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Social capital development on interest-based networks: examining its antecedents, process, and consequences

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Social capital development has been extensively studied on relationship-based networks (i.e., Facebook, WeChat), whereas scant attention has been devoted to another critical category: interest-based networks. People join interest-based networks primarily to exchange information on shared topics and interests, as opposed to relationship development or maintenance. Guided by social capital theory, the current research takes an initial step by looking into whether and how bridging and bonding social capital accrues on interest-based networks. A cross-sectional survey was conducted among users of a well-known Chinese interest-based network, Douban.com ($N = 624$). The participants reported their bridging and bonding social capital, frequency of online interactions with content (i.e., posting, favoriting) and with humans (i.e., chatting, discussing), and sense of belonging. The mediation analysis results informed us of a theoretical model of social capital development on interest-based networks with both online interactions with content and with humans as the antecedents, and a sense of belonging as the consequence. The findings also revealed the steps of bridging and bonding social capital development on interest-based networks. This study advanced our understanding of social capital theory by examining its applicability in an interest-based SNS, identifying OIs with humans and content as potential antecedents, and elucidating the association between two types of social capital. The findings hold practical significance for designers of interest-based networks.

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Introduction

With the diffusion and proliferation of online networks, an enormous portion of human communication has shifted to the digital realm. Online networks not only allow users to communicate with one another at any time and place but also afford content creation and transmission services (Carr and Hayes, 2015; Li et al., 2021). An outcome particularly associated with online network participation is the accumulation of social capital, which entails one's relationships developed from the network as well as the set of resources embedded within it (Lin, 2001; Williams, 2019).

There are primarily two strands of research concerning Internet social capital. One seeks to investigate whether and how social capital can be developed from online network use (e.g., Ellison et al., 2007; Fenton et al., 2023; Phua et al., 2017) as well as some specific activities, such as wall posting and chatting (e.g., Burke et al., 2011; Nguyen et al., 2022; Vitak et al., 2011). The other strand focuses on the beneficial outcomes brought by social capital, such as career success, personal well-being, and civic participation at individual levels (e.g., Chetty et al., 2022; Gil de Zúñiga, 2012; Meng et al., 2017; Seibert et al., 2001), as well as group solidarity and economic success at community and society levels (e.g., Cheong et al., 2007; de Clercq et al., 2009). The previous research substantially advances our understanding of social capital on online networks. Nevertheless, most of them exclusively focused on social capital building on relationship-based ones, such as Facebook, LinkedIn, WeChat, etc., whereas interest-based networks, along with their distinctive characteristics, seem to be neglected on this front.

Interest-based networks have steadily grown in popularity over the past decades, with established ones continuously expanding like Reddit and Pinterest, and new platforms constantly emerging like Fitbit, Trip Advisor, and Goodreads. Multiple relationship-based networks, such as Facebook, also developed similar features like interest-based pages and communities. As another critical category of online networks, interest-based ones entail platforms where users aggregate for shared interests (Armstrong and Hagel, 2000). Its essence of focusing on the content exchange of shared topics within a network greatly differentiates this type of network from other platform types. For one thing, the characteristic that users gather for content creation and transmission on certain topics of their interest distinguishes it from relationship-based networks whose users' goal is mainly to maintain existing relationships and develop new ones (Lee et al., 2003). For another, it also differs from online forums in the aspect that each user maintains a personal profile and is situated in a network where users can be navigated around.

Successful interest-based networks bring countless benefits, such as knowledge sharing (e.g., Ghahtarani et al., 2020), information exchanges (e.g., Jin et al., 2010), as well as creativity and innovation (e.g., Chu and Chan, 2009; Ganguly et al., 2019). All these operations are based on trust, attachment, and reciprocity, where social capital is often deemed to be a necessity (Pretty and Ward, 2001; Putnam et al., 1993). The advancement of social capital on interest-based networks, nevertheless, is presumed to be particularly challenging given the fact that their users are often aggregated to obtain and share information on certain topics rather than to maintain or build relationships. Therefore, a question arises as to whether interest-based networks generate social capital and how. Specifically, guided by the social capital theory, the current study aims: (a) to explore whether social capital would develop on interest-based networks and through what activities; (b) to explicate how the two types of social capital, strong and weak ties, develop on the sites; and (c) to examine whether the advancement of social capital would contribute to the vitality of interest-based networks. Taken together, we seek to answer the following overarching questions:

1. Given the nature of interest-based SNSs, would the sites breed social capital, and through what online activities?
2. How do the two types of social capital, strong and weak ties, develop from online activities on interest-based SNSs?
3. Would the advancement of social capital contribute to the vitality of interest-based SNSs?

By achieving these goals, this study represents an early effort to investigate whether and how two major activity categories on interest-based networks: online interactions (OIs) with content and with humans, nurture social capital. In addition, we also explored the interrelationship between two specific types of social capital on the sites, which are often treated as two parallel pathways explaining the impact of online network use in past literature (Williams, 2006). Lastly, this study demonstrates that both OIs with content and humans enhance the sense of belonging via the two types of social capital. Overall, the findings inform us of a conceptual model of social capital development on interest-based networks.

Literature review

Social capital theory. Social capital theory represents an important theory with a longstanding application within the disciplines of economics, political science, sociology, and various other branches of the social sciences. By definition, social capital refers to "resources embedded in one's social networks, resources that can be accessed or mobilized through ties in the network" (Lin, 2001, p. 51). It describes the ability of individuals or collectives to access resources embedded in their social network, which can subsequently be transformed into other forms of capital such as favors (human capital) or new information (intellectual capital) (Resnick, 2001). For decades, this concept has offered researchers the missing link explaining how collaborations among individuals are formed and collective problems are resolved (Best and Krueger, 2006; Fukuyama, 2001). Social capital is often conceived of as both a cause and an outcome (Ellison et al., 2007; Williams, 2006). For example, one study revealed that social media use positively predicts people's social capital development, which in turn impels their civic engagement and political participation (Gil de Zúñiga, 2012). Similar patterns have also been observed in domains like fandom (Fenton et al., 2023) and organizational innovation (Setini et al., 2020).

Social capital is believed to encompass three dimensions: structural, relational, and cognitive. The structural dimension refers to interconnections between members within a network, wherein connections provide access to resources. The relational dimension pertains to the personal relationships cultivated through repeated interactions among individuals. The cognitive dimension can be defined as shared codes, languages, and a collective vision. Scholars may emphasize varying facets of social capital. For example, Putnam (2000) contended that the conceptualization of social capital encompasses both the social network itself and its effects. Lin (2001) and Williams (2006) conceptualized social capital as the relational capital accrued from social networks, which should be separately viewed as the causal agent of social capital. The primary objective of the present study is to investigate how relational capital accumulates through online interactions on SNSs, and how this relational dimension may contribute to a sense of belonging, serving as an indicator of the cognitive dimension of social capital.

Social capital is often dichotomized into bridging and bonding. Bridging develops from loose ties over a broad network, like acquaintances and neighbors, and has the attribute of being inclusive. By contrast, bonding arises from the intense communication and emotional support from tightly-knit and intimate

circles like families and close friends and is characterized as being exclusive among members with homogeneous backgrounds (Granovetter, 1982; Putnam, 2000). These categories generate different types of resources embedded in the network. Bridging ties commonly serve to establish connections between distinct clusters within a network, facilitating the dissemination of innovative information across these groups. In contrast, bonding ties are deeply interwoven within tightly-knit groups which are characterized by heightened levels of interaction and intimacy. These ties typically afford access to the more substantial forms of capital, such as obtaining tangible capital (Burt, 2000; Granovetter, 1982). Empirical research has observed that bridging is often associated with shallow communication but flourishes novel and diverse information, whereas bonding brings deep emotional exchange and group cohesion but lacks breadth in domains like social support (Meng et al., 2016) and video games (Shen et al., 2014). It is important to note that these two types of social capital should not be regarded as mutually exclusive, and people can concurrently cultivate both forms of social capital (Putnam, 2000).

Numerous investigations have been dedicated to elucidating the development of social capital within relationship-based networks. For example, Ellison et al. (2007) explored how bridging social capital was formed on Facebook and observed a correlation between intense Facebook usage and the formation of bridging social capital, which further led to greater high self-esteem and life satisfaction. A similar impact also applies to other relationship-based networks, such as LinkedIn (Utz, 2016) and WeChat (Pang, 2018) (see Antheunis et al., 2015 for a review). Additional research looked into multiple specific behaviors on networks. The results suggested that although the passive use of relationship-based networks like browsing does not play a role in social capital development (Burke et al., 2010), bridging and bonding can rapidly grow from active behaviors, such as public broadcasting and private chatting (Lee et al., 2014; Yoder and Stutzman, 2011). The present study thereby chooses to follow the prior research practice and exclusively focus on the active interactions on interest-based networks.

Online Interactions with content and social capital. There are two distinctive elements in online networks: interactions with content and those with humans (Boyd and Ellison, 2007; Chen et al., 2014). The first feature is that network users can take on a more active role in creating and sharing linguistic, visual, or multimedia content on their own network sites (Burgess and Woodford, 2014). These activities can be accomplished through a variety of tools within the site, like broadcasting, reposting, and favoriting. Users engage in OIs with content mainly for self-expression (e.g., Choi and Sung, 2018; Park et al., 2022), impression management (e.g., Ranzini and Hoek, 2017), and documentation (e.g., Garde-Hansen, 2009; Nardi et al., 2004). This characteristic is immensely manifested in interest-based networks considering most participation is content-driven.

To our best knowledge, scant research has investigated the impact of OIs with content on people's social capital accumulation. One study looked in the opposite direction as to whether one's social capital leads to content-generation behaviors in virtual communities. The results suggested that cognitive social capital, such as perceived homophily, drives content creation intention because the users believe a common vision is shared with other users (Li et al., 2014). We argue that the other direction may also stand, particularly on interest-based networks. Specifically, OIs with content provide a venue for users to convey their thoughts and opinions on a topic of their interest, through which one is exposed to an abounding audience for prospect connections. Put another way, content creation and transmission

may increase the likelihood of attracting people who share a similar interest or standpoint and forming new connections. Therefore, we expect that OIs with content can contribute to social capital formation on interest-based networks.

Online Interactions with humans and social capital. Another core feature of online networks is their capacity to construct connection networks through which users can engage in OIs with their contacts regardless of temporal or geographic constraints (Chen et al., 2014). Distinct from OIs with content, OIs with humans refer to direct communication with other users and may take various forms, ranging from public ones like wall posting to private ones like direct messaging (Li and Chen, 2022). Regardless of its form, this activity involves another user, often with the intention of gratifying one's social integration needs (Korhan and Ersoy, 2016). Extensive research has investigated the associations between online social interactions and social capital accumulation (see Antheunis et al., 2015 for a review), and a consistent positive relationship was observed between OIs with humans on Facebook and social capital (Brooks et al., 2014; Burke et al., 2010, 2011; Ellison et al., 2011). We expect the same finding on interest-based networks, as through OIs with humans on an interest-based network, users can get to know others and social capital may start to accumulate.

Online interactions, bridging, and bonding social capital. When it comes to a fine-grained understanding of social capital development on interest-based networks, we propose a one-way sequential relationship such that bridging first forms and then serves as a breeding place for hatching the growth of bonding. As noted, regardless of whether users engage in OIs with content or humans on the sites, they are exposed to an abounding audience with a great chance to nurture social capital. Considering the fact that interest-based users normally do not know each other beforehand, shallow communication and bridging may first occur. Among the vast and diverse connections fostered through bridging, some relationships may go deeper and transform into bonding as more information is disclosed and common ground in some aspects is found, as suggested by social penetration theory (Vanlear, 1987). As such, the broader one's bridging network is, the more likely some weak ties may turn into bonding social capital.

Indeed, several studies in management fields have suggested a positive relationship between bridging and bonding. For instance, a study examining how social capital affects the evolving process of nonprofit organizations found a moderate positive relationship between these two types of social capital (Leonard and Bellamy, 2010). A similar pattern was again observed in small-size firms, such that strong bonding within a business group is associated with greater bridging, operationalized as external network mobilization (Uhlaner et al., 2015). Based on the foregoing reasoning and previous findings, we thereby expect a sequential positive relationship between bridging and bonding.

Social capital and sense of belonging. This study also seeks to examine whether the social capital accumulation on interest-based networks leads to a sense of belonging, an important indicator of site vitality. Sense of belonging is defined as the experience of personal involvement in a system or environment such that one feels like being an integral part of that system or environment (Hagerty et al., 1992). We choose to examine the sense of belonging for its particular significance and relevance to interest-based networks. First, unlike relationship-based networks, where users join primarily for interpersonal relationships, interest-based ones can only last when a dynamic vibe around

shared topics is created and maintained. This can be achieved through the formation of each member's sense of belonging (Zhao et al., 2012). Second, the sense of belonging is deemed to be particularly relevant to the activities on interest-based networks. The interactions in one's interest, regardless of whether with content or with humans, may make users experience a fit or congruence with other members and the environment through shared or complementary characteristics (Meyer and Alien, 1991). Therefore, we argue that a sense of belonging is a necessary and important outcome to examine when studying interest-based networks' vitality.

Existing literature suggested that OIs with both content and humans may help formulate one's sense of belonging. For one thing, as noted earlier, creating and sharing content on topics of one's interest with many other similar users can forge a feeling of sharing a common identity and fitting in the environment. For instance, in a study identifying factors flourishing virtual community, researchers found that information reading and posting drive one's sense of community (Blanchard, 2008; Tonteri et al., 2011). Similarly, we argue that on interest-based networks, OIs with content, such as creating and broadcasting information, also impel a sense of belonging. For another, it has been established that OIs with humans can generate a sense of connectedness (Kuwabara et al., 2002), a feeling tapping into relatedness and involvement with others or a group. With stronger connectedness expanded, the sense of belonging to the environment may start to grow. For example, a lab experiment found that lurking and ostracism, two activities not involving any social interactions, would attenuate participants' feelings of belonging (Tobin et al., 2015). In the same vein, we argue that the OIs with humans on interest-based networks can enhance users' sense of belonging.

The positive associations observed between social capital and a sense of belonging alike prevail in the literature. For example, research found that participants with greater social capital reported stronger group attachment (Kao and Sapp, 2020), sense of membership (Zhao et al., 2012), and interdependence with other group members (Davenport and Daellenbach, 2011). We argue that this also holds true on interest-based networks such that the accumulation of social capital may cultivate a sense of connection, which fosters a sense of belonging.

The present study

Taken together, the aforementioned hypotheses and research questions inform us of a conceptual model as depicted in Fig. 1.

H1: (a) OIs with content and (b) OIs with humans on interest-based networks are associated with bridging.

H2: Regardless of the antecedent (OIs with content or with humans), bridging leads to bonding.

H3: Sense of belonging is associated with (a) bridging and (b) bonding social capital, as well as (c) OIs with content and (d) OIs with humans.

One research question is proposed to probe whether bonding social capital can be *directly* formed by OIs with content and with humans.

RQ1: Does (a) OIs with content or (b) OIs with humans directly predict bonding social capital?

Methods

Platform selection. We gather data for our hypotheses and research question testing on Douban.com, one of the largest interest-based networks in China. Founded in 2005, the site hosts more than 600 million registered users (Statista Global Consumer Survey, 2022) and is a key site for users to create, share, and comment on global cultural works, including movies, books, and music. Scholars from various fields have employed it as a research venue for its diverse features and rich data volumes (Lu et al., 2021; Wang et al., 2020; Yecies et al., 2016). We chose Douban.com for its robust structural features, encouraging both OIs with content and humans. For instance, users can engage in OIs with humans via activities like commenting on others' reviews, participating in online discussions, private chatting, etc. OIs with content behaviors include rating, marking, and reviewing[1] work of one's interest.

Procedures and participants. A pilot study was performed among 73 Douban.com users to test the reliability and construct validity of the instruments to be used in the main study. Each scale was found to be a unidimensional construct with a Cronbach's alpha value above 0.7. The main study was subsequently carried out in June 2021 on Wenjuanxing, one of the largest survey platforms in China. Participant recruitment announcements were posted on several popular social media platforms in China to recruit Douban.com users. To boost the response rate, a reward of 3 RMB was offered upon completion of the survey.

In total, 624 Douban.com users participated in our study. As is shown in Table 1, the female participants accounted for a larger proportion (58.7%) compared to their male counterparts (41.3%). A minority of respondents fell below the age of 18 (20.9%) or exceeded 45 years (0.6%). The predominant portion of the sample was comprised of individuals between the ages of 18 and 25, constituting 70.7% of the total.

Measures. Unless indicated, all scales used in this study were on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree".
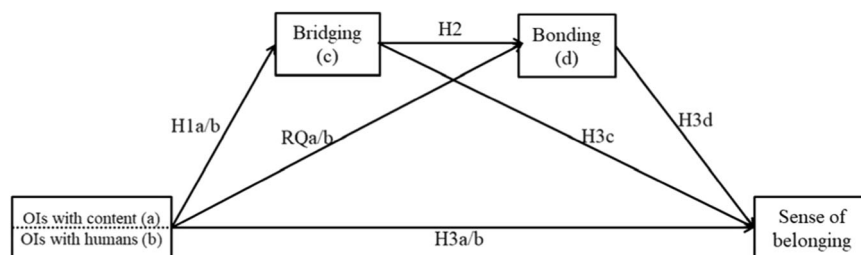
Fig. 1 The conceptual model of social capital development on interest-based networks. Note: H1a stands for the hypothesis of the relationship between OIs with content and bridging; H1b stands for the hypothesis of the relationship between OIs with humans and bridging; H2 stands for the hypothesis of the relationship between bridging and bonding; H3a stands for the hypothesis of the relationship between OIs with content and sense of belonging; H3b stands for the hypothesis of the relationship between OIs with humans and sense of belonging. RQ1a asks the question of whether OIs with content are directly associated with bonding; RQ1b asks the question of whether OIs with humans are directly associated with bonding.

Table 1 Participants' demographic profiles ($n = 624$).	
Demographic variables	**Frequency (percentage)**
Gender	
Male	258 (41.3%)
Female	366 (58.7%)
Age	
Below 18 years old	18 (2.9%)
18–25	441 (70.7%)
26–35	136 (21.8%)
36–45	25 (4.0%)
Above 45 years old	4 (0.6%)
Education	
High school and below	20 (3.2%)
Junior college (Dazhuan)	42 (6.7%)
Undergraduate	479 (76.8%)
Graduate	83 (13.3)
Disposable monthly income (in RMB)	
Below 1500	147 (23.6%)
1500–2999	281 (45.0%)
3000–4999	105 (16.8%)
5000–7999	55 (8.8%)
Above 8000	36 (5.8%)

Table 2 Correlations and descriptive statistics of the key constructs.

	M	SD	1	2	3	4	5
1. OIs with content	3.071	0.965	1				
2. OIs with humans	2.907	0.879	0.499**	1			
3. Bridging	3.735	0.771	0.356**	0.500**	1		
4. Bonding	2.215	0.895	0.312**	0.496**	0.354**	1	
5. Sense of belonging	3.141	1.064	0.355**	0.513**	0.597**	0.550**	1

Note: **$p < 0.01$.

Sense of belonging. Sense of belonging was measured by three items adapted from McMillan and Chavis (1986) and Zhao et al. (2012). The items were *"I have a sense of belonging to Douban.com." "I feel close to other members on Douban.com." "I am proud of being a Douban.com user"*. The scale had a reliability of $\alpha = 0.900$.

OIs with content and with humans. Items for the two types of online interactions were developed with reference to previous research (Chen et al., 2014). OIs with content encompassed three items, including rating, marking, and reviewing ($\alpha = 0.840$), and OIs with humans contained four items, including *participating in the forum discussions, private chatting, liking, and commenting on others' posts* ($\alpha = 0.785$). Participants reported how frequently they engaged in each of the above activities in the past six months on Douban.com.

Bridging and bonding social capital. We adapted the scales developed by Williams (2006) and Ellison et al. (2007) to measure bridging and bonding. The bridging scale includes five items, such as *"Interactions on Douban.com make me interested in what people unlike me are thinking"*, *"Interactions on Douban.com remind me that everyone in the world is connected"*. Another five items measured bonding social capital, and sample items were *"There are several people on Douban.com I trust to solve my problems"*, and *"When I feel lonely, there are several people on Douban.com I can talk to"*. Both bridging ($\alpha = 0.876$) and bonding ($\alpha = 0.855$) showed satisfactory reliability.

Results

The descriptive statistics and correlations between the studied variables are reported in Table 2. All studied variables were significantly correlated with each other. All the correlations were below the recommended threshold of 0.70 (Tabachnick et al., 2007), indicating no signs of multicollinearity issues in our data. Two serial mediator model analyses were performed to examine the development of social capital from OIs with content and with humans, respectively, using model 6 in SPSS PROCESS (Hayes, 2018).

Serial mediator model analysis with OIs with content as IV. OIs with content were entered as the independent variable, with a

sense of belonging as the dependent variable, bridging as the stage-one mediator, and bonding as the stage-two mediator. Meanwhile, OIs with humans and four demographic variables (i.e., age, sex, income, and education level) were included as covariates.

As shown in Table 3 and Fig. 2, OIs with content were positively associated with bridging ($B = 0.113$, $p < 0.001$). In contrast, OIs with content was not significantly associated with bonding ($B = 0.066$, $p = 0.078$). Meanwhile, bonding was positively predicted by bridging ($B = 0.178$, $p < 0.001$). As for the sense of belonging, the results showed that it was not directly associated with OIs with content ($B = 0.051$, $p = 0.164$), but was positively predicted by both bridging ($B = 0.550$, $p < 0.001$) and bonding ($B = 0.392$, $p < 0.001$).

To test the indirect effects, we then employed the bootstrap confidence interval recommended by Preacher and Hayes (2004). As Table 5 displays, a 95% bias-corrected confidence interval based on 5000 bootstrap samples indicated the BootCI of indirect 1 ($B = 0.062$, BootCI = [0.025, 0.102]) and indirect 3 ($B = 0.007$, BootCI = [0.002, 0.013]) were entirely above zero while that of indirect 2 straddled zero ($B = 0.026$, BootCI = [−0.003, 0.056]). To be specific, the indirect effect of OIs with content on the sense of belonging via bridging alone was significant, and so was the indirect effect via bridging and bonding in serials. However, the indirect effect of OIs via bonding alone was not significant.

Serial mediator model analysis with OIs with humans as IV. In the analysis examining OIs with humans, all variables were kept the same with the above model, except for OIs with humans entered as the independent variable while OIs with content as the covariate.

As Table 4 and Fig. 3 display, OIs with humans were positively associated with both bridging ($B = 0.374$, $p < 0.001$) and bonding ($B = 0.392$, $p < 0.001$). Bridging was also positively associated with bonding ($B = 0.154$, $p = 0.001$). Regarding the sense of belonging, the results showed that it was positively predicted by OIs with humans ($B = 0.149$, $p = 0.001$), bridging ($B = 0.550$, $p < 0.001$), and bonding ($B = 0.392$, $p < 0.001$) as well.

Similarly, we also turned to the bootstrap confidence interval to examine the indirect effects of OIs with humans on the sense of belonging. As Table 5 displays, a 95% bias-corrected confidence interval based on 5000 bootstrap samples indicated the indirect effect of OIs with humans on sense of belonging via bridging, bonding and both in serials were significant since the BootCI of indirect 1 ($B = 0.007$, BootCI = [0.002, 0.013]), indirect 2 ($B = 0.007$, BootCI = [0.002, 0.013]), and indirect 3 ($B = 0.007$, BootCI = [0.002, 0.013]) were all entirely above zero. Table 6 provides a complete summary of the results for all the hypotheses and research questions in the current study.

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Table 3 Serial mediator model analysis with OI with content as IV.

Antecedent	Consequent					
	Bridging		Bonding		Sense of belonging	
	B	**SE**	**B**	**SE**	**B**	**SE**
Constant	2.401***	0.260	0.861**	0.322	−0.092	0.317
OIs with content	0.113***	0.032	0.066	0.037	0.051	0.037
Bridging			0.154**	0.047	0.550***	0.046
Bonding					0.392***	0.040
Covariates						
OIs with humans	0.374***	0.035	0.392***	0.044	0.149**	0.046
Gender	−0.051	0.058	−0.052	0.067	0.001	0.066
Age	−0.044	0.052	−0.026	0.060	−0.113	0.059
Education	0.038	0.049	−0.112	0.057	−0.016	0.056
Income	−0.032	0.029	0.013	0.034	0.019	0.033
R^2	0.269		0.271		0.506	
F	37.910***		32.671***		78.632***	

Note: **$p < 0.01$, ***$p < 0.001$.
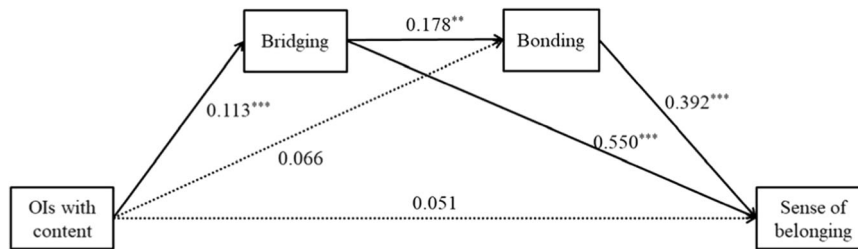
Fig. 2 Results of the serial mediator model analysis with OI with content as IV. Note: OIs with humans and four demographic variables (i.e., age, sex, income, and education level) were included as covariates.

Table 4 Serial mediator model analysis with OI with human as IV.

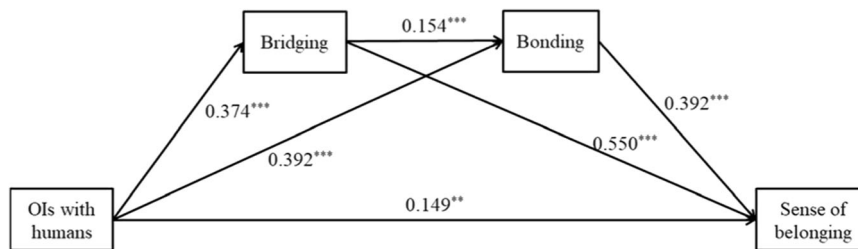| Antecedent	Consequent					
	Bridging		Bonding		Sense of belonging	
	B	**SE**	**B**	**SE**	**B**	**SE**
Constant	2.401***	0.260	0.861**	0.322	−0.092	0.317
OIs with humans	0.374***	0.035	0.392***	0.044	0.149**	0.046
Bridging			0.154**	0.047	0.550***	0.046
Bonding					0.392***	0.039
Covariates						
OIs with content	0.113***	0.032	0.066	0.037	0.051	0.037
Gender	−0.051	0.058	−0.052	0.067	0.001	0.066
Age	−0.044	0.052	−0.026	0.060	−0.113	0.059
Education	0.038	0.049	−0.112	0.057	−0.016	0.056
Income	−0.032	0.029	0.013	0.034	0.019	0.033
R^2	0.269		0.271		0.506	
F	37.910***		32.671***		78.632***	

Note: **$p < 0.01$, ***$p < 0.001$.

Discussion

Social capital is a much-studied topic in online network research. In particular, scholars have strived to understand the development and consequences of social capital on relationship-based networks (e.g., Ellison et al., 2007; Johnston et al., 2013). In this article, we argue that social capital development in another network category, interest-based ones, also needs great research attention for its ample popularity and distinctive characteristics. The existing research primarily focused on the social capital development of relationship-based SNSs, where users join primarily for interpersonal relationships. This study represents an early attempt at examining how social capital accrues on interest-based networks from the two types of common activities (i.e., OIs with content and with humans), as well as how they facilitate a sense of belonging, a critical index of online network vitality. Findings from the current study help explicate the social capital development process in interest-based networks, as well as its associated antecedents and consequences.

One major contribution of this study is an early endeavor to compare two major activities' impact on social capital on the sites:

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Fig. 3 Results of the serial mediator analysis with OI with humans as IV. Note: OIs with content and four demographic variables (i.e., age, sex, income, and education level) were included as covariates.

Table 5 Results of direct and indirect effects.								
	Model 1				**Model 2**			
	Effect	**(Boot)SE**	**(Boot) LLCI**	**(Boot) ULCI**	**Effect**	**(Boot)SE**	**(Boot) LLCI**	**(Boot) ULCI**
Direct effect	0.051	0.037	−0.021	0.123	0.149	0.046	0.058	0.239
Indirect1	0.062	0.020	0.025	0.102	0.206	0.029	0.151	0.264
Indirect2	0.026	0.015	−0.003	0.056	0.154	0.022	0.112	0.201
Indirect3	0.007	0.003	0.002	0.013	0.023	0.008	0.009	0.039

Note:
For model 1,
indirect 1: OIs with content → bridging → sense of belonging.
indirect 2: OIs with content → bonding → sense of belonging.
indirect 3: OIs with content → bridging → bonding → sense of belonging.
For model 2,
indirect 1: OIs with humans → bridging → sense of belonging.
indirect 2: OIs with humans → bonding → sense of belonging.
indirect 3: OIs with humans → bridging → bonding → sense of belonging.

Table 6 Summary of analysis results.			
The serial mediator model analysis with OIs with content as IV		**The serial mediator model analysis with OIs with humans as IV**	
H1a	Supported	H1b	Supported
H2	Supported	H2	Supported
H3a	Rejected	H3b	Supported
H3c	Supported	H3c	Supported
H3d	Supported	H3d	Supported
RQa	Non-significantly associated	RQb	Significantly associated

both OIs with content and with humans driving social capital. Nevertheless, when broken into bridging and bonding, the complicated process of social capital development from these two types of activities is unveiled. Specifically, OIs with humans directly predict both bridging and bonding, which is in line with most findings from relationship-based networks (Phua et al., 2017). By contrast, the association between OIs with content and bonding has to go through bridging, suggesting that the strong ties formed from OIs with content on interest-based networks are likely to be developed from the shallow relationships in the bridging network. This finding represents an early exploration of whether and how engagement with content, such as posting and marking content, helps one form a bridging network, with the possibility of some bridging turning into strong ties.

Secondly, our result indicates that a sequential relationship may exist between bridging and bonding. This might be explained by the nature of interest-based networks, such that most users gather on the sites for common interests and topics and, thereby do not have any prior relationship basis. Yet, bridging would develop swiftly as shared interests in movies, books, and music act as catalysts for shallow exchanges of information over a broad

network. While some of the communication goes deeper and more frequently, certain bridging may turn into bonding. This finding adds to our current theorizing of social capital by explicating the interrelationship between bridging and bonding. In prior scholarship, bridging and bonding were often conceived of as two parallel variables complementing one another by providing access to different kinds of resources (Wilken, 2011). Our study points to another possibility that bridging first develops and acts as a seedbed brewing bonding social capital. Our study points to another possibility: that bridging first develops and acts as a seedbed for brewing social capital. Although this speculation awaits further investigation via longitudinal research, we believe that this finding gains a more nuanced understanding of social capital theory by explicating the relationship between the constructs.

Our results also show that a sense of belonging on interest-based networks can be developed from both OIs with humans and with content, but through different pathways. Specifically, OIs with humans have a direct impact on the sense of belonging, whereas the impact of OIs with content has to go through bridging and bonding. It would be interesting to interpret the findings through the lens of community attachment categorization. Researchers have made a distinction of attachment in a community into two types: common identity describes the attached feelings to the community as a whole, whereas the common bond often happens towards certain fellow members (Prentice et al., 1994; Ren et al., 2007). Past research suggests that both attachment types can contribute to a sense of belonging. Nevertheless, our findings suggest that although interest-based networks often evolve around common interests, creating a shared identity is not sufficient to directly build a sense of belonging. It has to be bridged by relationship development (i.e., weak and strong ties).

The findings advanced our theoretical understanding of social capital theory in at least three ways. First, our study represents an inaugural endeavor examining the development of social capital

within interest-based SNSs. The findings indicated that individuals are capable of establishing and nurturing relationships and resources, even when their primary objective in visiting interest-based SNSs is information exchange. Additionally, we took one step further by identifying two activities on interest-based SNSs as precursors: OIs with content and with humans. This knowledge not only broadens the applicability of social capital but also deepens our understanding of its formation. Second, this study represents an early attempt to examine the potential association between bridging and bonding social capital. While earlier research suggested these two constructs are not mutually exclusive, we advance the discourse by delving into the potential relationship between them. This discovery imparts a more nuanced understanding of social capital theory by elucidating the intricate interplay between these constructs. Third, we found that bridging and bonding, which constitute the relational dimension of social capital, can foster a sense of belonging, an indicator of cognitive capital.

Our findings resulted in several clear takeaways for the design and development of interest-based networks. First, our results indicated that OIs with content on interest-based networks are equally important to OIs with humans in their contributions to the formation of a sense of belonging. Site designers may consider developing relevant features, like content recommendation algorithms, to better boost users' content contribution for social capital and sense of belonging advancement. Second, the full mediation from OIs with content to a sense of belonging via social capital suggests that merely interacting with content, such as creating or reposting, is inadequate to foster the feeling of belonging and that it has to be bridged by relationship development. In this light, we encourage the site designers to integrate algorithms for recommending friends based on shared topics and interests to accelerate relationship building.

The findings may also have social and political implications. First, our findings pointed to a possible avenue for augmenting social inclusivity and cohesion. That is, the identification of OIs with both content and humans as key factors in social capital development highlights the potential for interest-based networks to foster a sense of belonging and social inclusion. By providing arenas wherein individuals can gather around common interests, these platforms can contribute to reducing social isolation and promoting a sense of community among individuals. Second, the findings may also hold significant political implications. Recognizing the potential for bridging and bonding social capital development on interest-based networks, policymakers may encourage initiatives that leverage these platforms for civic engagement and community building. This could include supporting campaigns, events, or forums that facilitate dialogs and collaborative endeavors centered around shared interests, thereby contributing to a more connected and engaged citizenry.

Limitations. This study must be interpreted with its limitations. First, the nature of a cross-sectional survey restrains any causal relationship establishment. Therefore, the findings can only be considered suggestive of the causal inferences between the variables. Future research would benefit from conducting longitudinal research, particularly to elucidate the relationship between bridging and bonding. Second, self-report measures may yield the potential problem of subjectivity and inaccuracy. More objective measures, such as the footprint of one's interaction and network information, could be integrated into future research to ensure. Third, the findings are based on one online network specifically focused on cultural work. More replications are needed to test the model across other online network contexts, such as sites designed for travel, education, and so on. Fourth, we obtained an exploratory understanding of social capital

advancement from interest-based network activities by forming two broad categories. As the various activities are identified in existing literature, future studies can gain more explicating knowledge by examining the roles played by specific activities, such as commenting, sharing, etc.

Conclusion
In conclusion, along with the increasing specialization of online networks (Khajeheian, 2013), people constantly seek and join various interest-based networks to meet their needs for information exchange and sharing. We found that on the interest-based sites bridging and bonding social capital sequentially develops from OIs with content and with humans, all of which contribute to the formation of the sense of belonging to the site. The current study advances our understanding of social capital on interest-based networks by examining its antecedents, processes, and consequences.

Note
1 Rating, marking, and reviewing are activities exclusively involving content. For instance, rating entails the grading behavior of a given work and thus does not involve any interactions with humans.

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Author contributions

MC: conceptualization, methodology, writing—reviewing and editing. WL: conceptualization, methodology, data analysis, investigation, writing—reviewing and editing, funding acquisition.

Competing interests

The authors declare no competing interests.

Ethical approval

Informed consent

Informed consent was obtained from all study participants prior to participation. Respondents' participation in this study was voluntary.

Additional information

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