



How do Enterprises promote innovation performance? A study on the relationship between online communities and innovation performance—exploring the mediating effect of tacit knowledge

Chi-Cheng Lee¹ · Lian-Chun Lee² · Rui-Hsin Kao³ 

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Abstract

The objective of this study was to explore the relationship between online communities operated by different enterprises, tacit knowledge and innovation performance. An attempt was also made to understand whether tacit knowledge plays a mediating role on the relationship between online communities and innovation performance. This study applied questionnaire survey, and 163 enterprises in Taiwan served as the sample. Analyses were conducted by confirmatory factor analysis, hierarchical regression and structural equation modeling. It was found that online communities of the enterprises had significant positive effect on the acquisition of tacit knowledge. Also, tacit knowledge had a significant positive effect on the innovation performance of enterprises. Tacit knowledge had a mediating effect on the relationship between online communities and innovation performance. This study not only proved that communication between online community members promote the acquisition of tacit knowledge, but also tested the mediating effect of tacit knowledge. Therefore, enterprises could be aware of the importance of tacit knowledge (share and apply from operating online communities) to innovation performance. Moreover, enterprises that attach importance to the interaction between online community members and the sharing of tacit knowledge were implicated in this study.

Keywords Online communities · Tacit knowledge · Innovation performance

Introduction

Nowadays, the development of many organizations is based on knowledge (Martins & Terblanche, 2003). This is because the success and survival of an organization depends on innovation and inventiveness, and creativity at work (Zhang

et al., 2020). In the commercial environment, knowledge managers are definitely what enterprises need to respond to the changing business environment by creating organizational knowledge and innovative practices (Giannakis, 2008; Sikombe & Phiri, 2019). The rise in global online communities has become the major communication channel between enterprises and consumers. Online social platforms have also been applied to obtain the opinions and knowledge of members, in order to contribute to the business of enterprises (Moser & Deichmann, 2020). Therefore, business administrators now focus on encouraging and supporting various online communities, sharing information on social platforms nowadays, in order to apply more tacit knowledge and further promote the innovation performance of organizations.

As a result of the widespread application of digital technology today, it has become extremely important to make good use of e-commerce platforms and online communities to spread good reputation or assist in product promotion (Islam & Rahman, 2017; Mozaffar & Panteli, 2021). Online users engage and share information on the different community platforms so that members (consumers) are stimulated

✉ Rui-Hsin Kao
toptop074@yahoo.com.tw
Chi-Cheng Lee
k0011@gcloud.csu.edu.tw
Lian-Chun Lee
k0454@gcloud.csu.edu.tw

¹ Department of Business Administration, Cheng Shiu University, Kaohsiung, Taiwan

² Department of Business Administration, Cheng Shiu University, Kaohsiung, Taiwan

³ Department of Ocean and Border Governance, National Quemoy University, 1 University Rd Jinning Township, Kinmen 892, Taiwan

to share and comment on their ideas with each other. Thus, information could be exchanged and transmitted quickly, and users could establish connection and combine public wisdom to further improve the efficiency of community knowledge sharing (Mojdeh et al., 2018; Moser & Deichmann, 2020). From the perspective of social network theory, Huang and Lai (2019) believed that users could access the diverse knowledge and skills of communities through online community interaction, so that an individual's professional knowledge and skills could be deeply developed. Therefore, it is important for virtual communities to provide online interaction frequency and amount, so that members of such communities could share knowledge, increase the cohesion of communities and further help the operation of online communities (Armstrong & Hagel, 1996; Faraj et al., 2016). In addition, the professional knowledge and skills of individual members could be extended to other community members so that the entire community could share and apply learning benefits (Luo et al., 2016; Moser et al., 2017). Based on these reasons, business administrators could utilize or operate social platforms to interact and communicate with customers and other stakeholders to get important business information, in order to meet customer needs and maintain their competitive advantage.

In this study, two types of knowledge were considered, namely explicit and tacit knowledge (Polanyi, 1967). Daft (2016) believed that implicit knowledge comprised about 80% of valuable knowledge in organizations, which is difficult to transmit. Through interactive media, person-to-person or face-to-face connection, organizations could achieve the leverage of personal professional knowledge and know-how to become a personal network for sharing tacit knowledge (Hansen et al., 1999). Therefore, the development of information technology, and social media could provide members with more effective sharing of tacit knowledge (Daft, 2016). For example, many enterprises (such as IBM, GE) through interaction on the internet share insights, ideas and knowledge from network members all over the world, so that millions of people, instead of just traditional employees could contribute to innovation processes (Daft, 2016). Furthermore, traditional knowledge plays a key role in the progress of organizations (Nonaka & Takeuchi, 1995; Chen & Mohamed, 2010). Nevertheless, some scholars have proposed that the productivity of front-line workers was unaffected by traditional knowledge, but it was still mainly responsible for the success of enterprises (Paladino et al., 2016). However, tacit knowledge was found to be realistic, because it could increase innovation capabilities, general competitive positions and the productivity of enterprises (Zeng & Tang, 2014; Fallatah, 2018). Therefore, the circulation of knowledge could improve innovation performance (Mahdi et al., 2019; Al-Abadi et al., 2020). Furthermore, earlier studies have shown that the application

of tacit knowledge had significant positive effect on the finance and human resource development performance of enterprises (Lee, Tsai and Lee, 2001; Manaf et al., 2018; López-Cabarcos et al., 2019).

In summary, enterprises could interact and communicate with stakeholders through online social platforms, to further share tacit knowledge. Online communities could further share tacit knowledge between members, so that enterprises could utilize tacit knowledge to improve innovation performance. Theoretically, tacit knowledge could be shared and applied from the network, open dialogue, mentorship training, and cooperation (Daft, 2016). However, there are very few evidence-based studies on operating online communities (online and open dialogue) to strategically apply tacit knowledge. Some scholars have studied and proven that tacit knowledge could improve the innovation performance of enterprises. However, there was no clear proof of the relationship between the three, and whether tacit knowledge played an important role, such as a mediating role, in the relationship of online communities and the innovation performance of enterprises. In order to fill this research gap, this study evaluated the relationship between online communities, tacit knowledge and innovation performance, and the mediating effect model of tacit knowledge. According to the information above, it is expected that the study would provide more theoretical information for the relationship between online communities, tacit knowledge and innovation performance, and the mediating role of tacit knowledge in order to cover the existing research gaps. At the same time, more strategic suggestions and specific actions could be provided to enterprises running online communities through the actual research process. This is the latest contribution of this study.

Literature Review and Research Hypothesis

Online Community

The term “online community” refers to the virtual space created by computer communication, and it is a virtual space with sufficient people interacting on the internet and constituting an interpersonal network. It is a network organization built on the internet (Rheingold, 1992; Von Krogh et al., 2012). Through social platforms, members could share certain knowledge and information, and be loyal and committed to each other, as if they were friends and cared for each other (Rheingold, 2000; Deltour et al., 2014; Belk, 2014). Adler and Christopher (1998) believed that online communities represented a new social system that provided common interests, met the needs of people for interaction, and allowed users to gather together to express opinions on common issues and generate interaction to facilitate emotional

maintenance and information sharing (Matzat, 2010; Hau et al., 2013; Pi et al., 2013). Based on the information mentioned, an online community is a group of users gathering on the internet. They interact, communicate and share with each other on the internet platform to meet the needs of individuals for information (knowledge), entertainment, transactions, interpersonal relationships, and interests.

Online virtual communities are not only the combination of technology, goods exchange and users, but they are also the composition of emotions, behavioral interactions, values, language, time and space (Tapscott, 1998). It enables different users to share knowledge, create new concepts, and allow community members to share their learning experiences. Diverse information could be derived from the comments, links and feedbacks, and virtual interpersonal relationships with each other could be established and maintained (Haridakis & Hanson, 2009; Pi et al., 2010; Papp et al., 2012), and self-fulfillment and social emotions could be acquired (Chang & Chuang, 2011; Chang & Lee, 2013; Mojdeh et al., 2018). In terms of commercial applications, the characteristics of the internet included low cost, real-time, cross border interaction, and multimedia, which provided a good environment for enterprises to apply interactive marketing (Barreda et al., 2015; Wang et al., 2016). Prahalad and Ramawany (2000) explained that consumers were not only interested in purchasing products, but also wanted to create experiences with other consumers or experts. Enterprise administrators believed that by participating in online communities, customers could develop a higher level of cohesion and loyalty, gain competitive advantages for their products, and further affect their marketing performance (Jang et al., 2008; Zheng et al., 2015). In addition, Oliver and Marwell (2001) proposed the concept of critical mass and opined that when the number of participants has crossed a certain threshold, the people would develop a certain social tendency. Due to the influence of group information and norms, there would be a tendency to use the system (Lou et al., 2000). Therefore, the social network formed by the communities could acquire social capital (Moser & Deichmann, 2020). This type of social capital is a product of social relationship, could be converted into economic capital, and is regarded as rational investment (Bourdieu, 1986; Giorgi et al., 2015).

In addition, online communities are also regarded as a kind of social network relationship, and include all interactions between organizations (Knoke & Kuklinski, 1982; Mojdeh et al., 2018). The central concept of network analysis is “relationship”. The specific form of the network involves three aspects, namely: 1) network scale, 2) relationship strength and 3) stability. The 3 aspects covered the number of network systems and the number of members in the systems, relationship strength between the members (including the level of interaction, exchange of resources,

form of network relationship, penetration of boundaries, and capital dependence between members), and the margin of member changes (durability of relationship) (Wu, 1996; Faraj et al., 2011).

In summary, the network value increases with increasing number of members. When the network achieved critical mass, the tendency for use also developed. The specific form of network involved 3 aspects, namely: 1) network scale, 2) relationship strength, and 3) stability. Four aspects were applied in this study, namely: number of online community members, interaction frequency, stability of the number of interacting members, and satisfactory level of communication and interaction to evaluate the online communities. In addition, regarding the applications of online communities, this study emphasized online interaction, communication, and sharing of knowledge and experience in order to apply tacit knowledge that would be valuable to enterprises. Therefore, there was no restriction about the applications of online social platforms, including the commercial and entertainment community market. Enterprises may utilize corporate communities, business social communities, personal social communities, dating communities, and even establish discussion areas, multimedia sharing, mobile communities, or shopping communities, to continuously interact and communicate with stakeholders, thereby acquiring important knowledge and information for business (Institute for information industry, Taiwan, 2011; Zaglia, 2013; Baldus et al., 2015).

Tacit Knowledge

Polanyi (1967) divided knowledge into 2 categories: 1) tacit and 2) explicit. The former is personal, and related to special circumstances, which are difficult to formalize and communicate. Explicit knowledge refers to knowledge that could be formalized, institutionalized, and verbally conveyed (Huie et al., 2020). In addition, tacit knowledge is a kind of non-verbal, intuitive, unarticulated, and coherently unexplainable knowledge (Hedlund, 1994; AlMulhim, 2020). It includes the cognitive level and the skill level derived from experience. The former constituted the individual image of reality and future prospects, including beliefs, ideas, ideals, value systems, emotions and mental models. The latter included specific technique, craftsmanship, informal and coherently unexplainable know-how, and unexplainable skills and craftsmanship (Nonaka & Takeuchi, 1995; Jacobs & Park, 2009; Prajogo & Oke, 2016). Based on this, tacit knowledge is the knowledge accumulated over a long period of time. This type of experience includes results from long term accumulation and learning experience. Therefore, relevant know-how could be separated from individual behavior (Davenport & Prusak, 1998; Chugh, 2017). This is the technique or craftsmanship that could only be understood but not described. In the business circle it is called know-how.

The development of know-how originated from devotion, experience and accumulation of individual spirit. After a certain period of time, many experiences are internalized, combined and integrated. Tacit knowledge is obtained by cognitive activity that the individual did not realize, and this type of knowledge is difficult to express in words (Randeree, 2006; Huie et al., 2020).

In summary, tacit knowledge can only be understood but not described, and cannot be edited by humans. It is usually referred to as individual knowledge acquired by individual working experience. In practice, it is called know-how and is different from explicit knowledge that could be learnt from words and languages. Tacit knowledge has intangible characteristics but it exists in the process of business operation. Relevant studies (e.g., Daft, 2016) have shown that tacit knowledge accounts for about 80% of the valuable knowledge of enterprises, which is difficult to convey and learn. Therefore, it could improve the business performance of enterprises (Hadjimichael & Tsoukas, 2019).

In order to assess the different aspects of tacit knowledge, Zander and Kogut (1995) applied complexity, codifiability, and observability of information from different countries. Makhija and Ganesh (1997a and b) found that manufacturing procedures, external relations, marketing know-how, management procedures, and breakthrough of new technologies were the implied meaning of tacit knowledge. Inch et al. (2008) proposed that cognitive, technical, and social skills were the 3 elements of tacit knowledge. In addition, Drysdale and Mcbeath (2012) considered self management, managing others, managing tasks, local tacit knowledge and global tacit knowledge as elements for tacit knowledge evaluation.

One of the major objectives of this study was to explore the effect of the tacit knowledge of innovation performance. The classification of tacit knowledge proposed by Makhija and Ganesh (1997a and b) was based on the 5 know-how of the product (service) namely: manufacturing, external relations, marketing management, corporate internal management and innovation of new technologies. It included most researches related to tacit knowledge and focused on the element related to innovation. In this study, the mentioned elements were applied as indexes to evaluate tacit knowledge.

Innovation Performance

Innovation brings new ideas or practices into organizations, or the process of making profits, revenues, and enables organizations to achieve competitive advantage (Jisr & Maamari, 2017). Innovation is a weapon used by enterprises to maintain their competitive advantage, and is also a basic factor for their survival (Drucker, 1993; Cai et al., 2021). Innovation is very important to the growth and development of enterprises, regardless of traditional

or high-tech industries. Relevant performance would cover innovation strategies and activities at all levels, thereby creating an even greater comprehensive performance for organizations (Al-Abbadi et al., 2020). Therefore, innovation could be the only way for enterprises to maintain competitive advantage in the market (Van Zyl et al., 2021). Studies have shown that if the new knowledge and insights acquired from outside could result in change of organizational behaviors and achieve organizational performance, then it can be classified as organizational innovations (Garvin, 1993). Therefore, if enterprises would like to achieve innovation performance, they could follow innovation strategies to allocate resources, and then implement various innovations, such as innovation of marketing, products, technologies, and processes (Kör & Maden, 2013; Salem, 2014). In addition, enterprises could also improve organizational performance through various management processes (Yuniarty et al., 2021), such as the management of online communities, as well as the sharing and application of tacit knowledge. As early as 1911, Schumpeter introduced the term “innovation” into his economic literature “The Theory of Economic Development”. In order to further understand innovations, Schumpeter (1934) divided innovations into 5 aspects: (1) product innovation, (2) process innovation, (3) market innovation, (4) source innovation, and (5) organizational innovation (Kjellberg et al., 2015; Azar & Ciabuschi, 2017).

In order to have a better understanding, it was compulsory to fully evaluate innovation (Carlucci et al., 2014). Innovation performance was defined as the process of implementing ideas (Iqbal, 2011). Based on this, innovation performance was evaluated with several dimensions (Al-Abbadi et al., 2020). For example, Salem (2014) evaluated innovation according to innovation speed and magnitude. Innovation speed was related to the rapid generation of processes, products, and services, while innovation magnitude focused on the number of processes, products and services generated. Gloet and Terziovski (2004) evaluated the quality and responsiveness of innovation. Several studies have applied technological, administrative, radical and incremental innovations to evaluate innovation performance (Chen & Huang, 2009; Iqbal, 2011; Kör & Maden, 2013). In addition, Daft (2016) classified innovations into four categories as follows: technology innovations, product and service innovations, strategy and structure innovations, and culture innovations. Saunila (2017) divided innovation performance into four evaluating indices namely: inputs, processes, outputs and outcomes. They included resources that could promote the innovations of enterprises, the “bridge” between innovation inputs and outputs, creativity evaluation, innovation systems, and the direct result of innovation activities (Dodgson & Hinze, 2000; Bain & Kleinknecht, 2016).

In summary, there have been many studies and discussions about innovation performance. In recent studies, scholars have paid more attention to innovation outputs, such as patent data (Shah et al., 2020), R&D expense (Yang et al., 2010), and new product sales (Kirner et al., 2009) as indices of innovation performance. However, each index of innovation performance has its own limitation. This study has reported the perspectives of the above-mentioned scholars and summarized innovation performance into four aspects. They are: (1) product and service innovations index: it involves product (service) development, product (service) commercialization, product (service) customer demand, (2) process innovation index: product (service) process quality, product (service) yield rate, product (service) process flexibility, production cost reduction, (3) organizational innovation index: external responsiveness of organizations, smooth internal operations, and (4) strategy innovations: new positioning of product (service), new application of product (service), value chain reorganization.

Relationship between Online Community and Tacit Knowledge

Several studies have shown that the networks between organizations have provided various resources and valuable information, which could be responsible for the strategic advantages of enterprises (e.g., Dyer & Singh, 1998; Gulati, 1999), and new knowledge could be generated through social networks (Tsai, 2000). Corredoira and McDermott (2014) proposed that the social networks of enterprises could be helpful in proposing new business models. The more connections enterprises have, the easier for them to integrate network exclusive resources to upgrade the industrial value chain. If enterprises had diversified networks, they could apply differentiated competitiveness, which would be beneficial to them (Chen et al., 2012; Lin & Darnall, 2015). Based on this, having more diversified network connections could help enterprises acquire resources, knowledge and information, and thus improve enterprise competitiveness.

With the progress and development of information technology, virtual communities have become major knowledge sharing platforms (Armstrong & Hagel, 1996; Deltour et al., 2014; Belk, 2014; Islam & Rahman, 2017). According to social network theories, individual community members could reach the diversified knowledge and skills of members in the community through the process of online community interaction; so that their own professional knowledge and skills could be deeply and widely developed (Mojdeh et al., 2018; Huang & Lai, 2019). Individual members could promote the spread of professional knowledge and skills to other community members, for which this would

constitute the positive effect of knowledge spillover, so that the entire community could acquire learning benefits (Barreda et al., 2015; Luo et al., 2016). Organizations could achieve leverage of individual professional knowledge and know-how through interactive media, person-to-person, or face-to-face connections. Thus, administrators should focus on developing people connections, and share tacit knowledge in community networks through experience, opinion and idea sharing (Hansen et al., 1999; Daft, 2016). In addition, social media could provide official community websites, forums and blogs of enterprises so that members could interact, promote learning and share professional knowledge through online social communities, and improve their problem solving capabilities (Buunk et al., 2019). Knowledge communities could be ideal for tacit knowledge transmission and knowledge innovations. The autarky communities could even respond directly and quickly to the questions raised by each other (Zaglia, 2013; Islam & Rahman, 2016). Therefore, the revelation of experiences, opinions and the ideas of members of online communities did not only help in sharing professional knowledge and know-how in online communities, but benefited enterprises applying necessary professional knowledge and know-how as well. In summary, this study established the following hypotheses:

H1: The closer the network of online communities, the more positive effect it will have on the sharing of tacit knowledge between members and enterprises. It includes tacit knowledge about the know-how of manufacturing products (services) (H1a), know-how of external relationship (H1b), know-how of marketing management (H1c), know-how of enterprise internal management (H1d) and know-how of innovations of new technologies (H1e).

Relationship between Tacit Knowledge and Innovation Performance

Grant (1996) believed that knowledge is the basis of innovation. However, many enterprises have been unable to develop enough knowledge for innovation and it has been difficult to acquire necessary knowledge in the trading market. If enterprises could share and absorb knowledge, and combine with internal resources and capabilities, it would be easy to fill the gaps of knowledge thereby creating value, and new knowledge that would be consistent with the strategic goals of enterprises. This may be transformed into executable innovation strategies, to achieve the innovation performance of enterprises (Jiang et al., 2010; Arshad & Ismail, 2018). Keams and Leder (2003) found that if members of enterprises share knowledge, it could bring about innovative behaviors and improve organizational performance. Thus, in terms of buyer-supplier, tacit knowledge started from members of the buyer organizations (such as the design engineer). Through the collaboration of new product project, relevant

knowledge was transmitted to the entire buyer and supplier system. Then the supplier could make use of relevant knowledge to improve their proficiency and innovation capabilities (such as accuracy, robustness, and uniqueness of design) in buyer-supplier collaboration (Zhao, 2013). Therefore, many studies (e.g., Chen, 2015; Al-Abbadia et al., 2020) found that if organizations could inspire members to share and apply their tacit knowledge, there would be a positive effect on innovation performance. Since tacit knowledge is unique, rare and difficult to copy, it would form an important source of innovation in the buyer-supplier knowledge exchange, if properly applied. Therefore, tacit knowledge would improve competitive advantages and be valuable for improving the innovative capabilities of suppliers (Nonaka & Takeuchi, 1995; Chen, 2015). In summary, this study has established the following hypothesis:

H2: The more tacit knowledge shared by the members of online communities and applied by the enterprises, the more positive effect it would have on the innovation performance of the enterprises, including product innovations (H2a), process innovations (H2b), organization innovations (H2c) and strategy innovations (H2d).

Mediating Effect of Tacit Knowledge on the Relationship between Online Community and Innovation

Performance

Online communities have been identified as key platforms for knowledge sharing and innovation (Moser & Deichmann, 2020). People easily and rapidly share information, expertise and experience with each other via online communities. By sharing tacit knowledge, staffs or teams of organizations with a certain knowledge system or know-how would apply the beliefs, ideas, ideals, value systems, emotions and mental models thereby transforming them into specific technologies or processes. At the same time, through the sharing and absorption of tacit knowledge, and by integrating the resources and capabilities of organizations, the coherently unexplainable know-how, and unexplainable skills and craftsmanship (Prajogo & Oke, 2016) would be transformed into executable innovation strategies, which further demonstrate the innovation performance of enterprises (Arshad & Ismail, 2018). In addition, the quality of tacit knowledge is very important to online communities and their participants (Lou et al., 2013). Since high quality knowledge would be accurate, intact, reliable and timely (Chiu et al., 2006), the tacit knowledge accumulated from online communities would make community participants believe that it would be the wisdom of the team and exceed their personal ability. Thus, participants would support and share knowledge with each other (Fang & Neufeld, 2009; Huffaker et al., 2009). If

organizations could make use of the network links on online communities, it could achieve accumulation of individual professional knowledge, and further achieve the professional knowledge and know-how of online communities. Sharing experience, opinions and ideas in tacit knowledge, could encourage the learning of community members, accumulation of professional knowledge, and improvement of problem solving skills (Buunk et al., 2019). Online communities could directly and rapidly respond to the needs of organizations (Islam & Rahman, 2016) and thus promote innovation performance. Therefore, tacit knowledge has a mediating effect on the relationship between online community and innovation performance.

In summary, this study has established the following hypothesis:

H3: Tacit knowledge has a mediating effect on the relationship between online communities and innovation performance.

Research Design

Research Model

The research model was designed according to the objectives and hypotheses shown in Fig. 1.

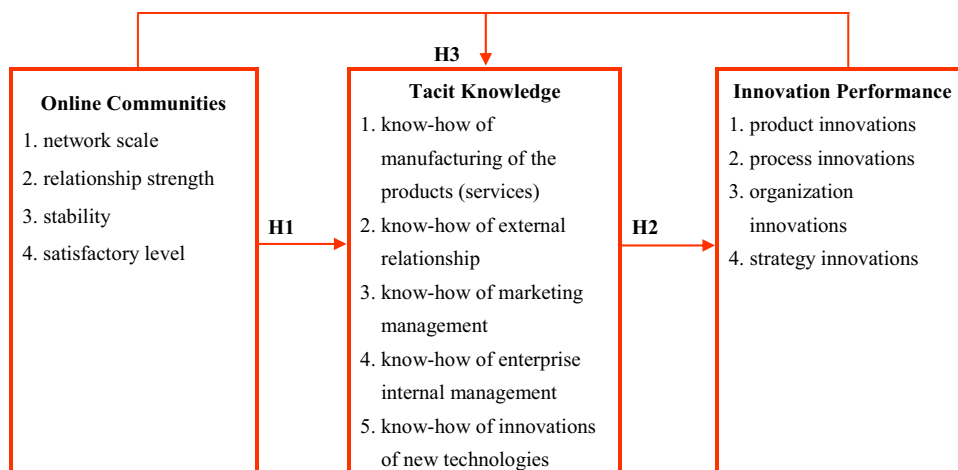
Analysis Strategy

In order to determine whether the hypotheses of this research are supported. The analytical strategy applied was as follows:

Firstly, to verify whether the hypothesis is true, the SPSS 22.0 and Lisrel statistics software were applied to analyze the data in the questionnaires. Next, confirmatory factor analysis (CFA) was applied to verify online community, tacit knowledge, and innovation performance. Then, hierarchical regression analysis was applied to estimate the relationships between online community, tacit knowledge, and innovation performance. In addition, Structural Equation Modelling (SEM) was used to measure the mediating effects of tacit knowledge on the relationship between online community and innovation performance. Furthermore, since different questionnaires were collected from different sources, t-test was applied to determine whether those three research variables and online questionnaires were different in perceptions before conducting statistical analysis. It was verified that the questionnaires from both sources did not have significant difference, so the data collected were combined for analysis.

The data used in this study was collected from a single source and the questionnaires were answered by the subjects. Therefore, there might be an issue with common method variance (CMV) and the relationship between variables

Fig. 1 Research model



might be enhanced (Podsakoff & Organ, 1986). Herman's single-factor post hoc test developed by Podsakoff and Organ (1986) was conducted to test the CMV issue of the questionnaires. Herman's single-factor post hoc analysis indicated the existence of a CMV problem when a single factor is extracted by factor analysis or when a compound factor explaining the main variance of dependent and independent variables exceeds 50% (Mattila &ENZ, 2002). The result of factor analysis showed that the maximum variance was 27.65%, which indicated that CMV was not significant in this study.

Based on the above, this analysis strategy should be able to accurately estimate the various research hypotheses of this study and highlight the theoretical and practical implications of this research theme.

Sample and Sampling

In this study, a questionnaire survey was conducted to collect subjects' perceptions of research variables. The samples were Taiwan enterprises operating online community platforms. In order to reflect the actual status of enterprises promoting online communities, this study interviewed 3 enterprise administrators that operated online communities. The interview content included platforms or approaches used to operate online communities, community members, source, structure, numbers and frequency of interaction, interactive content of the online community, the information and knowledge shared from interaction, and the experience about knowledge applied from interaction that could benefit business development and innovations of enterprises.

The first draft of the questionnaire was developed based on the interview results and literature review. Before the formal questionnaire survey, 5 enterprises were selected for pre-test. According to the pre-test results, the semantics of the questionnaire was revised. Thereafter, item analysis was performed to examine improper items. Finally, the content of

this research questionnaire was confirmed. The sample came from the company directory published by the Department of Statistics of the Ministry of Economic Affairs, including manufacturing, service and trading industries. Both online and paper questionnaires were used for purposive sampling. In addition, to ensure that the sample fully represents the population, the industry categories, level of the subjects and their job attributes, a questionnaire was administered to one subject in each enterprise, and an instruction was included.

Therefore, purposive sampling was adopted. Among the 550 questionnaires, appropriate subjects were selected according to the industry categories, level of the subjects and their job attributes, so that the study sample could represent the population. Paper questionnaires were delivered to industries that the authors were familiar with while others received online questionnaires. The subjects were businessmen who promoted interaction and communication of online communities. The questionnaire was administered to a specific representative of each enterprise. The representatives were either known by the authors, or recommended by others. The questionnaire was written by personnel in a certain department, level and position according to the design so that the subjects of the survey would cover different industries, departments and positions. In total, 550 questionnaires were administered and 171 questionnaires were returned. There were 163 valid questionnaires, including 88 paper versions and 75 online versions. The returning rate, 31%, was similar to those obtained in the same field (Cater & Cater, 2009; López-Cabarcos et al., 2019).

Measurement

The 5-point Likert Scale was applied to measure those variables. In the online community, having score of 1 to 5 represented "very rarely" to "always". For the scales of tacit knowledge and innovation performance, score 1 to 5 represented "strongly disagree" to "strongly agree". The higher

score indicated that the implementation of that item was frequent, or the perception of the subject was higher. The questionnaires consisted of four parts. The objective of the first part was to understand the interaction between members of the online community of the enterprise. The questionnaire was mainly based on the research scales of Duncan-Howell (2010) and Lai and Gwung (2013), including the three dimensions of network scale, relationship strength and stability. In addition, based on the literature discussion, this study adds one item of “satisfactory level”, and so there are four questions in the part. The second part was aimed at measuring the application of tacit knowledge from the interaction of the community. The questionnaire was derived from the classification of tacit knowledge proposed by Makhija and Ganesh (1997), including the 5 products (services) based on proprietary technologies, such as manufacturing, external relations, marketing management, corporate internal management and innovation of new technologies. Innovation performance was mainly based on the research scale of Gloet and Terziovski (2004), and Saunila (2017). There were 12 questions representing four dimensions, including product innovations, process innovations, organization innovations, and strategy innovations. The fourth part was the basic information of the enterprise and subjects. There were 6 questions, namely: the date of establishment, industry, gender of

subject, job tenure, job title and department. Table 1 presents the 21 items of the above mentioned scale.

In the past 30 years, since Churchill (1979) developed the scale process, several scales have been developed by scholars based on Dabholkar et al. (1996). There has been great improvement in the quality of dimensions and scales. However, most of the relationships between the dimension and observation variables were mainly based on the reflective indicator relationship. In the reflective indicator relationship, the correlation between the items was high and the construct was revealed by an indicator. The indicator was affected by the construct, and the correlation between indicators was medium to high. There were also error items for the indicator (Wilcox et al., 2008). According to the Self-report Measure of Multiple Intelligence by Furnham (2009), a total of 5 indicators did not show significance in the 28 paired correlation coefficients of the 8 indicators, and only verbal and mathematical indicators were significantly correlated. Only those two indicators could actually predict the intelligence. Among the 8 indicators, more than half of the Alpha value could not be higher than 0.7. According to the measurement results of Furnham (2009), the 8 indicators of multiple intelligence construct measurement did not include the reflective indicator relationship. The construct of online communities of this study was revealed by four indicators, namely: network scale, relationship strength,

Table 1 Variables/Questionnaire Items

Online community
1. Number of members participating in communication and interaction
2. Frequency of communication and interaction
3. Changes in the number of participating members joining or quitting the community
4. Satisfactory level of communication and interaction
Tacit knowledge
1. Know-how of manufacturing process
2. Know-how of external relations
3. Know-how of marketing management
4. Know-how of corporate internal management
5. Know-how of innovation of new technologies
Innovation performance
1. Important knowledge could be conducive to products (services) development capabilities
2. Important knowledge could be conducive to speeding up the commercialization of products (services)
3. Important knowledge could be conducive to mastering the characteristics of customer needs about the products (services)
4. Important knowledge could be conducive to the production yield rate of products (services)
5. Important knowledge could be conducive to products (services) and process quality
6. Important knowledge could be conducive to the process flexibility of products (services)
7. Important knowledge could be conducive to reducing the production costs
8. Important knowledge could be conducive to the smoothness of the organization internal operations
9. Important knowledge could be conducive to the reaction capability of the organizations to external
10. Important knowledge could be conducive to the new positioning of products (services)
11. Be conducive to the new uses of products (services)
12. Important knowledge could be conducive to rebuilding the value chain of the enterprises

stability, and satisfactory level. There was medium to high correlation between the indicators (the correlation coefficients of the indicator pairs reached significant correlation with 0.4 or above). Constructs of tacit knowledge and the innovation performance of this study also included the same result as above. Therefore, the constructs of this study belonged to reflective indicators. The aforementioned questionnaire distribution process, test method, and statistical method have been applied in other researches (eg. López-Cabarcos et al., 2019), and their reliability and validity were good.

Informed Consent

To obtain informed consent from the participants, research associates provided a complete explanation of the objectives and procedure of this research. The participants were assured that their responses would be confidential and anonymous. Moreover, all questions from the participants were answered.

Sample Structure

In order to understand whether the subjects met the survey objective of this study and were representative, the structural analysis of the sample was conducted. After analysis, it was found that the average established duration of the enterprises was 13.85 years and 79.2% of them were over 10 years. It was found that the service industry was the majority (63.2%), followed by the manufacturing industry (25.1%). The average job tenure of subjects was 15.25 years, and 71.7% of them were over 10 years. For the job title, there were 25.8% of senior managers, 20.9% of mid-level managers and 19.6% of junior managers. About the departments, there were 74 subjects (25.4%) from the management department, 34 subjects (18.9%) from the professional department, and 58 subjects (35.6%) from the information technology department. Regarding gender, there were 108 females (66.3%) and 55 males (33.7%). Based on the data above, the enterprises were mostly in the service industry and have been established for over 10 years. Most of the subjects were at the management level with over 10 years of job tenure and came from different departments. According to the structure, the subjects should have a strong understanding of the enterprise online communities, tacit knowledge and innovation performance. Therefore, this study sample should be representative.

Results

Basic Analysis

Table 2 shows the average number, standard deviation, α coefficient and related coefficient of variables. In order to test whether there were different potential constructs between online communities, tacit knowledge and innovation performance, this study applied confirmatory factor analysis (CFA) and the maximum likelihood of LISREL was used to compare 3 different potential constructs. The results of CFA are shown in Table 3 and were different potential constructs.

Table 4 shows that the CR value of different research variables is greater than 0.7, which is the test criterion. From Table 4, it could be observed that the standardized factor loading of each variable was greater than 0.5, which showed that each research variable scale had high construct validity. Therefore, convergence validity and discriminant validity were applied for further analysis. Furthermore, the standardized factor loading t of each variable reached a significant level ($t > 1.96$), which indicated that each observed variable and the corresponding latent variable had significant correlation and the average variance extracted (AVE) was over 0.5. It had convergence validity. Moreover, the correlation coefficient interval estimation method was applied in this study to test the discriminant capability of the variables. In terms of variable analysis, the results showed that the estimated confidence band of the paired dimensions did not include 1.00. Therefore, each variable had discriminant validity. Lastly, for the overall internal consistency reliability Cronbach’s α , the value of α and dimension were greater than 0.7, which showed that the reliability of this scale was good.

Hypotheses Analysis

Effect of Online Community on Tacit Knowledge and Tacit Knowledge on Innovation Performance.

In order to explore the effect of the interaction of online community members on tacit knowledge, this study applied hierarchical regression analysis for testing. Firstly, the control variables were the enterprise establishment time and the job tenure of subjects in that enterprise (Table 5 Model 1). Secondly, online communities were added in Model 2

Table 2 Descriptive Statistics, Correlation Coefficient, and Alpha Coefficient

	<i>M</i>	<i>SD</i>	α coefficient	Research Variables		
				(1)	(2)	(3)
Online Communities,	2.6534	.72878	.786	1		
Tacit Knowledge	3.2773	.47885	.918	.466***	1	
Innovation Performance	3.4463	.44739	.941	.373***	.533***	1

*** $p < .001$.

Table 3 Goodness of Fit Indicators for Research Variables

ResearchVariable	χ^2/df	AGFI		NNFI		PGFI		RMSEA	
		Observed value	Ideal value	Observed value	Ideal value	Observed value	Ideal value	Observed value	Ideal value
Online Communities,	4.54	0.84	>0.8	0.91	>0.9	0.53	≥0.5	0.072	≤0.08
Tacit Knowledge	3.29	0.93		0.94		0.62		0.062	
Innovation Performance	3.88	0.89		0.92		0.57		0.069	
References	Schumacker and Lomax(1996)	Lu(2003)		Bagozzi and Yi(1988)				Baumgartner & Hom- burg(1996)	

as independent variable. Table 5 Model 1 shows that control variables had no significant effect on tacit knowledge. Besides, Table 5 Model 3 shows that the online community had significant effect on tacit knowledge ($\beta = .478, p < .001$). It included the effect of online communities on the manufacturing know-how of products (services) ($\beta = .387, p < .001$), know-how of external relations ($\beta = .451, p < .001$), know-how of marketing management ($\beta = .492, p < .001$), know-how of enterprise internal management ($\beta = .399, p < .001$), and know-how of new technology innovations ($\beta = .352, p < .001$). Therefore, H1, H1a, H1b, H1c, and H1d were all supported.

Besides, in order to understand the effect of tacit knowledge on the innovation performance of enterprises, the analytical procedures mentioned above were applied. According to Table 6 Model 1, control variables had no significant effect on innovation performance. Moreover, Table 6 Model 2 shows that tacit knowledge had significant positive effect on innovation performance ($\beta = .538, p < .001$), including the effect of tacit knowledge on products and services ($\beta = .507, p < .001$), process innovations ($\beta = .531, p < .001$), organization innovations ($\beta = .438, p < .001$) and strategy innovations ($\beta = .386, p < .001$). Therefore, H2, H2a, H2b, H2c, and H2d were all supported.

Mediating Effect of Tacit Knowledge on the Relationship between Online Community and Innovation Performance.

In this study, LISREL 8.52 was applied to test the overall goodness-of-fit of the hypothesis model, and whether tacit knowledge has a mediating effect on the relationship between online community and innovation performance. As shown in Table 7, the analysis found that the index of overall goodness-of-fit of the hypothesis model was good ($\chi^2/df = 4.88, AGFI = .84, NNFI = .91, PGFI = .57, RMSEA = .078$). The path coefficients of the online community and tacit knowledge ($\gamma = .494, p < .001$), and tacit knowledge and innovation performance ($\gamma = .412, p < .001$) were significant. According to the study of Baron and Kenny (1986), there were 3 prerequisites for full mediation. Firstly, a significant relationship was found between independent, intermediate and dependent variables. Next, the intermediate and dependent variables must be significantly correlated. Finally, when an intermediate variable was introduced into the SEM model, the relationship between independent and dependent variables became insignificant. The product ($a*b$) of the path regression coefficient (a) of independent variable to intermediate variable, and the path regression coefficient (b) of intermediate variable to dependent variable must be bigger than the path regression coefficient (c) of independent variable to dependent variable. If there is a decrease in the relationship between independent and dependent variables, their relationship will still be significant but the intermediate variable will only have a partial mediating effect. According to Table 2, it was found that the relationship between the online community and innovation performance was significant ($\gamma = .373, p < .001$). When tacit knowledge

Table 4 CFA Summary

Research Variable	Observed Variable	Standardized λ	tvalue	AVEvalue	CR	Cronbach's alpha	
Online Communities	Network Scale	.57	7.06	.728	.775	.744	.775
	Relationship Strength	.94	12.07			.740	.737
	Stability	.96	14.88			.783	.728
	Satisfactory Level	.85	10.27			.779	.731
Tacit Knowledge	Manufacturing	.91	10.21	.814	.922	.881	.918
	External Relationship	.86	11.84			.895	.826
	Marketing Management	.87	13.52			.842	.849
	Enterprise Internal Management	.97	14.22			.901	.855
Innovation Performance	Innovations of New Technologies	.82	11.11			.913	.847
	Product Innovations	.73	8.44	.836	.939	.916	.941
	Process Innovations	.89	10.98			.884	.843
	Organization Innovations	.67	7.79			.891	.839
	Strategy Innovations	.89	9.89			.923	.845

λ is the standardized factor loading of the observed variable; AVE = average variance extracted; CR=composite reliability

Table 5 Hierarchical Regression Analysis (H1)

Variables	Model 1		Model 2					
			(1)	(2)	(3)	(4)	(5)	(6)
Step1:								
Control Variables								
Established duration of the enterprises (year)	-.052	-.022	-.005	.074	-.035	.016	-.130	
Years of service	-.106	.042	-.009	.007	.080	.027	.073	
Step2:								
Independent variables								
Online Communities			.478***	.387***	.451***	.492***	.399***	.352***
F	1.211	14.902***	9.535***	13.308***	15.583***	9.550***	8.413***	
Adj.R ²	.003	.205	.136	.186	.213	.137	.121	

Dependent variables: (1) tacit knowledge; (2) know-how of manufacturing of the products (services); (3)know-how of external relationship; (4)know-how of marketing management; (5) know-how of enterprise internal management; (6)know-how of innovations of new technologies
 *** $p < .001$; n= 163

was introduced to the SEM model, the relationship between both was still significant ($\gamma = .148, p < .01$). Therefore, tacit knowledge had a partial mediating effect on the relationship between online community and innovation performance, and the product of path coefficient of online community to tacit knowledge, and tacit knowledge to innovation performance was 20.35 (0.494 \times 0.412). This showed that tacit knowledge had 20.35% mediating effect on the relationship between online community and innovation performance, and was higher than the direct effect (14.8%) of online community on innovation performance (as shown in Fig. 2). In summary, the research hypothesis H3 was supported.

Conclusions and Suggestions

Conclusions and Discussions

From the questionnaire survey and statistical analysis, the findings of this study are presented below: firstly, the closer the network of online communities, the more positive effect it will have on the sharing of tacit knowledge between members and enterprises applying tacit knowledge. In other words, an online community with more members, will have more frequent interactions between

Table 6 Hierarchical Regression Analysis (H2)

Variables	Model 1	Model 2				
		(1)	(2)	(3)	(4)	(5)
Step1: Control Variables						
Established duration of the enterprises (year)	-.047	.057	.092	.072	.056	-.027
Years of service	-.099	.011	.025	.052	.016	-.058
Step2: Independent Variables						
Tacit Knowledge		.538***	.507***	.531***	.438***	.386***
<i>F</i>	.214	21.386***	18.436***	20.570***	12.466***	10.073***
Adj.R ²	.003	.287	.244	.266	.175	.144

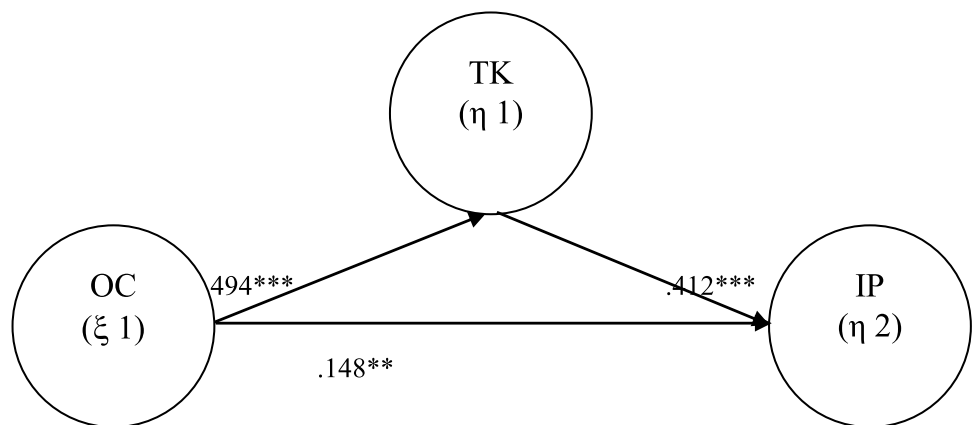
Dependent Variable: (1) innovation performance; (2) product innovations; (3) process innovations;(4) organization innovations; (5) strategy innovations

****p* < .001; n= 163

Table 7 Overall Model Test of Goodness-of-Fit

	Ideal value	Observed value	References
Absolute fit measures			
χ^2/df	1.00~5.00	4.88	Schumacker & Lomax(1996)
GFI	>.8	.93	Jöreskog & Sörbom(1988)
RMSEA	≤ .08	.078	Baumgartner & Homburg(1996)
Incremental fit measures			
AGFI	>.8	.84	Lu(2003)
NFI	>.9	.91	Bagozzi & Yi (1989)
NNFI	>.9	.91	Bagozzi & Yi (1989)
CFI	>.9	.94	Bentler(1990)
Parsimonious fit measures			
PNFI	≥.5	.73	Bagozzi & Yi (1989)
PGFI	≥.5	.57	Bagozzi & Yi (1989)

Fig. 2 The path diagram of research variables. Note: OC=Online Communities; TK=Tacit Knowledge; IP=Innovation Performance; ** *p* < .01; *** *p* < .001



members. Not only is it more beneficial to members to share tacit knowledge with each other, it is also beneficial for enterprises to use this tacit knowledge as well. Also, the higher the stability of member interaction, the greater

the tacit knowledge for know-how of sharing and application of product (service) manufacturing, external relationship, marketing management, internal management of the enterprises, and new technology innovations. In particular,

the operation of online communities had the greatest effect on the know-how of marketing management. The more tacit knowledge shared by the members of online communities and applied by enterprises, the more positive effect it would have on the innovation performance of the enterprises. This implies that the more tacit knowledge the enterprises applied from the online communities, the more benefits to the innovation performance of products, manufacturing processes, organizations, and strategies of enterprises. In particular, it would be beneficial to the process innovations of the enterprises. Finally, tacit knowledge had a mediating effect on the relationship between online community characteristics and innovation performance.

According to the study above, promoting online community relationship would help members in sharing and enterprises in applying tacit knowledge. This result agreed with the perception of Hansen et al. (1999) and Daft (2016) that through the information system, enterprises could promote interaction and dialogue between people, and effectively share tacit knowledge between members. The higher the number and frequency of interaction of online communities, the easier it is for enterprises to apply various know-how of tacit knowledge, including the know-how of product or service manufacturing, external relationship, marketing management, internal management of the enterprises, and new technology innovations. Therefore, as social networks are widely used today, enterprises could strategically employ dedicated personnel (such as social media editors) to promote online communities, such as commercial or entertainment communities. It is especially important to closely link and coordinate with the boundary-spanning roles, including the department of marketing, market research, purchasing, and research and development. Through the operation of online communities, important information of the external environment could be detected so that information related to change of environment could be provided to the organizations, and good organizational information could be provided to stakeholders. In addition, this study found that tacit knowledge from online communities was the important driving force behind the innovation performance of enterprises. Therefore, it was extremely important to know how the critical know-how related to organizations could be applied from online communities. Thus, the operation of online communities could be started from niche marketing (or segment marketing), such as grouping people based on their mental state or interest of consumers, in order to increase interaction rate, and further accumulate “appropriate” members. With the same common interests and topics, the interactive stability of the members could be gradually increased. Thereafter, business related issues could be strategically introduced to the communities in order to apply the tacit knowledge of enterprises in

different aspects, such as customer communities, employee communities and partner communities. Most community members with similar homogeneity property would have similar experiences. In the interactive process, members with similar experiences would be more stable, and they could stimulate a deeper level of dialogue after continuous interaction and further apply a lot of valuable knowledge. This perception has been consistent with the view of Jisr and Thérin (2018), and Sikombe and Phiri (2019), who advocated that knowledge communities could efficiently develop the transmission and knowledge innovations of tacit knowledge, and autarky communities could rapidly and directly respond to questions raised by each other.

In addition, the more the tacit knowledge applied by enterprises from online communities, the better the effect on the innovation performance of the enterprises. This is consistent with the research results of Lee et al. (2001) and Al-Abbadi (2020). Thus, enterprises could apply important knowledge or business information from the interaction of members of online communities. This knowledge or information was stored and undeveloped, accumulated, shared and applied to products (services), processes, organizations and business strategies of enterprises and could benefit the innovation performance of enterprises. As per the perception of Buunk et al. (2019) and AlMulhim (2020), knowledge circulation within organizations would help to promote the generation of innovation performance for enterprises. The study also found that tacit knowledge had mediating effect on the relationship between online communities and the innovation performance of enterprises. Therefore, in addition to attracting members, the primary objective of enterprises setting up online communities should be to encourage the sharing of tacit knowledge. Finally, according to an earlier study, tacit knowledge benefited the different types of innovation performance of enterprises, it was found that enterprises must continuously be able to apply tacit knowledge for business. Therefore, there should be a dedicated personnel in engineering, research and development, marketing and human resources management of enterprises to operate the online communities. It should start from skills of how to absorb members of online communities, introduce issues, interact and communicate in order to lead enterprises in applying important knowledge and increase the results of innovation performance. In addition, in order to encourage members to share their know-how, enterprises could motivate them through online community leaders. A relevant research found that leader humility and employee humility would increase follower moqi and in turn reduce employee’s knowledge hiding, and would be conducive to the overall performance of organizations (Zhong et al., 2021). Therefore, enterprises should be careful about the selection of online community leaders.

Theoretical and Practical Implication

In response to the research conclusions and discussions above, this study has the following theoretical and practical implications.

Theoretical Implication

Firstly, although there has been support from many theories and researches about the relationship between online communities and tacit knowledge, as well as the tacit knowledge and innovation performance of enterprises, studies about the relationship between the 3 parties and their mutual effects are rare. In particular, the mediating effect of tacit knowledge on the relationship between online communities and innovation performance was rarely studied by scholars. In this study, we found sufficient studies supporting the relationship between these 3 variables. Moreover, several factors have been discussed, including how enterprises could operate online communities to encourage members sharing tacit knowledge, and how enterprises improved innovation performance from the tacit knowledge applied by community members. Therefore, the results of this study increased the probative value of the relationship between these 3 research variables, and provided a direct proof that tacit knowledge plays a key role on how enterprises improved innovation performance through online communities. Therefore, this study has provided strategic contributions to enterprises operating online communities, and proposed that it was a task of top priority for enterprises encouraging members to share knowledge. The results of this study showed that the mediating role of tacit knowledge was indispensable for enterprises operating online communities. The enterprises were also inspired to understand that the importance of tacit knowledge was not related to the know-how of the members, but it was related to the proper application of know-how (Jisr & Maamari, 2017). Finally, the study samples were collected from many enterprises operating online communities. They covered manufacturing, service, and trading industry, and the subjects covered different levels of staffs. Therefore, the results of this study provide operational guidance on how enterprises should operate online communities, and apply tacit knowledge to increase innovation performance.

Practical Implication.

In addition to the theoretical implication above, this study also included the following practical implications.

Firstly, as the Internet is widely used nowadays, enterprises should strategically employ dedicated personnel to promote online communities. It is especially important to properly organize the connection and coordination between important departments of enterprises and the external environment, such as marketing, market research, purchasing, engineering, and research and development departments.

That is, through the operation of online communities, important information of the external environment could be detected so that information could be provided to organizations and stakeholders. Secondly, the stability of interactive members in online communities could help members in sharing more tacit knowledge so that enterprises could apply more key know-how. Thus, in addition to having sufficient number of members in the communities, the members should also have high homogeneity and representativeness. This allowed interactive members who had similar experience to deepen the effectiveness of interaction, and increased stability between members. This could result in the formation of self-sufficient communities. Therefore, enterprises should encourage members to share more tacit knowledge, so that they could apply the key know-how. In addition, this study has proven that the more tacit knowledge shared by the interaction of online community members and applied by enterprises, the more it could help the innovation performance of enterprises. Therefore, it was suggested that enterprises should employ professionals for online community platforms and write open dialogues with the community members, review important opinions related to business performance, and archive relevant information to form important projects of the enterprises. Furthermore, enterprises were suggested to promote the incentive mechanism of innovation in order to motivate individuals or teams involved in key projects, and in turn improve innovation performance. Finally, this study proved that tacit knowledge plays a mediating role on the relationship between online communities and innovation performance. This result showed that tacit knowledge served as hidden resources for organizational creativity and innovativeness. Therefore, it became the major source of competitiveness for enterprises to promote the sharing of important information by community members and critical know-how during interaction, and tacit knowledge was constituted to help the innovations of enterprises. Thus, enterprises must establish a “mechanism” for acquiring the collective wisdom and skills formed by the interaction process of community members, that is, high quality tacit knowledge (AlMulhim, 2020). Enterprises should also create a larger knowledge base in order to further increase innovation performance (Jisr & Maamari, 2017). The “mechanism” mentioned was a trust mechanism, that is, enterprises interacted with members through online community platforms and built up the trust between platforms and members; so that community members could build up their confidence and enterprises could encourage their sincere feedback, in order to increase information quality (Lou et al., 2013). Furthermore, online communities could be established as tacit knowledge sharing platforms (Huie et al., 2020), so it could be more beneficial to the innovation performance of enterprises. Lastly, it builds up the learning environment to motivate employees to actively acquire new knowledge and share their knowledge

with online community members (Banerjee et al., 2017) to stimulate more key know-how would also be a mechanism that enterprises should actively establish.

In general, this study has not only verified the relationship between online communities, tacit knowledge, and innovation performance, but has also found the mediating role of tacit knowledge to online community and innovation performance. By verifying the relationship between variables, and confirming the mediating role of tacit knowledge, this study did not only verify the theoretical elements of the three research variables and the direct evidence of the key role of tacit knowledge on innovation performance, but also proposed many strategic suggestions and specific practices to practitioners. Therefore, the results of this study have enriched the theories and supplemented the research gaps of the key role of tacit knowledge. It has also developed practical operation guidance for practitioners. This is the major contribution of this study to this field.

Limitations of the Study and Recommendations for Future Research

This study focused on enterprises with online communities and the sampling covered different industries. Although it should be widely applicable, the innovation types of different enterprises may be different. From this perception, it is recommended that follow-up researchers should conduct in-depth investigation of certain industries, in order to make more professional survey about the correlation between online communities operated by the communities, tacit knowledge and innovation performance. In addition, there are many forms and natures of online communities, such as study groups, members, staffs or friends. Thus, it is recommended that follow-up researchers should conduct research on knowledge base or non-knowledge base communities, in order to understand the differences between different communities on the acquisition of knowledge and innovation performance. This should be followed with the establishment of more in-depth guidance on online communities about knowledge learning and innovations, so as to provide enterprises operating online communities for reference. In this study, questionnaire surveys were conducted for enterprises operating online communities in Taiwan. In order to increase the breadth and depth of research objects, only one personnel was selected from each enterprise so that the number of enterprises involved was increased and most of the subjects were executive level. Although the questionnaire distribution method of this study has been applied by many scholars, this study measured the organization level, so measuring an enterprise with only one personnel would be a shortcoming. For future studies, it is recommended to randomly select enterprises from different industries, and select a certain number of subjects from these enterprises.

Their level, task, and seniority should be taken into account to determine whether they reflect the sharing and application of tacit knowledge from the online communities operated by these enterprises, and the actual situation of the innovation performance of the organizations.

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Data Availability This research is not suitable for public disclosure in relation to company internal information.

Code Availability Not applicable.

Declarations

Ethics Approval This study does not involve ethical issues.

Consent for Publication The authors of this study agree to the submission of this article.

Conflicts of Interest/Competing Interests On behalf of all authors, the corresponding author declares that there is no conflict of interest.

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