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# USER ENGAGEMENT BY USING A KNOWLEDGE-CREATION BASED MODEL IN THE VIRTUAL COMMUNITY

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Abstract

In this paper, we propose to organize knowledge generation and management as the foundation of the 7C model, by distinguishing the individual and the organization, and the tacit and explicit level presented by the spiral, knowledge-producer-oriented perspective to explore the existence of virtual communities in cyberspace. Through web-based organizational design features, hyperlinks play a role in the exchange of knowledge generation and to improve their core operational capabilities, access to the best competition of interests and economic value. According to the theory of knowledge management stages of development, knowledge sharing can be considered as the first generation knowledge management and is not only defined as transmitting knowledge to target receivers, but also as being used by people, and the continuation of knowledge creation and future value creation of the user engagement model. In the virtual community development process, ways are still being explored to improve, to effectively improve sparse data limitations, and this study provides matrix-clustering technology to explore the virtual community among its members on the behaviors of interactive evolution of knowledge creation and user engagement features in value creation, so that the internet community can continue to operate on principle of the best decisions.

**Keywords:** 7C model, Spiral, Knowledge creation, Matrix-clustering, User engagement

## Introduction

At present, the various business organizations in commercial core operations are facing a complex and urgent challenges, involving individuals, groups and inter-organizational

knowledge generation processes, which been regarded as the most important corporate competitive advantage (Nonaka & Takeuchi, 1995; Vorakulpipat & Rezgui, 2006), and with the Internet's rapid progress in information technology, economic, marketing, and any community-based activities are all greatly influenced by the virtual community (Teo, Chan, Weib, & Zhang, 2003), and the use of management techniques and members of the community interaction, information gathering, and knowledge of trading has become the trend of the times.

Only the virtual community can reach such a critical mass of business, and only after bringing a large number of business interests, from community members to create discussion, will personal beliefs, attitudes and behaviour information for commercial marketing and service advertising, bring about great value and interest (Hemetsberger, Andrea & Georg, 2007), the dynamic knowledge derived from assets and the value of factors such as the fans, exchange in epistemology and ontology spiral levels, and enhance organizational competitive advantage.

This study used virtual knowledge-sharing behaviour among the members of the virtual community and community members, using matrix-clustering techniques and 7C model to construct knowledge creation process. Derived from the development model in accordance with its community to explore the value of the follow-up of knowledge creation and user engagement, to meet the knowledge needs of producers and the reader-oriented, providing personalized community knowledge-sharing and recommendation, the main purposes of this study include:

- Information Categories: Posts themes based on different weights of the various sub-categories of membership qualifications, grouping by matrix method, a variety of information classified according to similarity threshold to the appropriate classification.

 Knowledge creation and evaluation: According to the spiral procedures of knowledge creation, among the members of the organizations concerned, language and technical background to assess the sustainable operation of the virtual community of suitability.

 Knowledge value creation and user engagement: Based on third generation knowledge management concepts (Chase, 1997; Gebert, Geib, Kolbe & Brenner, 2003; Vorakulpipat & Rezgui, 2006), focusing on the value creation of knowledge , with the human networks, social capital, intellectual capital, technology assets, and process changes, a combination of community factors such as user engagement, and quality of knowledge value creation.

## The Theoretical Model and Hypotheses

The following sections elaborate upon our theoretical model (see Figure 1.)

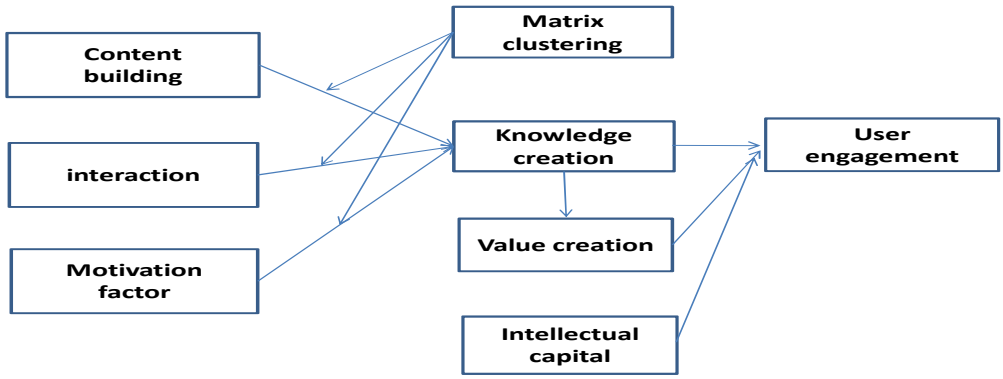


Figure 1. The Theoretical Model

### *The Critical Success Factors of Knowledge Sharing*

Community knowledge of the evolution of several important issues is implicit (Bieber, Engelbart, Furuta, Hiltz, Noll, Preece, Stohr, Turoff & Walle, 2002), in its competitive process, mainly in the study that possesses the consumer and provides customer service tools, to increase the bargaining power of suppliers in each single evolutionary point of time, therefore value

creation depends mainly on the behaviour of whoever has the information and transaction. Because the Internet community attracts target consumers and creates more consumption while maintaining good customer relationship management, consumers are given sufficient information and good service, allowing business operators to create another path different from the traditional choice, and this social phenomenon, results in a significant impact on traditional business (Bressler & Grantham, 2000; Kozinets, 2002; Subramani & Peddibhotla, 2004; Wasko, McLure & Faraj, 2005). The survival of the community depends on member loyalty and content of the attractiveness of member profile information and trading activities factors (Hagel & Armstrong, 1997). Pine (1999) has argued that the economic value of the community is divided into products, goods, services, and five other kinds of experience and transformation. As a result of transaction services, loyalty and feedback interaction elements, members can have full use of community assets, on the Internet to create unlimited business opportunities. We therefore propose the following hypothesis and the key factors in the success of the virtual business community as displayed in Table 1.

**Hypothesis 1: One's degree of content building is positively related to one's engagement in knowledge sharing with the virtual community.**

**Hypothesis 2: One's degree of interaction is positively related to one's engagement in knowledge sharing with the virtual community.**

**Hypothesis 3: One's degree of motivation factor is positively related to one's engagement in knowledge sharing with the virtual community.**

*Knowledge Creation and User Engagement*

At present, there are at least three accounts of generations of Knowledge Management (Firestone & McElroy, 2003), three generations of KM are summarized in Table 2. Knowledge sharing is a dynamic process or continuous learning, not a static process (Gilbert & Cordey-Hayes, 1996), Knowledge sharing is a process of communication, when the organization's

members learn from each other's knowledge, and is the sharing of knowledge of others (Hendriks, 1999).

Table 1. CSF of Virtual Communities

| Study | Critical Success Factors |
|---|---|
| Sangwan (2005) | Content building |
| Preece(2000,2001) | Sense of ownership<br>Sociability and usability |
| Rodgers et al.(2005) | Online quality |
| Koh and Kim (2003) | Offline activities |
| Donate (1999),Wasko and Faraj(2005) | Pro-social behavior, altruism, reputation |
| Hagel and Armstrong(1997)<br>Huang and Yen(2008) | Loyalty |
| Kankanhalli et al.(2005) | Trust and influence |
| Leimeister et al.(2006) | Member data are sensitive resources |

Knowledge holders sharing the purpose of knowledge are expected to receive the benefits of self-interest, the effectiveness is also better. Major points emerging from the review can be summarized as follows: information technology, human interaction, KM strategies, motivation and trust. Knowledge creation is an organizational, social, and collaborative dynamic process through interaction between tacit and explicit knowledge, Four modes of knowledge through the SECI model are proposed, which is the spiral, interaction process of knowledge conversion between tacit and explicit knowledge (Nonaka, Toyama & Konno, 2000).

Table 2. Generations of KM
(Chalee & Yacine, 2008)

| | Koenig's account | Snowden's account | McElroy's account |
|---|---|---|---|
| First generation | Knowledge sharing | Decision support | Supply-side KM |
| Second generation | Organizational learning and knowledge creation | Tacit/explicit knowledge conversion | Demand-side KM |
| Third generation | Taxonomy development and content management | organizations as engaged in sense-making | N/A |

Oinas-Kukkonen (2004) proposed the 7C model for understanding organizational knowledge creation , which consists of Connection, Concurrency, Comprehension, Communication, Conceptualization, Collaboration, and Collective intelligence, and is described as the dimension of different contexts: technology, language, and organizational contexts (Lyytinen, 1987), the framework assumes that Concurrent Connection of all stakeholders with the joint information space is provided in a technologically sound manner. The 7C model follows Nonaka and Takeuchi (1995) in that the integration of individual and organizational orientations is emphasized and that knowledge is assumed to create through interaction between tacit and explicit knowledge (Tervonen et al., 1997). The 7C model is a spiral process, as shown in Figure 2.

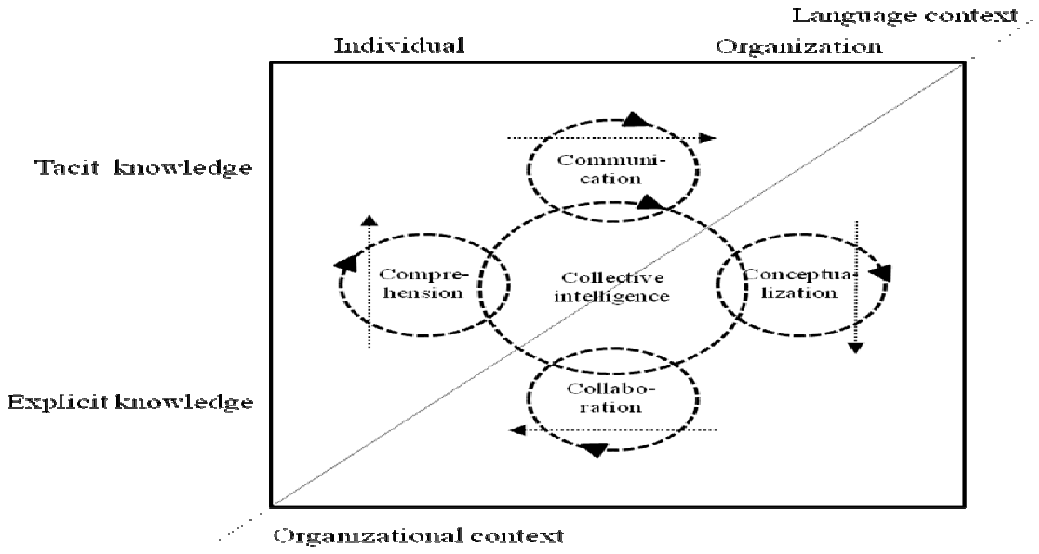


Figure 2. 7C Model
(Oinas-Kukkonen, 2004)

Accordingly we propose:

**Hypothesis 4: The style of the discovery (Pattern discovery) is a positive impact on knowledge generation.**

**Hypothesis 5: The community-based model will facilitate a positive impact on knowledge generation.**

Despres and Chauvel (1999) suggested that knowledge can be described as a source of value creation, Liebowitz and Suen (2000) included value creation into knowledge management metrics for measuring intellectual capital. Moreover, Amit and Zott (2001) studied the value creation in e-business and identified four main drivers: efficiency, complementarities, lock-in and novelty, knowledge resources contribute to create value not only by themselves but also by their dynamic interactions (Teece, Pisano & Shuen, 1997), so by assessing the links between knowledge assets and value objectives, virtual community managers can better align many investments in knowledge capital. How knowledge assets are engaged, separately and as clusters is addressed in value creation dynamics issues (Daniel & Giovanni, 2009). Community engagement is a planned process with the specific purpose of interactions between people, some examples of community engagement undertaken by government practitioners include: information of the community, consulting the community, part of the decision-making process, and collaborating with the community (Calvin & Shan, 2008). As long as the majority of their own interests, spiritual, financial capability to focus on a particular job who can be called "fans." Fiske (1992) considered that "fan" of the organization (fandom) itself is "productive" (productive), that is with a creative activity, in particular the "fans" have their own high degree of "recognition" (identification) and "involvement" (involvement), so "fans" are in accordance with their respective interests, forming different communities. Securing commitment and getting the most out of interactions with users are two key factors which must be considered in user engagement. Thus, it describes how much a participant is interested in and attentive to a conversation. We thus propose:

**Hypothesis 6: Community members of the fans have a positive influence on the knowledge value creation.**

## Research Method

The main purpose of cluster analysis is to identify certain characteristics under certain criteria similar to the object, according to the object properties to be divided into several sub-groups, so that each has a high degree of homogeneity within groups, and between different groups are highly heterogeneous. Oyanagiet, Kubota and Nakase (2001) proposed a new mining method named matrix clustering as computing the corresponding target. A target matrix Aij is shows in Fig.1., where the row represents customers and the column represents products. Namely, Aij = 1 means that a customer-i has bought a product-j, and Aij = 0 means that a customer-i has not bought a product-j, Aij is a large-scale sparse matrix. Similar to the Apriori algorithm that support is defined as an area of extracted sub-matrix, and confidence is defined as the density of extracted sub-matrix. Density can be calculated by dividing the total count of received markers at activated nodes by the area. The density of sub-matrix at the final stage in Figure 3 is 8/9=0.89.

Oyanagiet et al. (2001) proposed a new fast ping-pong algorithm to reduce the execution time by utilizing the spareness of a matrix. The algorithm iterates marker propagation between rows and columns until the state where the activated columns and rows are not changed. Pruning is performed by comparing the count of received markers with a threshold value. The structure of ping-pong algorithm is shown in Figure 3. below.

### *Data Collection*

At present various types of community organizations, are showing rapid growth, but the number of posts, popularity degree, and advertising is asymmetrical, therefore this study adopts a membership sensitivity, site response time, the contents of real time, continuous control, membership needs, user behaviour, loyalty, information type and other factors (Leimeister &

Krcmar, 2006), as the basis for selection of information. This paper investigates Taiwan Mychat Website (http://bbs.mychat.to/ index.php) empirically to find the link between user engagement and knowledge creation. Members were selected randomly, we surveyed from 10 to 20 members in each sections, data were collected for 2009/01 - 2009/07. This study selected 100 community members, covered the theme of Posts 90 had 1350 documented valid transactions, relationships array is 100 × 100 array, the density of the overall value of 25%. Table 3 highlights the relationship between members and posts behaviour information matrix.

```
While (convergence) {
        Row_to_col();   Prune_col();
        Col_to_row() ;   Prune_row (); }
```

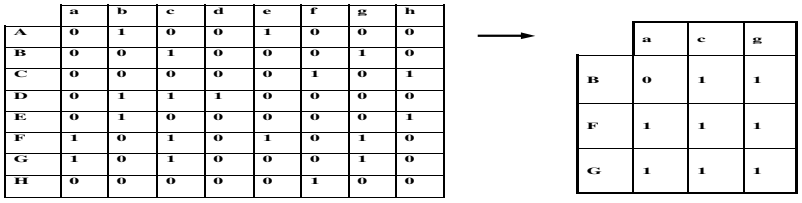


Figure 3. Dense sub-matrix

*Measurement Model*

In this study, members of the group as a community computing start value, through the mapping of posts themes, find out the specific features covered by other groups, and the ultimate goal is to build community sustained activation of the survival pattern of behaviour, the establishment of user engagement in future clustered index, and the empirical research framework shown in Figure 4. Matrix clustering method rather than the traditional Apriori algorithm is applied to a large number of rows and columns in cluster search, which will involve further analysis that

effectively shorten the time of the constraints, This research takes the group that is identified by the application of at least 80% of the group of density, accuracy and area coverage rate (Hinneburg & Keim, 1999; Ankerst, Breunig, Kriegel & Sander, 2009), and containing at least three community members, and posts themes in order to meet the results of the search limits (Oyanagi et.al., 2001). By using matrix clustering method calculation with Excel VBA macro program development, the search for the optimal density degree of clustering results, with the SECI model (Nonaka & Takeuchi, 1995) fits the results, presented in Figure 5.

## Analysis and Results

To enhance the core operating performance organizations need to have a share and generate

Table 3. Behaviours of Information Matrix

| Memberships | Synergistic | Extraction | Richness | reputation | emotional | self-confidence | loyalty | advertising | security | trust | psychology | will | Interest | Popular |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1. Forum General Focus 2.VC General Professional 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 4 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |

knowledge across the system. This 7C model extension of the original SECI process provides, comprehensive knowledge on the level and ontology level, and 7 C in turn plays an important role in organizational knowledge, Lyytinen (1987) also proposed the organization, language and technology background concepts and presented abstract background 7C relations. This produces aggregate user participation factors (such as: identifying the end-user, recruiting end-users, getting

D= 11/24=0.46 Socialization

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 |

D= 15/24=0.63 Externalization

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 0 |
| 0 | 0 | 1 | 1 | 0 | 1 |

D= 9/24=0.38 Internalization

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 |

D= 18/24=0.75 Combination

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 |

Figure 4. Ping-Pong Algorithm

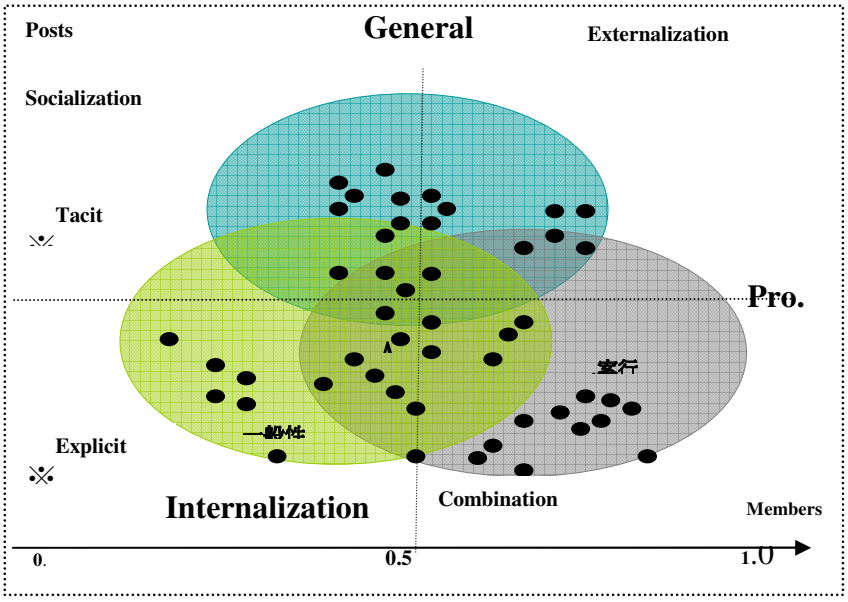


Figure 5. Distribution Process

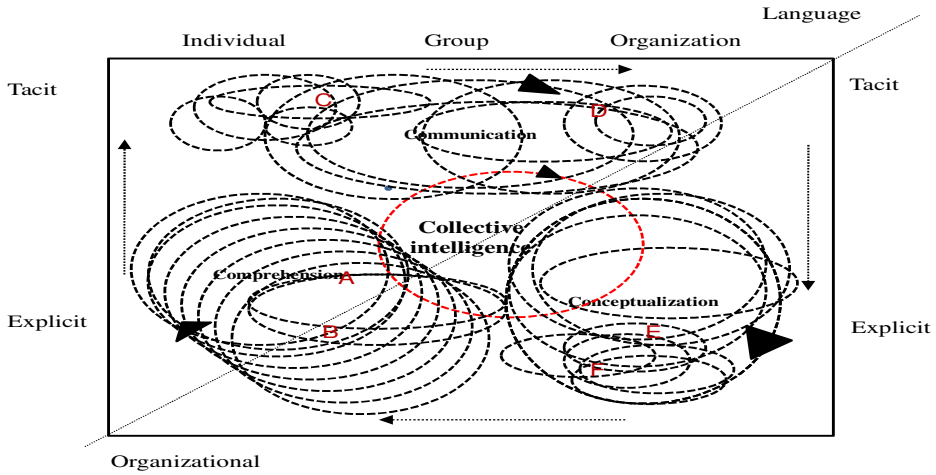


Figure 6. Distribution of Combined Clustering with 7C

the most out of interactions) that are closely related, and the 7C model fit the results, presented in Figure 6. This study shows the validation results in Table 4:

Table 4. The Results of this Study

| Cluster | Row / Col. | Density | Group characteristics |
|---|---|---|---|
| A | 25 X 20 | 0.48 | (posts/members) more |
| B | 30 X 20 | 0.35 | (posts/members) more |
| C | 8 X 15 | 0.41 | posts more |
| D | 6 X 10 | 0.68 | posts more |
| E | 15 X 6 | 0.79 | members more |
| F | 8 X 5 | 0.85 | members more |

Groups A and B are biased towards the earlier of the Forums are now thriving, and loyal users participate in information sharing, (in addition to probing psychological curiosity, the widespread worry in the community of making friends, to establish friendship networks), so repeat of information is on the high side, and there is less focus on the professional community of trading and ceremonial behaviour. Loyalty and trust is low, and the turnover rates match more suitable types of e-commerce community, and suitable recommendations to the high age of entry participation.

Groups C and D make expanded emphasis on the recruitment of community members, in addition to the professional community, to enhance the reliability and technical service satisfaction, to participate more actively in recommending a large number of users of the knowledge professional dedication, the community in this phase, should be classified Posts gradually improve the states, and there has been a contending transactions advertising period, by the analysis of array data that, at this stage in anti-viral protection, online brokerage, themes and replies to protect security, have been strengthening in implementation, for recommendation to have a steady job and have more conservative grassroots members to participate.

Groups E and F are biased towards the building of community expertise, in addition to maintaining member loyalty and trust givers, make better use of incentives to reduce the digital divide to meet with friends using customized interaction of the highest priority, combined with Web 2.0 design, active use of word of mouth marketing, value-added commercial products recommended to make the community become embedded in ordinary life, the establishment of community-based and universal goals daily, for recommendation to all levels of society, like a chain store popularity of convenience stores This stage is a development on the participation of members (members of the fans) that provides the best opportunity.

## Discussion and Conclusion

For the current structure of the Internet community, the majority still uses the non-profit approach to business, but a long-term perspective, between community members and business interaction, not only in trading, interest, fantasy, relationships coordination function with center needs, and development of products and services needs of individual members of the business process and information technology integration model, and the establishment of a new customer relationship management a different approach is needed. Internet community agents play the role

of marketing through searching and the ability to help companies expand in the market. This study is based on matrix clustering, interaction between members of the virtual community, and the evolution of cooperation and knowledge creation, and the main purpose of participation in the search for potential user engagement is to build a group recommendation system. The empirical results of this study can be summarized in the arguments proposed:

For different data array, the clustering method be used under the conditions, and might continue to create an effective community group to identify survival.

For the community in a particular group to posts themes (knowledge sharing), as recommended to the community managers, and help one-to-one customized implementation of marketing decisions. Posts on specific topic, can identify the most suitable ones for their respective groups of user engagement, and community groups can develop different best promotions

The fit parameter set was adopted in this study, and in the corresponding array, only elements of value 1 are weighted, since the group might want to search for the unknown, designated areas of the setting will affect the search group upper and lower boundaries, so the actual implementation should adopt liberal acceptance, re-use part of the array density to closely examine the principles, to achieve a more objective judgement of the results. The higher "Community Engagement" and smaller "Normative Community Pressure" let community members' brand community loyalty higher (Mollen & Wilson, 2009).

Finally, this study found that when the Community posts are richer in content and disorganized, the community features are summarized in the present slowdown phenomenon, especially when the recommendations of the private nature of posts are more universal, but the loss rate of community members present demand is high and security is an increasing

phenomenon, of which the network (owing to the lack of interpersonal confidence-building mechanisms, and weak relations of user engagement), results in a brief presentation of the stagnant growth of the community.

For limitations of the study, the matrix-clustering method is only suitable for use in the relationship between the array of binary values, and still needs further information on the value, converted to the analysis, but it will make the meaning of the original data possess distortion, however, when dealing with the relationship between the array of large-scale quantitative values, computing may be time-consuming.

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