

Post-print of the Construction of the Knowledge Value-added Path Model for Professional Virtual Communities

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Abstract

[Purpose/Significance] Building upon Delone & McLean' s success model, this study proposes knowledge appreciation as the criterion for evaluating the success of professional virtual communities. It identifies that the knowledge application process can extract general knowledge, correct existing knowledge, expand original theories, and introduce new theories, thereby constructing a path model for knowledge appreciation in professional virtual communities. [Method/Process] Based on data from 332 questionnaires and employing structural equation modeling, this paper empirically examines four pathways of knowledge appreciation in professional virtual communities. [Results/Conclusion] The findings reveal that the primary pathway for professional virtual communities to achieve knowledge appreciation involves users searching for knowledge, applying and correcting knowledge, applying and developing new theories, and subsequently feeding the new knowledge back to the PVC.

Full Text

Abstract

Based on Delone & Mclean' s IS success model, this paper proposes knowledge proliferation as a criterion for evaluating the success of professional virtual communities (PVCs). Addressing shortcomings in current research, we introduce the knowledge utilization process, which can refine general knowledge, modify existing knowledge, expand original theories, and introduce new theories, thereby constructing a path model for knowledge proliferation in PVCs. Using structural equation modeling with data from 332 questionnaires, we empirically tested four paths of knowledge proliferation in PVCs. The findings reveal that the primary path involves users searching for knowledge, applying and modifying it, applying and developing new theories, and finally feeding new knowledge

back to the PVC.

Keywords: professional virtual community; knowledge proliferation; knowledge utilization; path model

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1 Introduction

A Professional Virtual Community (PVC) is a cyberspace where geographically dispersed yet like-minded individuals gather to exchange professional knowledge and continuously create new content [1]. Since the 1990s, PVCs have emerged globally, exemplified by the “Github” IT community abroad and the “CSDN” IT community in China. Today, PVCs have expanded beyond IT into numerous fields, with their overall numbers growing continuously to become knowledge exchange and creation platforms in the internet era. Over two decades of evolution, some PVCs have thrived. For instance, the Renmin University Economic Forum (<http://bbs.pinggu.org/>) now boasts over 6 million registered users, more than 400,000 daily active users, over 3,000 new posts and resources daily, a total of over 300,000 economics and management resources, and more than 150 specialized sub-forums, making it a renowned community in its field. Conversely, other PVCs have stagnated and declined, such as the Capital of Statistics Forum (<http://cos.name/cn/>), also originating from Renmin University of China, which now sees only a handful of daily posts, lacks specialized sub-forums, and suffers from continuous user attrition—a stark contrast to the Renmin University Economic Forum.

Successful PVCs achieve “knowledge proliferation” —treating the knowledge resources initially provided by the PVC to users as knowledge input, and the knowledge resources generated by users after a period of operation as knowledge return. When the return is greater and newer than the input—when outdated knowledge is updated and the total knowledge resource increases—the

PVC has achieved knowledge proliferation. This paper continues the tradition in information management research by interpreting PVC knowledge proliferation from a user behavior perspective, treating user knowledge-seeking behavior as knowledge input and user contribution behavior as knowledge return. Based on W. H. Delone and E. R. Mclean's information systems success model [2], we explain the theoretical foundation of PVC knowledge proliferation and introduce the knowledge application stage. From four perspectives—refining general knowledge, modifying existing knowledge, expanding original theories, and introducing new theories—we propose specific paths for PVCs to achieve knowledge proliferation. We employ questionnaire-based data collection and structural equation modeling to test path hypotheses.

2 Theoretical Foundation and Research Hypotheses

2.1 Theoretical Foundation of Knowledge Proliferation

W. H. Delone and E. R. Mclean argued that the logic of “build the system and users will come” has failed, and that information systems success must consider user factors. In 1993, they proposed the classic Information Systems Success Model (the D&M model) [2], comprising six dimensions: system quality, information quality, use, user satisfaction, individual impact, and organizational impact (see Figure 1 [Figure 1: see original paper] top). This model has become an important foundation for information management scholars.

Addressing the characteristics of social online communities, I. Y. L. Chen proposed that users with more social connections in PVCs, occupying more central positions in social networks, are more likely to have high continuance intention [3]. H. F. Lin argued that face-to-face interaction among strangers lacks effective social rules, making trust crucial in PVCs, as it positively influences member satisfaction, sense of belonging, and loyalty [4]. Scholars have thus added user belonging and loyalty as success metrics for social online communities beyond core indicators like use and satisfaction (see Figure 1 bottom left).

PVCs, as professional knowledge exchange platforms, differ from general information systems and social virtual communities. Scholars have distinguished PVC user behaviors into knowledge seeking and knowledge contribution based on knowledge flow direction and conducted empirical research [5]. Building on this, we propose that knowledge proliferation is the direct result of user knowledge contribution (use) and the prerequisite for attracting potential users to seek knowledge (use). Knowledge proliferation represents the concentrated manifestation of high system quality, information quality, and service quality in PVCs, making it a specific criterion for judging the success of various professional virtual communities (see Figure 1 bottom right).

2.2 Indirect Evidence of Knowledge Proliferation

Scholars interpreting PVC knowledge proliferation from a user behavior perspective treat user knowledge-seeking as knowledge input and user contribution

as knowledge return. Studies by C. J. Chen and S. W. Hung [1], Y. M. Zheng et al. [6], K. W. Gang and T. Ravichandran [7], and J. H. Park et al. [8] on PVCs in IT, tourism, scientific research, and investment fields have found positive correlations between knowledge seeking and knowledge contribution. Knowledge seeking means PVCs provide professional knowledge to users, while knowledge contribution means users return knowledge to PVCs. This positive correlation provides indirect evidence for knowledge proliferation. However, these studies do not explain the mechanism by which users transition from knowledge seekers to contributors, leaving the black box of PVC knowledge proliferation unopened.

We identified three studies that attempted to examine mediating mechanisms between knowledge seeking and contribution. Y. L. Yan and R. M. Davison used three internal motivations—altruism, self-worth, and full engagement—to explain the positive relationship, arguing that users observe others' contribution behaviors during knowledge seeking, infer their internal motivations from external behaviors, and develop similar motivations to begin contributing [9]. Li Li used reciprocity as a mediator, proposing that when users decide to continue seeking knowledge in a community, their perception of community reciprocity norms strengthens, motivating them to contribute knowledge out of reciprocity [10]. Zhao Xin et al. used users' knowledge level as a mediator, arguing that knowledge seeking can improve users' knowledge levels and enhance self-efficacy, thereby promoting knowledge contribution [11].

However, Yan et al. and Li Li focused on PVC users' motivational changes, while Zhao Xin et al. focused on ability enhancement, yet none examined the core issue—whether new knowledge emerged in this process. If new knowledge emerges, the transition from seeking to contribution constitutes knowledge proliferation; if not, the transformation from seeker to contributor is meaningless for PVC knowledge proliferation. Logically, the positive correlation between knowledge seeking and contribution might simply reflect the circulation of identical outdated knowledge within and outside the PVC without new knowledge generation or total knowledge increase, thus not constituting knowledge proliferation. To exclude this competing explanation and truly understand PVC knowledge proliferation, we must further open the black box between knowledge seeking and contribution and theoretically explain its process mechanism.

2.3 Path Hypotheses of Knowledge Proliferation

This paper introduces knowledge application to PVC knowledge proliferation research, describing the process as “knowledge seeking in PVCs → knowledge application outside PVCs → knowledge contribution in PVCs.” Examining how knowledge resources are applied outside PVCs and understanding how users create new knowledge during application is key to understanding PVC knowledge proliferation [12].

PVC users create new knowledge during knowledge application. Based on differences in acquired knowledge resources and application contexts, we propose

four specific paths for PVCs to achieve knowledge proliferation. By application context, PVC users' searched knowledge resources can be divided into contextualized knowledge and non-contextualized knowledge. For example, a company's marketing plan is contextualized knowledge, while a universal marketing theory is non-contextualized knowledge. Similar classifications include M. H. Zack's general knowledge vs. specialized knowledge [13] and Li Jinming, Dai Changjun, and Tang Jianmin's principle knowledge vs. concrete knowledge [14-15]. By users' work/study domains, PVC knowledge application can be divided into within-domain application and cross-domain application [16]. For instance, a marketing professional applying marketing knowledge from a marketing PVC to their work constitutes within-domain application, while IT and media professionals applying marketing knowledge from that PVC to their work constitutes cross-domain application. Combining knowledge resource types and application domains yields the PVC knowledge proliferation process and paths shown in Figure 2 [Figure 2: see original paper].

Path 1: Users acquire contextualized knowledge from PVCs and apply it within their domain, refining general knowledge to feed back to PVCs. Much knowledge content in PVCs is intertwined with its context—an unavoidable issue in knowledge sharing [17]. M. L. Markus's knowledge reuse theory notes that novices or users in the same domain encounter difficulties when using others' contributed knowledge and must perform “de-contextualization” [18]. For example, User A's task is to plan a marketing campaign. A searches a marketing PVC and obtains the document “Company A's $\times\times$ Marketing Campaign Plan,” but this document cannot be directly applied to A's work. A must “de-contextualize” it. This process first requires supplementing missing background information about Company A to understand the plan, then eliminating marketing strategies specific to Company A's unique context to obtain general knowledge about marketing campaign planning, and finally applying this general knowledge to complete their work. Clearly, multiple pieces of embedded contextualized specialized knowledge become more universal general knowledge after de-contextualization. Accordingly, we propose:

Hypothesis 1: Users' behavior of applying and refining general knowledge mediates the positive relationship between knowledge seeking and knowledge contribution.

Path 2: Users acquire non-contextualized knowledge from PVCs and apply it within their domain, modifying and improving outdated knowledge in PVCs. Besides contextualized knowledge, PVCs contain substantial general knowledge. For example, User B, planning a marketing campaign, searches a marketing PVC and obtains the post “Ten Principles of Marketing Planning.” After learning these general principles and steps, B applies them to their work by adapting them to their company's actual situation. This “contextualization” application is what Li Jinming, Dai Changjun, and Tang Jianmin call “knowledge concretization,” considered an important pathway for knowledge creation [14-15]. During application, B may find the principles inconsistent with reality and re-

quire modification, or discover the content is outdated or incomplete and needs supplementation. Research by Huang Mengting and Zhang Pengyi provides evidence, finding that Zhihu users can question others' contributed content based on their own practice, correct errors, or provide new examples and supplementary materials [19]. Thus, contextualized application of knowledge constitutes practical testing of knowledge, and the original content becomes reliable new knowledge after eliminating falsehood, supplementing deficiencies, and improving [20]. Accordingly, we propose:

Hypothesis 2: Users' behavior of applying and modifying existing knowledge mediates the positive relationship between knowledge seeking and knowledge contribution.

Path 3: Users acquire non-contextualized knowledge from PVCs for cross-domain application, expanding the applicability scope of original theories in PVCs. When people encounter problems that cannot be solved by their domain's knowledge, they search and seek help across domains [18]. For example, when information systems scholar A. Bhattacharjee examined the new problem of information systems continuance, he found that domain knowledge such as the Technology Acceptance Model could not provide effective explanations. He turned to the "Expectation-Confirmation Theory" from marketing management, treating information system users as consumers and proposing that users' usage expectations, confirmation, and satisfaction determine their continuance intention [21]. Cross-domain application expanded the applicability scope of Expectation-Confirmation Theory from traditional goods to the IT domain, creating new knowledge—the Information Systems Continuance Model [22]—while solving new problems. As open knowledge exchange platforms, PVCs enable numerous like-minded non-professionals to search for and apply knowledge across domains, expanding original theories and creating new knowledge. Accordingly, we propose:

Hypothesis 3: Users' behavior of applying knowledge to expand original theories mediates the positive relationship between knowledge seeking and knowledge contribution.

Path 4: Users acquire contextualized knowledge from PVCs for cross-domain application, developing new theories using data mining methods and feeding back to PVCs. Knowledge reuse theory treats data mining as a primary form of knowledge reuse [18]. M. L. Markus noted that miners search for and use knowledge for purposes different from the original providers—to create new knowledge. For example, the well-known travel experience sharing website Mafengwo contains numerous highly personalized, contextualized travelogues and guides. Data mining these materials from tourism enterprises' perspective can establish tourist demand prediction models [23-24], generating new knowledge. Jiang Jianhong and Ma Ruiyun conducted text mining on personal travelogues from multiple tourism online communities to build models recommending next travel destinations for tourists [25], generating new knowledge that strongly supports tourism marketing work. PVCs' openness facilitates data mining, and analyzing

data from new perspectives can create new knowledge and develop new theories. Accordingly, we propose:

Hypothesis 4: Users' behavior of applying knowledge and developing new theories mediates the positive relationship between knowledge seeking and knowledge contribution.

3 Research Methods

Based on the fundamental principles of knowledge proliferation and four patterns of users creating new knowledge during knowledge application, we developed a 9-item knowledge application scale. Drawing upon and translating scales on knowledge seeking and knowledge contribution from C. J. Chen and S. W. Hung [1] and C. M. Chiu et al. [5], we formed our research questionnaire.

We distributed 410 questionnaires to users of economics and management PVCs and computer network PVCs. After eliminating non-responses and invalid questionnaires, we obtained 332 valid responses.

Reliability and validity test results are shown in Table 2. The Cronbach's α coefficients of our scales exceed the critical value of 0.7, composite reliability exceeds 0.7, and average variance extracted exceeds 0.5, indicating good reliability and validity.

4 Data Analysis

We used AMOS structural equation modeling software to test path hypotheses. Path coefficients between variables are shown in Figure 3 [Figure 3: see original paper].

Model fit indices show that the chi-square to degrees of freedom ratio is 2.047, below the standard value of 3; RMSEA is 0.056, below the standard value of 0.08; and other indices meet requirements, indicating good fit between survey data and the hypothesized model.

Data analysis results show that path coefficients from knowledge seeking to knowledge application—refining general knowledge, modifying existing knowledge, expanding original theories, and developing new theories—are all positive and significant. However, path coefficients from knowledge application to knowledge contribution are only significant for modifying existing knowledge, with developing new theories approaching significance. In short, Hypotheses 2 and 4 receive data support.

We argue that users' knowledge creation results from modifying existing knowledge and developing new theories can more easily be returned to the original PVC where knowledge was sought, because the newly created knowledge belongs to the same professional domain as the originally sought knowledge and is acceptable to professionals and enthusiasts in the PVC. In contrast, users' refining general knowledge and expanding original theories represent knowledge creation

with larger spans, whose results exceed the scope of knowledge exchange among PVC users and are difficult to contribute to the original community. Therefore, Hypotheses 2 and 4 are supported, while Hypotheses 1 and 3 are not.

Notably, partial links in the paths represented by Hypotheses 1 and 3 are verified: user knowledge seeking and application, and new knowledge creation through refining general knowledge and expanding original theories, receive data support. However, the newly created knowledge fails to return to the original PVC, suggesting multiple possibilities. Future research should focus on new knowledge created by PVC users during knowledge application that is not returned to the original community. Such knowledge remains personal, may be shared offline, or may flow to other PVCs, awaiting further empirical investigation.

5 Conclusion

Unlike previous research that conflated PVC success with general IS success or social online community success, this paper proposes knowledge proliferation as a unique criterion for PVC success based on the D&M success model. As M. Alavi and D. E. Leidner stated, knowledge management systems' role is not merely supporting existing knowledge storage and exchange but more importantly promoting new knowledge generation [26]. PVCs are not just professional knowledge sharing platforms but more importantly achieve their own knowledge proliferation while supporting users in applying and creating knowledge.

Unlike previous research that focused only on PVC users' motivational and capability mechanisms without examining whether new knowledge emerged, this paper theoretically proposes four specific paths for PVC knowledge creation. Using questionnaire surveys and structural equation modeling to test path hypotheses, we found that users applying and modifying knowledge, and applying and developing new theories, are the main paths for PVC users to achieve knowledge proliferation.

Future research should further empirically examine new knowledge created by PVC users during knowledge application that is not returned to the original community.

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Author Contributions

Zhao Xin: Proposed the knowledge proliferation concept and path hypotheses, revised the paper; Zhao Lin: Conducted data analysis and wrote the paper; Li Jiaqian: Conducted data collection and data analysis.

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

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