

Enhancing Customer Loyalty in E-Commerce: The Role of Personalization Recommendation Systems and Flow State

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[Abstract]

This study investigates the impact of personalization recommendation systems on customer loyalty in e-commerce, focusing on the role of information presentation, system interaction, and social community functions. It examines how these elements influence flow state, word of mouth (WOM), and repurchase intention (RPI). Using structural equation modeling (SEM) and data collected from 500 respondents in SPSS and AMOS, the study finds that all three personalization aspects significantly enhance flow state, which, in turn, positively affects WOM and RPI. System interaction directly boosts both WOM and RPI, while information presentation and social community functions influence only one of these loyalty measures. Flow state mediates the relationship between personalization factors and loyalty outcomes. These findings suggest e-commerce platforms should enhance system interaction and embed social community features to foster customer loyalty.

▶ **Key words:** Personalization recommendation, E-commerce, Flow state, Loyalty, Word of mouth

[요 약]

본 연구에서는 정보 제시, 시스템 상호 작용, 소셜 커뮤니티 기능의 역할에 초점을 맞춰 개인화 추천 시스템이 전자 상거래에서 고객 충성도에 미치는 영향을 조사합니다. 이러한 요소들이 플로 상태, 입소문(WOM), 재구매 의도(RPI)에 어떤 영향을 미치는지 살펴봅니다. 이 연구는 구조방정식 모델(SEM)과 500명의 응답자로부터 수집한 데이터를 SPSS와 AMOS를 사용하여 세 가지 개인화 측면이 모두 플로 상태를 크게 향상시키고, 이는 다시 WOM과 RPI에 긍정적인 영향을 미친다는 사실을 발견했습니다. 시스템 상호작용은 WOM과 RPI를 직접적으로 향상시키는 반면, 정보 제공과 소셜 커뮤니티 기능은 이러한 충성도 측정치 중 하나에만 영향을 미치는 것으로 나타났습니다. 플로 상태는 개인화 요소와 충성도 결과 사이의 관계를 매개합니다. 이러한 연구 결과는 전자 상거래 플랫폼이 고객 충성도를 높이기 위해 시스템 상호작용을 개선하고 소셜 커뮤니티 기능을 포함해야 함을 시사합니다.

▶ **주제어:** 개인화 추천, 전자 상거래, 플로 상태, 충성도, 입소문

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- Received: 2024. 05. 27, Revised: 2024. 06. 24, Accepted: 2024. 06. 24.

I. Introduction

Recommendation systems are widely used by E-commerce sites to suggest products to their customers, matching multiple products to multiple customers. It significantly helps E-commerce sites to sell their large commodity products more efficiently by providing customized services [1].

Recent theoretical developments have revealed that increasing complexity and exploding digital data have resulted in the generation of numerous recommendation systems. Besides some fundamental recommendation systems, hybrid recommendation systems and advancements in machine learning have contributed to the success of recommendation systems to be more personalized, accurate, scalable, and flexible in the e-commerce field [2, 3].

For those e-commerce sites, gaining customer loyalty is an essential business strategy where the performance of whole company depends on one or two clicks of customers [4]. Recommender systems improve loyalty by creating a value-added relationship between the site and the customer. E-commerce sites learn the customers' "manual effort" (refers to the preferences customers left on the sites) and with the operation of recommendation system, presenting customers with their flavored interfaces and products. The more a customer teaches recommendation system what they want, the more loyalty is stuck to the site [1].

These days, many e-commerce sites and platforms incorporate social media function into personalization recommendation systems as well as sites and Apps. Thus online social community is not exclusive to those frequently-used social platforms. Take Taobao, the largest e-commerce company in China, for example, Tao's Friend Moments is a function newly added, where friends can post and share products recently purchased. Even more, one's own shopping cart can be directly shared to others. Besides the regular text and picture review towards products, you can post

any questions about goods. The questions will be notified to everyone who has bought the same goods. In addition, key opinion leader (KOL) and some rapidly developed sectors of e-commerce, such as live streaming commerce, have exhibited strong social community features. Users always immerse into them just as immersing into attractive contents in some social media platform. Continuing retention in e-commerce website may have influence their loyalty to website.

Prior studies have examined that some features of e-commerce sites may have relationships with customer satisfaction purchase intention using Technology Acceptance Model (TAM). Other research focus on the flow state theory and Stimulus-Organism-Response (SOR) Model, but most of them investigate the relationship with purchase intention. Additionally, though many studies have demonstrated how personalization recommendation system and social media will impact customer behavior, there is a lack of inspection of what effect of social media function and online community embedded in the e-commerce sites will have on customer loyalty.

With all these entertainment and interactivity elements appear, personalization recommendation system is also seen as "addictive", which is psychologically and emotionally related. Here, based on S-O-R theory, we embed flow state as mediation to represent customer experience and psychology-related variable. In this study, we address previously mentioned questions by dividing variable of personalization recommendation system into several aspects and linking them to flow state. The subdimension of personalization recommendation system includes information presentation, system interaction, and social community function. It's more detailed to investigate exact effect that every dimension has.

II. Theoretical Background

1. Personalization recommendation

Recommending product based on user-specified preferences, a user's shopping history, or choices made by other consumers with similar profiles, personalization recommendation system have the potential to reduce consumers' information overload and search complexity [5]. The information content and the way to present information of a personalization recommendation are the key elements affecting the recommendation effect [6]. Quantities of research about antecedents of flow in information systems have been done. Information quality, system quality are regarded to have positive relationship with flow [7]. Here, we choose information presentation, system interaction and social community function as three dimensions to measure personalization recommendation level.

2. Flow state

Flow, also called as autotelic experience, is described by individuals participating in the activities of chess, rock climbing, dancing and performing surgery. It's a kind of complete involvement in activities. When at the flow state, people forget about time pass and lose the perception of surrounding environment [8]. [9] especially define the flow experience in a computer-mediated environment as the state occurring during network navigation, which is characterized by a seamless sequence of responses facilitated by machine interactivity, intrinsically enjoyable, accompanied by a loss of self-consciousness, and self-reinforcing. The quality of website is expected to influence the level of user's flow state. Convenience, contents, aesthetics and interactivity of sites influence flow level, and differences of effects between countries are significant [10]. Flow state has always appeared in the scenario of customer experience and loyalty. [11] view flow state as one of customer experience: cognitive experiences. Through the mediation of

flow state, interactivity, customization, connectedness and visibility indirectly influence customer stickiness.

3. Word of mouth

[12] defined word of mouth (WOM) as a consumer's likelihood to recommend and say positive things about a company to other consumers. In traditional marketing, WOM is the information one obtains through interpersonal communication with friends and family [13]. While nowadays, with massive digital marketing and explosion of online community and social media, word of mouth has expanded to activities such as liking a brand on Facebook, writing a review online, posting and sharing brands through social media. Compared to traditional WOM, WOM from internet channels covers more population and is more permanent and publicly available [14]. WOM not only shows its positive relationship with brand loyalty [14-16], but also boosts sales [17, 18]. In this study, we follow the similar logic of [11], recognizing WOM as a component of customer loyalty.

4. Repurchase intention

Loyalty can be classified into two types: behavior loyalty such as repeat purchase behavior and attitudinal loyalty such as positive feelings towards brands. [14, 19]. Repeated purchases consists brand loyalty [20]. Customer retention is of great importance to e-commerce sites [1]. And one of the obvious indicators of customer retention is repurchase intention. Here, we also set repurchase intention as measurement to customer loyalty.

III. Hypothesis Development

To further demonstrate the relationship between variables of personalization recommendation, loyalty and flow state, we built conceptual model as shown in Figure 1.

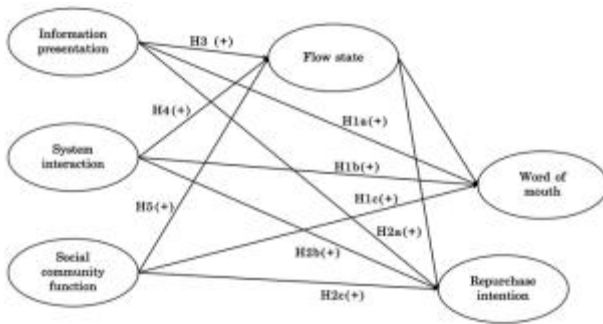


Fig. 1. Research model

1. Personalization recommendation & loyalty

In omnichannel retailing, previous studies have mentioned that from the view of social exchange theory, personalization recommendation and WOM is form of reciprocal behavior between customers and brands. Customers engaged in WOM believe they will benefit from brands [21]. Personalized services provided by brands as an exchange become a motivation of customer WOM behavior. [22] found that perceived personal preference fit have significant positive effect on both face-to-face WOM and social media WOM. With the application of personalized recommendation system, loyalty to e-commerce sites is largely enhanced through customer values, customer experiences. Personalized product recommendations of higher quality results in greater value by customers, which is positively associated with repurchase intention [23].

In the field of online retailing and business, the positive relationship between personalization recommendation and loyalty has been confirmed. [24] discovered that perceived quality of website content positively affects users' loyalty to tourism websites. In addition, E-loyalty was always found to be positively and indirectly affected by system interaction. Perceived interactivity to webpage affects e-loyalty through enjoyment, trust, effectiveness, etc. [25], and through customer satisfaction [26]. [27] stated that online community engagement has positive affect on community loyalty mediated by collective efficacy. Social community function embedded in personalization recommendation system can be viewed as a small social media of one specific platform. Many studies

have shown the importance and strong positive effect of social media engagement on loyalty either directly or indirectly [28, 29]. Based on the above discussion, the following can be hypothesized:

H1a. Information presentation has a positive direct effect on word of mouth.

H1b. System interaction has a positive direct effect on word of mouth.

H1c. Social community function has a positive direct effect on word of mouth.

H2a. Information presentation has a positive direct effect on repurchase intention.

H2b. System interaction has a positive direct effect on repurchase intention.

H2c. Social community function has a positive direct effect on repurchase intention.

2. Personalization recommendation & flow state & loyalty

Personalization recommendation positively influences people's flow state especially in some online scenario. Personalization recommendation system creates an environment which makes people immerse in, customizes for them with their preferred content and information, provide a smooth human-computer interaction. This kind of flow experience leads to active and excited engagement with a website and increase the likelihood of return visits and e-loyalty [30]. Researchers have widely embraced and used the Stimulus-Organism-Response model (S-O-R) to analyze behavior in the context of e-commerce purchasing intention [34-36], social media engagement [37], mobile applications adoption [38-40], online hotel booking behavior [41]. To conclude, the S-O-R model signifies the relation among stimuli in the environment, emotional states of people and the behavior of approach or avoidance which arises from the collaboration of stimuli and emotion.

Here is a complete purchase decision making process based on S-O-R model: Stimulated by multiple factors, motivation is generated. Driven by

such motivation, consumer make the decision to purchase goods and services, conduct purchase behavior, and make comments of both goods and manufactures. Therefore, personalization recommendation can be considered as stimulus, organism refers to individual's psychological activity, which is flow state in our study and response is customer's loyalty. [31] suggested that personalized design, information presentation and navigation in a website induce user's enjoyment thus playing a critical role in user's positive cognitive experience. [32] indicated that with usage of SNS, flow state has a direct and positive impact on purchase intention. Flow encourages repeated customer purchasing or consuming behavior [33]. Further, [30] extended flow state & e-loyalty model by adding five antecedents, including system quality, content visibility, design quality, etc. Therefore, the following hypothesis can be proposed:

H3: Personalization recommendation has a positive effect on flow state.

H4: Flow state has a positive effect on loyalty.

IV. Methodology

1. Questionnaire design & data collection

In this paper, we use the methodology of questionnaire to collect data for the following analysis. Our objective is to study personal recommendation of some online shopping sites, so questionnaire was distributed online through Credamo, a powerful and reliable survey platform used in much professional research. There are two parts in questionnaire: demographic information and measurement of variables. For measurement part, we design the questionnaire using 5-point Likert scale ranging from "strongly disagree" (numbered 1) to "strongly agree" (numbered 5). Measured variables include information presentation (Info), system interaction (Sys), social community function (Soc), flow state (FS), word of mouth (WOM) and repurchase intention (RPI). Questions of Info include whether the information

displayed in the websites is necessary, attractive, complete and well-arranged. Questions of Sys include if website provides intuitive and immediate interaction, feedback etc. Questions of Soc include if there is how much users get involved and influenced by social media function. All the respondents were well-informed that the survey was conducted anonymously in order to avoid dishonest answers. Since the survey is collected online, we set a verification question to confirm it is human not computer that is answering the questions. And we also delete sample with answer time either less than one minute or more than three minutes. After removing 23 invalid samples, a total of 500 questionnaire was successfully organized and used in following analysis.

2. Descriptive analysis

The respondents' profile is illustrated by descriptive analysis, shown in Table 1. We can see that percentages of male and female is quite close to 50%, meaning there is no gender bias in this survey. Noticeably, since members of Generation Z are spending more time on electronic devices [34], we cluster age based on social generation. Age 12 to 27, 28 to 43, and 44 to 59 indicate Generation Z, Generation Y and Generation X respectively.

Table 1. Descriptive analysis

Descriptive Statistics		Percentage (%)	Sample
Gender	Male	49.8	249
	Female	50.2	251
Age	Under 12	0	0
	12-27	33.4	167
	28-43	59.0	295
	44-59	7.4	37
	60 or more	0.2	1
Education	Elementary, Junior School	0	0
	High School	1.8	9
	Junior College	11.8	59
	Undergraduate (academic)	69.0	345
	Master's Degree	15.8	79
Occupation	Doctor's Degree	1.6	8
	Student (except Doctoral Student)	16.2	81
	Doctoral Student	0.6	3
	Working	78.2	391
	Freelance	4.4	22
	Other	0.6	3

3. Reliability test, validity test & model fit

Reliability indicates the consistency of a measure. In this study, we consider internal consistency, which is the consistency of people's responses across the items on a multiple-item measure [35]. The most common measure of internal consistency is Cronbach's Alpha. We use SPSS 29.0 to test Cronbach's Alpha and results are listed in the Table 2. The overall Cronbach's Alpha is 0.883, larger than 0.7, indicating a good internal consistency across questionnaires, so is the other variables.

Table 2. Reliability test

Variables	Cronbach's Alpha	Items
Overall	0.883	22
Info	0.849	4
Sys	0.873	4
Soc	0.837	4
FS	0.811	4
WOM	0.848	3
RPI	0.761	3

Validity is the extent to which the scores from a measure represent the variable they are intended to. The overall validity is examined through KMO and Bartlett's Test, which is 0.874, larger than stipulated criterion (0.8), indicating a good construct validity. In this study, we calculate Average variance Extracted (AVE) and Composite Reliability (CR) to test convergent validity. Generally, AVE larger than 0.5 and CR larger than 0.8 implies a good validity of data. In the Table 4, we can know that all the variables have reached the criteria, suggesting a good validity.

Table 3. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.874
Bartlett's Test of Sphericity	Approx. Chi-Square	4842.467
	df	231
	Sig.	<.001

Table 4. Validity test

Variables	AVE	CR	Items
Info	0.5845	0.8491	4
Sys	0.6335	0.8736	4
Soc	0.5643	0.8381	4
FS	0.5218	0.8136	4
WOM	0.6513	0.8486	3
RPI	0.5163	0.7619	3

Both reliability test and validity test indicate that data is qualified for analysis using structural equation model. Moreover, model fitting test should be conducted to evaluate the explanatory power of this model. Widely used indexes are shown in Table 5. All the indexes are within the range of ideal value, implying that this model has a good model fit and is acceptable.

Table 5. Model fitting

Items	CMIN/DF	NFI	TLI	CFI	RMSEA	GFI	AGFI
Ideal value	>1, <3	>0.9	>0.9	>0.9	<0.08	>0.8	>0.8
Model	1.242	0.951	0.988	0.990	0.022	0.959	0.946

4. SEM analysis

Based on above pre-tests, We can proceed to SEM analysis using AMOS 26.0. The estimation results and path diagram are showed in Table 6 and Figure 2. Since p-values of hypothesis H1a & H2c are much larger than 0.01, these two hypotheses are not proved to be statistically significant. All the other hypotheses are statistically supported.

Table 6. SEM results

	Estimate	S.E.	C.R.	P-value	S/NS
Info → WOM (H1a)	-.031	.066	-4.76	.634	NS
Sys → WOM (H1b)	.181	.055	3.264	**	S
Soc → WOM (H1c)	.223	.073	3.047	**	S
Info → RPI (H2a)	.241	.058	4.163	***	S
Sys → RPI (H2b)	.217	.048	4.487	***	S
Soc → RPI (H2c)	-.058	.062	-.942	.346	NS
Info → FS (H3)	.347	.053	6.550	***	S
Sys → FS (H3)	.243	.045	5.431	***	S
Soc → FS (H3)	.360	.059	6.149	***	S
FS → WOM (H4)	.391	.083	4.704	***	S
FS → RPI (H4)	.206	.069	2.974	.003	S

* S: Supported, NS: Not Supported

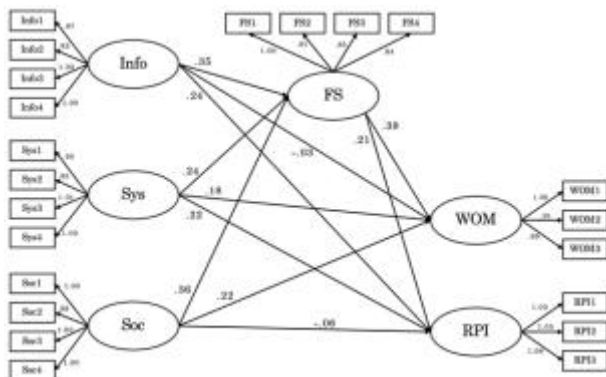


Fig. 2. Path diagram

5. Mediation effect

Bootstrapping procedures are conducted in order to test whether the indirect variable flow state mediates between personalization recommendation and loyalty. Unstandardized indirect effects were computed for each of 5000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects. As shown in Table, bootstrapped unstandardized indirect effects between three personalization recommendation variables and two loyalty variables are all statistically significant.

Table 7. Mediating effect/bootstrap intermediation test results

	Effect value	Standard Error	Bias-correlated 95% CI		P-value
			Lower	Upper	
Info → FS → WOM	.115	.032	.062	.187	.000
Sys → FS → WOM	.092	.027	.048	.154	.000
Soc → FS → WOM	.110	.029	.059	.175	.000
Info → FS → RPI	.076	.030	.026	.149	.003
Sys → FS → RPI	.061	.024	.022	.117	.003
Soc → FS → RPI	.072	.029	.023	.137	.004

V. Conclusions

1. Results

The SEM analysis revealed significant relationships between several variables, providing insights into the impact of personalization recommendation systems on customer loyalty in e-commerce. Specifically, three subdimensions of personalization recommendation: information presentation ($\beta=0.347$, $p<0.001$), system interaction ($\beta=0.243$, $p<0.001$) and social community function ($\beta=0.360$, $p<0.001$) are statistically proved to have positive effect on flow state. Social community function impacts most to flow states, which is consistent with previous research. In turn, flow state has a significant positive effect on both WOM and RPI. Therefore, hypothesis based on S-O-R theory are statistically significant. In the bootstrap mediation effect procedures, flow state was proved to have mediation effect between personalization recommendation and loyalty. System interaction showed significant positive effects on both word of mouth (WOM) and repurchase intention (RPI). While information presentation only positively affect repurchase intention and social community function only have positive impact on word of mouth. Therefore, the mediation effect of flow state experience is significant between system interaction

and loyalty (including both word of mouth and repurchase intention). While flow state only mediates between information presentation and repurchase intention and between social community function and word of mouth.

2. Implications

This study focuses on the personalization recommendation in e-commerce domain, selects three measurements of personalization recommendation which are important and worth noticing. We especially take social community function embedded in e-commerce platform into consideration, enhancing the understanding of personalization recommendation from psychological and customers' point of view. Social community function is positively related to customer's loyalty, the more social community function is applied in online shopping website, the more loyalty will be attached to the website. Generally, most of e-commerce platforms have basic social community function such as review and rate. But with the development of personalization recommendation system, complete functions of social media are almost totally embedded into e-commerce platforms, which are once originally served as pure online shopping websites. On the other hand, traditional social media platforms are also adding online shopping function into their ecology. The importance of social media or social community function has been fully revealed. Building and developing a unique social community is of great help of constructing a virtuous circle business model. Many other research have studied the importance of system interaction and information presentation from the technical view. System interaction is also a vital element when considering the customer's experience. SEM analysis and bootstrapping mediation test have demonstrated that an inspiring and intuitive system interaction can strengthen the loyalty of customers to the website, and this process is mediated by flow state experience. Information presentation is the

most obvious and direct interface communicating with customers. The quality of information presentation and display set a first impression to users. This study concluded that information presentation also plays an important role in loyalty, especially for repurchase intention.

Following are some implications for e-commerce Sites. First, e-commerce platforms should prioritize improving system interaction and integrating social community functions into their recommendation systems to foster customer loyalty. By facilitating seamless interaction and encouraging social engagement, platforms can enhance user experience and stimulate positive word of mouth, which is crucial for attracting new customers. Second, the study highlights the role of flow state as a mediator between personalization recommendation and customer loyalty. e-commerce platforms should aim to create an immersive and enjoyable experience for users, ensuring they feel deeply engaged with the platform. This can be achieved through personalized content, smooth navigation, and interactive features, ultimately leading to higher repurchase intention and positive word of mouth.

3. Limitation and future study

The methodology in this study is based on questionnaire collected online, so dynamic changes of variables can not be fully captured. And this study focuses on specific platforms popular in China, though these platforms show some similar features among e-commerce around the world, it has limitations ignoring some specific situations. Future research could explore additional factors that influence flow state and its relationship with customer loyalty. Investigating the role of demographic variables, such as age and gender, in moderating these relationships could provide deeper insights. Additionally, longitudinal studies could track customer behavior over time to understand how loyalty evolves in response to changes in personalization recommendation strategies.

ACKNOWLEDGEMENT

This work was supported by Kyonggi University's Graduate Research Assistantship 2023.

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