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Chenglong Li

Turku School of Economics, University of Turku, Turku, Finland, chenglong.li@utu.fi

Hongxiu Li

Department of Information and Knowledge Management, Tampere University, Tampere, Finland

Reima Suomi

Turku School of Economics, University of Turku, Turku, Finland

Maija Kolstela

Organisation for Respiratory Health, Helsinki, Finland

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Understanding the Technology Extra-role Behavior in Smoking Cessation

Online Health Communities: A Social Support Perspective

Chenglong Li^{1*}, Hongxiu Li², Reima Suomi¹, Maija Kolstela³

¹Turku School of Economics, University of Turku, Turku, Finland

²Department of Information and Knowledge Management, Tampere University, Tampere, Finland

³Organisation for Respiratory Health, Helsinki, Finland

Abstract: Technology extra-role behavior (TERB) is critical for the success of online communities (OCs). However, the factors that determine individual TERB vary in different contexts. In addition, less attention has been paid to smoking cessation online health communities (OHCs). This study aims to explore what motivates users' TERB in smoking cessation OHCs from a social support perspective. In this study social support (including informational, emotional, and esteem support) motivates individuals' knowledge contribution and recommendation behavior, which are studied as two different TERB in smoking cessation OHCs. We tested the research model by analyzing 173 valid answers of an online survey from two smoking cessation OHCs. The results show that emotional support positively affects knowledge contribution, and esteem support has a positive impact on recommendation. Informational support exerts influences on emotional and esteem support. The findings extend our understanding on the determinants of TERB in the context of smoking cessation OHCs, and offer practical implications for the administration of smoking cessation OHCs.

Keywords: Social support, Extra-role Behavior, Online Health Community, Smoking Cessation.

1. INTRODUCTION

Individuals cope with smoking cessation by seeking social support (e.g., physicians' advice on quitting and encouragement) to enhance their confidence or skills in stopping tobacco use in a long run ^[1]. However, acquisition of face-to-face support may be difficult because of limitations in time and space as well as social stigma due to anti-smoking social pressure ^[2, 3]. Consequently, smokers who want to quit their smoking habit increasingly turn to online settings, such as smoking cessation online health communities (OHCs), to complement social support from offline settings ^[2, 4, 5]. Smoking cessation OHCs are collectives of individuals who communicate with each other on smoking cessation online ^[6]. Such OHCs provide smokers with an easy-to-access channel to expand their social network of people who are facing similar situations and support each other via sharing advice, success stories, and personal feelings. In addition, smoking cessation OHCs allow users to communicate anonymously without social stigma. Using smoking cessation OHCs have been suggested to lead to positive smoking cessation outcomes, such as short-term abstinence ^[5] and reducing relapse ^[7].

In the Information Systems (IS) literature, there is a growing discussion on the technology extra-role behavior (TERB). According to Zou, Fang, Sun and Lim ^[8], TERB refers to users' voluntary contributions, and can be defined as "user behavior that benefits the IT service and/or is intended to benefit the IT service, which is not necessary to receive the IT service" ^[8, p.4], such as knowledge contribution and recommendation. TERB offers an appropriate perspective in investigating various types of user voluntary contributions in smoking cessation OHCs. For smoking cessation OHCs, users' knowledge contribution is a fundamental issue since the long-term success of OCs depends on the willingness of users to contribute to the OHCs voluntarily ^[9]. In addition, their recommendation of smoking cessation OHCs to outsiders could attract new users and extend the

* Corresponding author. Email: chenglong.li@utu.fi (Chenglong Li)

reach of OHC service^[8, 10]. Thus, there is a need to investigate the factors that motivate users' voluntary knowledge contribution and recommendation behaviors in smoking cessation OHCs, and to identify the motivator difference for the two different TERB: knowledge contribution and recommendation.

Previous research has argued that social support is a key driver of TERB within OHCs. For instance, Yan, Wang, Chen and Zhang^[11] found that social support is an important determinant of sharing both general and specific knowledge in general OHCs. Since social support may increase strong motivations for users to contribute voluntarily to OHCs, disentangling the components of social support may extend our understating of TERB in smoking cessation OHCs. Drawing on social support theory^[12, 13], this paper aims to investigate *how the three components of social support (including informational support, emotional support and esteem support) affects the two TERB (knowledge contribution and recommendation) in the smoking cessation OHCs?* Specifically, this study proposes a research model to explore the relationships between the components of social support and the two TERB in the context of smoking cessation OHCs. Three components are considered as motivators of TERB in smoking cessation OHCs, including informational, emotional, and esteem support. Two different TERB are explored, i.e., knowledge contribution and recommendation. The proposed research model was tested empirically with 173 valid online survey answers from users of smoking cessation OHCs in both China and Finland. In doing so, this study clarifies the impacts of three components of social support on two different TERB in the particular context of smoking cessation OHCs, and identifies the different roles of the three components of social support in explaining the two different TERB.

We structure the rest of this article as follows: Section 2 reviews prior literature on TERB and social support theory. Then Section 3 presents the research model and hypotheses. Section 4 introduces the research method. Finally, Section 5 discusses the research findings and limitations.

2. THEORETICAL BACKGROUND

2.1 Technology Extra-role Behavior

Due to the ever-changing online environment, users of OCs provide their voluntary contributions in more ways that are different. Users not only contribute knowledge to OCs, but also offer feedback or governance to improve the services of OCs, or refer OCs to outsiders for user expansion^[8]. Previous literature focuses on knowledge sharing in OCs^[11, 14], but pays less attention to other different user voluntary contributions OHCs. Zou et al.^[8] theorize various user voluntary contributions as TERB and classify it into four dimensions: (1) service provision, i.e., delivering services to other users, such as knowledge contribution and helping users; (2) service improvement, i.e., improving services, such as offering feedback and governance; (3) service advocate, i.e., promoting user expansion, such as recommendation and justification; and (4) service financing, i.e., contributing monetary terms. Following this typology of TERB offered by Zou et al.^[8], this study selects two key different TERB from two dimensions, i.e., knowledge contribution from service provision, and recommendation from service improvement, and attempts to investigate their determinants and compare the difference of determinants. Other two dimensions of TERB (i.e., service financing and service improvement) have not been studied in this research because tangible resources, service feedback or governance are not widely existed in smoking cessation OHCs^[15, 16].

2.2 Social support theory

Social support is defined as information and actions that make people believe that they are “cared for and loved, esteemed and valued, as well as belongs to a network of communication and mutual obligation”^[17, p. 300]. Social support has been viewed as an uncertainty-reduction or stress-management mechanism to buffer the negative effects of stressful events and protect people from stressors^[2, 12]. Previous studies have reported that social support from both offline settings and online settings is effective in promoting smoking abstinence^[1, 5].

Thus, in this study we applied social support as the theoretical framework to investigate the TERB in smoking cessation OHCs. Cutrona and Suhr^[13] classified social support into five different categories: (1) informational support, i.e., sharing information on problem-solving; (2) emotional support, i.e., sharing warmth and caring to reduce emotional distress; (3) esteem support, sharing compliments in others’ abilities; (4) network support, i.e., sharing companionship; and (5) tangible support, i.e., sharing goods or services. Among the five types of social support, informational and emotional support are the two most frequent types of social support, and esteem and network support are also found commonly exchanged in OHCs, but tangible is rare in OHCs^[2, 16]. Following the typology of social support proposed by Cutrona and Suhr^[13], this study considers three types of social support as motivators of TERB in smoking cessation OHCs, i.e., informational, emotional, and esteem support. Tangible support is excluded due to its rarity in OHCs^[2, 16]. We also remove network support because it is similar to companionship, which has been highlighted as a different activity from social support in OHCs^[4].

3. RESEARCH MODEL AND HYPOTHESES

3.1 Research model

Following the literature on social support and TERB, we argue that three components of social support, i.e., informational, emotional, and esteem support, are key drivers of two TERB (knowledge contribution and recommendation) in smoking cessation OHCs. In addition, informational support is assumed to affect emotional and esteem support. Figure 1 presents the proposed research model, and the definitions of construct included in the research model are shown in Table 1.

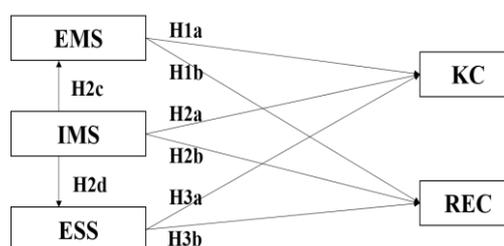


Fig. 1. The proposed model

Table 1. List of constructs in the research model

Construct	Definition
Emotional support (EMS)	Sharing encouragement, empathy, or caring in a smoking cessation OHC ^[13]
Informational support (IMS)	Sharing information on smoking cessation, such as suggestions, success stories, and medicine information, in a smoking cessation OHC ^[13]
Esteem support (ESS)	Sharing relief of blame or compliments regarding quitting smoking in a smoking cessation OHC ^[13]
Knowledge contribution (KC)	The behavior to contribute information, experience, and skill regarding smoking cessation in a smoking cessation OHC ^[14]
Recommendation (REC)	The behavior to recommend the smoking cessation OHC to others ^[10]

3.2 Hypotheses

Smokers who attempt to quit smoking often face stressful issues (e.g., unpleasant withdrawal symptoms), and have an urgent need of emotional support to buffer deleterious effects of such stressors (e.g., distress, anxiety, and self-doubt)^[2, 12]. In smoking cessation OHCs, most of users are ex-smokers or current smokers who truly understand the struggles in smoking cessation process, and they can empathize with others and offer adequate emotional support (e.g., sympathy and empathy). Such emotional support from OHCs may help users to decrease their emotional distress and restore their emotional stability^[2]. The reciprocal motivation brought out via emotional support might drive users to contribute to the OHCs in return^[18]. Emotional support has been reported to affect TERB regarding service provision, such as users’ willingness to offer support in OHCs for pregnant women^[19]. Hence, we assume that emotional support has a positive impact on knowledge contribution within smoking cessation OHCs, and we state the following hypothesis:

H1a: Emotional support is positively correlated with knowledge contribution in a smoking cessation OHC.

IS scholars have suggested that the fulfilment of users’ various needs in OCs could motivate users’ other

contribution behavior indirectly, such as through attachment and satisfaction^[20, 21]. Also, marketing research has shown that perceived value has a direct impact on customers' WOM^[22]. The users who perceive that they could obtain high value tend to be more committed to the organization and recommend it to others. Based on these findings, we argue that when users perceive that emotional support from smoking cessation OHCs could provide them with emotional value and satisfy their emotional needs, they are more likely to feel obligated to refer the OHCs to outsiders for attracting new users. Thus, we propose the following hypothesis:

H1b: Emotional support is positively correlated with recommendation in a smoking cessation OHC.

Smokers who intend to stop using tobacco products often need guidance on how to quit or prevent relapse^[23]. In smoking cessation OHCs, informational support often includes advice on quit plan making, personal tips, and success stories^[15]. Such informational support usually comes from real-life experience and expressed in the form of layman's terms. This could better meet users' personalized informational needs, and assist users to make better decisions on smoking cessation. As similar to emotional support, the reciprocal obligation may encourage users who received information support to return favors to the OHCs. Previous studies have found that informational support positively affects the willingness to help other users in OHCs^[19]. Therefore, we suppose that informational support exerts a positive influence on knowledge contribution in the smoking cessation OHCs, and the following hypothesis is suggested:

H2a: Informational support is positively associated with knowledge contribution in a smoking cessation OHC.

Similar to emotional value and emotional needs fulfilment, informational support in smoking cessation OHCs also could provide users with informational value, and allow users to fulfill the need to master the knowledge on smoking cessation. Previous research has shown that information support is one main social value in OHCs^[16]. Also, informational support has been found to affect recommendation through satisfaction in online brand communities^[24]. Therefore, we assume that in smoking cessation OHCs, when users gain informational value to fulfill their information needs, they tend to be satisfied with the OHCs and offer positive recommendations to others. Thus, we suggest the following hypothesis:

H2b: Informational support is positively associated with recommendation in a smoking cessation OHC.

In addition, informational support from smoking cessation OHCs is helpful to solve problems related to smoking cessation and reduce uncertainty^[2, 12]. This might trigger users' emotional recovery, for instance, from negative emotions (e.g., blame and self-doubt) to positive emotions (e.g., confidence and self-control) about smoking cessation. As a result, the exchange of emotional support and esteem support might be facilitated by sharing informational support. Thus, we propose following hypotheses:

H2c: Informational support is positively related to emotional support in a smoking cessation OHC.

H2d: Informational support is positively related to esteem support in a smoking cessation OHC.

In smoking cessation OHCs, esteem support is often in the form of expressing confidence and compliment in others' ability to deal with smoking cessation^[12, 13]. In smoking cessation OHCs, esteem support usually includes congratulations and positive feedback about others' achievements, as well as relief of blame for relapse^[15]. Such esteem support could help users to strengthen their beliefs and confidence in quitting, and relieve their self-blame regarding repeating smoking. Similar to informational and emotional support, the reciprocity might motivate users to contribute back to the OHCs voluntarily. Thus, we suggest the following hypothesis:

H3a: Esteem support is positively associated with knowledge contribution in a smoking cessation OHC.

Like emotional support, esteem support also could fulfill users' need to seek positive evaluations from others and feel confident about themselves^[12, 13]. Users who benefit from the esteem support in smoking cessation OHCs might establish a strong psychological bond with the OHCs, and perceive that they have rights and responsibility to recommend the OHCs to other smokers. Accordingly, we presume following hypothesis:

H3b: Esteem support is positively associated with recommendation in a smoking cessation OHC.

4. RESEARCH METHOD

4.1 Measurement Development

All constructs were measured by adopting multiple items taken from previous literature. The five-point Likert scale, ranging from (1) strongly disagree to (5) strongly agree, was used to measure each item. The measurements for informational and emotional support were adopted from ^[25]. The items for esteem support came from ^[26]. Knowledge contribution was measured with items taken from ^[14]. The items for recommendation were adapted from ^[10]. All items were reworded for fitting smoking cessation OHCs context.

4.2 Data Collection

We selected two smoking cessation OHCs in this study: one is Stumppi.fi in Finland; the other is the online Smoking Cessation Bar in China. We recruited users from these two OHCs to participate in our online survey via releasing the online questionnaire link to the OHCs. Before collecting data, we received an ethics permit approved by the Ethics Committee of the home University of the first author. Each respondent received a gift for their participation. We launched the official online survey on 13th November 2018 in China and 17th December 2018 in Finland. By 30 April 2019, 235 users completed the online survey (187 in China, and 48 in Finland). We excluded replies due to disagreement on participation (48 in China, 2 in Finland), and untrustworthy answers like the same answer choices for all items (12 in China). Finally, 173 responses were used as valid research sample base in this study. Table 2 presents the background information of the respondents.

4.3 Data Analysis

This study employed Partial Least Squares (PLS) ^[27] to evaluate both the measurement and structural model.

Table 2. Respondents' background information				Table 3. Confirmatory factor analysis results										
Measure	Items	Frequency	Percentage (%)	Constr	Item	Factor loading	Cronba ch's α	CR	AVE					
Country	China	127	73.4	EMS	EMS1	0.856	0.874	0.913	0.725					
	Finland	46	26.6		EMS2	0.841								
Age	15-24	17	9.8		EMS3	0.846								
	25-44	117	67.6		EMS4	0.863								
	45-65	35	20.2	ESS	ESS1	0.82	0.822	0.894	0.738					
	> 65	4	2.3		ESS2	0.86								
Gender	Male	103	59.5		ESS3	0.895								
	Female	64	37.0	IMS	IMS1	0.859	0.796	0.881	0.711					
	Unknown	6	3.5		IMS2	0.809								
KC	EMS	ESS	IMS		KC	REC				IMS3	0.861	0.935	0.954	0.838
				KC1			0.925							
				KC2			0.899							
				KC3			0.925							
	ESS	IMS	KC	REC	EMS	ESS	KC4	0.912						
							REC1	0.839	0.812	0.877	0.643			
							REC2	0.804						
							REC3	0.85						
REC4	0.706													

The measurement model test includes a convergent and discriminant validity test ^[27]. The factor loadings for each item, composite reliability (CR) and average variance extracted (AVE) of each construct were used to test the convergent validity. As shown in Table 3, the factor loadings for all the items exceed 0.7, and values of

CR and AVE meet the recommended threshold of 0.8 and 0.5, respectively. All Cronbach's alpha values also satisfy the threshold of 0.7, confirming adequate convergent validity^[27, 28].

We further evaluated the discriminant validity by calculating the square root of AVE for all the constructs. As presented in Table 4, the value of the square root of AVE for each construct is higher than its correlations with other constructs, supporting the discriminant validity^[27, 28].

We then tested structural model by using the bootstrap resampling procedure in PLS to test the significance and effect of the proposed hypotheses. As shown in Figure 2, the proposed research model explains 41% of the variation of knowledge contribution, 40% of recommendation, 60.8% of emotional support, and 59.7% of esteem support. As postulated, emotional support exerts significant impacts on knowledge contribution ($\beta=0.322$, $p<0.01$), and esteem support has a significant influence on recommendation ($\beta=0.387$, $p<0.001$), supporting H1a and H3b. Informational support significantly affects emotional support ($\beta=0.780$, $p<0.001$) and esteem support ($\beta=0.597$, $p<0.001$), thereby supporting H2c and H2d. Surprisingly, information has no significant impact on knowledge contribution and recommendation; emotional support exerts no impact on recommendation, and esteem support no impact on knowledge contribution either. Thus, H1b, H3a, H2a and H2b are not supported. In addition, through a mediation analysis, we found indirect effects from informational support on knowledge contribution via emotional support ($\beta=0.251$, $p<0.01$), and from informational support on recommendation via esteem support ($\beta=0.299$, $p<0.001$).

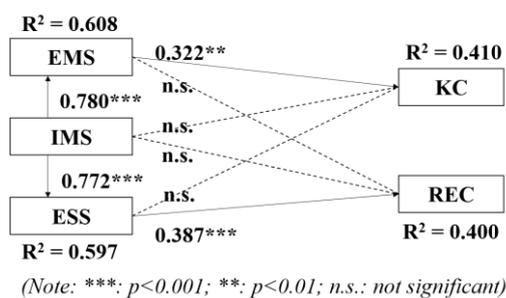


Fig. 2. The structural model

5. DISCUSSION AND CONCLUSION

5.1 Discussion

This study raises several interesting findings. Emotional support was found to affect knowledge contribution positively. This finding is consistent with research findings by Lin et al.^[19], who found that emotional support has a positive impact on users' willingness to offer support for other users in pregnant women OHCs. Nevertheless, emotional support has been found to have no influence on recommendation. A possible explanation is that recommendation and knowledge contribution are two different TERB motivated by different determinants^[8]. When users obtain emotional support from the OHCs, they are likely to contribute their knowledge to the OHCs for returning favors to OHCs, but may have no strong intention stimulated to recommend the OHCs to people beyond the communities. Emotional support might affect recommendation indirectly, such as through satisfaction or attachment^[20], only those users who satisfied with emotional support tend to be more committed to the OHCs, and eventually recommend the OHCs to outsiders.

Esteem support was found to have a positive effect on recommendation, but no influence on knowledge contribution. This might be because smokers who want to quit have a great amount of burden related to avoiding relapse, they require positive evaluations from others to make them feel confident about themselves. Esteem support in smoking cessation OHCs might lead to higher self-esteem and self-efficacy, which in turn facilitate cessation outcomes. Consequently, users who benefit from esteem support in OHCs are more likely to introduce such effective smoking cessation OHCs to other smokers beyond communities.

Surprisingly, informational support was found to exert no impacts on both knowledge contribution and recommendation. These finding contradicts prior research regarding OHCs for pregnant women^[19], informational support is found to be an important determinant of helping users. The possible reason is that informational support exerts indirect influences on TERB, as we found that informational support indirectly affects knowledge contribution via emotional support ($\beta=0.251$, $p<0.01$), and recommendation via esteem

support ($\beta=0.299$, $p<0.001$). Thus, informational support from the OHCs maybe not enough to activate TERB directly, but such informational support may motivate TERB via emotional support and esteem support.

5.2 Conclusion

This study offers some theoretical implications. First, the findings on emotional support as a determinant of knowledge contribution, and esteem support as a motivator of recommendation in smoking cessation OHCs, indicate that TERB could be explained from the social support theory, which is highly related to the context of smoking cessation OHCs. This brings new insights into TERB by disentangling the various components of social support and investigating their impacts on determining TERB in smoking cessation OHCs.

Second, emotional support has been found to affect knowledge contribution but not recommendation, while esteem support has been discovered to determine recommendation but not knowledge contribution. The different roles of each component of social support on different TERB suggest that extra-role behaviors are different and determined by different determinants in smoking cessation OHCs. This offers new implications to TERB by distinguishing the antecedents of different TERB in the context of smoking cessation OHCs.

Third, the findings on the significant influence of informational support on emotional and esteem support imply that informational support is a precondition of sharing emotional and esteem support in smoking cessation OHCs. Even though informational support cannot determine users' TERB directly, it is still important in such OHCs as it promotes emotional and esteem support. This provides new insights into social support by investigating the relationships between different components of social support in smoking cessation OHCs.

This study also offers some practical implications for administrations of smoking cessation OHCs. Specifically, emotional support and esteem support have been found to affect knowledge contribution and recommendation respectively, indicating that managers of smoking cessation OHCs should emphasize on emotional and esteem support when developing service improvement plans to motivate users' voluntary contributions. In addition, even though informational support has been found to exert no direct influence on TERB, it should be strengthened as it could promote emotional and esteem support in such OHCs.

This study has several limitations. First, this study only investigates knowledge contribution and recommendation in smoking cessation OHCs. Other types of TERB, such as feedback and governance have not been considered in this study. Further research should also explore other TERB in OHCs. Second, our data were limited to two OHCs in China and Finland, we should be cautious to generalize our findings to other contexts or culture. Future research should expand our research model to other contexts to validate our findings empirically.

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