

Impact of Social Capital on User Stickiness in Virtual Academic Communities from a Knowledge Exchange Efficiency Perspective: The Moderating Role of Knowledge Power (Postprint)

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Date: 2023-10-08T00:00:00+00:00

Abstract

[Purpose/Significance] Investigating the influence mechanism of social capital on user stickiness in virtual academic communities holds significant theoretical and practical implications for stabilizing user groups and achieving sustainable development amidst industry competition.

[Method/Process] From the perspective of individual user perception in virtual academic communities, this study deconstructs the constituent dimensions of social capital. Using this as a point of departure, it examines the theoretical structural model linking social capital, knowledge exchange efficiency, and user stickiness, analyzes the moderating effect of individual knowledge power emerging among community members, and empirically verifies the interplay among social capital, user stickiness, knowledge exchange efficiency, and knowledge power through correlation and regression analyses of 270 samples collected from typical virtual academic community platforms.

[Results/Conclusions] The findings indicate that: (1) social capital significantly enhances user stickiness in virtual academic communities; (2) knowledge exchange efficiency fully mediates the effects of social interaction ties and social trust on user stickiness, while partially mediating the effect of shared vision; (3) the relationship between knowledge exchange efficiency and user stickiness is negatively moderated by knowledge power, such that higher levels of knowledge power weaken the positive impact of knowledge exchange efficiency on user stickiness.

Full Text

Preamble

ChinaXiv Cooperative Journal: Academic Exploration

The Influence of Social Capital on User Stickiness in Virtual Academic Communities from the Perspective of Knowledge Exchange Efficiency: The Moderating Role of Knowledge Power

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Abstract

[Purpose/Significance] Exploring the influence mechanism of social capital on user stickiness in virtual academic communities holds important theoretical and practical significance for stabilizing user groups and achieving sustainable development amid industry competition. **[Method/Process]** From the perspective of users' personal perception in virtual academic communities, this study deeply analyzes the constituent dimensions of social capital. Using this as an entry point, it investigates the theoretical structural model of social capital, knowledge exchange efficiency, and user stickiness, and examines the moderating role of individual knowledge power derived from community members in virtual academic communities. Based on regression analysis of 270 sample datasets obtained from typical virtual academic community platforms, the study verifies the interactive relationships among social capital, user stickiness, knowledge exchange efficiency, and knowledge power. **[Result/Conclusion]** The research shows that social capital contributes to enhancing user stickiness in virtual academic communities. Knowledge exchange efficiency fully mediates the influence of social interaction relationships and social trust on user stickiness, and partially mediates the influence of shared vision on user stickiness. The impact of knowledge exchange efficiency on user stickiness is negatively moderated by knowledge power; that is, the higher the degree of knowledge power, the more knowledge exchange efficiency will negatively affect user stickiness.

Keywords: Virtual academic communities; Social capital; User stickiness; Knowledge exchange efficiency; Knowledge power

Classification Number: TP274

DOI: 10.13266/j.issn.2095-5472.2020.032

Citation Format: Sun Jinhua, Wu Can, Hu Jian. The Influence of Social Capital on User Stickiness in Virtual Academic Communities from the Perspective of Knowledge Exchange Efficiency: The Moderating Role of Knowledge Power [J/OL]. Knowledge Management Forum, 2020, 5(6): 337-348 [citation date]. <http://www.kmf.ac.cn/p/228/>.

1 Introduction

The rapid development of mobile internet and smart terminals has fundamentally transformed the technology and environment for knowledge exchange among academic researchers, giving rise to virtual academic communities. These communities are characterized by openness, sharing, and convenience, enabling members to overcome temporal and spatial constraints for real-time interactive academic exchanges. Members can not only publish their academic viewpoints but also effectively share various knowledge resources. However, as numerous virtual academic communities continue to emerge, the focus of community user management has gradually shifted toward enhancing user stickiness to ensure competitive advantage in the industry.

User stickiness, which reflects the closeness between users and platforms as well as among users themselves, depends largely on the close relationships established during interaction processes and whether these relationships enable individuals to obtain and generate valuable resources within social networks—that is, social capital. Currently, few scholars have examined the direct mechanism through which social capital enhances user stickiness in virtual academic communities, even though such interactive relationships have become an effective pathway for improving knowledge exchange efficiency and promoting knowledge transfer and diffusion, which in turn yields higher user stickiness.

During knowledge exchange processes, certain core members often possess knowledge power due to their control over critical or even irreplaceable knowledge resources, which to some extent affects knowledge exchange efficiency among community members. Particularly in the era of intelligent connectivity, people increasingly value their individual knowledge power. Wang Fufang argues that individuals typically enhance their knowledge power by quickly acquiring relevant knowledge through search engines, while Wang Zhongyi et al. suggest that users should promptly update their attention to emerging knowledge power nodes in networks to maintain their learning capabilities. However, when knowledge owners in virtual academic communities face knowledge seekers, they may experience a sense of knowledge power loss if they feel their knowledge is continuously being appropriated by others. To maintain their sense of superiority, they become unwilling to transfer knowledge to seekers, which not only reduces knowledge exchange efficiency but also undermines user stickiness enhancement.

Existing research on knowledge power has primarily focused on its promotional role in enterprise capability development within technological innovation networks, with few studies deeply exploring the mechanism of individual knowledge power in virtual communities during platform-based knowledge exchange processes. Therefore, this study examines the influence mechanism of social capital on user stickiness from the perspective of social capital theory, introducing knowledge exchange efficiency and knowledge power variables, and constructs a relational model of factors influencing user stickiness in virtual academic communities, which is then tested through empirical research.

2 Theoretical Framework

2.1 Theoretical Foundations

In recent years, research on user behavior in virtual academic communities has attracted scholars' attention, who have identified key influencing factors of user stickiness from perspectives including social exchange theory, resource dependence theory, social network theory, and social capital theory.

First, from the social exchange theory perspective, scholars believe that members of knowledge-based virtual communities can obtain valuable knowledge resources through communication and interaction. This knowledge exchange process exhibits reciprocal characteristics, and the interdependence formed through exchange relationships helps enhance community members' user stickiness.

Second, from the resource dependence theory perspective, no individual can possess all the knowledge and resources needed for their development and must continuously acquire new knowledge and resources from external sources. For academic researchers—the active subjects of innovation—establishing close connections with other actors based on their demands for knowledge resources to achieve knowledge transfer and acquisition has become a primary driver of innovation activity, and the process of fulfilling these knowledge demands can effectively enhance community members' user stickiness.

Third, from the social network theory perspective, individuals in social contexts tend to think and act similarly due to their bond relationships, which form the foundation for community members to conduct academic exchange activities. The generation of user stickiness among virtual academic community members depends on multi-dimensional social networks; the closer the relationships formed during interaction, the more conducive they are to enhancing user stickiness.

Fourth, from the social capital theory perspective, individuals can establish close relationships during interaction that enable them to obtain actual or potential resources within social networks. Social capital exists in interpersonal relationship structures, can shorten psychological distances between individuals, enhance knowledge exchange willingness, and directly affect user stickiness. Although social capital theory has been widely applied in research on virtual community user participation behavior, few studies have examined its mechanism of action on user stickiness in virtual academic communities. This paper will focus on social capital theory to investigate the influence mechanism from three dimensions: structural capital, relational capital, and cognitive capital.

2.2 Social Capital and User Stickiness

2.2.1 Social Capital Social capital refers to the sum of accessible resources embedded in the relational networks owned by individuals or social groups. As an online communication platform for knowledge and information that connects

dispersed individuals through knowledge interaction, virtual academic communities enable members to establish connections and obtain resources through text, images, links, and online interactions. This study treats various resources obtained by users through establishing connections in virtual academic communities as a form of social capital and analyzes its influence on user stickiness from three dimensions: structural, relational, and cognitive.

First, structural dimension social capital refers to the overall structural patterns of connections among social network members, including connection density, tie strength, and network position. Virtual academic community members primarily achieve knowledge resource transfer and acquisition through interactive communication on the platform. Since knowledge exchange subjects on the platform conduct exchanges in a back-to-back manner without absolutely authoritative subjects (i.e., no absolute network center position), knowledge exchange efficiency depends more on the density and strength of members' interactive relationships. Therefore, this study selects social interaction relationships as the measure for structural dimension social capital, specifically the relationship density formed by virtual academic community members based on social interaction.

Second, relational dimension social capital refers to various resources obtained through interpersonal relationships formed in social networks, such as trust and identification. Given that members of knowledge-based virtual communities do not know each other, trust should be a prerequisite for effective knowledge exchange in virtual academic communities, while identification links resource subjects in offline social networks. Due to the back-to-back nature of virtual academic community members, good trust relationships are needed to enhance mutual understanding and knowledge exchange willingness. Therefore, this study selects trust as the variable to measure relational dimension social capital, specifically the degree of trust that virtual academic community members have in the knowledge resources transmitted by other members.

Finally, cognitive dimension social capital refers to members in social networks having consistent views on issues or matters, such as common language and shared vision. Virtual academic community members differ from other social network members in that despite coming from different regions and having different knowledge backgrounds, they share common academic research goals and mutual assistance values, which help reduce unnecessary disagreements during knowledge exchange. Therefore, this study selects shared vision as the variable to measure cognitive dimension social capital, specifically the common goals and consistent values formed by knowledge-based virtual community members.

2.2.2 User Stickiness User stickiness refers to behavior formed by an individual's persistent participation in an activity based on psychological dependence, typically manifested as increased visit duration and frequency. User stickiness is the source of vitality for virtual community construction and sustainable development, stemming from community members' high recognition of and loyalty

to their community, as well as their dependence on the virtual community platform and its members. For virtual academic community members, they place greater emphasis on the platform's function of facilitating research rather than social functions. Their continuous access to the community is based on both the motivation to acquire knowledge for innovation and the belief that they can obtain needed knowledge resources and information from the community platform. In virtual academic communities, activity level reflects their vitality, while return visit rate reflects their recognition. Virtual academic communities with higher activity and return rates can better attract and retain users, gaining their sustained browsing and attention.

2.2.3 The Relationship Between Social Capital and User Stickiness

Virtual academic communities are an informal learning organization form that has emerged with the development of internet smart terminal technology. Initially, community members are strangers to each other and need to rely on the platform for real-time academic exchange activities. There are two types of interactions among virtual academic community members: help-seeking interactions oriented toward problem-solving and research-oriented interactions oriented toward knowledge innovation. The more frequent their interactions, the tighter the interactive relationships they build. Interactive behavior among community members can connect "user-user," "user-information," and "user-platform," enabling mutual influence. Social interaction is an important pathway for community members to establish connections, helping to build familiarity and dependence, increasing participation enthusiasm, and enhancing user stickiness. In essence, the closeness of social interaction reflects the density and strength of social relationships among community members, and the user stickiness established during interaction helps members obtain more knowledge and information resources in the community.

Social exchange theory posits that people decide whether to establish connections with others based on expected returns, and trust, as the core of social exchange theory, plays an irreplaceable role in developing and deepening social exchange relationships. Given the special nature of online platform exchanges where members are mostly strangers, trust is a prerequisite for knowledge exchange and the foundation for enhancing user stickiness in virtual academic communities. Only when community members trust other members can they participate more deeply in community activities, engage in in-depth knowledge exchange, and use the obtained knowledge as an important reference for their decisions. Trust-based interpersonal relationships can create a good academic exchange atmosphere, promote user stickiness, and enhance the community's appeal and influence.

According to social network theory, members are attracted to each other due to similarities in learning goals and research interests. Virtual academic community members come from different research fields and have different knowledge backgrounds, but their ultimate purpose for participating in community activ-

ities is to utilize each other's research advantages to solve academic problems, thereby achieving knowledge innovation, promoting the generation of new knowledge and theories, and opening new research directions. Common academic research goals and mutual assistance values help community members quickly and efficiently find relevant participants or potential collaborators in their research fields, consider themselves important members of the community, and are more willing to communicate with other members, ask questions, or help others solve problems, fostering strong identity and emotional belonging. Shared vision is thus an important factor for learning in virtual academic communities and a prerequisite for enhancing identity and value.

Based on the above analysis, the following hypotheses are proposed: - **H1a:** Social interaction relationships have a positive effect on user stickiness. - **H1b:** Social trust has a positive effect on user stickiness. - **H1c:** Shared vision has a positive effect on user stickiness.

2.3 The Mediating Role of Knowledge Exchange Efficiency

2.3.1 Knowledge Exchange Efficiency Knowledge is an important element of innovation, and knowledge exchange can promote the dissemination and sharing of knowledge resources, thereby facilitating knowledge value-added and innovation. Against the backdrop of rapidly developing mobile internet information technology, virtual academic communities, as a type of professional knowledge-based virtual community, provide researchers with more convenient knowledge exchange platforms that meet new demands for knowledge exchange in network environments. Knowledge exchange is a two-way dialogue between knowledge contributors and knowledge recipients or users, and the process of knowledge exchange involves the generation, transmission, and absorption of knowledge resources. Knowledge exchange efficiency reflects the knowledge level and exchange effectiveness among community members.

2.3.2 The Relationship Between Social Capital and Knowledge Exchange Efficiency Social capital theory indicates that connections established among individuals through social interaction are important antecedents of cooperative behavior. The nature, strength, and structure of relationships established among virtual academic community members all affect their knowledge exchange efficiency. Highly concentrated member interactions will further influence community knowledge exchange effectiveness. The more frequent the interactive behavior among virtual academic community members, the more they can enhance mutual understanding and obtain more valuable external knowledge or information resources, resulting in better knowledge exchange outcomes. The knowledge exchange process is member-centered, involving both knowledge sharing and acquisition behaviors; the stronger the interaction relationships among members, the higher the knowledge exchange efficiency.

Virtual academic community members are willing to ask questions, solve others' problems, and engage in knowledge exchange largely based on trust relation-

ships. The establishment of trust relationships is crucial for knowledge exchange among members—they believe their questions will be answered by other members and that they can help others solve problems. Trust is an important influencing factor for knowledge contribution in virtual academic communities and directly affects the depth of exchange and mutual influence among members. When community members establish high trust, they can communicate more freely and efficiently without worrying about opportunistic behavior. Trust relationship establishment is the guarantee for achieving efficient knowledge exchange and can create a favorable exchange atmosphere.

Shared vision refers to the common goals, interests, and values that connect community members. Community members with shared vision are more likely to become partners, willing to exchange information and knowledge. Shared vision plays a significant role in improving knowledge exchange efficiency among virtual academic community members. It enables members to form common goals, enhance cohesion, and create a mutually trusting and helpful community atmosphere. Additionally, shared vision can generate identity recognition, and common identity can accelerate community knowledge exchange and sharing, thereby improving knowledge exchange efficiency.

Based on the above analysis, the following hypotheses are proposed: - **H2a:** Social interaction relationships have a positive effect on knowledge exchange efficiency in virtual academic communities. - **H2b:** Social trust has a positive effect on knowledge exchange efficiency in virtual academic communities. - **H2c:** Shared vision has a positive effect on knowledge exchange efficiency in virtual academic communities.

2.3.3 The Relationship Between Knowledge Exchange Efficiency and User Stickiness User stickiness is an important factor for the future sustainable development of virtual academic communities. Communities with high user stickiness can better retain old members, attract new members, and expand user groups. Knowledge exchange is a process of knowledge resource and information generation, transmission, and absorption. When knowledge recipients continuously obtain knowledge resources and information from knowledge sharers, they develop path dependence, manifested as repeated visits and use of the target community, intention to continue using the website in the future, and naturally developing sticky tendencies toward the community. Knowledge exchange efficiency is a direct reflection of knowledge transfer and diffusion effectiveness in virtual academic communities and an important reference standard for community users when choosing platforms. Virtual academic communities with higher knowledge exchange efficiency are more likely to be favored by community users.

Based on the above analysis, the following hypothesis is proposed: - **H3:** Knowledge exchange efficiency is positively related to user stickiness.

2.4 The Moderating Role of Knowledge Power

2.4.1 Knowledge Power Power is the influence capacity of one person or organization over others, and power formed through controlling and dominating knowledge resources is called knowledge power. Resource dependence theory emphasizes the importance of obtaining external resources for self-interest, and resource dependence relationships inevitably lead to power generation. Virtual academic communities are built upon a foundation of abundant knowledge resources, and member relationships are based on mutual dependence of knowledge resources. When knowledge resource dependence among community members is asymmetric, knowledge power emerges. Knowledge power subjects in virtual academic communities typically possess scarce, irreplaceable, and valuable knowledge resources and have strong appeal and influence. This study defines knowledge power mainly from the perspective of knowledge power subjects' (i.e., core members) control over knowledge resources and the influence perceived by other community members.

2.4.2 The Moderating Effect of Knowledge Power on the Relationship Between Knowledge Exchange Efficiency and User Stickiness Control over any critical resource is a source of power, and unbalanced knowledge power leads to power erosion phenomena, mainly manifested as knowledge hiding, strong suggestions, and even malignant alliances that reduce knowledge exchange and diffusion, forming information silos through knowledge dependence. In virtual academic communities, decentralization can enhance members' awareness of equal participation in dialogue and exchange, forming a cultural pattern that focuses on individuals and respects diversity. Therefore, in virtual academic communities with high knowledge power, on the one hand, the concentration of social capital leads to uneven resource distribution, and community members are easily influenced by core members, creating path dependence in knowledge exchange processes, reducing their selection of knowledge contributed by other members, decreasing total knowledge flow, and hindering new knowledge entry, thereby inhibiting knowledge exchange efficiency. On the other hand, knowledge power erosion phenomena also reduce community members' expectations of the community, thereby decreasing knowledge exchange efficiency and weakening its promotional effect on user stickiness in virtual academic communities. Conversely, virtual academic communities with low knowledge power are more likely to form equal and free exchange environments.

Based on the above analysis, the following hypothesis is proposed: - **H4:** Knowledge power negatively moderates the relationship between knowledge exchange efficiency and user stickiness.

Figure 1 [Figure 1: see original paper] illustrates the theoretical model.

3 Research Methodology

3.1 Sample Data Source

This study employs a theoretical and practical combined research method, obtaining relevant data through survey questionnaires distributed in virtual academic communities such as XiaoMuChong and Renmin University Economic Papers. The survey subjects were primarily users of these communities, with the sample concentrated in the 18-30 age group (approximately 70%) and consisting of highly educated knowledge subjects with strong knowledge demands (approximately 63%). These users show strong dependence on virtual academic communities (approximately 30% access 4-6 times per week). To ensure questionnaire recovery quality, relevant scholars were interviewed before the final survey, and the questionnaire was revised based on their feedback. Questionnaire distribution lasted from May to August 2019 (four months), ultimately yielding 270 valid responses.

Table 1 shows the basic distribution of survey samples.

3.2 Variable Measurement and Settings

This study's measurement scales primarily draw upon existing mature scales from domestic and international sources, using a five-point Likert scale where respondents select from "1 - Strongly Disagree" to "5 - Strongly Agree" based on actual conditions. Social interaction relationships were measured primarily using scales developed by C. M. Chiu, with items such as "I maintain close contact with some members of the forum community." Social trust measurement referenced perspectives such as "Members of the forum community are honest when solving problems for others." Shared vision measurement referenced scales by H. H. Chang, with items such as "Members of the forum community share a common vision of helping others solve problems." User stickiness measurement referenced L. Hsi-Peng's work, assessing from three aspects including current usage and future usage intentions, with items such as "I am accustomed to browsing on the forum community." Knowledge exchange efficiency measurement primarily referenced Wan Li's work, assessing from aspects such as posting and replying, with items such as "I frequently ask questions on the forum community." Knowledge power measurement primarily referenced Wei Long's work, with items such as "The information and data knowledge resources possessed by core members of the forum community are unique."

4 Data Analysis

4.1 Reliability and Validity Analysis

This study used SPSS 22.0 software to test reliability and validity, with specific results shown in **Table 2**. The table shows that all variables' Cronbach's α values exceed 0.7, indicating good internal consistency and reliability. Confirmatory factor analysis revealed that all item factor loadings exceed 0.6, demonstrat-

ing reliable individual indicators and effective variable measurement, indicating significant convergent validity of the questionnaire.

4.2 Correlation Analysis

According to **Table 3**, correlation coefficients among all measurement variables are below 0.6. Further analysis calculated that all variables' variance inflation factor (VIF) coefficients range between 1.072-1.382, far below the critical value of 10, further indicating no multicollinearity problems among variables, allowing them to be included in regression models. The table also shows positive correlations between social interaction relationships, social trust, shared vision and knowledge exchange efficiency (correlation coefficients > 0.3 and significant), and between knowledge exchange efficiency and user stickiness (correlation coefficient > 0.5 and significant), providing preliminary support for research hypotheses.

4.3 Hypothesis Testing

4.3.1 Main Effects and Mediation Effects Testing Based on the above analysis, this study conducted regression analysis of main effects and mediation effects among variables, with specific results shown in **Table 4** and **Table 5**.

First, as shown in M1-M4 columns of **Table 4**, after controlling for gender, age, and education characteristics, social interaction relationships have a significant positive effect on user stickiness ($\beta = 0.208$, $p < 0.001$), supporting H1a; social trust has a significant positive effect on user stickiness ($\beta = 0.213$, $p < 0.001$), supporting H1b; shared vision has a significant positive effect on user stickiness ($\beta = 0.557$, $p < 0.001$), supporting H1c.

Second, as shown in M5-M8 columns of **Table 5**, after excluding control variable effects, social interaction relationships have a significant positive effect on knowledge exchange efficiency ($\beta = 0.329$, $p < 0.001$), supporting H2a; social trust has a significant positive effect on knowledge exchange efficiency ($\beta = 0.269$, $p < 0.001$), supporting H2b; shared vision has a significant positive effect on knowledge exchange efficiency ($\beta = 0.382$, $p < 0.001$), supporting H2c.

As shown in M13 column of **Table 5**, knowledge exchange efficiency has a significant effect on user stickiness ($\beta = 0.517$, $p < 0.001$), supporting H3.

As shown in M9-M11 columns of **Table 4**, when knowledge exchange efficiency enters the equation, the positive effect of social interaction relationships on user stickiness weakens ($\beta = 0.044$, $p > 0.1$), indicating that knowledge exchange efficiency fully mediates the relationship between social interaction relationships and user stickiness. The positive effect of social trust on user stickiness weakens ($\beta = 0.082$, $p > 0.1$), indicating full mediation. Shared vision maintains a significant positive effect on user stickiness ($\beta = 0.370$, $p < 0.001$), indicating partial mediation. In summary, the criteria for establishing mediation effects

are met, demonstrating that knowledge exchange efficiency mediates the relationship between social capital and user stickiness.

4.3.2 Mediation and Moderation Effects Testing To further verify whether knowledge power moderates the relationship between knowledge exchange efficiency and user stickiness, this study used hierarchical regression analysis. To reduce potential multicollinearity effects, variables were centered before constructing interaction terms, with results shown in **Table 5**. After excluding control variables, independent variables, and moderating variables, the regression coefficient of the interaction term between knowledge exchange efficiency and knowledge power on user stickiness is -0.144 and significant, indicating that knowledge power negatively moderates the relationship between knowledge exchange efficiency and user stickiness, supporting H4.

Using one standard deviation above and below the mean of knowledge power as benchmarks for high and low knowledge power, the moderating effect is illustrated in **Figure 2** [**Figure 2: see original paper**].

5 Conclusion and Analysis

This study examines virtual academic community users, constructing a moderated mediation model from the perspective of users' personal perception to analyze the influence mechanism of social capital on user stickiness. Model testing results reveal several key findings.

First, all three dimensions of social capital have significant positive effects on user stickiness. In virtual academic communities, frequent interaction helps members establish close connections, creating a sense of belonging during knowledge exchange and thereby enhancing user stickiness. Trust relationships encourage members to adopt knowledge resources provided by others and engage more willingly in opinion exchange, increasing their duration and frequency of visits to academic communities and strengthening their dependence on virtual academic communities. Members with shared vision—whether through common research interests or consistent values of mutual assistance—enhance their integration into community activities, promoting a more open and free academic exchange atmosphere and strengthening community stickiness.

Second, social capital positively affects user stickiness through the mediating role of knowledge exchange efficiency. Knowledge exchange efficiency fully mediates the effects of social interaction relationships and social trust on user stickiness, and partially mediates the effect of shared vision. Knowledge exchange is an efficient information transmission mechanism that channels the influence of social capital to user stickiness in virtual academic communities, representing an effective pathway for maintaining communication and interaction among community members. As an important measure of community activity level, knowledge exchange efficiency promotes the transfer and integration of knowledge and information. Therefore, using knowledge exchange efficiency as

a mediator can realize the transmission mechanism from social capital to user stickiness, further revealing the transformation path.

Finally, knowledge power negatively moderates the relationship between knowledge exchange efficiency and user stickiness. When virtual academic communities have high-intensity knowledge power, members become overly dependent on knowledge exchange information provided by core members, unable to achieve their own knowledge reconstruction and innovation. When knowledge power erosion occurs, phenomena such as knowledge hiding and strong suggestions further hinder interactive communication among members, reducing the influence of knowledge exchange efficiency on user stickiness to some extent.

Based on these findings, several recommendations are proposed for enhancing user stickiness in virtual academic communities. First, social capital is a crucial factor for enhancing user stickiness, and community management should emphasize social capital accumulation. This involves establishing good interaction patterns and improving communication mechanisms to enhance member interest and increase exchanges, as well as maintaining trust relationships and establishing sound community supervision and management systems. Additionally, shared vision reflects members' sense of belonging and requires implementing community incentive mechanisms to stimulate members' identification, participation, and loyalty.

Second, given that high knowledge power weakens the effect of knowledge exchange efficiency on user stickiness, community development should optimize exchange methods beyond simple "post-reply" patterns, guiding core members to regularly hold online thematic academic seminars to deepen knowledge exchange. Additionally, establishing material or non-material reward and promotion mechanisms can reduce knowledge contributors' sense of knowledge power loss and personal interest concerns, ensuring fair treatment for all members and mitigating knowledge power's negative impact.

Due to research condition limitations, this study used cross-sectional data, while the mediation process of knowledge exchange efficiency actually involves temporal effects. Future research could adopt longitudinal designs to clarify causal relationships more definitively. Additionally, future studies could integrate other theoretical perspectives such as sense of virtual community, which reflects members' membership, influence, and immersion in virtual communities and represents a worthwhile research direction.

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Note: Figure translations are in progress. See original paper for figures.

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