. In addition, perceived usefulness positively impacts users' experience of generating mind-flow, indicating that users' perception of efficient knowledge acquisition can make them engaged and gain a certain sense of satisfaction.

The results of the analysis in Table 6 show that the flow experience positively impacts the user's attitude towards using it. This study also verified the positive impact of live scene characteristics on users' generation of flow experience. This result is consistent with the results of Hsu, who verified that flow experience is significantly and positively related to online shopping behavior (persistent intention, purchase intention, and impulse purchase). When learning through knowledge sharing live streaming, telepresence brought by the live streaming scenario and the instant feedback between the user, the streamer and other viewers enables users to maintain their directed attention and enter a state of focus, resulting in a flow where they feel that time passes quickly and with great enjoyment. In addition, with the autonomy and convenience in watching knowledge-sharing live streams,

users are more likely to feel that the process of learning is exciting and fun, and thus will enjoy watching such streams and using knowledge-sharing live streams to acquire knowledge.

The analysis results from Table 6 show that the perceived value has a positive impact on users' intention to use and directly impacts users' usage behavior. The diversification of live content is increasingly attracting users of different age groups and live online. In addition to the platform user experience, live content has become a key point for users to choose actively. Compared with other entertainment live streaming, users who watch knowledge live streaming have more explicit information and knowledge needs. With the continuous development of the live streaming market, more and more live streaming platforms are coming in one after another, causing users to have more opportunities to perceive value. Users have higher requirements on the content and quality of the live streaming platform, and the live streaming content with high perceived value will become the core competitiveness of the live platform.

The analysis results in Table 7 show that users' attitudes play the role of mediating variables in the perceived value, perceived usefulness and flow experience, and users' intention to use. After the learning experience, users usually look for similar content to watch live or stay connected with the streamer on other online platforms. A good user experience on a live platform with high-quality live content retains users, and the state of flow experience generated by users' immersion in the context of knowledge acquisition tends to lead users to form an attitude of liking and approval. With the encouragement and catalyst of this attitude, users will develop higher expectations and

satisfaction, and their intention to use will be strengthened.

5. Conclusion

Although live-streaming platforms are growing rapidly and have many users, knowledge sharing live streaming on each platform is uneven, and there are many problems. This paper focuses on the user behavior and experience of knowledge sharing live streaming, helps platform operators optimize their services for the factors that affect users' intention to use them, and makes innovations and breakthroughs in knowledge sharing live streaming.

This paper explores the mechanisms underlying the influence of perceived value, perceived ease of use, perceived usefulness, and flow experience on users' intention to learn through knowledge sharing live streaming based on the TAM model through an empirical study of users who watch knowledge sharing live streaming. Through quantitative research and structural equations, the results of this study show that perceived value, perceived ease of use, perceived usefulness, and flow experience can positively influence users' attitudes, and users' attitudes are also positively correlated with intention to use.

This paper provides a new behavioral analysis model for the study of knowledge sharing live streaming user behavior, analyzes the factors influencing knowledge sharing live streaming user behavior, and takes "flow experience and perceived value," two variables that reflect the characteristics of knowledge sharing live streaming, as the analysis variables of the model. Unlike most studies on entertainment and shopping, this study focuses on non-entertainment live streaming to analyze its development possibilities, which has some practical implications.

Based on the findings of this study, the following recommendations are made for live streaming platform operators and content producers to promote users' continued use of knowledge sharing live streaming to acquire knowledge:

1. Platforms focus on the ease of use and usefulness of knowledge sharing live streaming to optimize users' perceptions of use. Enhance and improve the interactivity of small-screen learning, focus on improving the efficiency of knowledge acquisition, and help users eliminate distractions and maximize knowledge acquisition.

2. The platform and live streamers should ensure the flow experience of knowledge-sharing live streaming users, both in live streaming scenes and knowledge content settings, to enable users to devote more attention and guide them.

3. The platform and live streamers should pay attention to the quality of content, highlight the "Ganhuo" [38], and provide truly valuable content.

This paper has some limitations in the study. Firstly, the sample surveyed in this paper has a wide range of respondents. As far as the empirical study is concerned, the stability of the model is proportional to the depth of the investigation of the research subjects. Therefore, in the subsequent development of the study, it should be more targeted to explore different needs. Secondly, this paper only considered external factors related to the product/service and did not study the influence of individual user characteristics and social factors on the attitude and intention to use. Future models will have to expand the relevant variables of the model further, explore the factors that influence users' usage behavior, and explore them in more depth.

REFERENCES

[1] C. C. Chen & Y. C. Liu. (2018) What drives live-stream usage intention? The perspectives of flow, entertainment, social interaction, and endorsement. *Telematics and Informatics*, 293-303. DOI：10.1016/j.tele.2017.12.003

[2] Twitch Usage and Growth Statistics: How Many People Use Twitch in 2021. Available online:https://backlinko.com/twitch-users

[3] Z. Lu. (2021) Understanding and Supporting Live Streaming in Non-Gaming Contexts .Doctoral dissertation, University of Toronto.Canada.. DOI：10.1145/3025453.3025642

[4] China Internet Network Information Center.The 47th China Statistical Report on Internet Development. http://www.cnnic.cn/hlwfzyj/hlwxzbg/hlwtjbg/20 2102/P020210203334633480104.pdf

[5] Z. Lu, H. Xia, S. Heo & S. Wigdor. (2018). You Watch, You Give, and You Engage: A Study of Live Streaming Practices in China. *In Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18), 2018, pages Paper, 466, 13.* DOI：10.1145/3173574.3174040

[6] X. Su. (2019). An Empirical Study on the Influencing Factors of E-Commerce Live Streaming, In 2019 International Conference on Economic Management and Model Engineering (ICEMME). *IEEE,* 492-496. DOI：10.1109/ICEMME49371.2019.00103

[7] Z. Lu. (2019) Improving Viewer Engagement and Communication Efficiency within Non-Entertainment Live Streaming. *In The Adjunct Publication of the 32nd Annual ACM Symposium on User Interface Software and Technology,* 162-165. DOI：10.1145/3332167.3356879

[8] C. Chiu, E. T. G.Wang, F. Shih & Y. Fan. (2011). Understanding knowledge sharing in virtual communities. *Online Information Review, 35(1),* 134-153. DOI：10.1016/j.dss.2006.04.001

[9] K. Scheibe, K. J. Fietkiewicz & W. G. Stock. (2016). Information behavior on social live streaming services. *Journal of information science theory and practice 4(2),* 6-20. DOI：10.1633/JISTaP.2016.4.2.1

[10] K. Payne, M. J. Keit, R. M. Schuetaler. (2017). Examining the learning effects of livestreaming video game instruction over Twitch. 2019. DOI：110.1016/j.chb.08.029

[11] F. D. Davis, R. P. BAGOZZI & P. R. WARSHAW. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science, (8),* 982-1003. DOI：10.1287/mnsc.35.8.982

[12] J. W. Moom & Y. G. Kim. (2010) . Extending the TAM for a World-Wide-Web context. *Information & management , 38(4),* 217 - 230. DOI：10.1016/S0378-7206(00)00061-6

[13] W. Song & X. Zhu. (2015). A study of mobile library users' behavioral intentions based on TAM model. *Librarianship Research, (11),* 71-77. DOI：10.15941/j.cnki.issn1001-0424.2015.11.014

[14] J. Ming, C. Guo & J. Zhang. (2017). A review of research on mobile library user perception behavior based on technology acceptance model in my country . *Library Forum, 37(7),* 125-131.

[15] M. L. Richins. (1997). Measuring Emotions in the Consumption Experience. *Journal of Consumer Research 24(2),* 127-146. DOI：10.1086/209499

[16] M. Csikszentmihalyi. (1975). *Beyond boredom and anxiety: Experiencing flow in work and play.* Jossey-Bass Publishers.

[17] J. A. Ghani & S. P. Deshpande. (1994) Task Characteristics and the Experience of Optimal Flow in Human—Computer Interaction. *The Journal of Psychology: Interdisciplinary and Applied, 128(4),* 381-394. DOI：10.1080/00223980.1994.9712742

[18] W. Xiong, S. Wang & Q. Pan. (2015). Research on the influence of WeChat mobile social user's flow experience on user stickiness. *News, (7),* 13-18. DOI：10.15897/j.cnki.cn51-1046/g2.2015.07.003

[19] C. C. L. Judy. (2007) Online stickiness: its antecedents and effect on purchasing intention. *Behavior & Information Technology, 26(6),* 507-516. DOI：10.1080/01449290600740843

[20] M. C. Lee. (2010). Explaining and predicting users'continuance intention toward e-learning: an extension of the expectation-confirmation model. *Computers & Education, 54(2),* 506-516. DOI：10.1016/j.compedu.2009.09.002

[21] W. Wang, R. Shi & X. Li. (2017). Research on the Influencing Factors of Online Learning

Continuous Willingness Based on Flow Experience. *China Distance Education, (05),* 17-23.
DOI : 10.13541/j.cnki.chinade.20170517.004

[22] Y. Li, Y. Peng. (2021) What drives gift-giving intention in live streaming? The perspectives of emotional attachment and flow experience. International Journal of Human-Computer Interaction. 1-13.
DOI : 10.1080/10447318.2021.1885224

[23] T. Kim & F. Biocca. (1997). Telepresence via television: two dimensions of telepresence may have different connections to memory and persuasion. *Journal of Computer-Mediated Communication , 3(2).*
DOI : 10.1111/j.1083-6101.1997.tb00073.x

[24] F. H. Nah. B. Eschenbrenner & D. Dewester. (2011). Enhancing brand equity through flow and telepresence: a comparison of 2d and 3d virtual worlds. *Mis Quarterly, 35(3),* 731-747.
DOI : 10.2307/23042806

[25] D. L. Hoffman & T. P. Novak. (2009).Flow online: Lessons learned and future prospects. *Journal of Interactive Marketing, 23(1),* 23-34.
DOI : 10.1016/j.intmar.2008.10.003

[26] M. M. Wong & M. Csikszentmihalyi. (2014). Affiliation motivation and daily experience: Some issues on gender differences. In Applications of Flow in Human Development and Education. *Springer, Dordrecht,* 305-326.
DOI : 10.1007/978-94-017-9094-9_16

[27] Z. Guo, L. Xiao. C. V. Toorn. Y. Lai & C. Seo. (2015). Promoting online learners'continuance intention: an integrated flow framework. *Information & Management, 53(2),* 279-295.
DOI : 10.1016/j.im.2015.10.010

[28] L. LaPointe & M. Reisetter. (2008). Belonging online: Students' perceptions of the value and efficacy of an online learning community. *International Journal on E-learning, 7(4),* 641-665.

[29] R. L. Oliver & W. S. De Sarbo. (1988) Response determinants in satisfaction judgments. *Journal of Consumer Research , 14(4),* 495-508.
DOI : 10.1086/209131

[30] V. A. Zeithaml. (1988). Consumer perceptions of price , quality and value: a means-end model and synthesis of evidence. *Journal of Marketing , 52(3),* 2-22.
DOI : 10.1177/002224298805200302

[31] M. B. Holbrook & E. C. Hirschman. (1982) The experiential aspects of consumption: consumer fantasies , feelings , and fun. *Journal of Consumer Research , 9(2),* 132-140.
DOI : 10.1086/208906

[32] J. N. Sheth. B. I. Newmen & B. L. Gross. (1991). Why we buy what we buy: a theory of consumption values. *Journal of Business Research , 22(2),* 159-170.
DOI : 10.1016/0148-2963(91)90050-8

[33] R. L. Oliver. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research , 17(4),* 460-469.
DOI : 10.1177/002224378001700405

[34] J. C. Sweeney & G. N. Soutar. (2001). Consumer perceived value: the development of a multiple item scale. *Journal of Retailing, 77(2),* 203-220.
DOI : 10.1016/S0022-4359(01)00041-0

[35] P. Sweetser & P. Wyteh. (2005). Game Flow: A Model for Evaluating Player Enjoyment in Games. *Computer in Entertainment, 3(3),* 3.
DOI : 10.1145/1077246.1077253

[36] J. C. Nunnally. (1978). *Psychometric theory.* McGraw Hill.

[37] C. L. Hsu. K. C. Chang & M. C. Chen. (2012) Flow experience and internet shopping behavior: Investigating the moderating effect of consumer characteristics. *Systems Research & Behavioral Science , 29(3),* 317-332.
DOI : 10.1002/sres.1101

[38] W. Yan. (2021). Whether "Ganhuo" are enough: feature extraction and problem mining of knowledge sharing live streaming. *Knowledge of library information. 38(4),* 4-14.
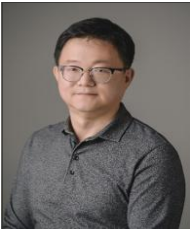DOI : 10.13366/j.dik.2021.04.004

류 이(Yi Liu)   [정회원]

· 2013년 7월 : 무한공과대학 조형 디자인과(학부)
· 2016년 6월 : 무한 기술 정보 및 상호 작용 디자인 대학(석사)
· 2019년 9월 ~ 현재 : 국민대학교 기술디자인대학원 경험디자인학과 박사

· 관심분야 : 경험디자인, 서비스디자인, 미분
· E-Mail : 309474058@qq.com

반 영 환(Young-Hwan Pan)   [종신회원]

· 1991년 2월 : 한국과학기술원 산업 공학과(공학사)
· 1993년 2월 : 한국과학기술원 인간 공학(공학석사)
· 1999년 8월 : 한국과학기술원 인간 공학(공학박사)

· 2013년 1월 ~ 2018년 12월 : 대한사용자경험전문가협회 회장
· 2019년 1월 ~ 2020년 12월 : 한국서비스디자인학회 회장
· 2006년 9월 ~ 현재 : 국민대학교 테크노디자인전문대학원 교수
· 관심분야 : 사용자 경험 디자인 전략, 서비스 디자인 방법론, AI 디자인, 지속가능디자인
· E-Mail : peterpan@kookmin.ac.kr