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How do social network sites support product users' knowledge construction? A Study of LinkedIn

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Abstract

Purpose - Social network sites (SNSs) are emerging as a popular communication tool for knowledge sharing and construction. LinkedIn, which concentrates on professional networking, is reported to generate great informational benefits to its users. This study aims to explore product users' knowledge construction in solving technical problems on LinkedIn, which was chosen as a case example.

Design/methodology/approach - Discussion threads with rich knowledge elements were selected from an interest group about solving technical problems with laptops. Adopting a qualitative content analysis method, selected threads were analysed with a prior analysis framework built in the context of traditional IT company sponsored peer user support forums.

Findings (mandatory) - The analysis revealed that the iterative and progressive knowledge construction process and associated trial-and-error strategy used on LinkedIn is similar to those found on peer support forums. However, LinkedIn members are more engaged in knowledge construction episodes. Meanwhile, the sub-category "proposing a new idea" accounts for a larger portion of discussions reflecting the high-level of expertise. One-to-one direct interaction is quite salient. Therefore, LinkedIn can support knowledge construction in a more efficient way due to the character of its social capital, including trust, sense of belonging, norms of cooperation, visible identity, knowledge articulation skills, one-to-one direct interaction, and suitable strength of ties.

Originality/value (mandatory) - This research is novel in empirically revealing how LinkedIn attributes and its social capital attributes interact with each other and together facilitate an efficient knowledge construction process.

Keywords Social Network Sites, Product Users, Knowledge Construction, Social Capital, LinkedIn

Article Type Research paper

1. Introduction

Since the arrival of Web 2.0, featuring strong social features (Matthews and Stephens, 2010), social network sites (SNSs) have risen rapidly in popularity as new technical platforms attracting millions of users. The associated social network perspective recognizes that networks consisting of individuals, groups and organizations promote access to markets, technology, influence or knowledge (Inkpen and Tsang, 2005; Hohenthal et al., 2014). Kietzmann et al. (2011) have developed a framework which defines SNS through a range of functions: identity, conversations, sharing, presence, relationships, reputation and groups. However, not all SNS have all these functions. Rather, different sites emphasise different

things. For instance, Facebook focuses on relationships and groups, while Twitter concentrates upon sharing information. LinkedIn has a clear focus on professional issues, such as job search, professional networking and continuing professional development (Papacharissi, 2009). Such functions of LinkedIn can be the key to share and construct knowledge (Syn and Oh, 2015). Verburg and Andriessen (2011) echo many authors (e.g. Nieto and Santamaria, 2007; Laursen and Salter, 2006) in suggesting that knowledge is the foundation for innovation and product improvement. However, SNSs' important use for creating innovative knowledge has not yet been fully explored by researchers. While the overwhelming majority of SNS research concentrates on Facebook, LinkedIn is reported to create the largest informational benefits by its users (Utz, 2015). Therefore, Utz (2015) suggests that researchers should pay more attention to the knowledge aspects of LinkedIn.

Regarding knowledge behaviours, SNSs have been considered to greatly influence knowledge sharing behaviours among organizational members (Chou and Chan, 2008; Ellison et al., 2015). Many researchers have speculated on the use of SNSs for knowledge sharing in IT companies (Ellison et al., 2015; DiMicco et al., 2008; Wu et al., 2010). A few researchers have explored organizational employees' creating new knowledge in the workplace through using SNSs or enterprise SNSs (Cross et al., 2001; Nieves and Osorio, 2013; Yamamoto, et al., 2008). Although the influence of social capital on creating new knowledge on SNSs has been highlighted (Casanueva and Gallego, 2010; Magnier-Watanabe et al., 2010), it is still not fully understood how people in certain networks construct knowledge on social network sites at a detailed level.

Users can provide valuable innovative knowledge for product development and marketing strategies (Wurster and Evans, 1997; Mahr et al., 2014; Cui and Wu, 2016; Bretschneider et al., 2015). From product users as a knowledge resource, producers are able to gain knowledge on product usage and applications, and discover design defects and improve product design from user group interactions (Anderson, 2005; Chatterji et al., 2014). On traditional company sponsored technical support forums, product users can collaboratively construct new knowledge to solve complex technical problems through participation from varying members with all sorts of knowledge levels (Li et al., 2017). As for the platform of SNSs, it is widely accepted that SNSs provide a way for users to access new knowledge (Nieve and Osorio, 2013; Syn and Oh, 2015), it is also of theoretical interest to explore whether product users on SNSs can create new knowledge, and how this works.

Nevertheless, there are very few empirical studies on product users' knowledge construction behaviours on SNSs. Therefore, there is value in exploring empirically how knowledge is constructed there by product users at a fine-grained level. This study seeks to do this, using LinkedIn, which is less examined, as an example, exploring the knowledge construction embedded within IT product users' discussions about solving technical problems without ready answers. It also investigates the impact of SNS functionality on knowledge construction behaviours.

The paper is laid out as follows: In the literature review section, it briefly examines the relationship between SNSs and knowledge construction. Then, from the social capital

perspective, it reviews the influences of the three dimensions of SNSs' social capital (i.e. structural dimension, relationship dimension and cognitive dimension), on knowledge construction. Section 3 explains why the case example of LinkedIn was chosen, and then introduces how the empirical data about knowledge construction was collected and analysed. Section 4 presents the findings about a content analysis framework for exploring knowledge construction by product users and an associated process model of knowledge construction, which are developed in the context of traditional technical support forums. Section 5 presents the knowledge construction patterns of product users on LinkedIn, which are in general similar to that on traditional technical support forums. Then it describes the unique features related to knowledge construction on LinkedIn: active engagement in knowledge construction and direct one-to-one interaction. Section 6 describes the high-efficiency of knowledge construction on LinkedIn, and explains the reason with the impacts from the attributes falling into three dimensions of social capital. Then it discusses the interrelationship between attributes of social capital and LinkedIn. Section 7 outlines the theoretical contributions and practical implications, and gives recommendations for future research.

2. Literature Review

2.1. SNSs and Knowledge Construction

Product users' knowledge can strengthen producers' core competencies in a large number of ways. For example, they are able to offer innovative insights about product usage, new product development and marketing (Brown and Duguid, 1998). Moreover, customers can also construct new knowledge which is indirectly beneficial to product development (Pirolo and Presutti, 2010). At a more mundane but important level product user community members, who widely exist on the Internet with a huge number, can also help solve problems with existing products in a timely and reliable way (Li and Cox, 2016). An understanding of such new knowledge construction can start with consideration of the role of social capital.

In existing literature, social networks are seen as vital to innovate new knowledge. Dhanaraj and Parkhe (2006) suggest that social networks can be essential to knowledge innovation, since they provide ways to obtain knowledge that can be combined or implemented in various ways to support and help it. However, there is not unanimity about how social networks can help construct new knowledge. Some scholars highlight the value of constructing innovative knowledge opportunities created by structural holes in social networks (e.g. Burt, 1992; Ahuja, 2000; Perry-Smith, 2006), while others focus on dense networks (e.g. Koka and Prescott, 2008; Moran, 2005).

Boyd and Ellison (2007:211) define SNS as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with who, they share connections, and (3) view and traverse their list of connections and those made by others within the system". They further point out that the unique feature of the SNS is the ability to enable users to display and develop their social networks rather than to allow individuals to meet strangers (Boyd and Ellison, 2007). SNSs such as LinkedIn are useful communication platforms for extending social networks (Chai and Kim, 2012), and

a newly emergent tool for building and displaying members' social networks (Ellison et al., 2007). They can be used in fostering knowledge construction through collective efforts (Chai and Kim, 2012). Magnier-Watanabe et al. (2010) point out that the interconnectedness between organizations and customers on SNSs enables enterprises to gather customers' knowledge. Therefore, their influence on constructing new knowledge through collective efforts of product users is of theoretical interest for this research.

It is generally accepted that social relationships play an essential role in knowledge creation (Nonaka and Takeuchi, 1995). Acknowledging this, Hu and Racherla (2008: 303) define knowledge creation as "a social process involving interactions among individuals and organizations with different backgrounds, resources, predispositions and insights". Knowledge creation is used as a broad term in the literature on expertise and innovation to depict the idea development for sustainable innovation in companies, organizations and academic fields (van Aalst, 2009). As for knowledge construction, it is originated from the online learning context (i.e. computer-supported collaborative learning), and is rooted in constructivism. It is associated with the social-cognitive process which is situated and is mediated by social interactions among the group members working together with particular technologies (Brown et al., 1989). Constructivist educators suggest that students' knowledge construction activities in online learning communities are characterised by high-order thinking and require sufficient scaffolding from instructors in the process of problem-solving (Stein et al., 2006; Ge and Land, 2004). Then, based on constructivist view, the concept of knowledge construction is extended from online learning field to other contexts (e.g. virtual product user communities) about collaboratively building new knowledge within social groups (e.g. Li et al., 2017; Pena-Shaff and Nicholls, 2004; Tsoukas and Mylonopoulos, 2004). Consequently, this concept, developed from the online learning context of high-level of critical thinking, is extended to the widely practiced knowledge construction of low-level of critical thinking (Li et al., 2017). From the constructivist view, stressing the social interaction process, Pena-Shaff and Nicholls (2004) point out that knowledge construction should be considered to be a social and interactive process which brings in different perspectives through dialogue. Therefore, unlike the general concept of knowledge creation, knowledge construction is oriented to describe the specific and micro-level process of creating knowledge through collaborative efforts and social interactions within a certain social group consisting of varying members. This research adopts the concept of knowledge construction emphasising that newly constructed knowledge is the product through social interactions among individuals on the SNSs. SNSs are online platforms supporting social interactions among contacts on the site (Ellison et al., 2011). In order to make the concept more tailored for this research, knowledge construction here could be defined as creating novel knowledge through the interaction of community members and complex cognitive efforts and information processing when requisite knowledge does not exist (Li et al., 2017).

2.2. The Influences of Social Capital on Knowledge Construction

Previous empirical researches confirm that the use of SNSs can promote the increase of social capital (Burke et al., 2011; Steinfield et al., 2008). Social capital is widely identified as a key influencing factor in constructing new knowledge (Nahapiet and Ghoshal, 1998; Nieves and

Osorio, 2013). Social capital is defined as "the aggregate of resources embedded within, available through, and derived from the network of relationships possessed by an individual or organization" (Inkpen and Tsang, 2005:151). It is generally considered to consist of three dimensions (Nahapiet and Ghoshal, 1998; Kang et al., 2007; Chua, 2002; Chow and Chan, 2008):

a. A structural dimension, which is about the overall relationship patterns between actors in the network (e.g. strong and weak ties; direct and indirect ties; social interaction ties);
b. A relationship dimension, which refers to types of relationships between actors (e.g. care, norms of cooperation, trust and identity);
c. A cognitive dimension, which refers to the sources giving shared interpretations, meaning system, and representations (Cicourel, 1973). Its key facets include shared language, narratives, and codes (Chua, 2002).

Nahapiet and Ghoshal (1998) suggest that the structural dimension influences construction of new knowledge by directly impacting the accessibility of information and knowledge. Social ties are linked to access to information resources. Moreover, social interaction ties can have a positive influence on knowledge sharing by generating trust and wider communication (Chen and Huang, 2007). Chai and Kim (2012) identify that social ties are one of the most important influencing factors on SNS members' knowledge construction performance.

The relational dimension focuses on the specific relations of group members, such as friendship, respect and bond. The sense of identification is a key facet of relationship dimension. It can affect the anticipation of value generated through group interaction and knowledge construction motivation (Chua, 2002). One salient feature of SNS is the visibility of members' identity. Visibility is defined as "the ability [of social media] to make [users'] behaviors, knowledge, preferences, and communication network connections that were once invisible (or very hard to see) visible to others." (Treem and Leonardi 2012:150). Another important facet of the relational dimension are the norms of cooperation. They offer a strong basis for collaborative knowledge construction (Chua, 2002).

The cognitive dimension stresses shared interpretations and language. Knowledge exchange requires that parties should have a certain level of shared understanding such as a common language (Nahapiet and Ghoshal, 1998). Nahapiet and Ghoshal (1998) suggest that such common ground enables organizations to be a suitable place for creating new knowledge . In virtual communities, shared languages and codes can do the same (Tsai and Ghoshal, 1998). Moreover, having a shared language can promote the capability of knowledge combination during social exchange among different parties (Chiu et al, 2006). It can also help idea sharing and increase efficiency of communication between group members with similar practices or backgrounds (Chiu et al, 2006).

From the above, it can be seen that the influences of social capital upon creating new knowledge have been mainly discussed at a macro level; we lack a detailed understanding of the knowledge construction process on SNS. Such processes in virtual groups have scarcely

been explored by researchers (Gapece and Costa, 2009). It is acknowledged that SNS users' knowledge contribution behaviours vary due to the influences of various social and technical factors (Chai and Kim, 2012). Nieve and Osorio (2013) suggest that there is no one correct way for SNSs to promote new knowledge construction, because of the dynamics of knowledge exchange in today's complex and rapidly changing environment. Therefore, this research chooses the case of LinkedIn as an example to explore the knowledge construction behaviours of users. In order to reduce uncertainty and improve decision-making, dimensions of SNS's social capital should be considered and analysed to identify the best new knowledge construction strategy (Nieve and Osorio, 2013). To conclude, studying SNS through the dimensions of social capital can be an effective approach to explore LinkedIn members' collaborative knowledge construction. In this context, this paper seeks to provide an account, at a fine-grained level of how knowledge is constructed on LinkedIn, a profession oriented SNS.

3. Methodology

LinkedIn was employed as an example of a specific SNS and it therefore represents a "case example" where knowledge construction behaviours occur. Members' profiles on LinkedIn strictly focus on professional information. They include abbreviated CVs to build connections (Skeels and Grudin, 2009). Varying groups including networks of interests, company employees, academics, or alumni are formed (Skeels and Grudin, 2009). More importantly, LinkedIn as a social network site can provide expertise location and enable question answering, thus directly supporting knowledge production (Skeels and Grudin, 2009). These features make it a very suitable place to explore knowledge construction.

A purposive sampling strategy was chosen in selecting interest group and discussion threads on LinkedIn. The sampling strategy enabled the researchers to select information-rich cases, "those from which one can learn a great deal about issues of central importance to the purpose of the research" (Patton 1990: 169).

The specific group examined was the Dell User Group. This involves Dell product users helping each other to fix problems with laptops. Laptops and notebooks are personal electronic products which often have more complex technical problems than other home electronic appliances due to varying hardware and software environment than other home electronic appliances. Because of lack of timely technical support from the company, users usually turn to peer support on the Internet and find solutions by participating in online groups where expertise is located. Accordingly, one open interest group about desktop support on LinkedIn, which is accessible for Internet users to read the contents about discussing laptop problems, was chosen for this study.

After reading and re-reading threads posted in the Dell User Group, eight theoretically interesting discussion threads about solving computer technical problems published in this group were chosen. These selected threads were mainly long ones (i.e. around fifteen to forty discussion posts), containing multiple proposed solution ideas, question asking and answers,

and so on. The long threads were more likely to contain multiple types of knowledge construction elements.

A qualitative content analysis method was adopted to code the selected discussion threads. Qualitative content analysis is defined by Hsieh and Shannon (2005:1278) as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns". Graneheim and Lundman (2003) suggest that this method can be used to deal with interpreting and analysing the latent content besides simply summarizing surface content. Thus, the hidden patterns of knowledge construction embedded in discussions can be explored through the content analysis method.

In phase one of the research, a content analysis framework of knowledge construction and a knowledge construction process model were developed, based on the data from traditional IT product user peer support discussion forums affiliated to the producer's websites, such as English Dell User Support Forum (Li and Cox, 2016).This developed a categorization framework containing two levels of categories: main-level and sub-level categories. These categories are internally meaningful to describe the data and externally meaningful in relation to other categories (Dey, 1993). Each sub-level category was given a clear definition and an example. In phase two of the research, reported here, the researchers applied this content analysis framework in analysing the discussion threads selected from LinkedIn, and a single post was treated as the unit of analysis. Selected threads were analysed in Excel, with emerging sub-categories as columns and the posts in temporal order, in rows. The inter-rater reliability was evaluated in this research. Two researchers with required computer knowledge independently coded the selected threads, and the coding results were compared for agreement. Some coding differences were discussed and got agreement between the coders. Only a very few differences remained due to that some posts could fall into two sub-categories. The percent agreement calculated according to Holsti's (1969) formula is 0.89, which is within the acceptable range of inter-rater reliability

4. Knowledge Construction: Content Analysis Framework & Process Model

4.1. Content Analysis Framework of Knowledge Construction

The content analysis framework for knowledge construction activities derived from the IT product peer support forums includes five main-level categories of "Knowledge construction episodes", "Problem description episodes", "Non-constructive episodes", "Moderation episodes", and "others" (Li and Cox, 2016). This framework was built for exploring knowledge construction of low-level critical thinking embedded in discussion of solving technical problems (Li et al., 2017). It is featured by strong operationalizability, which is enabled by clear definitions for each main-level and sub-level category, and corresponding examples as well.

The main-level category of "Knowledge construction episodes" is directly related to building requisite new knowledge to solve technical problems. It includes five main categories which are the essential constituents for constructing new knowledge:

- An “Initiation Episode” is where a question is asked to start a discussion to find a solution.
- A “New Idea Proposing Episode” are posts where a new possible solution not suggested before is put forward.
- An “Exploration & Explanation Episode” is a complex discussion process involving refining or elaborating already stated ideas, asking and answering focused questions, and exchanging information.
- An “Evaluating & Testing Episode” is about testing proposed ideas by applying them, by reasoning or existing facts.
- Finally the “Resolution Episode” is the stage at which it is concluded that a workable answer has been identified.

The second main-level category of “Problem description episodes” is about providing knowledge about technical problems by clarifying the symptoms of the problem and collecting contextual knowledge about it. These episodes facilitate rather than form the main knowledge construction process.

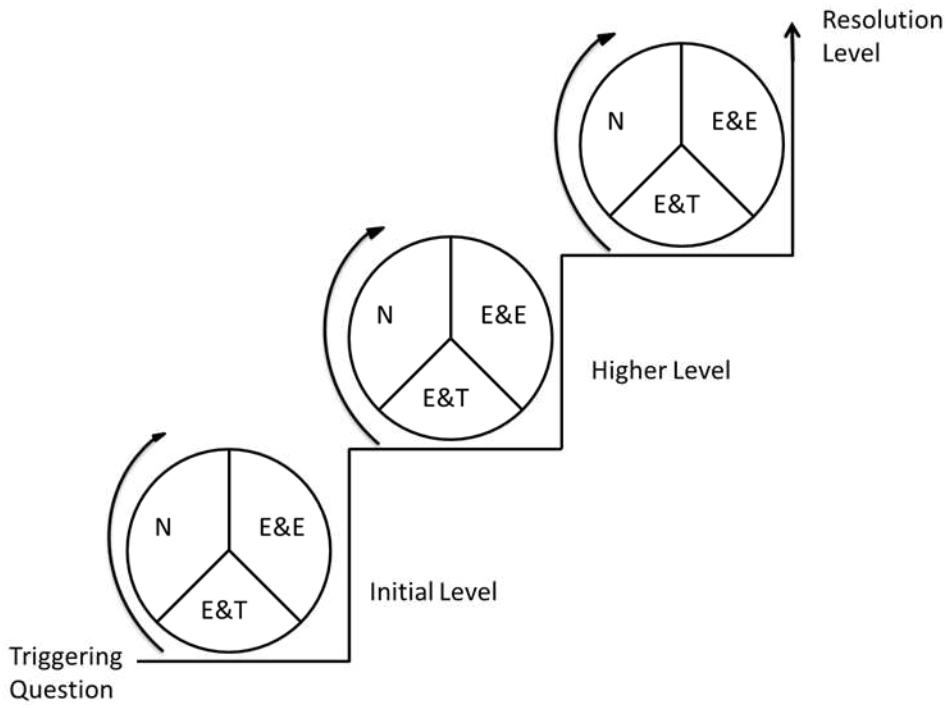
The third main-level category is “Non-constructive episodes” which include “Suggestion to give up finding a solution”, “Raising unnecessary issues”, etc. This category refers to discussion content which does not have a direct relationship with creating new knowledge and can sometimes impede knowledge building processes.

The fourth main-level category is a “Moderation episode” which refers to moderation activities conducted by either the formal moderator or by community members. It includes moderation activity including “Mediating argument /stopping talk about unnecessary topics”, “Comments about promoting/demoting the discussion idea” and so on. “Moderation Episodes” can offset the negative influence of “Non-constructive Episodes”.

The fifth main-level category of “Others” is about invalid posts, such as repetitive posts.

4.2. Model of the Knowledge Building Process within a Virtual Product User Community

A model that presents how these elements are typically organised around a typical “trial-and-error” knowledge construction strategy was developed (Li and Cox, 2016).



(N= New Idea Proposing Episode; E&E= Exploration & Explanation Episode; E&T= Evaluating &Testing Episode)

Figure 1: Model of the Knowledge Building Process within a Virtual Product User Community (Li and Cox 2016:1052)

The knowledge construction process usually proceeds in an iterative and progressive way. A newly proposed idea (i.e. a "New Idea Proposing Episode") undergoes the process of "Exploring & Explaining Episode" and "Evaluating & Testing Episode". When one proposed solution is believed to be impractical, another new idea will be suggested and then explored and tested. The process typically repeats itself until a workable idea is identified. Each successive idea is usually based on previous ones and thus it is closer to a solution.

5. Findings

5.1. Result of Coding Discussion Threads on LinkedIn

The eight threads selected were coded using the analytical framework of knowledge construction which had been developed in the traditional peer support discussion forum, and the results are presented in the following tables.

Table 1: Number of Posts Falling into Sub-categories of Knowledge Construction Episodes

Table 2: Number of Posts Falling into Main-level Categories

The analysis illustrates (Table 2 column 4) that the content analysis framework of knowledge construction, which had been developed in traditional peer support forums, can nearly completely code the discussion contents in these eight selected threads on LinkedIn. The four necessary knowledge construction episodes, namely "Initiation Episode", "Knowledge Exploration & Explanation Episode", "New Idea Proposing Episode" and "Evaluating & Testing Episode", are all involved in the discussion process. Moreover, these knowledge construction elements are generally organized in the process illustrated by the knowledge building process model (Figure 1). Therefore, the knowledge construction pattern is quite similar to that on peer support discussion forum. The discussion participants also adopt a "trial-and-error" solution finding strategy. In order to find a workable solution, multiple solution ideas are proposed and evaluated or tested through members' collective efforts.

5.2. Active Engagement in Knowledge Construction

Table 2 illustrates that nearly all of these discussion contents concentrate on knowledge construction episodes, i.e. a technical problem and its solution. Although it is an interest group for technical computer problems existing on a social network site, social content is rare. Even the debates between two members, Mi** and Ma**, were concentrated on the technical problem and its solution rather than issues not directly related to the problem at hand. Meanwhile, "Problem Description Episodes" are not common. This can be explained by detailed and accurate descriptions of technical problems being provided, and a large number of ideas proposed by the discussion participants providing sufficient choices for the questioner to try. In addition, posts falling into "Non-constructive episodes" only occurred in the first thread and accounted for a small percentage (12.5%), and disputes over irrelevant issues (i.e. the sub-category of "Raising unnecessary issues", which falls into "Non-constructive Episodes"), and verbal abuse and trolling, did not emerge in these discussion threads. This is probably because all of the discussion participants' identities were visible on LinkedIn and no one wanted to be considered a "troll" by people who can see their identities. This also reflects the norms of cooperation developed in the LinkedIn interest group.

Among the knowledge construction episodes, the sub-category of "proposing a new idea" accounted for a large portion of the discussions. Proposing new ideas or solutions was one of the key phases of constructing new knowledge to solve a problem. A large number of suggested ideas reflected that the discussion participants were deeply involved in knowledge construction embedded in finding solutions. In addition, it suggests the high-level expertise of the members in the professional group formed on the LinkedIn website. The members' expertise level can be revealed and confirmed by LinkedIn users' profile information. People with similar interests, professions, and expertise form groups and create strong personal links. In contrast, according to the member profile information, members on IT company sponsored peer support forums are more diverse in terms of professions, expertise and interests.

5.3. Direct One-to-one Interaction

LinkedIn creates a convenient platform for one-to-one interaction nested within group discussion. The correspondence between the posts of the discussion threads which fall into the sub-categories "asking focused question (about the problem)" and "clarifying ambiguity (about the problem)" are quite salient in the interaction. For instance, in thread 2, six focused questions about technical problems being discussed were asked, i.e. questions about contextual knowledge about the problem, which can help diagnose causes and find solutions. Corresponding to this, there were also another six posts respectively responding to these questions and clarifying the ambiguity about the technical problem.

For Example:

Asking focused question (about the problem):

> *"Is this your own machine, or a clients.?You seem to be doing a hell of a lot of work, to find something that could be hardware or software related..." (post 15)*-User A

Clarifying ambiguity (about the problem):

> *"This is my own compute*r, custom built. I have had hard drive fail on me before and I am *thinking that this is not a hard drive issue…" (post 16)*- User B

In post 15 user A asked a question about the contextual knowledge about the problem, namely, the ownership of the computer, in order to suggest a solution idea for the questioner to try. In post 16, the questioner user B provided the requisite information to this specific question. Consequently, this specific contextual knowledge about the problem, which helps to find a solution, is transmitted and explained.

Construction of new knowledge depends to a great extent on the combining and sharing tacit knowledge (McFadyen and Cannella, 2004). Moreover, knowledge has a situated and tacit nature (Cook and Brown, 1999). This property has a significant impact on knowledge transfer from one situation to another (Birkinshaw et al., 2002). Ambiguity is another critical characteristic of knowledge which influences knowledge acquisition and knowledge transfer (Van Wijk et al., 2008). It was found that peer user experts' knowledge on technical solution is acquired from either direct or indirect experience of solving technical problems (Li et al., 2017). Contextual knowledge about technical problems, which clarifies ambiguity, can assist diagnosing and identifying the requisite knowledge for proposing solutions. Thus, it can offset the negative influences of the nature of knowledge upon knowledge construction.

One-to-one direct interaction can also be observed in the conversational content about evaluating suggested ideas between another two discussion participants and their mentioning of each other's names in their posts. In thread 3, post 12, 13, 14, and 17 were about evaluating and debating each other's solutions between these two members.

For example, before the debate started, user C (Ma**) suggested an idea in the 9th post.

> "When booted up go start > Run > msconfig.exe > boot tab and look to see what is listed and remove all you don't want/need."

Then another group member, user D (Mi**), proposed a different idea to solve the problem in the 11th post, as follows:

> "…You need to get the mbr back to the normal Windows state. bootrec.exe should have done this for you. Since it hasn't something unusual is going on. ..Mi**"

Then user C (Ma**) evaluated and disproved user D's (Mi**) idea by providing many successful experiences of using his idea and proof from an external knowledge link in the 12th post.

> "Mi**you really don't need to do any of that, if he follows as I have said it will solve the issue and he won't need to mess about with partitions. I have done this hundreds of times on various Windows boxes and not once have I had to mess about with the partitions of the HDD. See also http://www.sevenforums.com/tutorials/2282-default-operating-system-change-default-boot-os.html..."

Immediately, user D (Mi**) defended his idea by clarifying its ambiguity in the following 13th post.

> "Ma**, *no it isn't that complicated. ...As for my advice on making sure the Windows* partition is the one marked active, there's nothing dangerous in doing that as long as you don't change the partitions proper..."

In the 14th post, user C (Ma**) analysed the nature of this technical problem and restated the workability of his idea:

> "But from looking at the options he is getting on the menu it's not a grub menu it's the Windows boot menu, he has confused the two ...I am familiar with grub in that I know unless you are duel booting to Linux/Windows you don't see a grub menu on a Windows install..."

In the 17th post, user D (Mi**) provided more facts to evaluate user C's (Ma**) ideas.

> "Ma**. *Checking a few facts… Some people install Linux and put the boot loader on a* separate partition. In that case you could wipe Linux off the drive and grub would survive..."

It can be observed that these posts were direct interactions evaluating proposed solution ideas between two members. These two members replied to each other and referred to each other by name. During this process no other members joined in the debate and evaluation of these two ideas, except the initial questioner claiming to try user C's (Ma**) idea in post 15 and another member proposed a different idea in post 16.This illustrates a highly one-to-one dialogue-like interaction.

The LinkedIn users also used lots of one-to-one communication symbols @ to refer posts to each other. The frequent usage of the technical symbol @ enhances one-to-one interaction during the discussion process. For example, in thread 4, there were several posts which used @ to communicate with particular members to report feedback after testing the suggested idea, to clarifying the ambiguity about contextual information of the problem, and to ask focused questions about the problems. For example,

> *"Thanks so much @* all. @ Nicholas, I suspected the processor as well. But even after *replacing it, the fault still persists…"*

Thus, it can be seen that one-to-one direct interaction between the discussion participants was quite salient in this social network site – in a way that was less apparent in the Dell forums used to develop the analytic framework. Direct interaction is required in information exchange and knowledge exchange which frequently emerges in order to create new knowledge (McFadyen and Cannella, 2004). McFadyen and Cannella (2004) identify that new knowledge is created though the direct interactions of researchers. In addition, direct relationships and ties can promote knowledge combination and resource exchange within the relationships (Nahapiet and Ghoshal, 1999). As the number of direct ties increases, the amount of knowledge and ideas that members can access will also go up and thus promotes their capability to solve complex problems (McFayden and Canella, 2004). Thus, direct relationships are very important for constructing new knowledge because direct ties can foster knowledge exchange (Nahapiet and Ghoshal, 1998).

6. Discussion

The knowledge construction process and solution finding strategy on LinkedIn is similar to that in traditional peer support forums. However, this process on LinkedIn appears to be more efficient in finding workable solutions. None of these eight threads involve any "Non-constructive Episodes" or corresponding "Moderation Episodes". Interestingly, even the contents falling into "Problem Description Episodes" which help to clarify problems are also quite rare (only one post in these eight threads). The discussion content in these selected threads focused strongly on knowledge construction episodes (thread 1 is 85% and thread 8 is 97%, and others are 100%), and a much larger portion of solution ideas were proposed. This can be seen from the fact that the sub-category "proposing a new idea" accounts for a large portion of all messages. The number of posts falling into this sub-category is between 42% and 50% of total codes, given that the post belonging to two sub-categories is accounted as two.

Moreover, the rareness of social contents in the discussions on LinkedIn also reflects the efficiency of the knowledge construction. In contrast to open technical support forums sponsored by producers, visible identities of participants and norms of cooperation developed on LinkedIn avoid trolling behaviours and verbal abuse. The sub-category of "Raising unnecessary issues" in the "Non-constructive episodes" and corresponding sub-category of "Mediating argument /stopping talk about unnecessary topics" in the "Moderation Episodes", which usually occur in the open technical support forum consisting of a huge number of

members, did not emerge in the selected discussion threads from the LinkedIn. However, in a different context not centring on IT issues but involving low-level critical thinking, more social messages which do not cause online social disorder or distract attentions from the topic, can promote interaction and knowledge construction process (Li and Cox, 2016). This will help to extend the content analysis framework to the social dimension.

The highly efficient process on LinkedIn can be explained by the following attributes: similar professions (/interests) of the interest group members, high-level expertise, clear and sufficient articulation of knowledge, visible identities, one-to-one direct interaction, trust and sense of belonging, norms of cooperation, and suitable ties well serving the purpose.

1). LinkedIn is a professional SNS, where people of similar professions can link to each other. Its interest groups attract people of similar interests or professions. That is to say, LinkedIn members participating in discussions of solving technical problems of IT products are much more knowledgeable than the traditional users support forum users with hugely diverse backgrounds.

2). Compared with traditional IT support forums, there are much fewer posts requesting the clarification of technical problems (questions) due to proficient knowledge articulation skills. Knowledge articulation is defined as the process whereby tacit knowledge is articulated and become explicit (Håkanson, 2007). David (2002) suggests that knowledge articulation plays an essential role in construct innovative new knowledge. Skilled articulation of knowledge (not only solution ideas, but also problem symptoms and occurrence contexts) proves to have strong impact on knowledge construction. For instance, clear and sufficient contextual knowledge about technical problems can help members with expertise to identify the requisite part of their knowledge to diagnose the causes of problems and proposing a workable solution. The skill of accurate articulation of technical knowledge on LinkedIn can be related to its members' professions and expertise. The skilful articulation of complex technical knowledge is certainly based on the correct use of shared common language. Therefore, it proves that the cognitive dimension of social capital on LinkedIn positively enhance its collective knowledge construction.

3).The visibility of identities of LinkedIn members means promotion of interaction and personal relations, and less distraction by irrelevant topics, unnecessary arguments, and trolls. The profile information in the predefined profile fields, such as interest, occupation and location, help to fulfil the purpose of SNS regarding creating and maintaining personal relations (Cress et al., 2014). Self-presentation of the identity by filling out a member profile to register on a SNS can be considered as the initial step to initiate interaction (Cress et al., 2014). Additionally, the visibility of identities which can be seen from members' profile information also create more visible, continuing and meaningful informational exchange (Ellison et al., 2011). The high-level visibility enabled from profile information on LinkedIn also reduces deviant behaviours. In addition, the high-level visibility of the SNS encourages knowledge sharing (Utz, 2015). Sharing knowledge is essential part in constructing new knowledge. It can therefore be speculated that the visibility of identities (i.e. as an element in

relational dimension of social capital) indirectly but positively affects the knowledge construction on LinkedIn.

4). Direct one-to-one interaction is salient on LinkedIn. It is reflected in the large portion of direct corresponding relationships between published posts, and lots of conversational content between discussion participants, and many usages of the symbol @ to refer posts to each other. McFadyen and Cannella (2004) identify empirically that construction of new knowledge depends on the number and strength of direct relationships an individual scientist has with other researchers. This suggestion is consistent with the findings in LinkedIn. The salience of direct interaction (i.e. a key element in structural dimension of social capital) on LinkedIn promotes the knowledge construction process.

5). Trust among LinkedIn members facilitates collective knowledge construction. The researchers identified that it is developed through norms of trust and reciprocity, an access controlled approach, design features, collective ? and so on. Social capital enables individuals on SNSs to develop norms of trust and reciprocity, which are needed for high-level engagement in collaborative activities (Valenzuela et al., 2009).Trust among LinkedIn members is built through the mechanism of the 'gated-access approach' on LinkedIn (Papacharissi, 2009). LinkedIn is designed to facilitate trust by requiring either a pre-existing relationship or a mutual contact to build connections with others. Trust can facilitate social ties, a sense of community and knowledge sharing (Chow and Chan, 2008). Moreover, trust helps group members work together on collective task (Putnam, 2004).

The trust (i.e. a key element in relational dimension of social capital) developed on LinkedIn can provide the high-level engagement which is requisite for the group of collaborative knowledge construction. Trust and visibility together can foster the development of norms of cooperation which facilitate LinkedIn members' collaborative knowledge construction behaviours.

6). Sense of belonging can be created by participating in discussions, sharing experiences, and communicating with other members on LinkedIn. Sense of belonging on the SNSs is defined by Chai and Kim (2012:120) as "an involvement and perception of belonging in the SNSs community such as participation in SNS communities and groups and communication with other users in the SNSs". It is an important factor that promotes commitment to maintain relationships with other virtual community members (Dholakia et al., 2004) and motivation for knowledge sharing (Chiu et al., 2006). A higher degree of belonging will generate greater chances to share knowledge among community members (Lin, 2008). Moreover, sense of belonging (i.e. a key element in relational dimension of social capital) also facilitates knowledge construction in SNS (Chai and Kim, 2012).

7). On LinkedIn, both strong and weak ties, which are aspects of the relational dimension of social capital, contribute to informational benefits according to its users' reports (Utz, 2015). Utz and Muscanell (2014) point out that the structure and contents of social networks which people create and maintain on LinkedIn suit well generating professional informational benefits for its users. Accordingly, the tie strength between LinkedIn members is suitable for

creating knowledge benefiting the whole group. This can be demonstrated by the fact that some of the discussion participants already had connections and frequently interacted with each other while some of them were not in other members' contact lists and do not have interpersonal communication. As for tie strength's influence on knowledge construction, it may be explained by the idea that weak ties can bring in more novel knowledge (Burt, 1992; Granovetter, 1973) and strong ties can smooth sharing complex knowledge (Hansen, 1999; Reagans and McEvily, 2003; Chow and Chan, 2008). The concrete mechanisms still need further exploration.

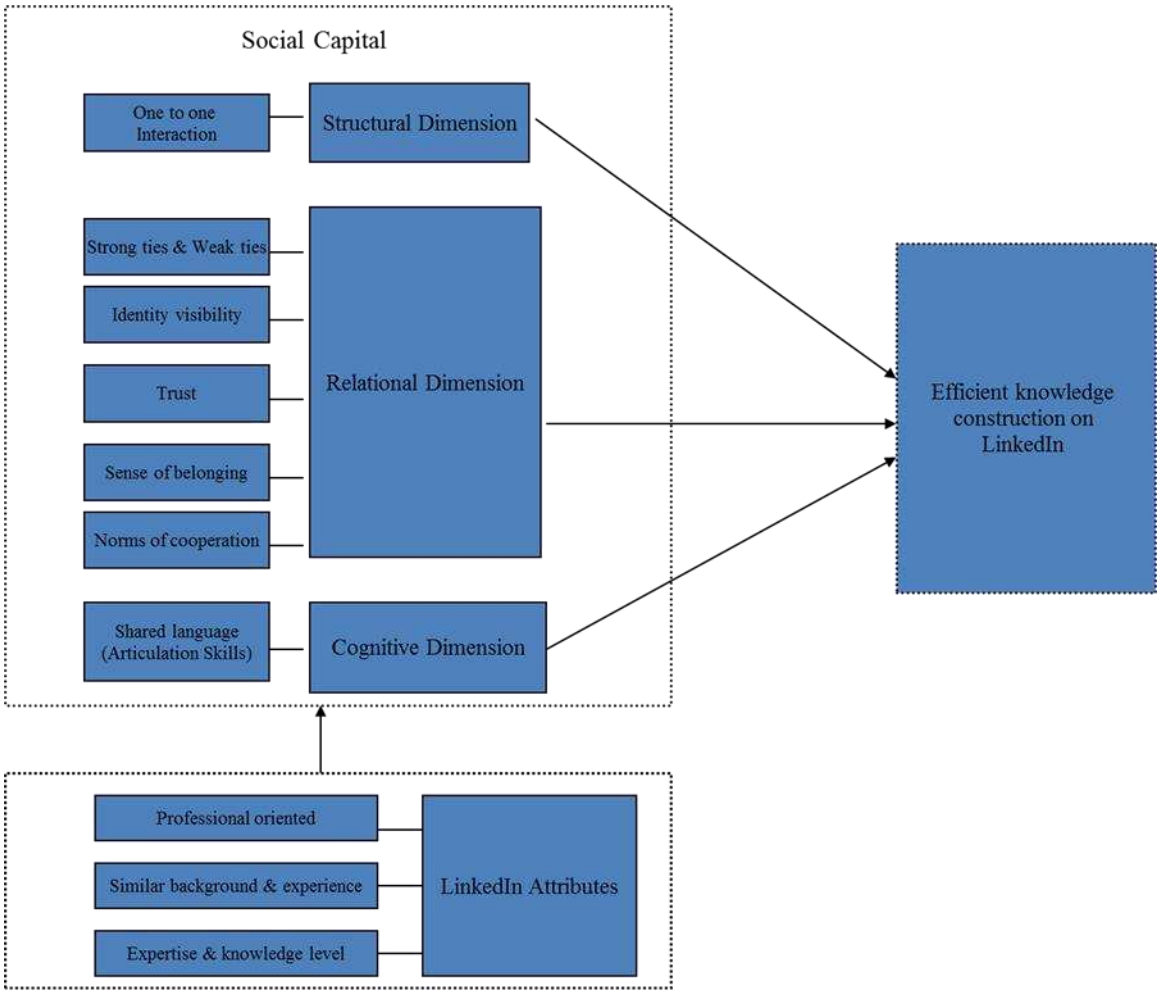


Figure 2: The relationship between LinkedIn Attributes, Social Capital Attributes, and Knowledge Construction

As shown in the Figure 2, the attributes of LinkedIn (namely similar profession, background and experience /interest, expertise and knowledge level) shape its social capital attributes (namely direct one to one interaction, social ties, trust, visibility, sense of belonging, norms of cooperation and articulation skills) of the three dimension (i.e. structural dimension, relational dimension, and cognitive dimension). The social capital attributes together directly and positively influence knowledge construction conducted by LinkedIn members.

Table 3: Interrelationship between Attributes of Social Capital and LinkedIn

Moreover, the attributes of LinkedIn and its social capital are inter-related to each other, as illustrated in the Table 3. For instance, imilar profession (/interest) shapes the members' expertise and skills in articulating technical knowledge, and promotes trust, sense of belonging and interaction. Similarly, the visible identity on LinkedIn can generate trust, which promotes social ties and sense of belonging. The social ties significantly affect SNS users' sense of belonging (Chai and Kim, 2012). The direct one-to-one interaction is produced by the visible identification, strong sense of belongings, and trust. Strong norms and mutual identification can be fostered over time in the interpersonal networks (Nahapiet and Ghoshal, 1998). Shared language can promote trust and sense of belonging.

In summary, the attributes of LinkedIn and its social capital attributes falling into the relational dimension, structural dimension and cognitive dimension, interact with each other and together facilitate an efficient knowledge construction process. On the other hand, according to Ellison et al. (2014), reciprocated interaction can be considered as the main element to promote the generation of social capital. Thus, it can be speculated that the collective knowledge construction as a reciprocal product of social interaction benefiting all members can enhance social capital.

7. Conclusion

Theoretical Implications

Previous studies suggest that consumers do not have very active information behaviours on social media where they generally have low-level participation and contribution (e.g. Preece et al., 2004; Joyce and Kraut, 2006). Heinonen (2011) reports that most consumers' input on social media concentrates on information acquisition and consumption, and the content production behaviours on social media are not common, but, Heinonen (2011) observes that the majority of such limited cases exist on one type of social media, namely SNSs. With in-depth investigation of product users' knowledge construction behaviour on LinkedIn, this research empirically extends Heinonen's (2011) understanding and confirms that knowledge construction through high-level participation and complex information processing can exist on SNS.

In addition, this research empirically supports the capability of LinkedIn, an SNS, in generating knowledge construction by consumers in a more efficient way than traditional peer support forums. It expands our knowledge that SNSs' functions as not just limited to aspects of marketing and customer relationship, but also contribute innovative knowledge. It also describes an efficient knowledge construction process in a detailed way. The positive influences of social capital, especially its structural, relational dimension and cognitive dimension, on knowledge construction process are also illustrated. Therefore, it contributes a comprehensive understanding of the dynamics around social capital and knowledge construction from multiple facets in the context of SNSs. This provides a theoretical lens for

other studies exploring influences of social capital on knowledge construction in the broader landscape of varying virtual communities. Moreover, it also reveals the interrelationship between attributes of social capital and LinkedIn, a typical SNS. Thus it can sheds light on research exploring the attributes of platforms supporting virtual communities and embedded social capital.

Practical Implications

In practice, the results of the study could help producers to realise the importance of SNSs in acting as a platform to provide technical support and performing as an important external knowledge resource to collect innovative and specific users' knowledge. This research empirically finds that social capital plays a highly important role. Therefore, this suggests that practitioners like group managers should put more efforts to promote trust, friendship, sense of community identity, norms of collaborative, ties and direct interactions to promote the knowledge construction.

It confirms the suggestion of Gapece and Costa (2009) that all components of the team should participate in the knowledge construction process in order to increase the number of ideas generated. This research also reveals that knowledge construction on SNS requires multiple construction elements and different types of participations. Therefore, all types of members and all kinds of participation should be encouraged in practices.

Obstfeld (2002) observes that knowledge articulation is essential to construct innovative knowledge in the automotive design process. Individuals who can effectively influence the process of creating new knowledge during social interactions are also competent in articulating knowledge (Obstfeld, 2002). This research confirms these observations. In order to promote technical problem solving processes occurring online, the questioner should be instructed to articulate the symptoms and contextual knowledge about the problem in a detailed and an accurate way.

This research finds that one-to-one direct interaction can promote knowledge construction. However, Papacharissi (2009) discovers that LinkedIn members are more static and less interactive due to textual and design elements. Therefore, more interaction tools and communication channels can be implemented on LinkedIn to promote knowledge interactions and collaborative knowledge construction.

Future Research

In order to explain the efficient knowledge construction behaviours on SNSs, this research focuses on the influences from a social capital perspective, including the structural dimension (e.g. ties), relationship dimension (e.g. trust and identity) and cognitive dimension (e.g. shared language). However, the mechanisms of how some elements, such as ties and norms, influence knowledge construction are not thoroughly explored. Therefore, more work regarding this could usefully be conducted to uncover the factors involved. Moreover, future research could use social network analysis to examine the impact of other elements of structural dimension, such as density and structural holes, on knowledge construction patterns

and process. The researchers speculate that the knowledge group under investigation in this research can be a common-identity community where members strive for completing the collective goal through collaborative efforts and concentrating on information relevant to the common interest of the community. However, an empirical research to investigate members' inter-personal relation and attachment to the group identity is needed to prove this.

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