

# Antecedents and consequences of the perceived usefulness of smoking cessation online health communities

Perceived  
usefulness of  
smoking  
cessation OHC

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## Abstract

**Purpose** – An empirical study investigated the antecedents to perceived usefulness (PU) and its consequences in the context of smoking cessation online health communities (OHCs).

**Design/methodology/approach** – To validate a research model for perceived informational support, perceived emotional support and perceived esteem support, the authors conducted a partial-least-squares analysis of empirical data from an online survey ( $N = 173$ ) of users of two smoking cessation OHCs. The proposed model articulates these as antecedents to PU from a social support perspective, and knowledge sharing and continuance intention are expressed as consequences of PU.

**Findings** – The empirical study identified that the PU of smoking cessation OHCs is influenced by perceived emotional support and perceived esteem support, and perceived informational support indirectly affects PU via these factors. In turn, PU exerts a positive influence on both knowledge sharing and continuance intention. Also, knowledge sharing positively affects continuance intention.

**Originality/value** – The study contributes to scholarship on users' postadoption behavior in the context of smoking cessation OHCs by disentangling the antecedents to PU from a social support perspective and pinpointing some important consequences of PU. The research also has practical implications for managing smoking cessation OHCs.

**Keywords** Online health communities, Perceived usefulness, Social support, Knowledge sharing, Continuance intention

**Paper type** Research paper

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## 1. Introduction

Internet-based smoking cessation interventions that allow social interactions among smokers have ballooned in popularity in recent years. It is estimated that more than 12 million adult smokers in the USA sought related assistance via the Internet in 2017 alone (Graham and Amato, 2019). Recently, smoking cessation online health communities (OHCs) have received considerable attention from academics and practitioners too. Smoking cessation OHCs can be defined as social networks in which individuals can interact with each other with regard to kicking the smoking habit, seeking or offering related social support (Chen *et al.*, 2019; Mpinganjira, 2018). Smoking cessation OHCs provide several benefits to smokers. Firstly, they offer smokers a communication channel through which they can interact with thousands of current smokers or ex-smokers without facing space and time restrictions. Also importantly, these OHCs allow users to remain anonymous by hiding their identity when online. This can help smokers maintain their privacy and avoid smoking-related stigma (e.g. blame, shame or negative stereotypes). Prior research suggests that participation in smoking cessation OHCs may lead at least to positive outcomes such as abstinence in the short term (Graham *et al.*, 2015).

Quitting smoking is more like a marathon than a sprint. Even though some smokers may not have smoked for a while, they still need constant assessment and repeated interventions to prevent relapse. A longitudinal study spanning 25 years found that about 39% of former smokers – those who had quit smoking successfully – reported relapsing at least once during the smoking cessation process (Caraballo *et al.*, 2014). For those who have quit in the recent past, the use of smoking cessation OHCs can help sustain the abstinence and aid in becoming permanently free of smoking (Cheung *et al.*, 2015, 2020). In addition, they may also support other users through sharing tips and experiences of the smoking cessation journey (Dickerson *et al.*, 2016; White *et al.*, 2020). Obviously, smoking cessation OHCs can benefit both current and former smokers. Though the potential benefits for users are clear, a challenge remains: low participation levels (Saul *et al.*, 2016). There are unanswered questions about how smokers can be motivated to keep using the OHCs as their smoking cessation process unfolds and about how to inspire them to contribute knowledge to the OHCs. Information systems (IS) scholars have posited that users' continuance intention toward an IS is critical for its success and sustainability (Bhattacharjee, 2001). In addition, knowledge sharing has been identified as important for the long-term success and sustainability of online communities (Chiu *et al.*, 2006). Therefore, it is essential to investigate the factors influencing users' intention to continue using smoking cessation OHCs and their knowledge-sharing behavior in these communities.

Although research has paid a large amount of attention to either knowledge sharing in OHCs (e.g. Yan *et al.*, 2016; Zhang *et al.*, 2020; Zhang *et al.*, 2017) or behavior related to their continuance intention (e.g. Song *et al.*, 2018; Wu, 2018), little research has investigated the links between these distinct postadoption behaviors. Given the importance of both – users' continuance intention toward smoking cessation OHCs and knowledge sharing in these OHCs – for the sustainability of smoking cessation OHCs, investigation of the link between the two should fruitfully advance understanding of the interdependence of these postadoption behaviors in smoking cessation OHCs.

Researchers have argued that perceived usefulness (PU) is a crucial motivator for continuance intention toward an IS (e.g. Bhattacharjee, 2001; Davis, 1989; Venkatesh and Davis, 2000) and an important driver of knowledge sharing in online communities (e.g. Hashim and Tan, 2018; Yuan *et al.*, 2016). While their studies have provided important insights into the role of PU in postadoption behaviors, prior research has ignored the specific context of smoking cessation OHCs and the needs of users of these OHCs. Unlike diseases that rely predominantly on physical treatment, many issues or problems relevant to smoking cessation could be alleviated via behavioral interventions, such as counseling and social support. By affording such interventions, smoking cessation OHCs can be an important and effective part of improving abstinence (Graham *et al.*, 2016), yet prior research has produced

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no evidence of whether PU retains its dominant role in determining users' postadoption behaviors in the particular context of smoking cessation OHCs.

Moreover, understanding of the external determinants of the PU of smoking cessation OHCs remains fragmented. Some research has found PU to be influenced by external factors (Davis, 1989). For instance, Zhang *et al.* (2012) discovered that the PU of computer-based communication media was affected by perceived communication efficiency and support for the information process. According to Agarwal (2000), PU is determined by how users feel connected to the value gained from using an IS. Smokers turn to smoking cessation OHCs not only to request informational support related to kicking the habit but also to seek emotional and esteem support for reducing smoking cessation-related stresses (Huang *et al.*, 2019; Zhang and Yang, 2015). Informational support, emotional support and esteem support have been highlighted as important resources and/or of great value in these OHCs (Wang *et al.*, 2017; Zhang and Yang, 2015). However, few studies have examined what determines PU of smoking cessation OHCs from a social support perspective. Hence, there is clear value in investigating whether the three types of social support that users experience from a smoking cessation OHC can predict the PU of that OHC.

Furthermore, in the trans-theoretical model (Prochaska and Velicer, 1997), smokers move through six stages of quitting smoking: precontemplation, contemplation, preparation, action, maintenance and termination. Smokers at different stages of smoking cessation differ in their needs (Velicer *et al.*, 2006) and tend to provide social support in distinct patterns (Zhang and Yang, 2015), which might lead to differential perceptions of the social support and the utility of smoking cessation OHCs between users. This might also influence continuance intention and users' knowledge sharing in the OHCs. Hence, a finer-grained investigation of users' stage in quitting smoking as a possible moderator is necessary for a more nuanced understanding of how such factors affect user-perceived utility of smoking cessation OHCs and their postadoption behaviors.

Against this backdrop, our research was designed to investigate the antecedents and consequences of the PU in the context of smoking cessation OHCs specifically. To reach this objective, we anchored our work in social support theory (Cohen, 2004; Cohen and Wills, 1985), proposing that user-perceived informational support, emotional support and esteem support are key antecedents to the PU of smoking cessation OHCs. In light of prior research into PU's impact on postadoption behaviors, we posited that PU of these OHCs leads to the two distinct postadoption behaviors identified earlier: continuance intention and knowledge sharing. Furthermore, we considered age, gender, country and smoking cessation stage as possible moderators of the proposed relationships. The proposed research model was tested with empirical data collected via an online survey with 173 responses, from two smoking cessation OHCs, in two countries: China and Finland.

Our discussion begins with a review of prior literature on both PU and social support theory in Section 2. Afterward, Section 3 presents the proposed research model and our hypotheses, and Section 4 introduces the research method. Then, we discuss the research findings in Section 5, followed by addressing the theoretical contributions and practical implications in Section 6. Finally, the limitations and future directions for research are presented in Section 7.

## 2. Theoretical background

### 2.1 Perceived usefulness

PU has been defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320), and nonwork settings are also relevant. This factor has been identified as a key determinant of attitude and intended behavior related to an IS in the postadoption stage. In framings such as the postacceptance

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model of IS continuance, PU has been posited to be a dominant factor in predicting intentions to continue using an IS (Bhattacharjee, 2001). The association between PU and continuance intention has been validated in various contexts, such as e-government (Hamid *et al.*, 2016), e-learning (Alraimi *et al.*, 2015) and general OHCs (Wu, 2018). Also, a link has been found between PU and other postadoption behaviors. For instance, Li and Liu (2014) discovered that it influences the word-of-mouth behavior of e-service users, and the findings of Yuan *et al.* (2016) suggest that PU has a positive impact on knowledge sharing in online travel communities. A study by Hashim and Tan (2018) identified users' intention to share knowledge in online business communities as driven by the PU of the community.

Another stream of research focuses on investigating antecedents to PU of an IS from various perspectives. For instance, Agarwal and Karahanna (2000) found the PU of the World Wide Web to be influenced by the individual users and situational factors, such as the individual-specific traits of playfulness, personal innovativeness and user experience. In addition, Zhang *et al.* (2012) suggested that system characteristics affect the PU of computer-based communication systems. In the general OHCs context, Wu (2018) found that social support, information quality and service quality influence PU of the OHCs. Also, user perceptions of the hedonic and utilitarian aspects of an IS could affect the PU of that IS – for instance, curiosity, information quality and enjoyment affect PU of travel-review websites (Wang and Li, 2019).

Recent research has paid increasing attention to the PU of IS in the specific context of smoking cessation. For instance, Ali *et al.* (2019) found that PU of mobile health and quick-response code technologies to be positively associated with smokers' use intention and actual use of both technologies. In research on digital educational games for students' smoking cessation, the PU of such games showed a positive association with the students' intention to quit smoking (Guo *et al.*, 2020). However, all these studies focused on outcomes from PU and ignored the antecedents to it, at least with regard to smoking cessation OHCs. While scholars have investigated PU from multiple angles – among them user characteristics (Agarwal and Karahanna, 2000), features of the technology (Zhang *et al.*, 2012) and hedonic and utilitarian value (Wang and Li, 2019) – and although prior research on smoking cessation OHCs has highlighted the importance of online social support for enhancing users' success in quitting smoking (Cheung *et al.*, 2015; Graham *et al.*, 2016), no empirical evidence has attempted to answer the question of whether social support can predict PU in the context of smoking cessation OHCs. This gap prompted us to examine the role of social support in predicting PU in the specific context of smoking cessation OHCs.

## 2.2 Social support theory

Social support refers to information and actions that lead an individual to believe that he or she is “cared for and loved, esteemed and valued” and “belongs to a network of communication and mutual obligation” (Cobb, 1976, p. 300). Prior literature suggests that social support affects human health and serves as a stress buffer (Cohen, 2004; Cohen and Wills, 1985). Social support has been found to be associated with positive outcomes in various health domains, such as alcohol withdrawal (Peirce *et al.*, 2000) and smoking cessation – specifically, smokers are more likely to show improved smoking cessation performance when receiving active social support via strong social ties to partners, family members and close friends (Wagner *et al.*, 2004; Westmaas *et al.*, 2010). Likewise, social support expressed along weaker social ties, such as those in smoking cessation OHCs, has been suggested to lead to positive outcomes. For instance, Graham *et al.* (2015) stated that smokers who participate in smoking cessation OHCs might be more likely than nonmembers to stop smoking within three months.

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Numerous studies have investigated social support in OHCs. These studies, summarized in [Table 1](#), represent two major streams of research. One stream, examining how social support is exchanged in OHCs, employs various typologies of social support to categorize the support via content analysis, with one frequently used typology being the social support behavior code (SSBC) developed by [Cutrona and Suhr \(1992\)](#). According to the SSBC, there are five types of social support: (1) Informational support involves communicating facts or suggestions. Often, the informational support in OHCs includes messages about diseases, treatments and how one can cope with stress caused by illness. (2) Emotional support communicates love and caring. Such support usually produces a sense of being cared about by other users. In OHCs, sympathy and empathy shown through the communication are common examples of emotional support. (3) Esteem support involves communicating confidence and respect for others' abilities. In OHCs, esteem support often is given when the messages conveyed state or imply that the reader is capable of and competent in dealing with a disease. Such support is generally intended to enhance users' self-confidence. (4) Network support encourages a sense of belonging to a social network of people with similar health concerns. Finally, (5) tangible support is the provision of goods or financial support needed in a stressful environment. In various contexts, such as OHCs related to HIV/AIDS ([Coursaris and Liu, 2009](#)), autism spectrum disorders (ASDs) ([Mohd Roffeei et al., 2015](#)) and smoking cessation ([Zhang and Yang, 2015](#)), informational support and emotional support have been found to be the two main types of social support exchanged, followed by esteem support and network support, while tangible support is quite uncommon. This might be because OHC users are generally dispersed geographically and stay anonymous online; only rarely do they provide material goods physically or directly supply financial support via the OHC ([Huang et al., 2014, 2019](#)).

The other research stream focuses on the role of social support in OHCs. For instance, [Wang et al. \(2017\)](#) investigated which types of social support affect users' participation and found that informational support, seeking emotional support and companionship are three important determinants of users' continued participation in breast-cancer OHCs. The findings of [Chen et al. \(2019\)](#) indicate that the exchange of social support is determined by the structural capital developed in OHCs. Also, they found that social support has a positive influence on users' health literacy and health-attitude valence. The work of [Huang et al. \(2019\)](#), in turn, identified that structural capital, cognitive capital and relational capital all facilitate the provision of emotional support, whereas only cognitive capital promotes the provision of informational support.

The literature shows that social support theory may be amenable to explaining users' perceptions of the usefulness of smoking cessation OHCs from the individual perspective. Firstly, the literature on social support points to a positive correlation between that support and health. This may partly explain the positive impact of social support from OHCs on the success of one's smoking cessation efforts. Secondly, social support theory is useful in identifying the types of social support in smoking cessation OHCs and examining their roles in smoking cessation OHCs. While these OHCs are collectives of users with a common goal of quitting smoking, users differ in the types of social support they need for coping with the stresses and uncertainties related to reaching that goal. Since social support from smoking cessation OHCs might increase user perceptions of the usefulness of smoking cessation OHCs, thereby further affording abstinence, social support theory represents a suitable theoretical framework for examining the determinants of PU with regard to smoking cessation OHCs. Informed by findings from prior research on several types of social support in OHCs, our study focused on three important types of social support identified in the literature: informational, emotional and esteem support. We excluded tangible support because of its rarity in OHCs ([Huang et al., 2019; Wang et al., 2017](#)). Also, we omitted network support from consideration in our study because it has been argued to be distinct from social support and functions differently in OHCs ([Huang et al., 2019](#)). Since social support is a

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Authors	Context	Purpose of research	Types of social support	Method (sample size)	Research findings
Coursaris and Liu (2009)	HIV/AIDS	To identify and analyze the types of social support exchanged in OHCs	Informational support, emotional support, esteem support, network support and tangible support	Content analysis (5,000 posts)	Informational support (41.6%) and emotional support (16.0%) are shared most frequently, followed by network support (6.8%) and esteem support (6.4%), while tangible assistance is uncommon (0.8%)
Chuang and Yang (2012)	Alcoholism	To explore the types of supportive interaction in online social networks	Emotional support, esteem support and network support	Content analysis (493 forum messages, 423 journal messages and 1,180 "notes")	Of all the forms of nurturing support, emotional support appeared most frequently, with network and esteem support appearing in patterns of varying combinations
Cavallo <i>et al.</i> (2014)	Physical activity	To examine the relationship between social support and physical activity among young women	Companionship, esteem, and informational support	Survey (N = 134)	Esteem support affects physical activity directly, whereas companionship influences it indirectly
Guo and Goh (2014)	HIV/AIDS	To investigate the types of social interaction over time in OHCs	Socioemotional support (positive emotions, negative emotions and intimacy relationships) and informational (medically related and not medically related) support	Content analysis (2,243 messages)	With time, the number of emotional messages increases by almost a third, coming to surpass informational messages as the dominant content of all online postings. Additionally, medically related informational messages eclipse non-medical-condition-related ones as time passes

**Table 1.**  
Summary of prior studies on social support in OHCs

(continued)

Perceived  
usefulness of  
smoking  
cessation OHC

Authors	Context	Purpose of research	Types of social support	Method (sample size)	Research findings
Huang <i>et al.</i> (2014)	Breast cancer and prostate cancer	To contrast community members' support behavior and companionship activities in OHCs	Informational support, emotional support, esteem support, network support and support requests	Mixed methods (2,053 messages, from two OHCs)	Five types of social-support exchange are displayed in OHCs: support requests and informational, emotional, esteem and network support. Also, five types of companionship activities were identified: celebration, chat or idea sharing, life events, updates and event/information-sharing
Yan and Tan (2014)	Mental health	To investigate the effect of online interactions on health conditions	Informational support, emotional support and companionship	Partially observed Markov decision process model	Informational support is the most prevalent type of support in OHCs, and emotional support is important for helping patients reach a healthier state
Mohd Roffeei <i>et al.</i> (2015)	Autism spectrum disorders (ASDs)	To examine the types of social-support messages exchanged in OHCs related to ASDs	Informational support, emotional support, network support, esteem support and tangible support	Content analysis (3,637 messages)	Informational support (30.7%) is frequently shared, followed by emotional support (27.8%). Network- and esteem-support messages account for 20.97% and 20.2% of the content, respectively. Tangible support is rare (0.4%)

(continued)

Table 1.

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Authors	Context	Purpose of research	Types of social support	Method (sample size)	Research findings
<a href="#">Reifegerste et al. (2017)</a>	Obesity	To investigate the effect of forum activities on social support	Informational support and emotional support	Survey (N = 230)	Forum activities have a positive effect on perceived informational and emotional support
<a href="#">Deng and Liu (2017)</a>	Nonserious illness (e.g. fevers, colds and eye discomfort)	To examine social support's influence on consumers' intention to seek health information on mobile social-media websites	Tangible support, emotional support, esteem support, and appraisal support	Survey (N = 439)	Tangible support and appraisal support significantly influence perceived risk, whereas emotional support and esteem support significantly influence self-efficacy related to health
<a href="#">Flickinger et al. (2017)</a>	HIV/AIDS	To investigate the types of social support in OHCs	Emotional support, esteem support, informational support, and instrumental support	Content analysis (840 posts)	Messages offering support focus predominantly on emotional support (41%), followed by network (27%), esteem (24%), informational (18%), and instrumental (2%) support
<a href="#">Wang et al. (2017)</a>	Breast cancer	To analyze OHC users' online interactions and reveal which types of social support affect their participation	Informational support, emotional support, and companionship	Text-mining (posts from October 2002 to August 2013)	Providing informational support, seeking emotional support, and companionship are predictors of continued participation in OHCs

Table 1.

*(continued)*



Perceived  
usefulness of  
smoking  
cessation OHC

Authors	Context	Purpose of research	Types of social support	Method (sample size)	Research findings
<a href="#">Song <i>et al.</i> (2018)</a>	Weight loss	To identify the types of social support expressed and investigate their roles in sustaining participation in OHCs	Informational support, emotional support, and companionship	Text-mining (survival data from 2nd August 2008 to 20th December 2013)	Emotional support and companionship experienced within OHCs have a greater influence on continued participation than does informational support received in them. Informational support from outside OHCs has a greater effect on users' continued participation than does either OHC-external emotional support or companionship
<a href="#">Chen <i>et al.</i> (2019)</a>	OHCs related to general conditions, mental and behavioral conditions and specific diseases	To explore the influence of structural capital on social-support exchange in OHCs and the impacts of sharing social support on health literacy and attitudes	Informational support and emotional support	Integrated content analysis and social-network analysis (96,360 discussion threads containing 867,799 replies posted by 22,484 participants)	Structural capital is an antecedent to the exchange of social support in OHCs. Provision of social support (i.e., offering informational and emotional support) has a stronger impact than the receipt of social support on health literacy and attitudes
<a href="#">Huang <i>et al.</i> (2019)</a>	Three OHCs: for breast, colorectal and prostate cancer	To examine the antecedents to social-support provision and companionship activities in OHCs	Informational support, emotional support, and companionship	Integrated content analysis and social network analysis (user-generated data from 387 members)	Structural, relational, and cognitive capital affect the provision of emotional support. Structural and relational capital influence companionship. Only cognitive capital facilitates the provision of informational support

Table 1.

mechanism for reducing uncertainty and stress, the analysis could have been unnecessarily complicated by the inclusion of network support, which scholars regard as the shared activities for their own sake rather than for buffering against a stressful situation (Albrecht and Adelman, 1987; Huang *et al.*, 2019; Rook, 1987; Thoits, 1986).

### 3. The research model and hypotheses

#### 3.1 The proposed model

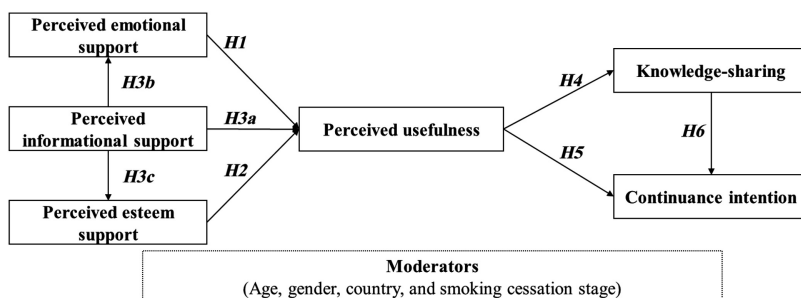
Proceeding from the literature on postadoption behaviors (Bhattacharjee, 2001; Venkatesh and Davis, 2000; Yuan *et al.*, 2016), we expected to find PU to be an important factor in predicting both continuance intention and knowledge sharing in smoking cessation OHCs and to find a link between these two postadoption behaviors. Furthermore, research examining social support in OHCs led us to posit that three particular types of perceived social support (perceived informational support, perceived emotional support and perceived esteem support) are central antecedents to the PU of smoking cessation OHCs. In addition, we hypothesized that perceived informational support influences perceived emotional and perceived esteem support in these OHCs. Age, gender, country and smoking cessation stage were tested as possible moderators. Table 2 presents the definitions of the constructs in the proposed research model. Figure 1 summarizes the model itself.

#### 3.2 Hypotheses

Emotional support – that is, communicating encouragement, concern, understanding, sympathy and even love to others (Cutrona and Suhr, 1992) – can help individuals restore

Construct	Definition
Continuance intention (CI)	Willingness to continue using the smoking cessation OHC (Bhattacharjee, 2001)
Perceived emotional support (PEMS)	Users' perceptions of the care, empathy, encouragement and even love received in the smoking cessation OHC (Cutrona and Suhr, 1992)
Perceived esteem support (PESS)	Users' perceptions surrounding respect and confidence gained in their abilities via the smoking cessation OHC (Cutrona and Suhr, 1992)
Perceived informational support (PIS)	User perceptions connected with the information on smoking cessation received in the smoking cessation OHC, such as advice, facts and referrals (Cutrona and Suhr, 1992)
Knowledge sharing (KS)	The behavior of exchanging information, experience and skills related to smoking cessation in the smoking cessation OHC (Hsu <i>et al.</i> , 2007)
Perceived usefulness (PU)	The degree to which a user believes that using the smoking cessation OHC will enhance his or her success in ceasing to smoke (Davis, 1989)

**Table 2.**  
Constructs in the  
research model



**Figure 1.**  
The proposed  
research model

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their emotional stability by reducing such signs of emotional distress as anxiety and sorrow (Huang *et al.*, 2019). Smokers who are trying to kick the habit often feel disappointed over their relapses and become anxious about the repeated failure. Smoking cessation OHCs offer a friendly environment in which smokers can disclose their negative feelings and ask for emotional support from people who have experienced similar situations (Huang *et al.*, 2019; Zhang and Yang, 2015). Members of a smoking cessation OHC can receive empathy from peers who truly understand their negative emotions related to the smoking cessation process. In addition, users can obtain encouragement from other users that bolster their confidence in achieving abstinence. Moreover, the anonymity and privacy protections developed for smoking cessation OHCs allow freely sharing personal emotions without many security or privacy risks. Emotional support from these OHCs may assist in users' efforts to reduce the stress they face on the smoking cessation journey and to restore their emotional stability (Granado-Font *et al.*, 2018; Rocheleau *et al.*, 2015; Zhang and Yang, 2015). A positive correlation between emotional support and smoking cessation success has been reported in the context of telephone-based interventions (Burns *et al.*, 2014), providing further reason to expect perceived emotional support from smoking cessation OHCs to help smokers regain emotional stability, which may lead to greater success in kicking the habit. Accordingly, the more emotional support users can obtain from the smoking cessation OHC, the more useful we would expect them to find the OHC. We formed the following hypothesis:

*H1.* Perceived emotional support is positively associated with the PU of a smoking cessation OHC.

Esteem support provides compliments and releases from blame (Cutrona and Suhr, 1992). This support can help smokers elevate their belief in themselves and their abilities with regard to quitting smoking (Deng and Liu, 2017; Huang *et al.*, 2014). Specifically, users of smoking cessation OHCs often receive congratulations and positive feedback when sharing their achievements (e.g. a month of being tobacco-free). This can help them cultivate a positive self-image and believe in their ability to quit smoking and in their capabilities for doing so. Furthermore, peers' expressions of forgiveness might alleviate users' feelings of guilt associated with relapse and motivate them to move past failures without blaming themselves unfairly. Studies have identified compliments as one type of partner support that promotes success in smoking cessation in offline settings (Cohen and Lichtenstein, 1990). As for online contexts in general, the literature suggests that esteem support is a social factor that supports health-related behavior changes, such as increased physical activity (Cavallo *et al.*, 2014). Therefore, it is reasonable to expect perceived esteem support from a smoking cessation OHC to have positive effects on users' perceptions of the usefulness of the OHC. The more esteem support one receives from the smoking cessation OHC, the more useful that OHC is perceived to be. We developed the following hypothesis accordingly:

*H2.* Perceived esteem support is positively associated with the PU of a smoking cessation OHC.

Scholars have identified informational support as another major type of social support in smoking cessation OHCs (Granado-Font *et al.*, 2018; Rocheleau *et al.*, 2015). This form of support provides users with information on problem-solving (Huang *et al.*, 2019). Users of a smoking cessation OHC may receive information on the benefits of quitting and the negative consequences of continuing to smoke (Granado-Font *et al.*, 2018; Rocheleau *et al.*, 2015; Zhang and Yang, 2015). This might assist smokers in developing firmer intentions to stop smoking and get ready for truly quitting (World Health Organization, 2014). Additionally, users can get suggestions, such as tips on coping with cravings and withdrawal symptoms, and read personal success stories addressing how to quit (Granado-Font *et al.*, 2018; Rocheleau *et al.*, 2015; Zhang and Yang, 2015). With this support, smokers may gain skills for quitting and

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better optimize their quitting strategies and plans. In addition, unlike general guidelines produced by professionals, the informational support in smoking cessation OHCs is largely based on real-world experiences so may better match individual smokers' practical needs. Informational support from smoking cessation OHCs may help users prepare, plan and act to stop their tobacco use. Therefore, it is reasonable to expect that the perceived informational support from the OHC will lead them to perceive the OHCs as useful. The more informational support one can receive from it, the more useful it is perceived to be. Accordingly, we hypothesized thus:

*H3a.* Perceived informational support is positively associated with the PU of a smoking cessation OHC.

Psychology literature shows that the information individuals have received can affect their emotions (Joseph *et al.*, 2020; Westermann *et al.*, 1996). For instance, Zupan and Babbage (2017) found that reading information (e.g. narratives or stories) can elicit emotions such as sadness, anger and happiness. Familiar events and situations depicted in written stories lead readers to sympathize with the characters, thereby evoking emotional responses (Oatley, 1999; Zupan and Babbage, 2017). Much of the informational support received in smoking cessation OHCs takes this form – not only smoking cessation tips, advice and facts, but also personal experience and stories (Cheung *et al.*, 2017), which may trigger emotional reactions and help cultivate experiences of emotional support (Derks *et al.*, 2008; Verheyen and Goritz, 2009). For instance, personal stories about quitting posted by other members of the OHC may remind users that they are not alone in their struggle and encourage them to feel a sense of companionship. Meanwhile, others' achievements and victories might also support rebuilding a user's confidence in continuing the fight against nicotine addiction, having the effects of esteem support in smoking cessation OHCs. At the same time, those who benefit from such informational support may give supportive feedback to its providers, expressing congratulations and thanks in return. These factors led us to expect perceived informational support to have an influence on perceived emotional and esteem support, so we proposed the following hypotheses:

*H3b.* Perceived informational support is positively associated with perceived emotional support in a smoking cessation OHC.

*H3c.* Perceived informational support is positively associated with perceived esteem support in a smoking cessation OHC.

In the literature, some have argued that PU is the primary determinant of knowledge-sharing behavior in online communities. For instance, Yuan *et al.* (2016) found that PU affected it in the context of online travel-oriented communities. In addition, some work has found that PU is the predominant driver of users' intention to continue using the given IS (Bhattacharjee, 2001). Hence, we expected to find that PU affects both continuance intention and knowledge-sharing behavior in smoking cessation OHCs, and we proposed the following two hypotheses:

*H4.* PU is positively associated with users' knowledge sharing related to smoking cessation OHCs.

*H5.* PU is positively associated with users' intention to continue using the smoking cessation OHC.

Prior literature highlights contributors to different post-IS-adoption behaviors, among them continuance intention and knowledge sharing, but minimal attention has been paid to associations between these distinct postadoption behaviors. Li and Liu (2014) have suggested that there is value in investigating these relationships for purposes of examining their

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possible interdependence. Studying online auction communities, Wang and Chiang (2009) found that users who are more engaged in online communities (e.g. asking and/or answering questions) are more likely to continue using them. Therefore, it is reasonable to argue that the more knowledgeable users of smoking cessation OHCs share (whether sharing tips/advice/experience or asking/answering questions), the more likely they will be to keep using the OHCs. We developed this hypothesis:

*H6.* Users' knowledge sharing is positively associated with their intention to continue using the smoking cessation OHC.

Finally, considering possible effects of user characteristics such as age and gender as moderators has been recommended for anyone testing whether social support affects smoking cessation outcomes (Westmaas *et al.*, 2010). Furthermore, research indicates that an additional factor, the individual's stage on the smoking cessation journey, has an association with social support in OHC contexts (Ploderer *et al.*, 2013). Since we collected our empirical data in two countries with different cultural backgrounds, we considered the country as another possible moderator. We hypothesized that country, age, gender and smoking cessation stage moderate the proposed relationships in our model.

## 4. Research method

### 4.1 Development of the measurement technique

To guarantee the reliability and validity of the measurements for each construct in the proposed model, we employed previously validated instruments. The items for each construct were reworded for the context of smoking cessation OHCs. A five-point scale, ranging from "1 = strongly disagree" to "5 = strongly agree," was used to measure all the construct items in the study. The source items for perceived informational support and perceived emotional support were informed by the research of Liang *et al.* (2011), the measurement items for perceived esteem support were adapted from work by Oh *et al.* (2013), PU and continuance intention were measured with items adapted from Bhattacharjee (2001) and items for knowledge sharing were adapted from the work of Hsu *et al.* (2007). The Appendix presents details of the construct items.

### 4.2 The data-collection process

Two nonprofit smoking cessation OHCs, one in Finland (Stumppi.fi) and the other in China (a smoking cessation bar on Baidu Post Bar), were selected for this research. Even though the smoking cessation OHCs operated in very different countries and were hosted by separate organizations, they showed some similarities in platform structure and functions. Both OHCs provided users with basic functions, such as starting a new discussion, submitting questions to seek help, commenting or replying in a discussion thread and sending private messages, and both are easy to use.

We employed our online survey to collect the data after having received ethics approval from the corresponding author's home university. The survey questionnaire for collecting empirical data was developed in English and then translated into Finnish and Chinese. Then, IS researchers who are native speakers of the respective languages reviewed the questionnaire in all three variants to verify the validity of the content and its translation. After this, we conducted a pilot study with 20 users of Stumppi.fi to test the questionnaire in Finnish. We modified the questionnaires in all three languages further on the basis of their feedback.

The full-scale online survey was launched on November 23, 2018 in China and December 17, 2018 in Finland. We recruited participants by making the questionnaire available via the two target smoking cessation OHCs. In all, 235 users had responded by April 30, 2019 (48 in

Finland and 187 in China). Each respondent received an incentive for participating in the online survey.

After exclusion of replies that indicated an unwillingness to participate in the survey (2 in Finland, 48 in China) and unreliable replies, such as ones with the same answer option marked for all measurement items (12 in China), we had 173 forms as a valid sample for data analysis.

All respondents were smokers at different stages in smoking cessation. As for the sample's demographic breakdown, most respondents were between 25 and 44 years old (67.6%), and 37.0% were female, 59.5% were male and 3.5% concealed their gender. [Table 3](#) presents all respondents' demographic information and smoking cessation stage.

#### 4.3 Measurement invariance, common-method variance and collinearity

Because the data were collected from different smoking cessation OHCs, in two countries, we conducted an invariance test to check whether the construct measurements were understood similarly by the two samples, following the measurement invariance of composite models (MICOM) assessment procedure proposed by [Henseler et al. \(2016b\)](#). The results of permutation testing show that all *c* values, the difference in mean values and the variance of composites between the two countries fall between the upper and lower bound for the 95% confidence interval, as recommended by [Henseler et al. \(2016b\)](#). Thus, the testing established that we achieved measurement invariance, indicating that we could safely pool the data from the two sources and proceed with the analysis.

We used Harman's single-factor test ([Podsakoff et al., 2003](#)) to check for common-method variance (CMV). The highest total variance for any factor is 45.8%, which is below the recommended maximum of 50% ([Podsakoff et al., 2003](#)), thereby indicating minimal concern about CMV. Further, we measured collinearity via partial least squares (PLS), following the suggestion of [Kock and Lynn \(2012\)](#). All variance inflation factors from the full collinearity test are below the recommended upper limit of 3.3 ([Kock and Lynn, 2012](#)), so the research model is free of collinearity.

#### 4.4 Data analysis

We used the PLS implementation of SmartPLS 3.0 to test both the measurement model (this involved assessment of convergent validity and discriminant validity) and the structure model. To test convergent validity ([Chin, 1998](#); [Hulland, 1999](#); [Tenenhaus et al., 2005](#)), we used

Variable	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	17	9.8
	25–44	117	67.6
	45–65	35	20.2
	>65	4	2.3
Stage in ceasing to smoke	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 3.** Respondents' demographic data and stage in the smoking cessation process

the factor loading for each item, composite reliability (CR) and average variance extracted (AVE) for each construct. We removed two items, PEMS3 and PIS1, because their loadings were lower than the recommended minimum. As Table 4 shows, each item's factor loading exceeded 0.70, and the AVE and CR figures met the recommended criteria: the threshold values are 0.5 and 0.7 (Chin, 1998; Fornell and Larcker, 1981), respectively. This indicates adequate convergent validity.

To evaluate discriminant validity, we calculated the square root of the AVE for all constructs in the research model. We then conducted a comparison between the loading of each item for an associated construct and its cross-loadings on other constructs. For each construct, the value of the square root of the AVE is higher than the correlation with other constructs (See Table 5). As shown in Table 6, the factor loading of each construct item for the relevant construct is higher than the cross-loadings on the other constructs. Thus, the discriminant validity of all constructs in our proposed model is supported (Chin, 1998).

Construct	Item	Factor loading	Cronbach's alpha	CR	AVE
CI	CI1	0.872	0.807	0.886	0.723
	CI2	0.806			
	CI3	0.870			
PEMS	PEMS1	0.866	0.843	0.905	0.761
	PEMS2	0.851			
	PEMS4	0.899			
PESS	PESS1	0.812	0.822	0.894	0.738
	PESS2	0.865			
	PESS3	0.897			
PIS	PIS2	0.868	0.670	0.858	0.752
	PIS3	0.866			
KS	KS1	0.926	0.935	0.954	0.838
	KS2	0.898			
	KS3	0.923			
	KS4	0.913			
PU	PU1	0.821	0.799	0.870	0.626
	PU2	0.842			
	PU3	0.785			
	PU4	0.711			

**Note(s):** CI, continuance intention; PEMS, perceived emotional support; PESS, perceived esteem support; PIS, perceived informational support; KS, knowledge sharing; PU, perceived usefulness; CR, composite reliability; AVE, average variance extracted

**Table 4.**  
Results from  
confirmatory factor  
analysis

	CI	PEMS	PESS	PIS	KS	PU
CI	0.850					
PEMS	0.428	0.872				
PESS	0.507	0.740	0.859			
PIS	0.460	0.743	0.766	0.867		
KS	0.470	0.578	0.565	0.611	0.915	
PU	0.541	0.631	0.660	0.604	0.572	0.791

**Note(s):** CI, continuance intention; PEMS, perceived emotional support; PESS, perceived esteem support; PIS, perceived informational support; KS, knowledge sharing; PU, perceived usefulness

**Table 5.**  
Correlations and  
square roots of AVE

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	CI	PEMS	PESS	PIS	KS	PU
CI1	0.872	0.392	0.430	0.396	0.373	0.460
CI2	0.806	0.364	0.489	0.387	0.383	0.436
CI3	0.870	0.338	0.381	0.390	0.438	0.482
PEMS1	0.395	0.866	0.646	0.673	0.529	0.624
PEMS2	0.330	0.851	0.632	0.617	0.486	0.489
PEMS4	0.390	0.899	0.657	0.650	0.494	0.528
PESS1	0.428	0.630	0.812	0.647	0.521	0.480
PESS2	0.421	0.639	0.865	0.660	0.468	0.633
PESS3	0.458	0.639	0.897	0.668	0.471	0.578
PIS2	0.414	0.666	0.648	0.868	0.481	0.525
PIS3	0.384	0.623	0.681	0.866	0.579	0.523
KS1	0.460	0.549	0.526	0.558	0.926	0.534
KS2	0.377	0.498	0.517	0.533	0.898	0.511
KS3	0.438	0.566	0.522	0.585	0.923	0.535
KS4	0.440	0.499	0.503	0.561	0.913	0.513
PU1	0.432	0.423	0.451	0.420	0.458	0.821
PU2	0.497	0.493	0.535	0.459	0.504	0.842
PU3	0.380	0.548	0.594	0.585	0.488	0.785
PU4	0.400	0.533	0.499	0.439	0.347	0.711

**Table 6.**

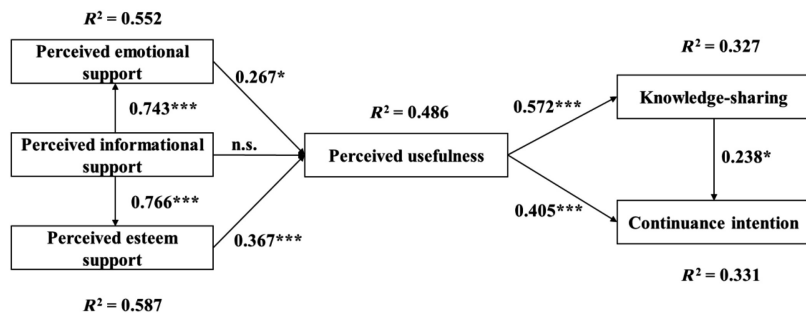
Loadings and cross-loadings

**Note(s):** CI, continuance intention; PEMS, perceived emotional support; PESS, perceived esteem support; PIS, perceived informational support; KS, knowledge sharing; PU, perceived usefulness

We tested the predictive validity of the model by computing the Stone–Geisser  $Q^2$  (Geisser, 1974; Hair *et al.*, 2017; Stone, 1974), which was measured by means of SmartPLS 3.0's blindfolding technique. The  $Q^2$  for knowledge sharing was 0.255, the  $Q^2$  for continuance intention was 0.221 and the  $Q^2$  for PU was 0.279, indicating good predictive relevance.

Finally, we tested the goodness of fit by measuring the standardized root mean square residual or SRMR (Henseler *et al.*, 2016a). The result was 0.064, which is lower than the maximum acceptable value of 0.08 proposed by Hu and Bentler (1999). Our model showed a good fit.

We applied the bootstrapping procedure of SmartPLS 3.0 to test the structural model, including the path significance and the hypotheses' effects. The overall explanatory power and estimated path coefficients are presented in Figure 2. As postulated, perceived emotional support ( $\beta = 0.267$ ,  $p < 0.05$ ) and perceived esteem support ( $\beta = 0.367$ ,  $p < 0.001$ ) had a significant positive correlation with PU. We did not find a significant association between

**Figure 2.**  
The structural model without moderators**Note(s):** \*\*\* $p < 0.001$ ; \* $p < 0.05$ ; n.s., not significant



perceived informational support and PU, but the former was significantly correlated with perceived emotional support ( $\beta = 0.743, p < 0.001$ ) and perceived esteem support ( $\beta = 0.766, p < 0.001$ ). PU showed a significant positive correlation both with knowledge sharing ( $\beta = 0.572, p < 0.001$ ) and with continuance intention ( $\beta = 0.405, p < 0.001$ ). Finally, knowledge sharing showed a significant association with continuance intention ( $\beta = 0.238, p < 0.05$ ). Therefore, H1, H2, H3b, H3c, H4, H5 and H6 are supported. Our model explains 48.6% of the variation in the PU of smoking cessation OHCs, 32.7% of knowledge sharing, 33.1% of continuance intention, 55.2% of perceived emotional support and 58.7% of perceived esteem support.

#### 4.5 Moderation analysis

To test for moderating effects of age, gender, country and smoking cessation stage, we performed multigroup analysis (MGA) to investigate whether the paths' strengths differ with the user group, after evaluating the measurement invariance by means of the aforementioned MICOM procedure.

Since most respondents were aged 25–44 ( $N = 117$ ) and the numbers in other age bands were relatively small, we balanced the samples in size by dividing the respondents into two groups: group A includes those aged 25–44, and group B includes all those under 25 or over 44. Regarding the smoking cessation stage, we divided the sample into three groups in line with the six stages on the journey described by Prochaska and Velicer (1997), (1) before-action users, encompassing all those intending to quit but not having acted on this intention yet and covering the contemplation and preparation stages; (2) in-action users, for those who had entered a stage of action; and (3) after-action users, covering those who had not smoked for at least six months – individuals in the maintenance or temptation stage. Note that the four responses from those in the precontemplation stage, without an intention to quit smoking, were excluded from the analysis.

As Table 7 illustrates, we verified full measurement invariance between Finnish and Chinese respondents and also with regard to different age groups. For the gender and smoking cessation stage, partial invariance was identified. Therefore, performing MGA can be considered acceptable in this case (Henseler *et al.*, 2016b).

No significant difference was found between Finnish and Chinese users (see Table 8). A significant difference did appear between the two age classes, however, with specific regard to the relationship between knowledge sharing and continuance intention (see Table 9). Also, as Table 10, on gender, indicates, we found a significant difference between male and female users for the connection between perceived emotional support and PU: perceived emotional support was a significant driver of PU for female users ( $\beta = 0.599, p < 0.001$ ) but not for male users.

As Table 11 shows, we found a connection between perceived emotional support and PU for before-action users, and perceived esteem support was linked to PU for after-action users. Also, PU showed a significant correlation with knowledge sharing no matter the user's stage in the smoking cessation process. For before-action and in-action respondents alike, PU was significantly correlated with continuance intention, but knowledge sharing displayed a significant connection to continuance intention among only those users in the after-action group.

## 5. Discussion

Our findings on the antecedents to the PU of smoking cessation OHCs and on its consequences raise several points that are of interest.

Firstly, perceived emotional support emerged as a determinant of the PU, particularly for users who want to quit smoking but have taken no action thus far. One possible explanation

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Group	Composite	<i>c</i> value (=1)	95% confidence interval	Compositional invariance	Equal mean values and variances
Finland vs. China	CI	0.993	[0.987; 1.000]	Yes	Yes
	PEMS	1.000	[0.998; 1.000]	Yes	Yes
	PESS	0.999	[0.997; 1.000]	Yes	Yes
	PIS	0.999	[0.995; 1.000]	Yes	Yes
	KS	1.000	[0.997; 1.000]	Yes	Yes
Age group A vs. B	PU	0.997	[0.991; 1.000]	Yes	Yes
	CI	0.999	[0.990; 1.000]	Yes	Yes
	PEMS	0.999	[0.999; 1.000]	Yes	Yes
	PESS	1.000	[0.997; 1.000]	Yes	Yes
	PIS	0.999	[0.996; 1.000]	Yes	Yes
Male vs. female	KS	0.999	[0.999; 1.000]	Yes	Yes
	PU	0.997	[0.994; 1.000]	Yes	Yes
	CI	0.997	[0.991; 1.000]	Yes	Yes
	PEMS	1.000	[0.999; 1.000]	Yes	Yes
	PESS	1.000	[0.997; 1.000]	Yes	Yes
Before-action vs. in-action	PIS	1.000	[0.997; 1.000]	Yes	No
	KS	0.999	[0.999; 1.000]	Yes	No
	PU	0.999	[0.994; 1.000]	Yes	No
	CI	0.996	[0.983; 1.000]	Yes	Yes
	PEMS	1.000	[0.998; 1.000]	Yes	Yes
In-action vs. after-action	PESS	0.998	[0.996; 1.000]	Yes	Yes
	PIS	0.999	[0.995; 1.000]	Yes	Yes
	KS	0.998	[0.997; 1.000]	Yes	Yes
	PU	0.995	[0.995; 1.000]	Yes	Yes
	CI	0.991	[0.985; 1.000]	Yes	No
Before-action vs. after-action	PEMS	0.999	[0.997; 1.000]	Yes	Yes
	PESS	0.999	[0.993; 1.000]	Yes	Yes
	PIS	1.000	[0.993; 1.000]	Yes	Yes
	KS	0.999	[0.998; 1.000]	Yes	Yes
	PU	0.994	[0.967; 1.000]	Yes	Yes
Before-action vs. after-action	CI	0.989	[0.987; 1.000]	Yes	Yes
	PEMS	1.000	[0.998; 1.000]	Yes	Yes
	PESS	1.000	[0.997; 1.000]	Yes	Yes
	PIS	0.999	[0.996; 1.000]	Yes	Yes
	KS	0.999	[0.998; 1.000]	Yes	No
	PU	0.994	[0.992; 1.000]	Yes	Yes

**Table 7.** Measurement invariance testing via MICOM

**Note(s):** CI, continuance intention; PEMS, perceived emotional support; PESS, perceived esteem support; PIS, perceived informational support; KS, knowledge sharing; PU, perceived usefulness

	Comparison by country		Path coefficients of separate structural models	
	China vs. Finland		China ( <i>N</i> = 127)	Finland ( <i>N</i> = 46)
H1	n.s		n.s	0.574***
H2	n.s		0.422**	n.s
H3a	n.s		n.s	n.s
H3b	n.s		0.765***	0.658***
H3c	n.s		0.779***	0.647***
H4	n.s		0.541**	0.353***
H5	n.s		0.440***	0.309*
H6	n.s		0.268*	n.s

**Table 8.** Results from testing country as a moderator

**Note(s):** \*\*\*, *p* < 0.001; \*\*, *p* < 0.01; \*, *p* < 0.05; n.s., not significant

Perceived usefulness of smoking cessation OHC

Comparison by age group Group A vs. group B		Path coefficients of separate structural models Group A (N = 117)      Group B (N = 56)	
H1	n.s	n.s	0.540***
H2	n.s	0.374*	n.s
H3a	n.s	n.s	n.s
H3b	n.s	0.758***	0.716***
H3c	n.s	0.766***	0.778***
H4	n.s	0.527***	0.640***
H5	n.s	0.348*	0.605***
H6	$p < 0.05$	0.378***	n.s

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

**Table 9.**  
Results from testing age as a moderator

Comparison by gender Male vs. female		Path coefficients of separate structural models Male (N = 103)      Female (N = 64)	
H1	$p < 0.05$	n.s	0.599***
H2	n.s	0.479***	n.s
H3a	n.s	n.s	n.s
H3b	n.s	0.770***	0.692***
H3c	n.s	0.799***	0.689***
H4	n.s	0.560***	0.543***
H5	n.s	0.390*	0.339*
H6	n.s	0.367*	n.s

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

**Table 10.**  
Results from testing gender as a moderator

Comparison by stage in smoking cessation			Path coefficients of separate structural models		
Before action vs. in action	In action vs. after action	Before action vs. after action	Before action (N = 64)	In action (N = 40)	After action (N = 65)
H1	n.s	n.s	0.387**	n.s	n.s
H2	n.s	n.s	n.s	n.s	0.345*
H3a	n.s	n.s	n.s	n.s	n.s
H3b	n.s	n.s	$p < 0.05$	0.845***	0.802***
H3c	$p < 0.05$	n.s	$p < 0.05$	0.887***	0.660***
H4	n.s	n.s	$p < 0.05$	0.737***	0.645***
H5	n.s	$p < 0.05$	$p < 0.001$	0.718***	0.692***
H6	n.s	$p < 0.05$	n.s	n.s	0.404***

**Note(s):** \*\*\*,  $p < 0.001$ ; \*\*,  $p < 0.01$ ; \*,  $p < 0.05$ ; n.s., not significant

**Table 11.**  
Results from testing the user's stage in smoking cessation as a moderator

is that those users are still hesitant to initiate actions in this regard and, hence, need encouragement or expressions of care from others, to dispel any misgivings about smoking cessation and to enhance their confidence in such actions. Also noteworthy is the gender difference we uncovered in the relationship between perceived emotional support and PU. A possible explanation for it being an antecedent to PU among female but not male users is that women value emotional support more than males do, particularly in stressful situations (Matud, 2004; Tamres *et al.*, 2002). Female users of smoking cessation OHCs might be likely to view emotional support as crucial for reducing smoking-related stress than male users. Accordingly, when experiencing high levels of emotional support via a smoking cessation

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OHC, female users are likely to perceive the smoking cessation OHC as useful for improving the outcome of their smoking cessation efforts.

Secondly, our findings suggest that perceived esteem support is another important antecedent to the PU of smoking cessation OHCs, especially for users who have been able to avoid smoking for at least six months. It may be that these users in particular are likely to blame themselves for repeated lapses, which can occur easily. Esteem support from others can reduce their self-blame, and positive feedback recognizing what they have achieved on the journey of quitting smoking may well enhance their self-confidence. Our findings in relation to this contribute significantly to the literature. Little prior research has examined the association between perceived esteem support and the PU of OHCs. This might be because most scholars focus on emotional support when considering the social support associated with users' personal emotions in OHCs and overlook the importance of esteem support.

Contrary to our hypothesis, perceived informational support did not emerge as an antecedent to the PU of the OHCs in our research context. This finding is at odds with research by Wu (2018), who identified informational support as an important driver of the PU of general OHCs. This discrepancy might arise from the indirect influences that perceived informational support exerts on PU, via the effects of both perceived emotional support and perceived esteem support on the PU of the smoking cessation OHCs. Indeed, the post hoc mediation analysis showed that the impact of perceived informational support on PU was fully mediated by perceived emotional support (direct effect  $\beta = 0.127, p > 0.05$ ; indirect effect  $\beta = 0.199, p < 0.05$ ) and by perceived esteem support (direct effect  $\beta = 0.127, p > 0.05$ ; indirect effect  $\beta = 0.278, p < 0.001$ ). The informational support experienced from smoking cessation OHCs may not always be adequate to enhance users' perception of the OHC's usefulness, since they can obtain similar information from alternative sources, such as online self-help materials or advice from doctors. In addition, informational support in smoking cessation OHCs might feed into users' perceptions of emotional and esteem support instead. For instance, reading other users' stories in a smoking cessation OHC may help to produce a sense of stress release in the course of smoking cessation and a sense of being cared for by other members of the smoking cessation OHC. Meanwhile, the stories of success shared by other users could also shore up their confidence in quitting smoking. Through these mechanisms, perceived informational support has an indirect influence on the PU of smoking cessation OHCs via perceived emotional support and perceived esteem support.

Fourthly, we found significant impacts of PU on both continuance intention and knowledge sharing. Our findings on the former relationship are consistent with those from research in the domains of online banking (Bhattacharjee, 2001), e-learning (Alraimi *et al.*, 2015), e-government (Hamid *et al.*, 2016) and general OHCs (Wu, 2018): The PU strongly influences users' intention to continue using the smoking cessation OHC. Our findings on the association between PU and knowledge sharing are in line with prior research too, such as the work of Yuan *et al.* (2016). Looking at the context of online travel communities, they found that the PU positively influences knowledge sharing in said communities. In smoking cessation OHCs, when users perceive the OHC to be useful for faring better with the smoking cessation process, they are more likely to continue using the OHC and contribute their knowledge to the OHC.

Another important finding is that knowledge sharing exerts positive effects on continuance intention with regard to smoking cessation OHCs. Our results demonstrate that the more knowledge users share with the smoking cessation OHC, the stronger their intention to continue using it. This might be explained by the fact that users who have devoted time and effort to sharing knowledge in a smoking cessation OHC tend to form a bond with it. Such connections may render them more likely to continue their use. Interestingly, an age difference was evident in the relationship between knowledge sharing and continuance intention. The two showed a correlation among users aged 25–44 but not

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among those of other ages. There are several possible explanations. One is that those aged 25-44, who constitute the majority of users of smoking cessation OHCs, form a use-encouraging psychological bond with the OHC via their knowledge-sharing activities, a bond perhaps fortified by attention to age-specific concerns. The other users, on the other hand, might not share much knowledge in these forums, with their need for social support being the main factor in their wish to keep using them.

Finally, we should discuss the differences connected with users' stage in quitting smoking with regard to the impacts of PU on continuance intention and knowledge sharing. Specifically, PU exerts stronger significant effects on the continuance intention of before-action users than on that of in-action users but no significant effects for after-action users in this regard, and significant differences are visible both between the in- and after-action group and between the before- and after-action group. These significant differences might be due to the following factors: Before-action users may be new to the smoking cessation OHC, turning to it as they seek further guidance and social support to prepare themselves and to translate their quitting intentions into specific actions. When before-action users view the smoking cessation OHC as useful, they have much stronger intentions to continue using it than in-action users; they know that they will need even more social support from it when they enter the action stage. Finally, though after-action users perceive smoking cessation OHCs as useful in supporting their long-term goals, they have already reached the goal of abstinence, so PU might not be a large factor in their continuing use of the smoking cessation OHC.

We also found significant stage-related differences when examining perceived informational support's effects on perceived emotional support and perceived esteem support. Specifically, it has its strongest influence on the former among before-action users ( $\beta = 0.845, p < 0.001$ ), followed by in-action users ( $\beta = 0.802, p < 0.001$ ) and then after-action users ( $\beta = 0.623, p < 0.01$ ); a significant difference exists between before- and after-action users. Obviously, after-action users have been members for some time and achieved abstinence. Though they can still get informational support from the OHC, they are familiar with the guidance and tips most commonly provided, so the influence of perceived informational support on perceived emotional support is weaker for them than for the other users. Before-action users, in contrast, are in more need of informational support, to help them decide to move on to actions, than are in-action users. The informational support they receive from smoking cessation OHCs gives them a stronger sense of empathy, encouragement and so on. from the OHC's other users. Therefore, it may be little surprise that perceived informational support has bigger impacts on perceived emotional support for before-action users relative to in-action users, who have already received considerable informational support that assists them in quitting smoking. Hence, the information they keep receiving might not confer as much emotional support as before-action users – who are in great need of informational support – experience.

As for the impact of perceived informational support on perceived esteem support, the influence is strongest for before-action users ( $\beta = 0.887, p < 0.001$ ), followed by after-action users ( $\beta = 0.705, p < 0.001$ ) and then in-action users ( $\beta = 0.660, p < 0.001$ ). We found significant differences between before- and in-action users and between before- and after-action users both. One possible explanation for these is that users at different stages differ in the social support they need, for overcoming different challenges. Those who intend to quit but have not yet acted need guidance and advice, to build their confidence for doing so; therefore, perceived informational support influences these users most strongly, with regard to perceived esteem support. Those who have already quit smoking have experienced difficulties in keeping this up and need information that maintains their confidence in their ability to stay smoking-free. Finally, perceived informational support affects perceived esteem support least for members of the in-action group, who have established their confidence in quitting smoking but have not experienced all the hardships of the process.

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Stage-related differences emerged in relation to knowledge sharing too, with PU having the strongest connection with it among before-action users ( $\beta = 0.737, p < 0.001$ ), then in-action users ( $\beta = 0.645, p < 0.001$ ) and after-action users ( $\beta = 0.392, p < 0.001$ ). We identified a significant difference between the before- and the after-action group. The users who had already abstained from smoking for at least six months perceived smoking cessation OHCs as useful for their success in quitting smoking, but they were less likely than other users to contribute knowledge to the OHC. One possible reason is that successful quitters use such OHCs less often than others do.

When examining the relationship between the two postadoption behaviors, we found a positive correlation between knowledge sharing and continuance intention only for after-action users, with a significant difference visible between the in- and the after-action group. It might be that users who have already abstained for a while have solid practical tips and advice for other users, based on their experience, and also share more knowledge in the smoking cessation OHC, to demonstrate reciprocity and support the users and OHC that supported them on the path to quitting smoking. When they share more knowledge in the smoking cessation OHC, they feel a strong bond with the group and a sense of solidarity, so they are more likely to keep using the OHC.

## 6. Conclusions

### 6.1 Theoretical contributions

The research findings have several implications for scholarship. Firstly, we extended the application of social support theory to explain IS postadoption behaviors in the context of smoking cessation OHCs from the view of social support in explaining PU of smoking cessation OHCs. Our consideration for the roles of distinct components of social support in explaining IS postadoption behaviors enriches IS research from the view of the social support of smoking cessation OHCs in addressing societies' public-health and well-being issues.

Secondly, whereas prior literature on external factors affecting PU has almost exclusively taken a technological perspective (Zhang *et al.*, 2012), our work enriches PU literature by employing social support theory to investigate the antecedents to the PU of smoking cessation OHCs. Our findings on perceived emotional and esteem support as two important determinants of PU in this context suggest that PU can be explained well from the perspective of social support, which is especially relevant in a smoking cessation OHC context. By looking at users' perceptions of emotional support and esteem support as factors in explaining PU in this specific context, we advance understanding of PU of such OHCs and provide evidence of the value of contextualizing the antecedents to PU from the social support view with regard to specific research settings.

Furthermore, our work contributes to social support theory through its investigation of the associations between distinct types of social support in smoking cessation OHCs. Our findings suggest that perceived informational support is a prerequisite for perceived emotional support and perceived esteem support in such OHCs. Though perceived informational support has no direct impact on PU, it exerts an indirect influence on the smoking cessation OHC's PU via perceived emotional and esteem support. With this new empirical insight, we offer a plausible explanation of how specific types of social support trigger users' perceptions as to the PU of smoking cessation OHCs. The findings on the relationships between perceived informational support and perceived emotional and esteem support also provide a comprehensive understanding of the role of informational support in these OHCs from a social support perspective.

The postadoption literature also benefits from our theory-grounded insights. While previous studies investigated the determinants of continuance intention (e.g. Song *et al.*, 2018; Wu, 2018) and of knowledge sharing separately (e.g. Yan *et al.*, 2016; Zhang *et al.*, 2020; Zhang *et al.*, 2017), our study incorporated these two postadoption behaviors into a single research

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model in the context of smoking cessation OHCs. Our findings related to how PU affects different postadoption behaviors (e.g. continuance intention and knowledge sharing) and the relationship between these distinct postadoption behaviors in the context of smoking cessation OHCs demonstrate that intentions to continue using such an OHC could be strengthened via knowledge-sharing activities. This study provides further evidence that knowledge-sharing behavior can trigger users' continuance intention with regard to smoking cessation OHCs while also suggesting that IS continuance research should consider the impacts of additional postadoption behaviors (knowledge sharing and others) on continuance intention, not merely users' motivations for continuance intention toward the IS.

Our final key theoretical contribution is related to the gender differences in the antecedents to PU and the moderating effects of smoking cessation stage on the consequences of PU. These findings highlight the crucial roles of user-specific factors (i.e. gender and smoking cessation stage) in explaining PU in such OHCs and for bringing new insights that can advance our understanding of the antecedents and consequences of PU for particular user groups in this specific context and others. In other words, this study provides further empirical evidence that user-specific factors are closely associated with user perceptions of the usefulness of smoking cessation OHCs and their postadoption behavior regarding such OHC while also suggesting that research on smoking cessation OHCs should consider the role of user-specific factors when investigating users' postadoption behaviors regarding such OHCs, not only the usefulness of such OHCs.

### *6.2 Practical implications*

There are several practical implications also, principally for those managing and running smoking cessation OHCs. Our findings implying that PU affects continuance intention and knowledge sharing enable us to recommend that smoking cessation OHC service providers promote retention of users and sharing of knowledge by enhancing user perceptions of the usefulness of the smoking cessation OHCs. Specifically, our finding that perceived emotional and esteem support are antecedents to PU implies that smoking cessation OHC service providers should focus on their strategies and approaches for facilitating users' perceptions of emotional and esteem support in smoking cessation OHCs. For instance, smoking cessation OHC administrators should use warm and caring language when answering inquiries and also recommend users of such OHCs to apply warm messages in their communications with others to provide emotional support to other users. They can also offer templates expressing empathy and encouragement for users to use when they respond to other users. Users may find it more convenient to make selections from predefined message starters than to type out messages of emotional and esteem support from scratch.

Another recommendation, informed by the findings on the indirect impact of perceived informational support on PU, is that smoking cessation OHC service providers should continue to encourage information and knowledge sharing in these OHCs.

Since users in different stages on the smoking cessation journey differ in their needs for social support and their perceptions of the PU of the OHC, the service providers could offer differential social support, tailored to stage-specific needs, thereby nurturing knowledge sharing and intentions to continue using the smoking cessation OHC. For instance, we found that perceived emotional support has a positive influence on PU for users who intend to quit smoking but have taken no action thus far. The findings suggest that it is crucial to provide these users with encouragement or expressions of care in online interactions in smoking cessation OHCs, which might meet their needs and enhance their perceptions of the usefulness of smoking cessation OHCs in support their quitting of smoking.

One of the most important stage-specific practical implications arises from the association between knowledge sharing and continuance intention among the after-action users.

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This link suggests that smoking cessation OHC service providers should encourage users at this stage on the journey to share more knowledge in the OHC, thereby not only strengthening their intention to continue using the smoking cessation OHC but also producing informational support for other users.

### 7. Limitations and paths for future research

This study has several limitations, which represent directions for future research. Firstly, since we limited our consideration of the antecedents to the PU of smoking cessation OHCs to social-support exchange behavior, some other external determinants of PU could be investigated further. Research could examine the role of companionship activities in determining the PU of smoking cessation OHCs and evaluate the associated differences with regard to exchanging of social support. Secondly, while we examined how social support affects two distinct postadoption behaviors indirectly via PU, we did not test the direct impact of social support on these behaviors of smoking cessation OHC users. Therefore, future research could usefully investigate whether particular types of social support directly affect these two postadoption behaviors – and others. While we limited ourselves to investigating only two consequences of the PU of smoking cessation OHCs, further work could test whether our proposed model is appropriate for studying postadoption behaviors additional to continuance intention and knowledge sharing, such as governance- and recommendation-related outcomes (Zou *et al.*, 2018). Finally, we recruited a relatively restricted sample of users to participate in our survey. As people with certain experiences of using smoking cessation OHCs, the respondents from these two smoking-cessation OHCs suited our focus well. However, data could be collected from more countries to address the generalizability of our findings. Furthermore, our approach and findings point to the potential benefits of carrying out similar work with data from OHCs that are focused on other specific health concerns, such as problematic gambling or abuse of alcohol or other drugs.

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Construct	Measurement items	References
Continuance intention (CI)	(1) I intend to continue using the smoking cessation OHC rather than discontinuing my use of it (2) I intend to continue using the smoking cessation OHC rather than use alternative online communities (3) If I can, I will continue using the smoking cessation OHC	Bhattacharjee (2001)
Perceived emotional support (PEMS)	(1) When I faced difficulties, some people in the smoking cessation OHC were on my side (2) When I faced difficulties, some people in the smoking cessation OHC comforted and encouraged me (3) When I faced difficulties, some people in the smoking cessation OHC listened to me talk about my personal feelings (4) When I faced difficulties, some people in the smoking cessation OHC expressed interest in and concern for my well-being	Liang <i>et al.</i> (2011)
Perceived esteem support (PESS)	(1) Some members of the smoking cessation OHC have shown confidence in my ability to deal with smoking (2) Some members of the smoking cessation OHC have made me feel that I was good at making decisions about quitting smoking (3) Some members of the smoking cessation OHC have made me feel that I was capable of handling my smoking cessation	Oh <i>et al.</i> (2013)
Perceived informational support (PIS)	(1) Some people in the smoking cessation OHC have been ready to offer suggestions when I needed help (2) When I encountered a problem, some people in the smoking cessation OHC gave me information to help me overcome the problem (3) When I faced difficulties, some people in the smoking cessation OHC helped me discover the cause and offered suggestions	Liang <i>et al.</i> (2011)
Knowledge sharing (KS)	(1) I participate frequently in knowledge-sharing activities in the smoking cessation OHC (2) I usually devote lots of time to knowledge-sharing activities in the smoking cessation OHC (3) I usually share information actively with others in the smoking cessation OHC (4) I usually get involved in discussion of various topics in the smoking cessation OHC	Hsu <i>et al.</i> (2007)

**Table A1.**  
Measurement items

(continued)

Construct	Measurement items	References	Perceived usefulness of smoking cessation OHC
Perceived usefulness (PU)	<ol style="list-style-type: none"> <li>(1) Using the smoking cessation OHC made my smoking cessation proceed more quickly (improving efficiency)</li> <li>(2) Using the smoking cessation OHC made my smoking cessation proceed better (improving performance)</li> <li>(3) Using the smoking cessation OHC helped me make better decisions about my smoking cessation (effectiveness)</li> <li>(4) Overall, using the smoking cessation OHC was useful for smoking cessation</li> </ol>	Bhattacharjee (2001)	

**Table A1.**

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