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The Role of the Sense of Community in the Sustainability of Social Network Sites

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ABSTRACT: The evolution of information technologies enables new forms of communication and facilitates the emergence of different types of virtual communities, such as social networks. While some social network services have succeeded, others have failed. Understanding the factors that affect the sustainability of social network sites is important for both research and practice. We draw on the sense of community theory to develop a nomological framework of antecedents and consequences associated with sense of community in social network sites. We evaluate the framework with a survey of 506 Facebook users. We find that sense of community has a strong effect on information consumption and contribution, as well as exit intentions among social network site users, thus highlighting the important role of sense of community in the sustainability of social network sites. We also find that both system-related (sense of place associated with the social networking site) and social (social interaction) factors contribute to the development of sense of community. The nomological framework developed in the current study provides a theoretical foundation that could be adapted to study other factors that influence the development of sense of community across different virtual community contexts.

KEY WORDS AND PHRASES: Online communities, psychological ownership, sense of community, sense of place, social identity, social network sites, sustainability of social networks.

The evolution of information technologies has enabled new forms of communication and has facilitated the emergence of virtual communities, which have been the subject of active research in information systems [3, 50, 53]. The Internet has seen waves of different types of virtual communities emerge atop evolving technical infrastructure—newsgroups, blogs, knowledge repositories, question-and-answer forums, and social networks have all been described as virtual communities [17, 74, 78]. Information shared by virtual community members serves as the key asset that sustains member engagement and draws new members [15]. Consequently, the early research on virtual communities focused on understanding individual cognitive motives for information sharing within the communities [42, 53, 78, 91]. The more recent studies on virtual communities have begun to explore the affective ties that affect the sustainability of user engagement in virtual communities [40].

History offers many examples of social network site failures. For example, Friendster and MySpace were the early leaders that lost users to Facebook [88]. Even Facebook, although growing globally, is reportedly losing the younger users to other services, for example, Instagram and SnapChat [57]. Understanding the psychological factors that underpin sustained user

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participation in virtual communities is essential for the success of technology providers enabling the virtual communities as well as for the members of virtual communities. The disappearance of a virtual community means the potential loss of social connections and resources embedded in the virtual community. Research on traditional offline communities has emphasized the focal role of the psychological sense of community among the community members as affecting community viability, yet there has been relatively little work on the role of sense of community in virtual communities. We address this gap in research by examining the effects of the users' sense of community on information sharing and intention to exit a virtual community, in the context of social network sites. We also evaluate the effects of users' sense of place associated with the social network site, psychological ownership of information shared on the site, and social interactions on the users' sense of community.

A rich stream of research in sociology has established the psychological sense of community experienced by individual community members as the key differentiator between traditional offline *communities* and mere *settlements* where people coinhabit a geographic area but lack a sense of community [58, 59]. Sense of community has been shown to be a strong predictor of community engagement and intention to remain a member of the community across different offline community contexts. Integrating decades of research on traditional offline communities, McMillan and Chavis provided a multidimensional conceptualization of psychological sense of community and proposed that it encompasses membership, fulfillment of needs, emotional attachment and influence among community members [58]. Subsequent research on offline communities has shown that both location and social factors influence the development of psychological sense of community [73, 79]. In this study we integrate existing research on offline and online communities and construct a nomological framework that includes the antecedents of the sense of community in social network sites as well as its consequences, specifically those pertaining to the sustainability of such sites.

Virtual communities, such as those established in social network sites, are built on information sharing and user engagement. This is especially important in social network sites, whose viability depends on continuous member participation. In offline communities, sense of community has been shown to increase community member engagement. For example, sense of community increases involvement in civic organizations [11] and political participation [22]. In our study, we examine the effects of sense of community on users' intentions to engage in information consumption and information contribution in social network sites. We also look at its impact on users' intention to exit the relationship with the site. This is an important set of questions that address issues of viability and sustainability for social network sites and other virtual communities.

Virtual communities, such as those enabled by social network sites, differ in important ways from traditional offline communities. For example, their members need not be located in the same geographical areas. They also do not share communal physical objects, such as land, houses, or furniture. Such differences raise questions about whether a sense of community can truly exist in virtual communities or if the evolving technology has transformed the traditional communities into networks of individuals [92, 93]. A qualitative study of adolescents

suggested that individualism dominates social network site use among this demographic [75].

Research on offline communities has been done primarily on geographically based communities and it has revealed that sense of community often emerges through association with specific geographic locales [72, 73], from a sense of attachment to a specific location, and through social interaction with members of the community. Sense of community is positively affected by investment (ownership of property) which is often required to become a member of the community [59]. It is further strengthened through adoption of community norms and practices reflecting social identification with the community [63]. In order to see whether such factors are also important in the virtual context, we examine the role of place attachment, perceived ownership, and social interaction in the development of sense of community in social network sites.

Hypotheses Development

Virtual Communities

A virtual community is commonly defined as "a group of people who communicate and interact, develop relationships, and collectively and individually seek to attain some goals in an IT-supported virtual space" [53, p. 42]. Virtual communities have been the subject of active research in information systems. Prior studies highlighted the potential of virtual communities to provide support in crisis situations [71], help medical patients find instrumental and emotional support [49], and offer companies a source of novel ideas supporting new product design [33]. While the earlier research focused on exploring the motivations underlying virtual community participation [53, 78, 91], the more recent studies shifted to exploring attitudinal factors that predict sustained community engagement. Bateman, Gray, and Butler [3] examined the role of commitment attitudes in promoting information consumption and information contribution in a professional question-and-answer forum and found that while individual utility reflected in continuance commitment was positively related to information consumption, affective commitment was positively related to information contribution and normative commitment, which reflects subjective norms, was positively related to moderating behaviors.

Several studies have previously explored sense of community in virtual community contexts. Interviews with newsgroup participants suggested that while newsgroup members felt a sense of membership, fulfillment of needs, and emotional attachment to the communities, they lacked a sense of influence [6]. A study of virtual communities in Korea explored the relationships between offline activities as well as enjoyment experienced by community members as factors that may influence sense of community among virtual community members [45]. However, the study included only two dimensions of sense of community developed by McMillan and added a new dimension of immersion, thus complicating the interpretation of its findings. Building on the observation that sense of community in a virtual community

may differ from sense of community felt by traditional community members, Blanchard proposed a new measure for the sense of virtual community [8]. However, the development of the instrument did not include a complete validation according to recommended guidelines [54] and subsequent studies revealed the limitations of the proposed instrument [9]. The issue of appropriate measurement of the sense of virtual community has also posed a challenge in offline community research [62]. A properly validated instrument was only relatively recently developed [66].

Sense of Community in Social Network Sites and Its Antecedents

Social network sites (SNS) represent a remarkable sociotechnical phenomenon. Facebook, the largest social network site, counts over 1.4 billion active users worldwide and an average user spends more than twenty minutes on the service per day [30]. The prevalent definition of social network sites in research focuses on the functionality offered by SNS services. A social network site is characterized by allowing users to (1) establish a profile, (2) connect with others, and (3) traverse the list of other users [12]. Many social network services, including Facebook, evolved to support a broader range of functions that include individual and group messaging, interest group forums, and company-sponsored pages among other features, yet little is known about how any of these technical affordances may affect the development of a sense of community. Facebook is also a unique case of a virtual community in that many Facebook connections originate offline [83] and Facebook users regularly interact with many of their connections offline [27].

To understand how a sense of community may evolve among Facebook users we draw on research in offline communities and adapt it for the social network site context. In addition, we define the referent community for the sense of community as the entire set of first-degree connections in a social network site. In the case of Facebook, these are a user's Facebook friends (but not friends of friends or any other Facebook users). We do not differentiate within a user's first-degree connections, such as those a user communicates with more often than with others or those a user interacts with offline and those with whom a user does not. In this way, we acknowledge that users will not realistically feel a sense of community with all the members of a social network site (e.g., over 1.4 billion users on Facebook). At the same time, we are able to examine whether a user's entire group of online first-degree connections is in fact sufficient to create a sense of community for the user.

The research on factors that contribute to the development of traditional offline communities emerged after the 1950s, when growing urbanization of many industrial societies undermined the sense of community typically associated with small towns and close neighborhoods. Seymour Sarason [86] provided a key contribution in this stream of research, arguing that the psychological sense of community was essential to understanding societal problems. Sarason saw the lack of the sense of community as the leading cause of many societal problems stemming from alienation and individualism. His work laid the foundation for the

research that followed. McMillan and Chavis [58] took the next step in developing a theoretical foundation underpinning the psychological sense of community. They defined psychological sense of community as "a feeling that the members of a community have in relation to their belonging to a community, a feeling that members worry about each other and that the group is concerned about them, and a shared faith that the needs of the members will be satisfied through their commitment to being together" [58, p. 9]. They also proposed a framework emphasizing the multidimensional nature of sense of community, which encompasses four dimensions: membership, influence, fulfillment of needs, and shared emotional connection. Membership in a community defines who is a part of the community and who is not. Influence reflects a need to have a voice in what goes on in a community. The instrumental and symbolic benefits obtained through participation in a community contribute to the fulfillment of individual needs and make sense of community more vital in the mind of a person. The community is also often a source of emotional support. The shared emotional connection among the community members is reflected in the experience leading to the formation of sense of community.

The research on offline communities suggested that communities can develop in one of two ways. First, geographically rooted communities typically arise from shared experiences of living in a given geographic area, which can be a neighborhood, a town, or a larger geographic region [55]. Second, communities can also arise from shared interests, such as communities of sports fans [90]. While interest-based communities may not have a specific geographic area that they coinhabit, engagement in a community nonetheless requires that there be a place where the community members can interact. Without a location for social interaction there would be no community. Sports stadiums become the rallying points where sports fans converge [90]. The locations where members of a community meet become important artifacts that enable shared experiences and bonding among the community members. Therefore, even for interest-based communities, the places where the community members socialize play an important role in the development of communities.

In a parallel line of research, environmental psychologists have discovered that people frequently develop attachments to physical locations that they inhabit [76]. *Sense of place* has evolved in environmental psychology as the focal construct that captures individual identification and needs fulfillment associated with a physical location. Importantly, sense of place helps to understand how people feel about and act in relation to physical locations that are important to them. For example, a study of Michigan residents living around a lake has revealed a strong sense of place among the residents reflected in attachment to their homes and the lake [41]. The importance of the geographic locale to the individual residents was reflected in a strong reaction to proposed changes in the lake environment suggested by a local municipality. Sense of place, which develops as a consequence of spending significant time in a given location, leads to protective territorial behaviors and resistance to any changes.

The evolution of telecommunication technologies has expanded the range of communication options available, enabling social interactions that do not require people to meet in person. While the early virtual communities exemplified by

newsgroups were focused around information sharing and less around the user interface and design elements that facilitated interaction with other users, modern virtual communities, for example, social network sites such as Facebook, put far more emphasis on the user experience and provide a much more structured and engaging user experience. Facebook users can construct online profiles, establish connections with other users, and share messages, links, photo albums, and videos. The social networking site becomes the place where users get together and exchange information. Prior research has shown that users often treat information systems similarly to the way they treat physical locations and form attachments to them [36], so we believe that the same would apply to social network sites. Facebook and other social network users also invest considerable effort in developing their online presence. Research has found that the totality of information shared by users on Facebook reflects their real identities [2]. As we discussed above, such identification with a location is a central component of sense of place. Given that research in offline communities has shown that sense of place is strongly predictive of the psychological sense of community [56], we expect that sense of place associated with the social network site will be positively related to sense of community (as defined previously) felt by its users.

> ***Hypothesis 1:*** *Sense of place associated with the social network site is positively related to sense of community.*

In developing the sense of community theory, McMillan and Davis [58] emphasized the role of investment by individual community members on the strength of their sense of community. In traditional offline communities, investments are most directly reflected in property ownership. Property ownership promotes caring for the property and it offers a common objective that unites property owners in a specific community. In the context of social network sites, community members are engaged in the construction of the environment in which the community members interact. Members of social network sites create individual profiles and share information—text, pictures, videos—which become the focal points for social interaction. Though the social networking site users in essence construct the virtual environment, they are generally limited in their ability to establish legal ownership of the information artifacts that are created through information exchanges among the community members. Contributors to virtual communities commonly relinquish legal rights to shared information through the act of sharing it. In the context of Facebook, the terms of service give the company "a non-exclusive, transferable, sub-licensable, royalty-free, worldwide license to use any intellectual property content" which users post on the site [29]. However, this does not mean that information contributors lose the *psychological* sense of ownership felt toward contributed information [68].

Psychological ownership is defined as a cognitive-affective state in which individuals feel as though the target of ownership is theirs. Psychological ownership may exist in the absence of legal ownership. For example, in the organizational context employees may feel that they "own" their workplace while having no legal ownership [26]. The objects of psychological ownership can be both tangible and intangible—children may claim ownership of

nursery rhymes ("that is my song") and employees frequently claim ownership of ideas [67]. In the organizational context, employees claim ownership of their workplace in part by decorating it with personal artifacts [67]. Similar behaviors are evident among social network site users. Social network site users construct online profiles and claim ownership of the virtual space by decorating it with personal messages, images, and videos. Prior research on offline communities has shown that ownership promotes a sense of community [13, 23]. We expect that psychological ownership felt by social networking site users in relation to the information that they share will be positively related to their sense of community.

> ***Hypothesis 2:*** *Psychological ownership of information shared on social network sites is positively related to sense of community.*

Social network sites have evolved to enable individual users to connect and communicate with each other. Research reveals that information sharing is the primary activity that occurs on these sites [21]. Facebook alone reports that users share over 1.7 billion messages per day [43]. We believe that these social interactions of information sharing will increase the users' sense of community. There is strong evidence in prior research that social interactions among community members are central to the process underlying the development of psychological sense of community [79]. In offline communities, members interact regularly with each other, exchange information, seek advice, and provide emotional support. This process also occurs in virtual communities. A longitudinal investigation of interactions among members of a newsgroup revealed that the exchange of information among the community members helped build a sense of community among the participants [7]. A recent experimental study of a movie review site has shown that features enabling communication among the system users had a positive impact on the sense of attachment to the community [77].

The information-sharing-based social interactions on social network sites has also been explained through the lens of social exchange theory, which states that individual behavior can be based on their expectations of costs and benefits from exchanging their resources with others [10]. The benefits can be intangible, such as the expectation of reciprocity by others or an improved reputation in their community. For example, prior research in virtual communities has shown that users may increase their participation as a result of the expectation of reciprocity by other members [91] or their enhanced sense of competence [4]. The heightened participation of virtual community users has also been shown to have a positive relationship with their sense of attachment to the community [53].

Therefore, we expect that social interactions will play a similar role in social network sites in that the frequency of social interactions of their users will contribute to the development of their sense of community.

> ***Hypothesis 3:*** *Social interactions among social network site users is positively related to sense of community.*

Impact of Sense of Community on Social Network Site Sustainability

Sense of community plays an important role in motivating user behaviors that are critical for community sustainability. Higher sense of community has been shown to be associated with greater community engagement in traditional offline communities. It has also been shown to be positively related to civic engagement reflected in participation in political groups addressing community concerns and improving the quality of life for all community members [55]. The positive effects of sense of community on community engagement have also been demonstrated in the context of computer-mediated learning. Higher sense of community in virtual classrooms encourages helping behaviors among the students and leads to improved learning outcomes [84] and lower dropout rates [51].

In examining the behavioral responses associated with sense of community, we focus on the behaviors that are critical to the sustainability of social network sites. Information consumption, information contribution, and sustained participation are key user behaviors that can affect the long-term viability of all virtual communities [3]. As we discussed above, sense of community promotes engagement in offline communities and computer-mediated learning environments. Higher sense of community is associated with a higher degree of interest and involvement in what is going on in the community by its members [1]. We believe that the same will apply in social network sites. Prior research has already shown that, social network site users commonly rely on social network sites for updates on what is going on among their friends [20]. We expect that higher sense of community among social network site users will increase this behavior of information consumption, reflecting an active search of information related to the community.

> ***Hypothesis 4:*** *Sense of community among social networking site users is positively related to information consumption.*

Social network sites are built around information sharing. Information sharing by individual members is critical for creating information resources that have value for all community members. The information shared by individual community members may be related to personal news, but it can also be of a nonpersonal nature. Social network site users often share funny and inspirational quotes, pictures, and videos. Research on offline communities reveals that members of communities characterized by a heightened sense of community are more willing to help each other by offering instrumental and emotional support [58]. The same research suggests that members of communities who experience greater sense of community may go even farther and be willing to make individual sacrifices for the benefit of the community as a whole. For example, a study of sense of community in the workplace found a positive relationship between sense of community in the workplace and organizational citizenship behaviors [44]. Studies in virtual communities echo the findings from offline communities. Sense of community promotes information contribution in virtual classroom discussions [24]. It is also positively associated with contributions to open-source

software projects [46]. A study of factors that affect information sharing in a consumer product review repository has also found a positive association between sense of belonging, one of the dimensions of sense of community, and review contributions [18]. Similarly, we expect that a greater degree of sense of community on a social network site will be positively related to information contribution by its users—the frequency of contributions of different types of information: comments, likes, pictures, and status updates.

> ***Hypothesis 5:*** *Sense of community among social networking site users is positively related to information contribution.*

Information sharing can play a critical role in the sustainability of virtual communities. Social network sites are unique in that self-disclosure is the principle activity that enables the users to maintain and build relationships [21]. Self-disclosure is the process of disclosing private information aimed at building trust and relationships. Such disclosure of private information makes the disclosing party vulnerable to the recipient. Continued engagement in a social exchange depends on reciprocity [37]. Repeated acts of reciprocal personal information disclosure help build trust and create a source of social capital and emotional support. Consequently, self-disclosure is a critical aspect of information sharing in the context of social network sites. It is important to note that while self-disclosure necessitates information sharing, not all information sharing involves self-disclosure. Social networking site users often share nonpersonal content, such as funny or inspirational sayings, pictures, and videos, without disclosing any personal information. McMillan [59] argued that sense of community encompasses the feeling of belonging that implies acceptance by a group. He also emphasized that sense of community provides the perception of safety that promotes self-disclosure and intimacy. In offline communities, a sense of community promotes disclosure of personal news among the community members [16]. In the context of social network sites we expect that sense of community will promote a greater degree of self-disclosure among the users.

> ***Hypothesis 6:*** *Sense of community among social network site users is positively related to self-disclosure.*

A higher sense of community reflects community members' perceptions that the virtual community helps to fulfill their needs. Virtual communities can be a source of social capital and provide instrumental and emotional support [49]. An exit from the community would mean the loss of benefits gained through participation in the community. Users commonly rely on social network sites to stay informed about their connections, maintain affective ties with others, and also to coordinate their activities [97]. Disengagement from the social network site would mean the loss of all these benefits. A greater sense of community in the offline context is associated with the intention to remain a member of the community [52]. This effect has also been demonstrated in the context of virtual learning. Sense of community has been found to be positively associated with lower dropout

rates among students engaged in virtual classrooms [85]. A higher sense of community also reflects a great degree of emotional bonding for individual community members. In addition to the practical benefits provided by the community, departure from the community can also have an emotional impact. Consequently, we expect to find a negative relationship between sense of community and intentions to exit in the context of a social networking site as well.

> ***Hypothesis 7:*** *Sense of community among social networking site users is negatively related to intention to exit.*

The research model and nomological network shown in Figure 1 summarizes the hypotheses in the current study. Sense of community is the focal construct. It captures the key individual attitude that describes how people feel about the referent community, which in our case is the user's group of first-degree connections on the social network site. In the context of Facebook, this corresponds to a user's group of Facebook friends. We examine the effects of social interaction and attitudes related to the social network site (sense of place, psychological ownership) on users' sense of community. We also examine the effect of sense of community on the individual behavioral intentions (information consumption, information contribution, self-disclosure, and intention to exit) that are critical to the sustainability of the social network sites. In addition to the core constructs in our research model, we control for the number of connections (Facebook friends), the percentage of those connections with whom users interact frequently (at least once per week), which we call *connection density*, and the product of these two

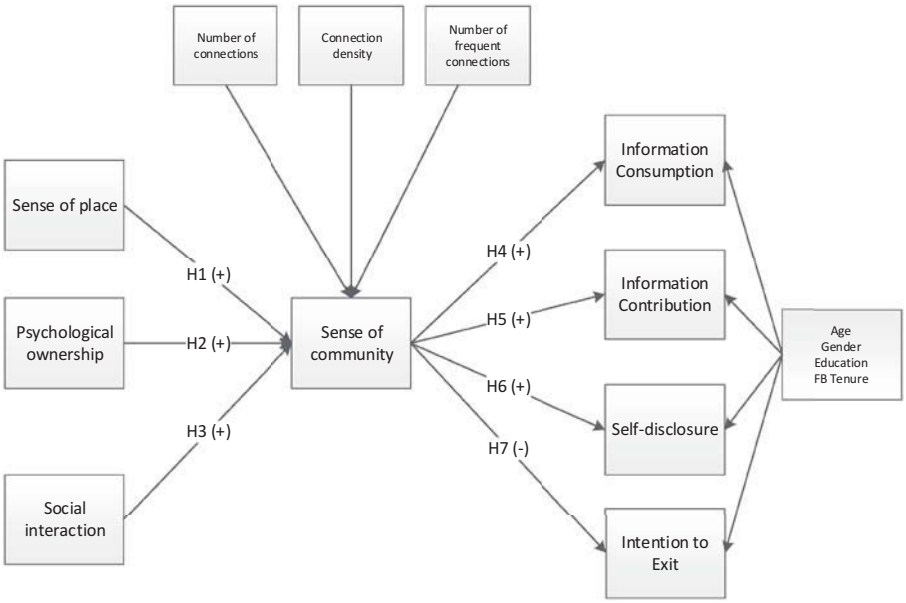


Figure 1. Research Model

variables, which provides us with an estimate of the actual number of connections with whom users interact frequently (at least once per week), which we call *number of frequent connections*. Finally, we include age, gender, education, and site tenure as covariates of the behavioral intentions, in order to control for their potential effects.

Methodology

Practical relevance has been highlighted as an important consideration in information systems research [82]. For this reason we chose to evaluate the theoretical framework in the context of Facebook, the largest social networking site. We employ a cross-sectional survey to examine the hypothesized relationships among the theoretical constructs. Survey-based research, a dominant methodology in information systems research [64, 69], allows theoretical models to be evaluated in a relevant context.

Measurement

The survey instrument has been developed for the present study based on previously published scales. Our measure for *sense of community* is based on the brief sense of community scale [66]. The reference community is defined as a user's entire group of Facebook friends. It is worth noting that a measure for *sense of virtual community* (SoVC) has been proposed in prior research [8]. However, we have chosen not to use it because we feel that the development of the measure lacked sufficient validity testing, at least according to commonly accepted guidelines for instrument development [54]. In addition, the measure for SoVC is based on the sense of community index (SCI) which has also been shown to lack validity [61, 62]. Instead, we have opted to adapt the brief sense of community scale, which was developed specifically to address concerns related to SCI. The measure was developed following the recommended guidelines and validated across different contexts [66, 96]. It includes the four dimensions associated with sense of community as outlined by McMillan [58].

The measure for s*ense of place* is adapted from [41]. The measure for *psychological ownership* is based on the work of Lee and Chen [48]. Survey responders are asked to indicate perceived ownership of different types of information typically shared on Facebook—status updates, comments, likes, and pictures. Responses for the *sense of community*, *sense of place*, and *psychological ownership* scales are measured on seven-point Likert scales anchored in 1—strongly disagree and 7—strongly agree. *Social interaction*, *information consumption*, and *information contribution* are measured using frequency scales anchored in 1—never and 7—daily. The full survey instrument is provided in the Appendix. Age, gender, education, number of Facebook friends, percentage of Facebook friends with whom users interacted frequently, and the length of tenure on the social network were collected and used as covariates in the evaluation of the research model.

Participants and Data Collection

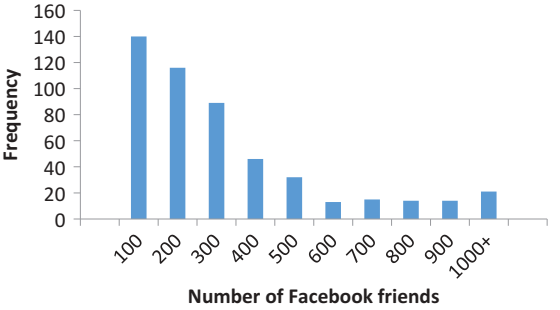
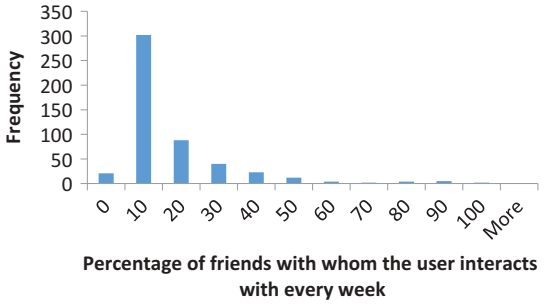
Study participants were recruited through Amazon's Mechanical Turk. Mechanical Turk (MT) is an online labor market that is organized around micro tasks called human intelligence units (HITs). Participant recruitment through Mechanical Turk offers the benefits of higher internal and external validity compared to student samples commonly used in research [87]. The internal validity of an MT sample stems from a lower risk of the researcher interference—HITs are completed anonymous online and Amazon serves as a financial broker for compensation [65]. The greater external validity stems from a more diverse subject pool available through MT compared to student population pools. The MT subject pool demographics are continually evolving and include subjects from many countries. However, only subjects based in the United States were recruited for participation in the current research in order to avoid possible country-specific effects that could affect our results. The demographics of MT workers located in the United States have been shown to be similar to the U.S. Census data, though the participants' distribution of incomes has a lower mean compared to the overall U.S. population [14]. The cognitive performance of Mechanical Turk subjects has been evaluated against the performance of university subject pools and a panel that was recruited online has been found to be similarly affected by common cognitive biases [65] and ti score similarly on a battery of psychographic measures to subjects from other research pools [14], thus providing no evidence that self-selection bias that may be present in the MT pool has an effect on common psychographic measures.

Participants recruited through Mechanical Turk were provided with a link to the survey. Following Down, Holbrooks, and Sheng [25], at the end of the survey a unique code is provided to each participant who successfully completes the survey. The code is used to track survey submissions and assign credit for participation through the Mechanical Turk tracking system. A total of 514 participants were recruited to take the survey. We relied on several trap questions to make sure that the participants followed our instructions. Eight respondents did not complete the survey as instructed, which led to 506 usable responses. The average age of the participants was 30.8 ± 9.4. The participants were 62.6 percent male. Importantly, more than 76 percent of the study participants were Facebook members for more than four years and another 16 percent were Facebook members for at least two years. The extended tenure on Facebook is important in allowing the members to develop sense of community with their connections over time. Additional descriptive statistics of the participant sample are provided in Table 1.

Results

The proposed theoretical model includes eight core constructs and seven covariates (age, gender, education, social networking site tenure, number of connections, connection density, and number of frequent connections). Because of model complexity we employed the component-based partial

Table 1. Study Participants: Descriptive Statistics

Variables	Descriptive Statistics
Age	Mean: 30.8, SD = 9.4, Min. = 18, Max. = 79
Gender	Male: 62.6%, Female: 37.4%
Education	High school diploma: 7.9% Some college: 40.9% Bachelor degree: 38.9% Advanced degree: 10.9%
Facebook tenure	Less than 1 year: 2% 1-2 years: 5.1% 2-4 years: 16% More than 4 years: 76.7%
Number of Facebook friends	
Percentage of Facebook friends with whom the user interacts every week	

least squares modeling method and we used the SmartPLS software package to evaluate our research model [35, 81].

Measurement Model

We evaluated convergent validity, discriminant validity, and construct reliability of the measurement instrument. Convergent validity was assessed by item cross-loadings [31]. The results are shown in Table 2. Individual survey items have loading factors above 0.7 on the respective constructs; the loadings on the respective constructs exceed loadings on other constructs in the model, indicating good convergent validity. Construct reliability was checked using composite reliability and Cronbach's alpha. The data are

Table 2. PLS Loadings and Cross-Loadings.

	1	2	3	4	5	6	7	8
SoP1	0.908	0.236	0.373	0.517	0.383	0.499	0.548	–0.366
SoP2	0.822	0.184	0.339	0.496	0.422	0.487	0.467	–0.339
SoP3	0.902	0.240	0.373	0.565	0.357	0.475	0.554	–0.345
SoP4	0.899	0.215	0.382	0.511	0.362	0.476	0.527	–0.319
PsyOwn1	0.233	0.928	0.166	0.214	0.197	0.237	0.241	–0.131
PsyOwn2	0.224	0.932	0.173	0.216	0.231	0.253	0.178	–0.175
PsyOwn3	0.232	0.910	0.163	0.211	0.237	0.239	0.192	–0.177
PsyOwn4	0.234	0.944	0.177	0.230	0.228	0.254	0.227	–0.138
SocInt1	0.366	0.124	0.853	0.470	0.271	0.409	0.433	–0.103
SocInt2	0.301	0.188	0.742	0.411	0.388	0.422	0.329	–0.185
SocInt3	0.347	0.141	0.850	0.442	0.231	0.332	0.353	–0.103
SOC1	0.419	0.130	0.464	0.816	0.233	0.286	0.404	–0.234
SOC2	0.490	0.200	0.482	0.809	0.287	0.377	0.486	–0.288
SOC3	0.594	0.241	0.381	0.799	0.409	0.429	0.452	–0.407
SOC4	0.482	0.192	0.461	0.842	0.451	0.479	0.402	–0.313
SOC5	0.424	0.177	0.433	0.826	0.372	0.439	0.401	–0.333
SOC6	0.457	0.189	0.425	0.781	0.228	0.298	0.464	–0.194
InfoCons1	0.322	0.179	0.270	0.342	0.897	0.604	0.181	–0.302
InfoCons2	0.436	0.209	0.310	0.376	0.797	0.606	0.253	–0.277
InfoCons3	0.331	0.212	0.278	0.345	0.921	0.629	0.173	–0.295
InfoCons4	0.310	0.225	0.315	0.327	0.895	0.643	0.204	–0.278
InfoCons5	0.458	0.209	0.378	0.401	0.789	0.601	0.251	–0.273
InfoCont1	0.479	0.220	0.435	0.457	0.697	0.912	0.393	–0.293
InfoCont2	0.423	0.243	0.380	0.424	0.772	0.863	0.286	–0.282
InfoCont3	0.504	0.255	0.413	0.378	0.511	0.848	0.439	–0.202
InfoCont4	0.519	0.210	0.433	0.423	0.508	0.878	0.510	–0.223
SelfDis1	0.473	0.169	0.370	0.463	0.260	0.470	0.787	–0.181
SelfDis2	0.527	0.145	0.402	0.425	0.166	0.320	0.853	–0.066
SelfDis3	0.496	0.214	0.407	0.492	0.239	0.431	0.874	–0.204
SelfDis4	0.466	0.204	0.367	0.451	0.184	0.352	0.796	–0.151
SelfDis5	0.508	0.207	0.346	0.378	0.160	0.327	0.839	–0.072
Exit_1	–0.387	–0.161	–0.156	–0.363	–0.305	–0.268	–0.169	0.984
Exit_2	–0.376	–0.167	–0.153	–0.365	–0.347	–0.299	–0.157	0.984

Notes: 1–sense of place, 2–psychological ownership, 3–social interaction, 4–sense of community, 5–information consumption, 6–information contribution, 7–self-disclosure, 8–exit intention.

provided in Table 3. All values of composite reliability and Cronbach's alpha were above the generally accepted threshold of 0.7 [31], indicating appropriate internal consistency. Discriminant validity was assessed by comparing interconstruct correlations with the square root of the average variance extracted (AVE) for each construct. The average variance extracted is above 0.7 in all cases and the square root of AVE is greater than the correlation coefficients among the constructs, thus indicating appropriate discriminant validity. The results are shown in Table 3.

Table 3. Descriptive Statistics, Measurement Reliability, Construct Correlations, and Square Root of AVEs.

	M	SD	CR	CA	1	2	3	4	5	6	7	8
1. Sense of place	2.62	1.48	0.93	0.91	0.88							
2. Psychological ownership	4.53	1.81	0.97	0.96	0.25	0.92						
3. Social interaction	2.99	1.30	0.86	0.75	0.42	0.18	0.82					
4. Sense of community	3.82	1.26	0.92	0.90	0.59	0.23	0.54	0.81				
5. Information consumption	5.36	1.52	0.93	0.91	0.43	0.22	0.36	0.42	0.86			
6. Information contribution	4.03	1.58	0.93	0.90	0.55	0.26	0.47	0.48	0.72	0.88		
7. Self-disclosure	2.45	1.26	0.92	0.89	0.59	0.23	0.46	0.54	0.25	0.46	0.83	
8. Exit	3.87	1.96	0.98	0.97	-0.39	-0.17	-0.16	-0.37	-0.33	-0.29	-0.17	0.98

Notes: M–mean, SD–standard deviation, CR–composite reliability, CA–Cronbach's alpha.

Common Method Variance Analysis

To examine the potential impact of common method bias in our study we followed the procedure suggested by Podsakoff and Organ [70]. We added a control predictor variable to the PLS model, which was indicated by the items that loaded on the first factor in our principal component analysis. This control factor is assumed to approximate common method variance [70]. The control factor did not produce a significant change in variance explained in any of the dependent variables, providing evidence that common method bias does not present a significant problem in the current study.

Structural Model

The hypotheses were assessed by examining the parameters by PLS structural modeling. R^2 values of the dependent variables reflect the predictive value of the model and standardized path coefficients indicate strength of the relationship between the independent and dependent variables [19]. We used a bootstrapping resampling procedure to estimate the significance of paths in the structural model.

Sense of place ($\beta = 0.44$, $p < 0.001$) and social interaction ($\beta = 0.29$, $p < 0.001$) are positively related to the sense of community, providing support for H1 and H3. The two factors explain 49.3 percent of variance in sense of community among social networking site users. These relationships are significant after controlling for the number of connections, the connection density, and the number of frequent connections on Facebook. The connection density, that is, the percentage of Facebook friends that the user interacts with frequently, is significantly positively related to sense of community ($\beta = 0.12$, $p < 0.01$). The number of connections and number of frequent

connections are not significantly related to sense of community. Psychological ownership of information shared on Facebook is not significantly related to sense of community.

Sense of community is positively related to information consumption (β = 0.39, $p < 0.001$), information contribution (β = 0.49, $p < 0.001$), and self-disclosure (β = 0.59, $p < 0.001$). Sense of community is negatively related to exit intentions (β = –0.35, $p < 0.001$). Sense of community predicts 24 percent of variance information consumption, 30 percent of variance in information contribution, 31 percent of variance in self-disclosure, and 17 percent of variance in exit intention. These results provide support for H4, H5, H6, and H7.

Examination of demographic covariates revealed that age was negatively correlated to self-disclosure (β = –0.13, $p < 0.01$) and exit intention (β = –0.14, $p < 0.01$), gender had a positive relationship to information consumption (β = 0.13, $p < 0.01$), and information consumption (β = 0.22, $p < 0.01$), and Facebook tenure had a positive relationship to information contribution (β = 0.10, $p < 0.05$) and consumption (β = 0.20, $p < 0.01$) and a negative relationship to exit intentions (β = –0.13, $p < 0.01$). The findings are summarized in Figure 2.

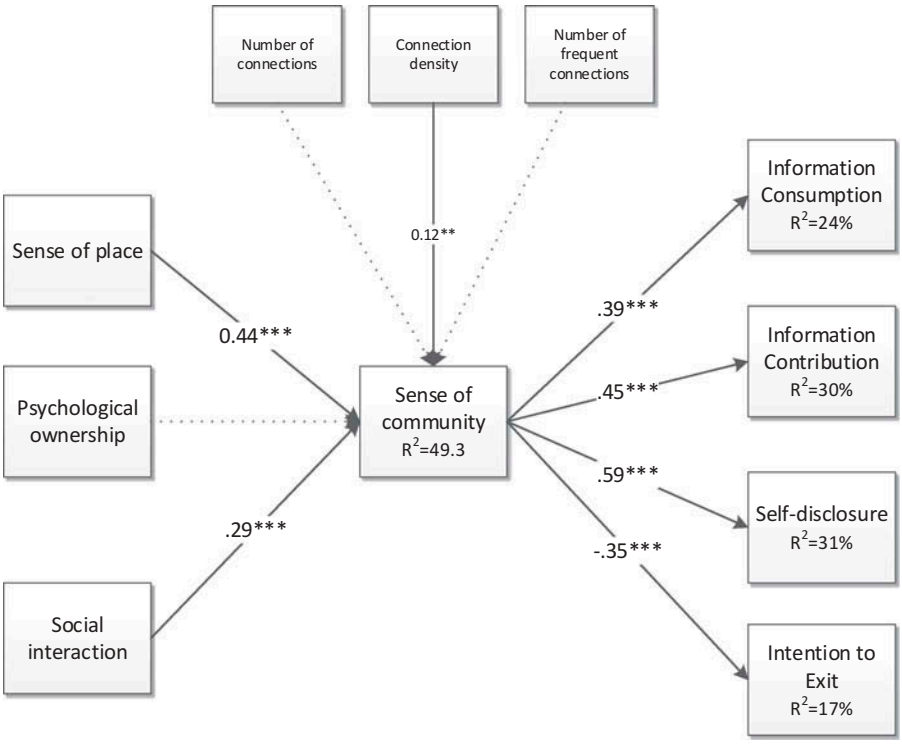


Figure 2. Structural Model Path Coefficients

**Significant at $p < 0.01$; ***significant at $p < 0.001$.

Discussion

In our study, we proposed that sense of community is a central factor that affects the sustainability of social network sites. In order to test this assertion, we developed and tested a nomological network that includes both the consequences of sense of community, that is, the user behaviors that can determine the survival of a social network site, and its antecedents. The framework is grounded in the sense of community theory, which emphasizes sense of community as the focal construct for community research. We evaluated the framework in the context of Facebook and the results largely support our theoretical model.

Our findings support the motivational role of sense of community on the key user behaviors that are critical for the sustainability of social network sites. Sense of community is positively and significantly related to information consumption, information contribution, and self-disclosure. In addition, it predicts a high degree of variance in the three variables, with R^2 values of 24 percent for information consumption, 30 percent for information contribution, and 31 percent for self-disclosure. Sense of community also has a negative relationship to intention to exit with an R^2 value of 17 percent. In summary, we find that sense of community is a key attitude that predicts user behaviors in social network sites that directly affect their sustainability.

In terms of the antecedents of sense of community, we found that sense of place associated with the social networking site and social interactions with other members contribute to the development of sense of community among social networking site users. Examining the contribution of each factor to the development of sense of community we find that sense of place has the larger effect size (f^2= 0.23), while social interaction has the smaller effect size (f^2= 0.09). These findings are not surprising because construction of the online profile defined by the activity stream shared through the service is the principal activity on Facebook. Perhaps like nowhere else, the user profile on Facebook becomes intricately intertwined with the user identity. The online profiles collectively become the place where interactions occur. Identification with a location is the core attitudinal component of sense of place. Through sharing personal information on a social network, users develop strong emotional bonds with the system that facilitates their virtual identity construction.

We did not find support for the hypothesized effect of psychological ownership of information on sense of community. One possible explanation for the lack of a direct effect of psychological ownership on sense of community is a possible mediation of this effect by sense of place. Studies on sense of place in offline contexts have frequently assumed property ownership as a prerequisite for evaluating sense of place [41, 95]. In other words, ownership may in fact have a strong effect on the development of sense of place. People are far more likely to identify with and become attached to property that they actually own. We examined this possibility post hoc by evaluating the mediating relationship of sense of place between psychological ownership of information among Facebook users and their sense of community. We found that there is a

statistically significant relationship between psychological ownership of information and sense of place ($\beta = 0.25$, $p < 0.01$), while psychological ownership has no direct effect on sense of community. In other words, psychological ownership associated with information shared on Facebook has a positive relationship to sense of place felt toward the site, but psychological ownership does not appear to directly affect sense of community.

To ascertain the central mediating role of sense of community in motivating information consumption, contribution, self-disclosure, and exit intentions, following the recommendations of Ringle, Sarstedt, and Straub [80], we also evaluated a saturated model in which we added direct relationships between sense of place, psychological ownership, and social interactions and user behaviors/intentions. Evaluation of the saturated model revealed that sense of place was positively associated with information contribution, information consumption, and self-disclosure. Sense of community partially mediates these relationships. Social interaction was positively associated with information contribution on Facebook. Psychological ownership of information shared on Facebook was not positively associated with any of the user behaviors or intentions in our model. This analysis further affirms the focal mediating role of sense of community attitude in motivating user behaviors and intentions that have a direct impact on the sustainability of information sharing on a social network site.

Contributions to Theory

Our study makes a number of contributions to theory. First, through integration of prior theoretical and empirical studies we develop a set of antecedents that can affect the development of sense of community in a virtual community context. By drawing on McMillan and Chavis's [58] sense of community theory, and integrating research on traditional and virtual communities, we proposed that system-related, information and social factors can affect the development of sense of community in the context of social networks. Our findings reveal that system-related attitudes (sense of place) and social factors (social interaction) influence the development of sense of community. As different kinds of virtual communities grow in importance as a source of social capital and social support, our framework provides a foundation for understanding how sense of community develops across diverse contexts, such as health-related support forums, open-source software projects, and social media platforms.

Our second contribution to the field of information systems is our focus on the sense of community as a central attitudinal construct for understanding the sustainability of social network sites and possibly other types of virtual communities. Early virtual community research focused on the motivations of virtual community participation [53, 91], but as many virtual communities matured, the focus shifted to understanding attitudinal factors that influence virtual community sustainability. Prior research in information systems examined the role of commitment [3] and attachment [77] in users' continuance intentions. Sense of community offers a richer attitudinal construct that

encompasses both system and social factors as antecedents. Our findings echo prior research on traditional communities that found sense of community to be a driver of community engagement [1]. Sense of community explains a high degree of variance in user information consumption, information contribution, self-disclosure, and intention to remain a member of the virtual community. These behaviors are critical for the sustainability of social network sites and other virtual communities as they provide the information resources that drive sustained participation.

Our third contribution to theory is the introduction of the *sense of place* construct to information systems research. Prior research in information systems has noted the importance of attitudes associated with the "place" represented by information systems [36] but there was no clear theoretical definition or operationalization of the construct. We draw on research in environmental and social psychology that established sense of place as a key attitude capturing identification and needs fulfillment associated with a geographic location [38]. Studies of sense of place associated with specific geographies have revealed that sense of place motivates behaviors in relation to specific locations [41]. By adapting the construct for information systems researchers we open the door for further research on the effects of sense of place associated with a variety of systems, such as social networks, online retail websites, and online media.

Our study also provides some insights, albeit limited ones, on whether social networks such as Facebook are real communities. The commonly accepted definition of social network sites does not address the question of whether they are communities. Instead, it states that social network sites are defined by the combination of allowing users to (1) construct a profile, (2) establish connections with others, and (3) view and traverse the list of connections [12]. Research on offline communities suggests that communities are defined by perceptions of sense of community among the community members [58]. In other words, a group of people is a community only if they believe that they are one. Based on this definition, our study suggests that social networks, and more specifically Facebook, are in fact communities, although the strength of the sense of community that Facebook users feel toward their friends is not very high. The mean value of the sense of community variable among our subjects was 3.82 with a standard deviation of 1.26 on a seven-point scale. Nevertheless, our study places sense of community as a central construct that predicts user engagement with and contribution to the social network.

Finally, our results related to the covariates in the model provide some interesting insights that could form the basis of future research. The negative relationship of age to self-disclosure was perhaps not surprising. It may reflect generational differences in approaching privacy of personal information. Younger users, who have grown up with the web and social networks, may be more inclined to share personal information online. Older users may also be less willing to try different social networks, as the negative relationship of age and exit intentions indicates. While there were significant relationships between gender and information contribution and consumption, we have found no consistent evidence in the literature on a gender effect on participation in social networks. Not surprisingly, Facebook tenure was

positively related to information contribution and consumption and negatively related to exit intention. This may be an indication of a virtuous cycle effect. The longer users stay on Facebook, the more they interact with other users, which results in more information sharing and consumption, which in turns makes it more difficult for them to leave, thereby increasing their tenure on the social network and continuing their increasing participation.

Contributions to Practice

In addition to the theoretical contributions, our study also contributes to practice. Social network sites and other types of virtual communities have been touted for their potential to contribute to new marketing channels [34, 47], new product design [32], and customer support [60]. The potential of virtual communities in providing social support has also been extensively studied in the context of health support groups [28]. While much of prior research has focused on the individual motivations for participation in all types of virtual communities, we offer a framework that outlines factors contributing to the development of sense of community, which in turn has important consequences for the sustainability of social network sites and potentially other types of virtual communities. Specifically, our findings highlight the importance of sense of place in the development of sense of community. In other words, the capacity of the system to support individual identification and to fulfill individual needs is a critical antecedent for the development of sense of community. Furthermore, our study is consistent with prior research showing that technical features enabling social interaction can enhance user affinity for virtual communities [77]. Building on this stream of research, we show that social interactions contribute to the development of sense of community among SNS users, which in turn affects key user behaviors critical for the sustainability of virtual communities.

Study Limitations

The focus of this study was on the user behaviors that can affect the sustainability of a social networking site. It is important to note, that we did not consider other potential factors—for example, changes in the technical affordances of a service or service performance—that may also affect the sustainability of an SNS service [5]. Further, our reliance on the survey methodology and a single social network site limit the generalizability of our study. Since our data come only from Facebook users, the generalizability of our results to other social network sites or other types of virtual communities is limited. In addition, we use a cross-sectional survey that relies on self-report measures, which are subject to common-method bias. We examined the common method bias in our study and we did not find significant indicators of common method variance. The cross-sectional design of our study also precludes definitive claims of causal relationships in our research model. A further limitation of the present study is that it examines the proposed model in a relatively small sample of 506 Facebook users drawn from a population of over a billion users.

Furthermore, we have purposefully limited the sample to users from the United States, thus also limiting our ability to generalize the findings. In addition, though extensive, our nomological network does not include all possible antecedents and consequences of sense of community. These limitations point to opportunities for further research. Experimental studies exploring various system variables that may influence factors contributing to the development of sense of community among a more diverse group of participants would help evaluate the generalizability of the proposed model and uncover boundary conditions.

Conclusion

The present study addressed the issue of whether online communities resemble offline communities in terms of key processes that underlie community development and behavioral consequences that arise from sense of community in the online context. We found that sense of place associated with the information system enabling the virtual community and social interactions plays a key role in predicting sense of community among social networking site users. In turn, sense of community is a strong predictor of users' behavioral intentions affecting sustainability of online communities. Our study lends support to prior arguments that online communities share much in common with offline communities and it paves the way for further research on the individual, cultural, and system variables that may affect virtual community participation.

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Appendix

Survey Instrument

All scales are seven-point Likert, anchored in 1—strongly disagree, 7—strongly agree, unless otherwise indicated.

In the following survey questions, "Facebook friends" refers to all the individuals with whom you have a connection on Facebook, regardless of how often you communicate with them online or offline.

Sense of place [41]:

SoP1	Facebook is my favorite place to be online.
SoP2	I really miss Facebook when I am away from it for too long.
SoP3	Facebook is the best place online for doing the things that I enjoy most.
SoP4	As far as I am concerned, there are no better places online than Facebook.

Psychological ownership [68]:

PsyOwn1	I feel that I own comments that I post on Facebook.
PsyOwn2	I feel that I own pictures that I create and post on Facebook.
PsyOwn3	I feel that I own my profile picture on Facebook.
PsyOwn4	I feel that I own status updates that I post on Facebook.

Social interaction [39]:

SocInt1	How often do you ask your Facebook friends for advice?
SocInt2	How often do you chat with your Facebook friends?
SocInt3	How often do you exchange favors with your Facebook friends?

1—never, 2—less than once a month, 3—once a month, 4—two to three times a month, 5—once a week, 6—two to three times a week, 7—daily.

Sense of community [66]:

SOC1	I can get what I need from my Facebook friends.
SOC2	My Facebook friends help me fulfill my needs.
SOC3	I feel that I belong when I am on Facebook.
SOC4	I feel connected to my Facebook friends.
SOC5	I have a good bond with my Facebook friends.
SOC6	I have a say in what goes on among my Facebook friends.

Information consumption:

InfoCons1	How often do you read comments on other Facebook users' posts?
InfoCons2	How often do you review "likes" posted by other Facebook users?
InfoCons3	How often do you view pictures posted by other users on Facebook?
InfoCons4	How often do you read status updates on Facebook?
InfoCons5	How often do you watch videos posted by other users on Facebook?

1—never, 2—less than once a month, 3—once a month, 4—two to three times a month, 5—once a week, 6—two to three times a week, 7—daily.

Information contribution:

InfoCont1	How often do you comment on other Facebook users' posts?
InfoCont2	How often you "like" posts made by other Facebook users?
InfoCont3	How often do you post pictures on Facebook?
InfoCont4	How often do you post status updates on Facebook?

1—never, 2—less than once a month, 3—once a month, 4—two to three times a month, 5—once a week, 6—two to three times a week, 7—daily.

Self-disclosure [94]:

SelfDisc1	I often talk about myself on Facebook.
SelfDisc2	I usually talk about myself for fairly long periods at a time on Facebook.
SelfDisc3	I often discuss my feelings about myself on Facebook.
SelfDisc4	I intimately disclose who I really am, openly and fully in my conversations on Facebook.
SelfDisc5	I often disclose intimate, personal things about myself without hesitation on Facebook.

Intention to exit [89]:

Exit1	I have frequent thoughts of leaving Facebook.
Exit2	I frequently think of deleting my profile from Facebook.

Number of connections: How many Facebook friends do you currently have on Facebook? If you do not have the exact number available, please provide an estimate.

Frequency of interaction: What percentage of your Facebook friends do you communicate with at least once per week?

Interaction intensity = Number of connections * Frequency of interaction

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