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Knowledge sharing in online smoking cessation communities: a social capital perspective

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Abstract

Purpose – Although knowledge sharing in online communities has been studied for many years, little is known about the determinants for individuals' knowledge sharing in online health communities (OHCs) surrounding smoking cessation. Examining the determinants of knowledge sharing in such OHCs from the social capital perspective may prove particularly enlightening.

Design/methodology/approach – A questionnaire-based online user survey of two smoking cessation OHCs, one based in Finland and one based in China, was performed. Performing data analysis with partial least squares (SmartPLS 3.0), the authors developed a model conceptualizing the structural, cognitive and relational dimensions of social capital as drivers for knowledge sharing in smoking cessation OHCs, with users' stage in giving up smoking as a moderator.

Findings – The results show that structural capital (social ties) and relational capital (reciprocity) are important motivators behind knowledge sharing in smoking cessation OHCs, and the authors found a moderating effect of the stage in quitting on the antecedents' relationship with knowledge sharing in these OHCs.

Originality/value – The study enriches understanding of knowledge sharing in smoking cessation OHCs, contributing to theory and identifying practical implications for such groups' administration.

Keywords Online health community, Knowledge sharing, Social capital, Smoking cessation

Paper type Research paper

Introduction

With the popularity of Web 2.0, millions of smokers have turned to the Internet for help in quitting (Graham and Amato, 2019), with one avenue being participation in online health

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communities (OHCs) designed for this aim (Graham *et al.*, 2015). Smoking cessation OHCs are collectives of people who interact with each other over the Internet to give up smoking (Mpinganjira, 2018). Smoking cessation OHCs provide support differently from offline venues (e.g. face-to-face one-on-one counseling or group-based behavior therapy): OHCs provide around-the-clock access to an extended social network of ex-smokers and current smokers who share similar smoking cessation experiences, and the interaction with peers in these communities can be anonymous. Users may share their experience of the process of quitting, related struggles and support for others in the OHCs without disclosing their identity. Furthermore, smoking cessation OHCs can offer a setting free of the social stigma (discrimination, prejudices and shame) that can arise from social pressure against smoking (Brown-Johnson and Popova, 2016; Castaldelli-Maia *et al.*, 2016). For instance, 8% of respondents in research by Stuber and Galea (2009) reported concealing their smoking status from a health provider because of concerns about smoking-related stigma. In contrast, smoking cessation OHCs that promise anonymity may offer an empathic environment where smokers can share quitting-related information and support each other.

Studies have found that participating in smoking cessation OHCs may lead to positive smoking cessation outcomes, such as achieving 30-day point-prevalence abstinence after short-term use of the OHCs (Graham *et al.*, 2015) and preventing relapse (Cheung *et al.*, 2015). These advantages notwithstanding, questions remain as to what motivates users to share their knowledge of smoking cessation in smoking cessation OHCs, which is critical for the success of online communities (Chiu *et al.*, 2006). Thus, it is important to investigate knowledge sharing behavior in smoking cessation OHCs.

While knowledge sharing in online communities has been subject to research in various contexts (e.g. Chai *et al.*, 2011; Chiu *et al.*, 2006; Mojdeh *et al.*, 2018; Zhao *et al.*, 2016), smoking cessation OHCs have been largely ignored thus far. One factor that sets these online communities apart from others is a shared aim of eliminating what the members share in common; that is, most users of smoking cessation OHCs are smokers who want to stop using tobacco products. Some of them might doubt their chances of success in quitting because of past failures in this regard and hence turn to the OHC for support, to improve their confidence and coping skills as they attempt to kick the habit. Also, a smoker may suffer from unpleasant withdrawal symptoms during the smoking cessation process, such as irritability, headaches and cravings, and specific personalized information from smoking cessation OHCs might be able to aid in dealing with such struggles in smoking cessation, beyond what general guidelines smoking cessation professionals offer. Unlike clinical diseases that rely primarily on physical treatments and medications, smoking cessation could be achieved via nonpharmacological interventions, such as interacting with counselors or peers (Maseeh and Kwatra, 2005). The psychological or emotional additions to smoking can be addressed from negative (such as sadness and fear) to positive (such as joy and pleasure) by engaging in online social networks (Granado-Font *et al.*, 2018). Given smokers' unique features and needs, the motivation beyond their knowledge sharing in smoking cessation OHCs might differ from those in other online communities.

As the literature shows, knowledge sharing in online communities involves social interactions among people in online social networks, and social capital has been posited to be an important determinant of knowledge sharing in this context (Chiu *et al.*, 2006; Wasko and Faraj, 2005). However, researchers have reported conflicting findings on motivations for knowledge sharing when studying different online communities from the social capital view. For instance, some scholars found a positive impact of relational capital (e.g. reciprocity) on knowledge sharing in the context of blog (Chai *et al.*, 2011) and general online communities (Chang and Chuang, 2011), whereas some research reported a negative impact of relational capital (e.g. reciprocity) on knowledge sharing in professional online communities (Wasko and Faraj, 2005) or no impact in commercial online communities (Wiertz and de Ruyter, 2007).

And prior research also reported a positive impact of cognitive capital (such as shared language) on knowledge sharing in general OHCs (Zhou, 2019) but no significant impact in specialized OHCs (Zhao *et al.*, 2016). Hence, more context-aware theorizing is called for in knowledge sharing research (Sergeeva and Andreeva, 2016). This could uncover both differences and common patterns.

In the context of smoking cessation OHCs, past studies have examined knowledge sharing mainly from the technology (e.g. Li, 2020; Li *et al.*, 2021) and the content perspectives (e.g. Zhang and Yang, 2015). While prior research has investigated the effects of social capital on knowledge sharing in different contexts (e.g. Chai *et al.*, 2011; Chiu *et al.*, 2006; Mojdeh *et al.*, 2018; Zhao *et al.*, 2016), relatively little attention has been paid to the specific context of smoking cessation OHCs. All these factors point to a need to study whether social capital built in smoking cessation OHCs can help explain individuals' knowledge sharing behavior in the specific context of smoking cessation OHCs.

According to the trans-theoretical model of behavior change (TTM) (Prochaska and Velicer, 1997), smokers pass through a distinct series of cessation stages before successfully quitting. Smokers have been argued to differ in their characteristics and information needs between stages (Prochaska *et al.*, 2004; Thrul *et al.*, 2015). However, few studies have empirically explored whether the impact of social capital on knowledge sharing in smoking cessation OHCs varies among smokers across smoking cessation stages. Hence, we examined the smoking cessation stage as a possible moderator when exploring the relationships involving social capital and knowledge sharing in smoking cessation OHCs.

To address the aforementioned gaps, we developed a research model based on social capital theory (Nahapiet and Ghoshal, 1998). For investigating the determinants of knowledge sharing in smoking cessation OHCs, we then tested the proposed model empirically via 173 online survey responses from users of smoking cessation OHCs in Finland and China. This work shed light on individual users' knowledge sharing behavior from the social capital perspective and the posited moderating effect of users' stage in quitting on the impact of social capital on that behavior in smoking cessation online communities.

We begin our discussion with a review of prior literature on knowledge sharing in smoking cessation OHCs and social capital theory. Then, we present the hypotheses and research model. Against this backdrop, we describe the research methods and discuss the results. The paper concludes with thoughts on theoretical and practical implications, alongside the identification of the work's limitations and further opportunities.

Theoretical background

Knowledge sharing in smoking cessation OHCs

The concept of knowledge sharing refers to an individual disseminating the knowledge, skills or experiences he or she has obtained with others (Hsu *et al.*, 2007). The information systems (IS) literature includes investigations of knowledge sharing in various online contexts, such as online communities for legal professionals (Wasko and Faraj, 2005), blogs (Chai *et al.*, 2011), web-based discussion communities (Ray *et al.*, 2014) and general-purpose OHCs (Zhang *et al.*, 2017b).

Smoking cessation OHCs are like other online communities in that knowledge sharing is their core activity and also vital for the sustainable development of the OHC. Those studies investigating knowledge sharing in a smoking cessation context have taken various perspectives. One focus has been on identifying what has been shared in smoking cessation OHCs by applying content analysis to the sharing activities in these groups. For instance, the work of Myneni *et al.* (2016) identified the following 12 themes: social support, traditions, progress, cravings, motivation, benefits, virtual rewards, relapse, obstacles, nicotine replacement therapy specifically, friends and family members and conflict; in contrast,

Cheung *et al.* (2017) classified the topics of sharing in smoking cessation OHCs on WhatsApp and Facebook platforms into three main types: sharing views and experience (55.5%), encouragement (28.7%) and knowledge and information (15.8%). The predominant framework applied in these studies for exploring the sharing behavior among the users has been social support theory, and knowledge sharing has been identified as one important activity alongside sharing of emotional support, esteem support and network support (Cheung *et al.*, 2017; Granado-Font *et al.*, 2018).

Another stream of research has focused on users' knowledge sharing patterns in smoking cessation OHCs. For instance, Ploderer *et al.* (2013) found that users at different stages of quitting manifest different patterns of knowledge sharing in these OHCs. Specifically, those at later stages in quitting mainly make comments in the smoking cessation OHCs, whereas the supportive responses and leadership come mainly from users who have just started the process. Investigating the knowledge sharing patterns in smoking cessation OHCs from a social support perspective, in turn, Zhang and Yang (2015) found that those who share knowledge to provide information support have typically been abstinent for a longer time than those who give emotional, esteem and network support. For instance, users further along in quitting exhibit a preference for sharing more advice and personal experiences with users who are in the early stages.

Some scholars have attempted to investigate the motivations for knowledge sharing in smoking cessation OHCs. Such as Li *et al.* (2021) have identified the perceived usefulness of smoking cessation OHCs as an important determinant of knowledge sharing. Li (2020) discovered a positive correlation between user satisfaction with smoking cessation OHCs and knowledge sharing. Table 1 lists some literature on knowledge sharing in smoking cessation OHCs.

As shown in Table 1, the prior literature examines knowledge sharing behavior principally from the content and technology perspectives, and the role of social relationships in knowledge sharing in smoking cessation OHCs has been ignored, notwithstanding literature stating that social relationships are important reasons for knowledge sharing in online communities in general. In addition, most of these studies have applied qualitative research methods, and research in a quantitative manner is very limited. Prior research suggests that social capital theory may hold value for explaining consequences of social relationships and community connections (Bartelt *et al.*, 2020; Cabrera and Cabrera, 2005; Choi, 2015). This points to a need to investigate what motivates knowledge sharing in smoking cessation OHCs from the social capital perspective.

Social capital theory

With its roots in community studies, social capital theory focuses on the resources derived through interpersonal relationships among people. Nahapiet and Ghoshal (1998, p. 243) defined social capital as "the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" and "[s]ocial capital thus comprises both the network and the assets that may be mobilized through that network." Social capital theory has been widely applied to investigate the effect of resources on social relationships in our lives from both individuals' and organizations' perspective in various fields, with examples being the research contexts of health promotion (Wakefield and Poland, 2005) and management (Leana and Van Buren, 1999; Nahapiet and Ghoshal, 1998). In general, prior literature points to an association between social capital and a host of positive outcomes, such as better health at the level of the individual and improved performance of organizations (Adler and Kwon, 2002).

Social capital theory has been applied specifically to knowledge sharing from both the individual and the organization's angle. Scholars have posited that it provides a framework to

Table 1. Summary of the literature on knowledge sharing in smoking cessation OHCs

Authors	Research focus	Research method	Theory	Research findings
Ploderer *et al.* (2013)	Patterns of knowledge sharing	Content analysis	Social support theory	Users' sharing behaviors are distinctive to the stage of quitting. Specifically, most informational comments are made by users later in the process, while supportive responses and leadership are mainly from users who have just started it
Myneni *et al.* (2015)	Shared content	Mixed methods	–	Twelve themes were identified – namely social support, traditions, progress, cravings, motivation, benefits, virtual rewards, relapse, obstacles, nicotine replacement therapy, family and friends and conflict
Zhang and Yang (2015)	Patterns of knowledge sharing	Content analysis and social network analysis	Social support theory	Users who share information and knowledge often have been abstinent for a longer time than those who share emotional, esteem and network support
Myneni *et al.* (2016)	Shared content	Qualitative analysis	–	Forty-three concepts were identified. These were further grouped under 12 themes: conflict, virtual rewards, pharmacotherapy, family and friends, obstacles to quitting, benefits of quitting, readiness to quit, cravings, relapse, progress in quitting, social support and traditions
Cheung *et al.* (2017)	Shared content	Content analysis	Social support theory	The themes of sharing in smoking cessation OHCs were classified into three types: views and experience, encouragement and knowledge and information
Granado-Font *et al.* (2018)	Shared content	Content analysis	Social support theory	Most messages shared in smoking cessation OHCs provide informational and emotional support
Hefler *et al.* (2019)	Shared content	Experiment	–	Messages that are child-focused or feature indigenous content are most likely to be shared, and those that include disgusting images, are environment-focused or are ambiguous/sarcastic are less likely to be shared
Li *et al.* (2019)	Motivators for knowledge sharing	Conceptual paper (survey as the proposed method)	Privacy calculus theory	The authors posited that appraisals of threat (i.e. its perceived severity and vulnerability) negatively correlate with knowledge sharing while appraisals of coping (i.e. of response efficacy and self-efficacy) were proposed to have positive influences on knowledge sharing in smoking cessation OHCs
Li (2020)	Motivators for knowledge sharing	Questionnaire	Expectation confirmation theory	Knowledge sharing is positively influenced by satisfaction, which is determined by both perceived usefulness and confirmation
Li *et al.* (2021)	Motivators for knowledge sharing	Questionnaire	Post-acceptance model of IS continuance	The perceived usefulness of smoking cessation OHCs in general affects knowledge sharing in specific smoking cessation OHCs

explain knowledge sharing mainly in terms of three dimensions: structural, relational and cognitive capital (Chiu *et al.*, 2006; Wasko and Faraj, 2005). The first refers to the overall structure of connections among people and is regarded as the channel for information flows (Tsai and Ghoshal, 1998). Researchers measure it by evaluating patterns and density characteristics of social networks, such as centrality (Wasko and Faraj, 2005) and social ties (Chiu *et al.*, 2006). The notion of relational capital brings in the affective nature of the relationships within a social network, such as trust, reciprocity and commitment (Chiu *et al.*, 2006; Wasko and Faraj, 2005). Finally, cognitive capital denotes resources providing shared interpretations and meanings within a social network, such as a shared language and vision (Chiu *et al.*, 2006).

The three dimensions of social capital have been applied to explore knowledge sharing in numerous contexts, among them a profession-based online community (Wasko and Faraj, 2005), IT-oriented online communities (Chiu *et al.*, 2006), firm-based commercial online communities (Wiertz and de Ruyter, 2007), blog sites (Chai *et al.*, 2011), online games' user communities (Hau and Kim, 2011), work teams (Yu *et al.*, 2013), firms (Chow and Chan, 2008; Hau *et al.*, 2013), OHCs (Zhang *et al.*, 2017a; Zhao *et al.*, 2016) and social networking site (SNS) contexts (Mojdeh *et al.*, 2018). For instance, examining an online community of legal professionals, Wasko and Faraj (2005) found both structural and cognitive capital to play important roles in knowledge sharing, while relational capital was not a significant motivator of knowledge sharing. As for OHC settings, structural capital (i.e. network density) has been found to enhance both the externalization and the combination aspect of knowledge creation (Zhao *et al.*, 2016). In a similar vein, SNS research by Mojdeh *et al.* (2018) revealed that one factor in relational capital (i.e. identification) has a positive influence on knowledge sharing intention, while the other factor considered (i.e. reciprocity) is only marginally significant. Table 2 presents more details on the research findings connected with the three dimensions of social capital in the field of knowledge sharing.

We selected social capital theory as our theoretical framework for investigating knowledge sharing for several reasons. Firstly, social capital theory highlights the role of social capital in obtaining different resources to benefit individuals and organizations (Bartelt *et al.*, 2020; Ellison *et al.*, 2006; Nahapiet and Ghoshal, 1998). Prior research suggests that this theory may hold value for explaining the outcomes obtained due to social relationships and community connections (Bartelt *et al.*, 2020; Cabrera and Cabrera, 2005; Choi, 2015). Secondly, social capital has been identified as a central theme in explaining knowledge sharing based on the social relationships and community connections inherent to online communities (Chiu *et al.*, 2006; Wasko and Faraj, 2005). This ties in with the aim of investigating the knowledge-sharing behavior of individual users in the context of smoking cessation OHCs in this study. Thirdly, smoking cessation OHCs are collectives of people who have similar concerns about quitting and who are embedded in social networks formed in online communities. Individual users can develop social capital via social interactions with others in online communities. This renders social capital theory suited to explaining knowledge sharing in smoking cessation OHCs. Taking it as a basic theoretical framework for the study, we followed established literature in applying the three-dimensional model of social capital for investigating the knowledge sharing in question.

The research model and hypotheses

Development of the model

Prior research indicates that social capital is one of the main factors in individuals' sharing of knowledge in online communities (Chai *et al.*, 2011; Chang and Chuang, 2011; Chiu *et al.*, 2006; Mojdeh *et al.*, 2018; Nahapiet and Ghoshal, 1998; Zhao *et al.*, 2016). Below, we explain how we developed our use of the framework to address the research phenomenon in light of previous

Table 2.
Literature on knowledge sharing that involves social capital factors

Authors	Context	Method (sample size)	Social capital typology	Research findings
Wasko and Faraj (2005)	Electronic network for a professional legal association	System log data and survey (173)	Structural capital: centrality Relational capital: commitment and reciprocity Cognitive capital: self-rated expertise and tenure in the field	Centrality positively influences the helpfulness of knowledge sharing and the volume of knowledge shared. Tenure in the field has a positive effect on the knowledge volume. Commitment correlates negatively with helpfulness in knowledge sharing. Reciprocity has a negative impact on the volume of knowledge shared
Chiu *et al.* (2006)	IT-oriented virtual community	Survey (310)	Structural capital: social interaction ties Relational capital: trust, norms of reciprocity and identification Cognitive capital: shared vision and shared language	Social interaction ties, reciprocity, and identification affect the amount of knowledge sharing. Shared language, shared vision and trust affect the quality of knowledge sharing. Shared language has a negative impact on the amount of knowledge sharing
Wiertz and de Ruyter (2007)	Firm-hosted commercial online communities	Survey and objective data (203)	Relational capital: reciprocity, commitment to community and commitment to host firm	Reciprocity does not affect knowledge sharing's quality or quantity. Commitment to the community exerts a positive effect on its quality and quantity. Commitment to the host firm does not affect either the quality or the quantity of knowledge-sharing significantly
Chow and Chan (2008)	Firms in Hong Kong	Survey (190)	Structural capital: social network Relational capital: social trust Cognitive capital: shared goals	The social network and shared goals are positively related to both attitudes toward knowledge sharing and subjective norms related to knowledge sharing
Chai *et al.* (2011)	Blog site	Survey (446)	Structural capital: social ties Relational capital: trust and reciprocity	Social ties, trust and reciprocity have positive effects on knowledge sharing
Chang and Chuang (2011)	Virtual community	Survey (282)	Structural capital: social interaction Relational capital: trust, identification and reciprocity Cognitive capital: shared language	Identification, reciprocity and shared language affect the quality and quantity of knowledge sharing positively. Social interaction and trust affect the quality of knowledge sharing
Hau and Kim (2011)	Online game community	Survey (1244)	Structural capital: social ties Relational capital: social trust Cognitive capital: shared goals	Social goals influence the attitudes and subjective norms connected with knowledge sharing. Social trust has a positive influence on the intention to share knowledge. Social ties and shared goals have positive impacts on social trust

(*continued*)

Table 2.

Authors	Context	Method (sample size)	Social capital typology	Research findings
Lu and Yang (2011)	Virtual communities	Survey (475)	Structural capital: social interaction ties Relational capital: trust, norms of reciprocity and identification Cognitive capital: shared vision and shared language	Structural capital increases information quantity, while relational capital and cognitive capital affect information quality positively. Structural capital influences cognitive capital also, which, in turn, has a significant influence on relational capital
Chang *et al.* (2012)	Medical center in Taiwan	Survey (797)	Structural capital: social interaction Relational capital: trust Cognitive capital: shared vision	Trust and shared vision have positive effects on knowledge sharing
Nov *et al.* (2012)	Flickr	System log data and survey (269)	Structural capital: log-groups Relational capital: log-contacts Cognitive capital: log-years	Structural capital and relational capital exert positive influences on meta-knowledge sharing
Hau *et al.* (2013)	Employees of firms	Survey (2010)	Structural capital: social ties Relational capital: social trust Cognitive capital: social goals	Social capital has positive effects on sharing of tacit and explicit knowledge both, showing a stronger impact on sharing of tacit knowledge than on explicit knowledge sharing
Yu *et al.* (2013)	Knowledge-intensive work teams	Survey (343)	*Team-level* Structural capital: network density Relational capital: norms of cooperation Cognitive capital: cognition commonality *Individual-level* Structural capital: betweenness centrality Relational capital: affective commitment Cognitive capital: shared cognition	On the team level, network density has an inverted-U-shaped relationship with both explicit and tacit knowledge sharing. Cognition commonality shows a marginally negative impact on sharing of tacit knowledge. Cooperative norms have a negative impact on explicit knowledge sharing At the level of the individual, betweenness centrality has an inverted-U-shaped relationship with both tacit and explicit sharing of knowledge. Shared cognition and affective commitment correlate positively with sharing of explicit and tacit knowledge
Zhao *et al.* (2016)	Specialized OHCs in US	Survey (265)	Structural capital: network density Relational capital: trust Cognitive capital: shared language	Network density positively affects both externalization and combination in knowledge creation. Trust and shared language are positively associated with network density

(*continued*)

Table 2.

Authors	Context	Method (sample size)	Social capital typology	Research findings
Zhang *et al.* (2017a)	Health Q&A communities	Survey (363)	Structural capital: network density Relational capital: trust Cognitive capital: shared language	Both intrinsic and extrinsic motivations mediate the path between social capital and intentions of knowledge sharing
Mojdeh *et al.* (2018)	Social networking sites	Survey (329)	Relational capital: identification and reciprocity	Identification has a significant positive effect on attitudes to SNS-connected knowledge sharing, while reciprocity's impact on attitudes to knowledge sharing is only marginally significant User anonymity has a positive influence on both identification and reciprocity Community type has a significant correlation with identification
Zhou (2019)	General OHCs in China	Survey (312)	Structural capital: social interaction ties Relational capital: trust and identification Cognitive capital: shared language	Social interaction ties and trust have no significant influences on knowledge contribution. Identification and shared language significantly affect knowledge contribution

findings on the impact of the dimensions of social capital on knowledge sharing at the level of the individual, and Table 3 lists the definitions of the constructs included in the research model.

As noted above, users of a smoking cessation OHC interact and establish connections with others even though they are anonymous. For instance, they post messages to seek help, reply to others' questions or comment on others' achievements. The users are connected with the other members of the smoking cessation OHC via social interaction activities, and users also share information in the connected communities. In other words, they build a social bond in and with the OHCs. Studies have validated that this set of social ties is indeed a key factor reflecting structural capital (Chai *et al.*, 2011; Chiu *et al.*, 2006). Accordingly, we assumed that social ties are an element reflecting structural capital in smoking cessation OHCs.

Online communities also provide users with a way of building relational capital (Chiu *et al.*, 2006; Wasko and Faraj, 2005). According to Wasko and Faraj (2005), reciprocity is an essential feature of online communities. Users of smoking cessation OHCs contribute to these communities by posting initial messages, answering questions and commenting on others' contributions. Thus, the content both benefits others and solicits help – for example, via requests for tips or advice. Thereby, reciprocity is evident in online communities. Furthermore, to realize mutuality in smoking cessation OHCs, users must maintain their commitment to the online community (Chiu *et al.*, 2006). The literature points to reciprocity and commitment as reflecting relational capital connected with knowledge sharing in online communities (Chiu *et al.*, 2006; Wiertz and de Ruyter, 2007), so we presumed that the constructs of reciprocity and commitment should capture relational capital in smoking cessation OHCs.

Research has revealed that, over time, communicating with peers who have shared similar situations and experiences will help users gradually develop cognitive capital, such as shared language and a shared vision (Chang and Chuang, 2011; Chiu *et al.*, 2006; Zhang *et al.*, 2017a; Zhao *et al.*, 2016). In smoking cessation OHCs, users indeed develop both shared terms/jargon and such components of a joint vision as common goals or concerns about smoking cessation. Since shared language and shared vision have been concluded to constitute the factors best capturing cognitive capital in knowledge sharing within online communities (Chang and Chuang, 2011; Chiu *et al.*, 2006; Zhang *et al.*, 2017a; Zhao *et al.*, 2016), we assumed that these two factors should capture cognitive capital in smoking cessation OHCs.

Hypothesis development

Members of smoking cessation OHCs can build relationships through both asynchronous methods (e.g. one-to-one private messages or one-to-many postings in threads) and

Table 3.
Constructs included in the research model

Construct	Definition
Knowledge sharing	The act of exchanging information, experience and skills connected with smoking cessation among users within a smoking cessation OHC Hsu *et al.* (2007)
Commitment	An enduring desire to maintain the relationship with the smoking cessation OHC Wiertz and de Ruyter (2007)
Reciprocity	A sense of a mutual debt to repay or appreciation for the benefits obtained from others in the smoking cessation OHC Chiu *et al.* (2006)
Shared language	Distinctive smoking-cessation-related terms for which users share a common understanding so as to facilitate communication in the smoking cessation OHC Chang and Chuang (2011), Chiu *et al.* (2006)
Shared vision	Values, goals and concerns held in common with regard to smoking cessation Chiu *et al.* (2006), Hau *et al.* (2013)
Social ties	The strength of the relationships, communication frequency and duration of communication among users in the smoking cessation OHC Chiu *et al.* (2006)

synchronous ones (e.g. real-time chatrooms) (Cobb *et al.*, 2010). The relationships among them provide cost-effective information channels suitable for sharing knowledge with thousands of ex-smokers and current smokers participating in the OHCs. These relationships may be strengthened via frequent and sustained interaction among users. The social ties are largely built upon the closeness of users' relationships with each other. Work by Chiu *et al.* (2006) and by Chang and Chuang (2011) has explicated that the stronger the social ties built, the greater the quantity of knowledge shared in the online community. Likewise, Chai *et al.* (2011) have articulated that social ties constitute a strong driver of knowledge sharing among bloggers. Proceeding from the foregoing discussion, we postulated that the stronger the social bond in smoking cessation OHCs, the more the users will share knowledge in their smoking cessation OHC. Accordingly, we formed the following hypothesis:

H1. Social ties are positively associated with knowledge sharing in smoking cessation OHCs.

Shared language pertains to the common codes, vocabulary or understandings that users adopt in their communications, here in smoking cessation OHCs (Chang and Chuang, 2011; Chiu *et al.*, 2006). Often, the information shared is related to the range and extent of nicotine withdrawal symptoms, medical treatments and tobacco products. However, smokers frequently are confused about the associated terminology. For instance, Alexander *et al.* (2016) found that, while smokers generally understand electronic cigarette products overall, the details of product types often confuse them. To build a common understanding for purposes of smoking cessation, users create common terms in many cases, such as slang that is easy to understand for members of the community – for instance, employing the commonly used "e-cigarette" and "vaping" to represent electronic cigarettes in a Twitter-based group (van der Tempel *et al.*, 2016). In smoking cessation OHCs, shared language promotes effective knowledge sharing by offering an avenue by which users can adopt common terms connected with smoking cessation and thereby avoid certain misunderstandings. Moreover, shared language offers a template with well-established codes for new members to follow and learn, making them capable of communicating with others more readily. Research has identified shared language as a motivator that determines knowledge sharing in online communities (Chang and Chuang, 2011; Chiu *et al.*, 2006). Likewise, we expected shared language among the users of smoking cessation OHCs to exert a positive influence on knowledge sharing in the communities, so we formed this hypothesis:

H2. Shared language is positively associated with knowledge sharing in smoking cessation OHCs.

A shared vision articulates common goals, values and aspirations among the users of a smoking cessation OHC (Chang *et al.*, 2012; Chiu *et al.*, 2006). One key part of the vision shared is to deal with difficult situations caused by the smoking habit and achieve long-term abstinence through supporting one another. The shared vision binds previously isolated smokers together and enhances interactions by such means as helping the users see the potential value of sharing medical and experiential knowledge of smoking cessation with others. Studies have validated shared vision as a significant influence on knowledge sharing in online communities (Chiu *et al.*, 2006). The above reasoning led us to propose that shared vision is one of the main factors determining the knowledge sharing in smoking cessation OHCs, and the following hypothesis was developed:

H3. Shared vision is positively associated with knowledge sharing in smoking cessation OHCs.

Reciprocity is an important aspect of relational capital because people expect mutuality of costs in terms of effort and time devoted to contributing knowledge (Chiu *et al.*, 2006; Wasko and

Faraj, 2005). The reciprocity expressed in smoking cessation OHCs provides users with a sense of fairness and some kind of guarantee that their contributions will be rewarded by others in the long run (Chiu *et al.*, 2006). One would expect this pattern to hold irrespective of the use of pseudonyms, and indeed there is evidence of reciprocal interactions even though most smoking cessation OHCs provide anonymity. For instance, a study of a Twitter-based smoking cessation OHC found more than 50% of ties to be reciprocal (Lakon *et al.*, 2016). The fairness evidenced by mutuality and reciprocity among users of smoking cessation OHCs might encourage users to contribute knowledge by replying to others' questions or promptly supplying information in the OHCs. Finally, findings in previous studies support the conclusion that reciprocity has a positive impact on knowledge sharing in online settings (Chai *et al.*, 2011; Chang and Chuang, 2011; Chiu *et al.*, 2006). Thus, it seemed reasonable to assume that:

H4. Reciprocity is positively associated with knowledge sharing in smoking cessation OHCs.

Commitment entails a sense of belonging and positive feelings toward the collective, and it nurtures loyalty and citizenship-oriented behavior collectively (Yu *et al.*, 2013). How do smoking cessation OHCs express this? They can provide users with both informational and emotional support (Rocheleau *et al.*, 2015), which confer a sense of being attached to the OHC. The mutual support and the empathy embodied by the online communications with peers might further motivate a user to participate and maintain the relationship with the OHC. Users with a high level of commitment to a smoking cessation OHC would be expected to possess and convey an ethos of an obligation and duty of helping others, and they are likely to remain members and share knowledge of smoking cessation with their peers in the long term. In work by Yu *et al.* (2013), considering knowledge-intensive work teams, the commitment was found to be positively correlated with knowledge sharing. The above reasoning led us to expect the commitment of the individual users to drive their knowledge sharing in smoking cessation OHCs, and we developed the following hypothesis accordingly:

H5. Commitment is positively associated with knowledge sharing in smoking cessation OHCs.

Smokers pass through a series of distinct cessation stages before achieving long-term abstinence, characterized as precontemplation (no intention to quit), contemplation (thinking about quitting), preparation (planning to quit within the next month), action (quitting successfully within six months), maintenance (no smoking for at least six months) and termination (zero temptation and 100% self-efficacy) (Prochaska and Velicer, 1997). Smokers' needs vary between these stages; for example, when Thrul *et al.* (2015) investigated a smoking cessation intervention on the Facebook platform, they found that users at precontemplation or contemplation stage were concerned more about the pros and cons of quitting while those at the preparation stage were more focused on consciousness raising. Accordingly, Prochaska *et al.* (2004) recommended providing smokers with information customized for their particular stage in smoking cessation, to match their personal needs. In addition, the smoking cessation stage has been found to be associated with the foci of smoking cessation behavior, such as restrictions on smoking in the home (Pizacani *et al.*, 2008). Concentrating on a Facebook-based smoking cessation OHC, Ploderer *et al.* (2013) reported that the smoking cessation stage has a connection also with the social support shared in online communities, with the majority of comments being provided by those who had successfully progressed to a more advanced stage, such as people at the maintenance or termination stage.

Findings from prior research indeed suggest that the motivation for users' knowledge sharing in smoking cessation OHCs might differ with one's stage in giving up smoking

(Ploderer *et al.*, 2013; Zhang and Yang, 2015). For instance, for those who have not taken actions to quit smoking, such as in contemplation and preparation stages, their participation in smoking cessation OHCs might not have developed strong relationships with other users and have a strong sense of commitment and reciprocity. But they will share the similar language in the OHCs as well as share the similar vision supporting each other in quitting smoking in the OHCs. Thus, structural capital and relational capital might have a weaker influence on knowledge sharing than cognitive capital for these users. And those who are in the process of quitting (such as in the action stage) might have benefited from the OHCs in quitting smoking, and relational capital (such as reciprocity and commitment) might have a much stronger influence on their knowledge sharing in these OHCs than structural and cognitive capital. For those who have quit smoking (such as in maintenance and termination stages), structural capital and relational capital might have stronger impacts on their knowledge sharing than cognitive capital. They have used smoking cessation OHCs for a certain period of time and might have built strong relationships with other users, and they have also achieved certain success in smoking cessation, which might help them build a strong sense of responsibility and duty for them to help others via sharing their knowledge. Therefore, we considered the smoking cessation stage as a possible moderator of the proposed relationships between social capital and knowledge sharing in smoking cessation OHCs. Thus, the following hypotheses were developed:

H6. The smoking cessation stage moderates the relationship between knowledge sharing and (a) social ties, (b) shared language, (c) shared vision, (d) reciprocity and (e) commitment.

In addition, prior research has identified gender and age differences in smoking cessation (Messer *et al.*, 2008; Wetter *et al.*, 1999), and knowledge sharing literature also suggests that gender differences should be considered in studies in online settings (Chai *et al.*, 2011). Since we collected data from two countries with different cultures, there might be cultural differences between the two user groups participating in this study. Therefore, we set age, gender and country as control variables in the proposed research model. Figure 1 presents the proposed research model and hypotheses.

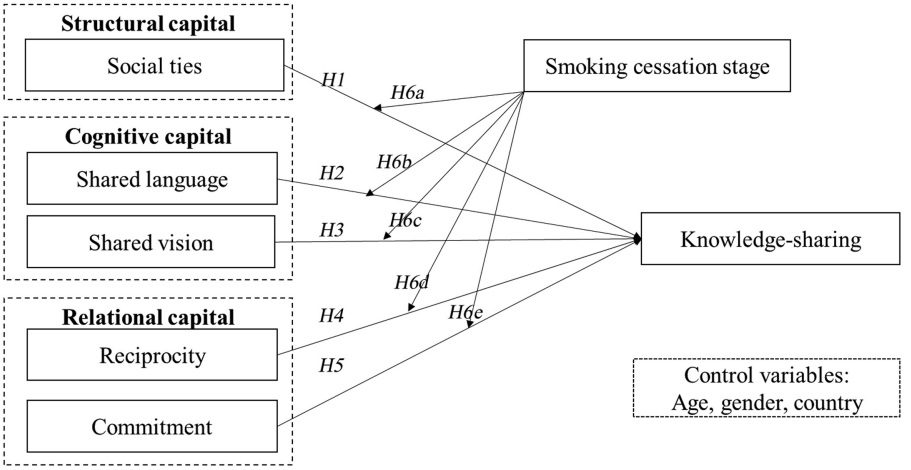

Figure 1.
The research model

Methods

The questionnaire

To investigate the determinants of knowledge sharing in smoking cessation OHCs, we employed an online survey for collecting data in Finland and China. The questionnaire was initially prepared in English and reviewed for content validity by two IS researchers. Then it was translated into Finnish by one author whose mother tongue is Finnish and into Chinese by another of the authors, who is a native speaker of Chinese. For reasons of translation quality, the questionnaire was further reviewed by an administrator of the Finnish smoking cessation OHC (Stumppi.fi), and additional checking for the Chinese-language questionnaire was performed by two Chinese IS researchers. With administrator assistance, 20 Stumppi.fi users were invited to participate in a pilot test of the Finnish-language online survey, on the basis of which the questionnaire was revised further. Questions were reordered to improve the flow and clarity of the questionnaire both in Chinese and in Finnish.

Construct measurements

The proposed research model contains six constructs: social ties, shared vision, shared language, reciprocity, commitment and knowledge sharing. The items for all the constructs in the model were measured via multiple-item scales with instrumentation adapted from items suggested in the literature. Further rewording was carried out in light of the context of smoking cessation OHCs. The metrics for social ties, shared language and shared vision were based on contributions from (Chiu *et al.*, 2006), while those for reciprocity were taken directly from work by Wasko and Faraj (2005). The commitment items were items suggested by (Liang *et al.*, 2011) but in adapted form. Finally, knowledge sharing was measured via four items adapted from items in a study by (Hsu *et al.*, 2007). A five-point Likert scale from "strongly disagree" (1) to "strongly agree" (5) was employed to measure all the items in the research model. The set of measurement items for all the constructs included is summarized by the list in Table A1.

Data collection

Individual users of smoking cessation OHCs were the respondents in our study. For this research, we selected two nonprofit smoking cessation OHCs, the Finland-based Stumppi.fi and one accessed in China via a subbar in Baidu's "post" bar that is denoted as for smoking cessation. We recruited individual users of the OHCs to take part in the online survey published within the two OHCs. The first page of the questionnaire presented potential respondents with a consent form stressing the voluntary nature of participation and stating that respondents may withdraw from the survey at any time. Only those agreeing to participate in it after acknowledgment via the consent form proceeded to complete the survey. The questionnaire presented questions on the respondent's background, smoking history and opinions and perceptions related to knowledge sharing in smoking cessation OHCs. Each respondent completing the Finnish survey received a free electronic movie ticket as an incentive, and each completing the Chinese version received a red envelope containing a random amount of money from 1 RMB to 3 RMB. Before the collection of data, the ethics committee of the authors' home university granted approval for this study.

Sampling for the online survey began on November 13, 2018, in China and December 17, 2018, in Finland. In total, we received 235 response forms, from 48 individuals in Finland and 187 in China. After removal of responses that either did not demonstrate informed consent to participate in the survey (2 in Finland, 48 in China) or suggested unreliable answers – for example, from people completing the survey in a very short span of time (12 in China) – we had a valid sample of 173 response forms for data analysis.

Roughly 59.5% of the respondents indicated that they were male, 37.0% specified that they were female and 3.5% did not disclose their gender. Most were aged 25–67 (87.8% fell within this range), and all had smoking cessation OHC use experience. They represented various stages of smoking cessation. Table 4 presents their demographic information and some characteristics of the respondents' smoking cessation OHC use.

Assessment of common method bias and measurement invariance

To check for the presence of common method bias in this study, we used both Harman's single-factor test (Podsakoff *et al.*, 2003) and the unmeasured latent method construct (UMLC) test developed by Williams *et al.* (1989). Specifically, first, we subjected all the variables to factor analysis to test whether a single factor emerged, and no single component was found to account for more than 50% of the total variance explained. Second, the UMLC approach was assessed with three models: a method-only model, a trait-only model and a trait and method model. The results were listed as below:

(1) M1 was a method-only model in which all items were loaded on one factor (i.e. the method factor) ($x^2(90) = 643.847, p = 0.000$, CFI = 0.680, TLI = 0.627, RMSEA = 0.189).

(2) M2 was a trait-only model in which items were loaded on its expected construct ($x^2(80) = 210.078$, $p = 0.000$, CFI = 0.925, TLI = 0.901, RMSEA = 0.079).

(3) M3 was a trait and method model in which a common method factor linking to all items was added into M1 ($x^2(65) = 131.902$, $p = 0.000$, CFI = 0.961, TLI = 0.938, RMSEA = 0.077).

Comparing these three models, M2 and M3 are much better than M1 according to the data, and M3 is only slightly better than M2. This indicates that trait rather than the common

Measurement	Items	Count	Percentage (%)
Country	Finland	46	26.6
	China	127	73.4
Gender	Male	103	59.5
	Female	64	37.0
	Unwilling to disclose	6	3.5
Age	15–24 years old	17	9.8
	25–44 years old	117	67.6
	45–65 years old	35	20.2
	65 years or older	4	2.3
Frequency of visiting	Less than once per week	34	19.7
	Once a week	27	15.6
	Several times per week but not every day	70	40.5
	Once a day	22	12.7
	Multiple times each day	20	11.6
Typical duration of a visit	Less than 10 min	25	14.5
	10–30 min	106	61.3
	30–60 min	38	22.0
	More than an hour	4	2.3
Stage in smoking cessation	Precontemplation	4	2.3
	Contemplation	45	26.0
	Preparation	19	11.0
	Action	40	23.1
	Maintenance	50	28.9
	Termination	15	8.7

Table 4. Respondents' demographic and usage profiles

method factor explains most of the variance (Williams *et al.*, 1989). Therefore, common method bias is unlikely to be an issue in this study. Overall, there is strong support for concluding that common method bias is not a critical concern in the current study.

To assess whether differences exist between the respondents from China and Finland, we conducted an invariance test by applying the Measurement Invariance Assessment (MICOM) procedure proposed by (Henseler *et al.*, 2016b). The results show all *c* value, the difference of the mean value and the variance of composites between the two countries fall between the upper and lower bounds of the 95% confidence interval as recommended by Henseler *et al.* (2016b); thus, the measurement invariance is established in this study.

Data analysis

We employed partial least squares (SmartPLS 3.0) to test the measurement model and structural model.

Testing of the measurement model. Testing the measurement model involved evaluating the items' convergent validity and discriminant validity. Convergent validity can be assessed via certain standard estimates: the factor loading of each measurement item on the respective constructs must be above 0.7, each construct's composite reliability (CR) must be above the cutoff value of 0.8, and the average variance extracted (AVE) by each construct must exceed 0.5 (Hulland, 1999; Tenenhaus *et al.*, 2005). As Table 5 shows, the factor loadings of all measurement items encompassed by the research model exceed the prescribed threshold of 0.70, and the CR and AVE values for all constructs are above the 0.8 and 0.5 cutoffs, respectively, showing evidence of convergent validity.

To assess discriminant validity, we used two techniques, one developed by Fornell and Larcker (1981) and the other proposed by Henseler *et al.* (2015). Firstly, we compared the square root of the AVE for each construct against its correlation with other constructs. As Table 6 shows, each construct's AVE square root value is greater than the estimated correlation with any other constructs. Secondly, we conducted a comparison between items' loading for an associated construct and their cross-loading on other constructs. All items

Construct	Item	Factor loading	Cronbach's alpha	CR	AVE
Knowledge sharing (KS)	KS1	0.923	0.935	0.954	0.838
	KS2	0.898			
	KS3	0.923			
	KS4	0.916			
Commitment (CO)	CO1	0.896	0.844	0.906	0.763
	CO2	0.844			
	CO3	0.879			
Reciprocity (RE)	RE1	0.867	0.704	0.871	0.771
	RE2	0.890			
Shared language (SL)	SL1	0.794	0.775	0.854	0.595
	SL2	0.759			
	SL3	0.708			
	SL4	0.820			
Shared vision (SV)	SV1	0.846	0.786	0.875	0.700
	SV2	0.784			
	SV3	0.877			
Social ties (ST)	ST1	0.954	0.952	0.965	0.875
	ST2	0.909			
	ST3	0.935			
	ST4	0.942			

Table 5.
Results of confirmatory factor analysis

loaded on their corresponding construct more strongly than on other constructs (figures are presented in Table 7). Finally, we applied a new approach, the heterotrait–monotrait (HTMT) ratio of correlations suggested by Henseler *et al.* (2015), to assess the discriminant validity in variance-based structural equation modeling (SEM). An HTMT of 0.90 has been posited to be an acceptable upper limit (Henseler *et al.*, 2015), and all HTMT values we obtained are below 0.90 (see Table 8), which indicates that discriminant validity has been established. Overall,

Table 6. Correlations and square roots of AVE

	KS	CO	RE	SL	SV	ST
Knowledge sharing (KS)	0.915					
Commitment (CO)	0.694	0.873				
Reciprocity (RE)	0.477	0.448	0.878			
Shared language (SL)	0.518	0.552	0.432	0.771		
Shared vision (SV)	0.489	0.588	0.501	0.686	0.837	
Social ties (ST)	0.813	0.674	0.383	0.527	0.417	0.935

Note(s): The diagonal elements represent square root of average variance extracted (AVE)

Table 7. Loadings and cross-loadings

	KS	CO	RE	SL	SV	ST
KS1	0.923	0.648	0.472	0.476	0.495	0.720
KS2	0.898	0.558	0.415	0.504	0.413	0.713
KS3	0.923	0.651	0.468	0.447	0.424	0.756
KS4	0.916	0.676	0.393	0.472	0.458	0.783
CO1	0.637	0.896	0.362	0.457	0.518	0.606
CO2	0.602	0.844	0.394	0.484	0.520	0.592
CO3	0.575	0.879	0.421	0.508	0.503	0.564
RE1	0.400	0.369	0.867	0.33	0.370	0.326
RE2	0.437	0.416	0.890	0.426	0.504	0.346
SL1	0.374	0.404	0.343	0.794	0.454	0.419
SL2	0.358	0.368	0.362	0.759	0.615	0.317
SL3	0.332	0.385	0.413	0.708	0.566	0.370
SL4	0.501	0.519	0.260	0.820	0.509	0.494
SV1	0.378	0.538	0.454	0.514	0.846	0.319
SV2	0.379	0.405	0.376	0.545	0.784	0.292
SV3	0.463	0.529	0.429	0.650	0.877	0.423
ST1	0.761	0.612	0.354	0.502	0.396	0.954
ST2	0.753	0.629	0.320	0.496	0.410	0.909
ST3	0.743	0.625	0.382	0.506	0.332	0.935
ST4	0.783	0.653	0.376	0.469	0.422	0.942

Note(s): KS, knowledge sharing; CO, commitment; RE, reciprocity; SL, shared language; SV, shared vision; ST, social ties)

Table 8. Heterotrait–monotrait ratios of correlations

	KS	CO	RE	SL	SV
Knowledge sharing (KS)					
Commitment (CO)	0.778				
Reciprocity (RE)	0.588	0.581			
Shared language (SL)	0.595	0.672	0.600		
Shared vision (SV)	0.566	0.720	0.670	0.883	
Social ties (ST)	0.860	0.750	0.467	0.602	0.476

there is strong empirical support for concluding that discriminant validity exists for all constructs in our theoretical model.

The multicollinearity of each construct was also examined by assessing the values of variance inflation factor (VIF) (Kock and Lynn, 2012). As shown in Table 9, the VIF values in this study were all lower than the suggested threshold of 3.3 (Kock and Lynn, 2012). Thus, multicollinearity was not a critical issue in this study.

Testing of the structural model. A PLS bootstrapping procedure was applied in the structural model test, including the path significance of the hypothesized effect and the explanatory power of the model, via SEM techniques. As postulated, social ties ($\beta = 0.522$, $p < 0.001$) and reciprocity ($\beta = 0.124$, $p < 0.05$) showed significant positive effects on knowledge sharing, thus supporting H1 and H4. Contrary to expectations, shared vision, shared language and commitment displayed no significant influence on knowledge sharing. Accordingly, H2, H3 and H4 were not supported. Our model explains 74.5% of the variance in knowledge sharing in smoking cessation OHCs, indicating that it has good explanatory power (see Figure 2). The results of the control variable test indicate that gender ($\beta = -0.077$, $p < 0.05$) and country ($\beta = 0.159$, $p < 0.05$) affect knowledge sharing in smoking cessation OHCs significantly while age does not.

Table 9.
Full collinearity test for VIF values

Construct	VIF value
Knowledge sharing (KS)	1.393
Commitment (CO)	1.521
Reciprocity (RE)	1.219
Shared language (SL)	1.573
Shared vision (SV)	1.429
Social ties (ST)	2.010

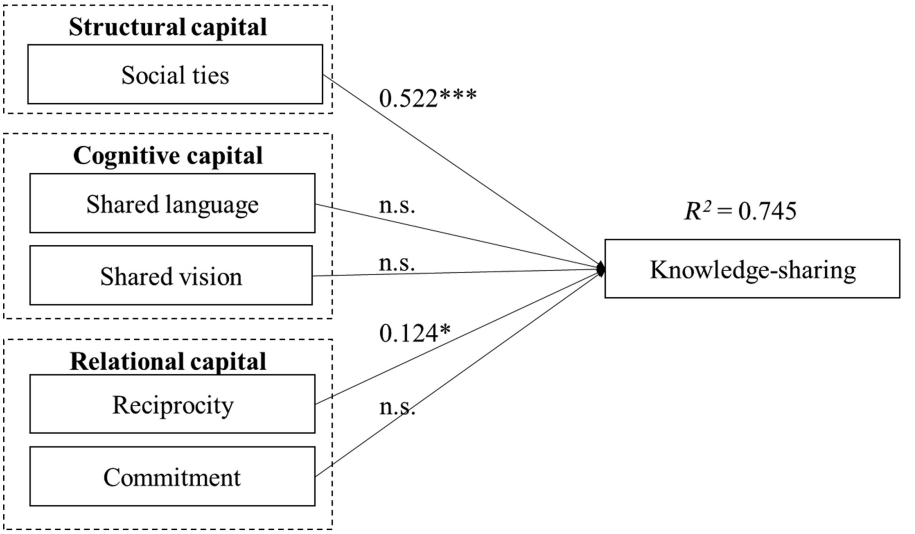

Figure 2.
The structural model

Note(s): ***, $p < 0.001$; *, $p < 0.05$; n.s., not significant

We examined the predictive validity of the model by computing Stone–Geisser's Q^2 (Geisser, 1974; Hair *et al.*, 2017; Stone, 1974), which is measured via the blindfolding technique of SmartPLS 3.0. Our Q^2 for knowledge sharing is 0.573, indicating good predictive relevance.

Finally, the goodness of fit was tested by the measurement of the standardized root mean square residual (SRMR) (Henseler *et al.*, 2016a). The resulting SRMR value, 0.060, is lower than the acceptability maximum of 0.08 proposed by Hu and Bentler (1999). Therefore, our model shows an acceptable fit.

Moderator analysis. Finally, we tested the moderation effects of the user's stage in quitting to see whether the strength of the relationships between the proposed antecedents (social ties, shared language, shared vision, reciprocity and commitment) and knowledge sharing varies with the smoking cessation stage of individual users of smoking cessation OHCs. We divided the users into three subgroups on the basis of broad stages in ceasing smoking: those intending to quit but not taking action, including users in the contemplation or preparation stage (Group A); those in the action stage (Group B); and those who had succeeded in having not smoked for at least six months, including people in the maintenance or temptation stage (Group C). Note that the four responses of users in the precontemplation stage, without an intention to quit smoking, were excluded. We applied multigroup analysis (MGA) (Henseler, 2012) with SmartPLS 3.0 in the moderating-effect test.

Prior to the MGA, we used MICOM procedure proposed by Henseler *et al.* (2016b) to assess whether differences existed among three groups. Since there are three groups in this study, every two groups were analyzed at a time. Overall, the analysis was carried out three times (i.e. Group A vs Group B; Group A vs Group C; Group B vs Group C). The results show that all c values met the criteria suggested by Henseler *et al.* (2016b), but the difference of the mean value and the variance of composites for several constructs did not fall between the upper and lower bounds of the 95% confidence interval. Thus, partial measurement invariance is established, which permits MGA in this study (Henseler *et al.*, 2016b).

The MGA results are presented in Table 10. Social ties and commitment emerged as significant determinants of knowledge sharing among Group A users, who intended to quit smoking but had not yet taken action. Commitment is the only factor exerting a positive influence on knowledge sharing among those in Group B, who were actively trying to quit smoking. For those in Group C, who had successfully abstained for at least six months, social ties and shared vision were found to be significant predictors of knowledge sharing in the smoking cessation OHCs.

Social ties exhibited a stronger significant influence on knowledge sharing among those who had not smoked for at least six months (Group C) than on those who only intended to quit

	Comparison of stages in smoking cessation			Path coefficients of separate structural models		
	Group A vs Group B	Group B vs Group C	Group A vs Group C	Group A ($N = 64$)	Group B ($N = 40$)	Group C ($N = 65$)
H1	0.280 n.s.	0.409 $p < 0.05$	0.129 n.s.	0.537 $p < 0.001$	0.257 n.s.	0.666 $p < 0.001$
H2	0.248 n.s.	0.071 n.s.	0.177 n.s.	0.159 n.s.	−0.089 n.s.	−0.018 n.s.
H3	0.123 n.s.	0.447, n.s.	0.325 $p < 0.05$	−0.130 n.s.	−0.253 n.s.	0.194 $p < 0.05$
H4	0.103 n.s.	0.083 n.s.	0.020 n.s.	0.102 n.s.	0.205 n.s.	0.122 n.s.
H5	0.371 n.s.	0.684 $p < 0.01$	0.312 n.s.	0.338 $p < 0.01$	0.709 $p < 0.01$	0.025 n.s.

Note(s): Group A, users who intend to quit but have not taken action; Group B, users who are in the action stage; Group C, users who have succeeded in having not smoked for at least six months; n.s., not significant

Table 10. Test for the smoking cessation stage as a moderator

smoking (Group A), but no significant influence on those actively attempting to quit (Group B) was found. A significant difference was revealed only between groups B and C. Shared vision showed a significant impact on knowledge sharing among users who had not smoked for at least six months but not on the other two groups' knowledge sharing. A significant difference was found between Group A and Group C. For commitment, a stronger significant influence on knowledge sharing was visible among those actively attempting to quit smoking than among those with only an intent to cease, and no significant influence was visible for those who had abstained from smoking for at least six months. A significant difference was found between groups B and C in this regard. Finally, neither shared language nor reciprocity was a significant factor predicting knowledge sharing, with no significant difference evident among the groups. Thus, H6a, H6c and H6e were supported, whereas H6b and H6d were not.

Discussion

Of the several social-capital-related factors we investigated that might affect knowledge sharing in smoking cessation OHCs, the results show that two dimensions of social capital have significant impacts on users' knowledge sharing in these OHCs: structural capital (social ties) and relational capital (reciprocity). The results also offer evidence for the existence of a moderating effect of one's stage in smoking cessation on the relationships between the antecedents and knowledge sharing.

Structural capital (social ties) was found to be the most important factor in knowledge sharing in smoking cessation OHCs. This finding is consistent with research regarding knowledge sharing among bloggers (Chai *et al.*, 2011) and users of OHCs (Zhao *et al.*, 2016). Prior research shows that social ties motivate knowledge sharing behavior among bloggers and support OHC users' combination and externalization in knowledge creation. In the study Chen and Shi (2015) conducted on special-interest OHCs – focused on HIV – users with stronger online social ties appeared more likely to share information/knowledge than those with weaker social ties. In smoking cessation OHCs, users establish social ties with other users via social interactions. Such ties may get strengthened over time, in line with the frequency and duration of interactions (Chai *et al.*, 2011); for instance, users might build friendships in OHCs. Such friendships, in turn, create peer pressure among users to share more knowledge with their online friends or other contacts (Chai *et al.*, 2011). For instance, they might disseminate more knowledge in the communities to support other smokers' efforts to quit, whether sharing their own stories, providing tips or commenting on posts by other members of the online community.

Our finding that reciprocity is another important factor predicting knowledge sharing in smoking cessation OHCs is consistent with the research results of (Chai *et al.*, 2011) and of Chang and Chuang (2011). The literature attests that norms of reciprocity have a positive effect on knowledge sharing in blogs (Chai *et al.*, 2011) and on both the quantity and quality of knowledge sharing in online communities more broadly (Chang and Chuang, 2011). In their research on HIV-related OHCs, Chen and Shi (2015) found reciprocity to correlate positively with information sharing. Likewise, when users of smoking cessation OHCs believe that others care about their contributions and are going to respond to them with similar offerings, they will share more knowledge in the communities to support others.

Contrary to our hypothesis, commitment did not appear to exert a significant influence on knowledge sharing in smoking cessation OHCs. This finding is at odds with those of Yu *et al.* (2013) and of Wiertz and de Ruyter (2007). In their research on knowledge-intensive work teams, Yu *et al.* (2013) found that commitment positively affects sharing both explicit and tacit knowledge at the level of individuals. The research results of Wiertz and de Ruyter (2007) in commercial online communities likewise indicate that commitment to online communities affects the quantity and quality of knowledge sharing significantly. One

possible reason is that users of smoking cessation OHCs keep anonymous online and do not know each other, and their commitment to the OHCs might be weaker than intensive networks. Prior research has found that anonymity weakens users' group identification toward online communities (Kim *et al.*, 2019). In addition, unlike professional or customer-oriented online communities, users of smoking cessation OHCs often experience a sense of urgency about obtaining social support to cope with difficult situations caused by smoking cessation. Thus, they tend to use smoking cessation OHCs intermittently and irregularly, and their commitment to smoking cessation OHCs might also be weaker than other online communities.

Our finding that cognitive capital, including shared language and shared vision, has no significant impact on knowledge sharing in smoking cessation OHCs is part of a complex picture. While this result is at odds with some previous findings on the impact of cognitive capital on knowledge sharing in various online communities, such as IT-oriented online communities (Chiu *et al.*, 2006) and general OHCs (Zhou, 2019), it supports the conclusion of Zhao *et al.* (2016) offered for specialized OHCs. In professional online communities, expertise and common language in a professional domain and shared values and goals about collective actions are important for users to avoid misunderstanding and improve communication efficiency. Quitting smoking is a well-known topic, and many individuals (even some nonsmokers) are familiar with some terminologies or jargons regarding smoking cessation. When users join in smoking cessation OHCs, they have the general common goal of stopping tobacco use. Users of smoking cessation OHCs might have already established the shared language and shared vision when engaging in smoking cessation OHCs. In addition, the inconsistent findings between prior studies on OHCs indicate that we should be cautious about the research context when studying the impacts of cognitive capital on knowledge sharing in OHCs. Compared with general OHCs, the number of users of smoking cessation OHCs is much smaller, and the level of homophily is higher. To cope with the difficulties caused by the same health concern, forming robust relationships among users in these OHCs might be necessary for motivating knowledge sharing activities rather than developing a shared language or vision (Zhao *et al.*, 2016).

The moderating effect of the smoking cessation stage on the relationships between some of the proposed antecedents and knowledge sharing is one of the most valuable contributions of the study. A moderating effect was visible on the paths from social ties, shared vision and commitment to knowledge sharing but not between other posited antecedents (shared language and reciprocity) and knowledge sharing. This might be due to stage-specific differences in both needs and the user's purposes behind using smoking cessation OHCs.

Conclusion

The study contributes to research and practice with regard to individual-level knowledge sharing in smoking cessation OHCs on several fronts.

Contributions to theory

This study enriches the knowledge sharing literature by unpacking the context of smoking cessation OHCs and clarifying the role of social capital for knowledge sharing in the specific context of smoking cessation OHCs. The literature has largely ignored the knowledge-sharing behavior in such OHCs. Investigating knowledge sharing in this specific OHC context from the standpoint of social capital, our work addresses this gap and answers the call from Sergeeva and Andreeva (2016) to bring context back into knowledge sharing research.

Secondly, the theoretical angle of social capital yields insights into the mechanisms underlying knowledge sharing in smoking cessation OHCs. Our findings show that structural capital and relational capital built in smoking cessation OHCs can motivate users' knowledge sharing in these OHCs. The social-capital-related mechanisms identified speak to the potential value of enhancing the social relationships in the networks within smoking cessation OHCs in pursuit of stronger knowledge sharing. The insignificant impact of cognitive capital (i.e. shared vision and language) on knowledge sharing in smoking cessation OHCs indicates that though social capital theory can help explain knowledge sharing in online communities, it is necessary to consider the research context when applying social capital theory in knowledge sharing research as the roles of different social factors might vary in explaining knowledge sharing in different contexts.

Thirdly, investigating the components that construct social capital helps one understand the dimensions of social capital – in our case, those specific to smoking cessation online communities. This research disentangled the components of the three dimensions of social capital: structural capital (social ties), cognitive capital (shared language and vision) and relational capital (reciprocity and commitment). Specifically, our empirical evidence of positive effects of structural capital (social ties) and relational capital (reciprocity) on knowledge sharing in smoking cessation OHCs provides further support for concluding that structural and relational capital can facilitate users' knowledge sharing behavior in an online environment (Chiu *et al.*, 2006; Wasko and Faraj, 2005). The findings also inform the literature on smoking cessation OHCs with new insights that may assist in optimizing the mechanisms of users' knowledge sharing behavior in light of the structural capital and relational capital built in smoking cessation OHCs.

The findings connected with the smoking cessation stage's moderating influence constitute a fourth contribution: they provide evidence that user context is a critical factor for explaining how social capital affects knowledge sharing in smoking cessation OHCs. This represents new insight for a greater understanding of knowledge sharing in these OHCs among different user groups.

Practical significance

The results offer insights through which practitioners can better promote knowledge sharing activities in smoking cessation OHCs. Firstly, these findings from the social capital perspective indicate that it is critical for those managing smoking cessation OHCs to exploit the power of social capital in these online communities in pursuit of enhanced knowledge sharing, through such means as employing strategies to help users with social-bond development and to encourage reciprocal activities in the OHC.

Secondly, this work highlights the salient role of social ties in determining knowledge sharing. Accordingly, those who run smoking cessation OHCs should develop strategies and mechanisms to enhance relationship development on users' part, so as to promote knowledge sharing in smoking cessation OHCs. For instance, the administrators could arrange smoking-cessation-related online social events or campaigns associated with the OHC to help the users interact with each other. This would promote the formation of new social ties and sustain existing online relationships in these communities, thereby potentially enhancing knowledge sharing in them. The managers of smoking cessation OHCs could also invite smoking cessation experts to join in their smoking cessation OHC, not only to provide professional knowledge but also to facilitate interaction among the members of the community. That may nurture the development of social ties among users too.

A third relevant contribution is the finding of a positive effect of reciprocity on knowledge sharing. In response, managers should develop approaches that boost the reciprocity in smoking cessation OHCs – for instance, adding functions that allow users to reward

knowledge contributors or respond to others' postings conveniently. In addition, those managing smoking cessation OHCs should motivate members of the OHCs to support their peers by sharing information and knowledge, through invitations to establish a dedicated discussion forum or thread. Doing this should increase the likelihood of other users contributing actively to the OHCs, on account of reciprocity considerations (related to knowledge sharing, etc.).

Fourthly, because we found the user's stage in smoking cessation to moderate relationships between social capital and knowledge sharing, managers should consider user context, such as the needs and goals of users at various stages on the journey of quitting. For instance, smoking cessation OHC service providers could offer custom content that is based on users' stage of ceasing smoking to meet their personal needs. This may help with knowledge sharing in the communities.

While offering insights that inform scholars' and practitioners' understanding of knowledge sharing in smoking cessation OHCs, this study has certain limitations. Firstly, because of the limits inherent to online surveys, the data we collected may not add in-depth information for explaining the nuanced features of social capital with regard to sharing knowledge in smoking cessation OHCs. Therefore, further methods could be employed to enrich the findings in this special domain. For instance, one could combine quantitative and qualitative research. Secondly, the five social capital factors proposed in our research model may not fully capture social capital's effects on knowledge sharing in these OHCs. Other facets of each dimension (e.g. trust on the relational dimension) that may be connected with knowledge sharing in smoking cessation OHCs could be taken into consideration in future research. Another possible avenue for further research would be to examine the moderating effects of other noteworthy elements, such as socioeconomic status, which has been found to be closely connected with smoking (Laaksonen *et al.*, 2005). Finally, researchers could consider collecting data from OHCs focusing on different health concerns (e.g. alcohol and drug addiction) and various countries to generalize our findings to addiction cessation OHCs.

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Appendix A.

Table A1.
Measurement items and their sources

Construct	Measurement items	Reference
Knowledge sharing (KS)	KS1: I frequently participated in knowledge sharing activities within the smoking cessation OHC KS2: I usually spent a lot of time in knowledge sharing activities within the smoking cessation OHC KS3: I usually shared information with others in the smoking cessation OHC actively KS4: I usually involved myself in discussions of various topics within the smoking cessation OHC	Hsu *et al.* (2007)
Commitment (CO)	CO1: I was proud to belong to the smoking cessation OHC CO2: I felt a sense of belonging to the smoking cessation OHC CO3: I cared about the long-term success of the smoking cessation OHC	Liang *et al.* (2011)
Reciprocity (RE)	RE1: I knew that other members would help me, so it is only fair to help other members RE2: I knew that someone would help me if I were in a similar situation	Wasko and Faraj (2005)
Shared language (SL)	SL1: The members of the smoking cessation OHC used common terms SL2: The members of the smoking cessation OHC used understandable communication patterns during discussion SL3: The members of the smoking cessation OHC used understandable narrative forms to post messages or articles SL4: The members of the smoking cessation OHC were always on the same frequency when we talked about smoking cessation	Chiu *et al.* (2006)
Shared vision (SV)	SV1: Members of the smoking cessation OHC shared the vision of helping others solve their smoking problems SV2: Members of the smoking cessation OHC shared the same goal of supporting each other SV3: Members of the smoking cessation OHC shared the same sense that helping others was pleasant	Chiu *et al.* (2006)
Social ties (ST)	ST1: I maintained close social relationships with some members of the smoking cessation OHC ST2: I spent a lot of time interacting with some members of the smoking cessation OHC ST3: I knew some members of the smoking cessation OHC on a personal level ST4: I was in frequent communication with some members of the smoking cessation OHC	Chiu *et al.* (2006)