MIS Quarterly

RESEARCH ARTICLE

THE NEEDS–AFFORDANCES–FEATURES PERSPECTIVE FOR THE USE OF SOCIAL MEDIA[1]

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The paper develops a needs–affordances–features (NAF) perspective on social media use which posits that individuals' psychological needs motivate their use of social media applications to the extent to which these applications provide affordances that satisfy these needs. Our theoretical development builds upon two psychological theories, namely self-determination and psychological ownership, to identify five psychological needs (needs for autonomy, relatedness, competence, having a place, and self-identity), that we posit are particularly pertinent to social media use. According to NAF, these psychological needs will motivate use of those social media applications that provide salient affordances to fulfill these needs. We identify such affordances through a comprehensive review of the literature and of social media applications and put forth propositions that map the affordances to the psychological needs that they fulfill. Our theory development generates important implications. First, it has implications for social media research in that it provides an overarching comprehensive framework for the affordances of social media as a whole and the related psychological needs that motivate their use. Future studies can leverage NAF to identify psychological needs motivating the use of specific social media sites based on the affordances the sites provide, and design science research can leverage NAF in the design and bundling of specific social media features to engage users. Second, it has implications for technology acceptance research in that NAF can enrich existing models by opening up the mechanisms through which psychological needs influence user perceptions of social media and their use patterns and behaviors. Finally, NAF provides a new lens and common vocabulary for future studies, which we hope can stimulate cumulative research endeavors to develop a comprehensive framework of information systems affordances in general and the psychological needs that information systems satisfy.

Keywords: Social media, psychological needs, affordances, technology acceptance, technology use, system use, self-determination, psychological ownership, autonomy, relatedness, self-identity, identity, motivation

[1]F. Mariam Zahedi was the accepting senior editor for this paper. Harrison McKnight served as the associate editor.

The appendices for this paper are located in the "Online Supplements" section of the *MIS Quarterly*'s website (http://www.misq.org).

Introduction

Research on human needs suggests that needs specify the necessary conditions for psychological well-being and that their satisfaction is associated with the most effective functioning of human beings (Deci and Ryan 2000). We propose a needs–affordances–features (NAF) perspective on social media use,[2] which posits that individuals' psychological needs motivate their use of social media applications to the extent to which these applications provide affordances that satisfy these needs.

Different from other theories that explain why people use technology, which primarily focus on situational motivations (e.g., performing well at work, accomplishing a task; for a review, see Venkatesh et al. 2003), needs-based theories transcend situations to address *universal* life needs. Because everyone has innate psychological needs (Deci and Ryan 2000, 2002), a needs-based theory is a powerful lens to explain why people use technology, particularly in contexts where use is personal and voluntary, without mandates and work performance goals. In such contexts, innate psychological needs provide strong inner motivations energizing human behaviors (Deci and Ryan 1987).

Social media exemplify the current personal, voluntary, ubiquitous use of technology, making needs-based theories especially relevant. Although some prior research on social media has included psychological needs (e.g., Kim et al. 2012; Krasnova et al. 2010; Nadkarni and Hoffman 2012; Partala 2011; Sachdev 2011; Sheldon et al. 2011; Xu et al. 2012; Yoon and Rolland 2012) and other prior research has identified social media affordances (e.g., Davis et al. 2009; Goel et al. 2013; Halpern and Gibbs 2013; Junglas et al. 2013; Kietzmann et al. 2011; Majchrzak et al. 2013; Mesgari and Faraj 2012; Treem and Leonardi 2012; Wellman et al. 2003), the focus of most prior studies has been on specific social media applications such as social networking sites or online games. Different applications, however, tend to have different salient affordances and their use is motivated by different sets of psychological needs. Thus, although such a piecemeal approach advances our understanding of needs and affordances for specific applications, it also results in fragmentation where it is not clear how the identified needs and affordances fit into a more holistic understanding of social media use. For example, different sets of affordances have been identified across studies of specific social media applications—some of which are different; some of which are similar but use different labels; some of which are components of others; some of which are at different levels of abstraction; and some of which have different boundary conditions (i.e., for specific tasks or in a relatively more general context). There has been no attempt in the extant literature, to the best of our knowledge, to provide an overarching comprehensive framework for the affordances of social media as a whole and the related psychological needs that motivate their use. Further, there has been little attempt to theorize a relationship between psychological needs and social media affordances as an explanation for social media use. Our research takes a more holistic view of social media and develops an overarching framework by addressing the following questions: *What innate psychological needs do people seek to fulfill by using social media? What are the salient affordances that social media provide? Which of these social media affordances fulfill which psychological needs?*

Developing such a comprehensive set of psychological needs and social media affordances is important for four reasons. First, they can serve as a generative mechanism for research on social media and on specific social media applications by comprehensively identifying (1) relevant needs and affordances and (2) motivations for use based on specific features of the social media applications. Second, they can provide a common vocabulary for needs and affordances in future studies and aid in building a cumulative research tradition. Third, given that psychological needs are universal, our theorizing can be incorporated in situation-specific models of user behaviors in a social media context. Finally, from a design science perspective, the needs and affordances identified can aid in the design or bundling of social media features to engage users.

To answer these questions, we engage in an integrative, *theory-based* approach to (1) identify the innate psychological needs that are salient in the social media context; (2) identify a comprehensive set of social media affordances; and (3) map the affordances to the needs that they satisfy. These steps of theory development, generating our NAF perspective, unfold in the following sections.

NAF Perspective for Social Media

Deci and Ryan (2000) describe basic *psychological needs* as "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being" (p. 229). Using the word nutriments, Deci and Ryan assume a human trajectory toward psychological well-being, and argue that it is *innate* for human beings to engage in attaining the nutriments in their everyday life to maintain psychological well-being.

[2] *Social media* refer to online platforms where people form communities in which they create, exchange, comment, recreate, and cocreate content (Ahlqvist et al. 2008; Kaplan and Haenlein 2010).

Affordances are action possibilities afforded by a technology to users; in other words, affordances are what a user can potentially do through using the technology (Gaver 1991; Gibson 1979; Markus and Silver 2008). We submit that social media have affordances that can fulfill certain psychological needs, and that the *features* of a social media application enable the affordances that the application can offer.

The psychology literature suggests that people are driven to engage in activities that satisfy their innate psychological needs and, as such, these psychological needs are energizing states that serve as an impetus to action (e.g., see Deci and Ryan 1985). Based on this premise, the NAF perspective suggests that innate psychological needs drive people to engage in using social media applications that have affordances that can potentially fulfill their psychological needs. For instance, social media offer the affordance to connect with others, enabled by, for example, features such as "friending" on Facebook and "following" on Twitter. Leveraging this affordance can fulfill people's psychological need for relatedness. This psychological need thus drives them to engage in using the Facebook and Twitter features that provide this affordance to fulfill this psychological need (see Figure 1).

Psychological Needs in the Social Media Context

Based on a comprehensive review, we have identified two needs-related psychological theories that guide the identification of salient psychological needs fulfilled by use of social media. The two psychological theories are *self-determination* (Deci and Ryan 1985, 1987, 2000, 2002) and *psychological ownership* (Pierce et al. 1991, 2001).[3]

Self-Determination

A defining feature of social media is user-generated content in that the media becomes "social" as users create and co-create content (Ahlqvist et al. 2008; Kaplan and Haenlein 2010). Users of social media enjoy a high degree of flexibility to determine which social media to use, when and to what extent, what to create, what to share, and what to read. Before the emergence of social media, the content of most websites was created and presented by the website owners (thus not social); and most users were largely passive receivers of content, not having the ability to comment or easily and effortlessly add their own content to existing platforms and sites. Today on social media, users both create information and personalize the way they use it. Self-determination, therefore, is arguably a salient aspect of social media.

Self-determination theory (SDT) (Deci and Ryan 1985, 1987) describes a set of psychological needs whose satisfaction is an intrinsically motivating source of action, which provides energy for individuals to act on their environment and to manage their behaviors in a *self-determining* fashion. To be maintained, the behaviors require satisfaction of the psychological needs for *autonomy*, *competence*, and *relatedness*. Deci and Ryan (2000) argue that

> it is part of the adaptive design of the human organism to engage in interesting activities, to exercise capacities, to pursue connectedness in social groups, and to integrate intrapsychic and interpersonal experiences into a relative unity (p. 229).

Need for autonomy is an individual's innate psychological need to be the causal agent of one's own life and act in harmony with one's integrated self. That is, to act authentically in a manner consistent with one's true self, and to engage in activities not because one should or must (e.g., because of social pressures, norms, or obligation, or to look good) but rather volitionally because one freely chooses to (Deci 1995). All people intrinsically desire to be autonomous (Deci and Ryan 2002). They have an innate desire to act according to their genuine desires and preferences, to engage in actions that reflect their true selves, and to experience themselves as the true cause of their own action (Deci and Ryan 1985, 2000).

Need for competence is an individual's innate psychological need of being effective in dealing with the environment in which a person finds oneself. It is the psychological need to have a personal impact on the environment, self, and others, and to achieve valued outcomes (Bauer and McAdams 2000; Deci and Ryan 2000). The need for competence leads people to seek challenges that are optimal for their capacities, and to seek opportunities for independent mastery where they acquire or maintain skills, knowledge, and competencies and attain a feeling of achievement. In this sense, competence does not refer to one's skill (i.e., being competent), but rather it is a feeling of confidence and effectance *in action* (Deci and Ryan 2002). Competence is the accumulated result of one's interactions with the environment. People gain experiences

[3]Appendix A maps the needs identified by the self-determination and psychological ownership theories to needs from other perspectives (for example, Maslow's (1943) hierarchy of needs, Alderfer's (1972) ERG theory of needs, and McClelland's (1987) needs theory). Future research can examine additional needs derived from these other theories that may be relevant to social media use. These theories may also be a source of additional needs relevant to the use of other types of applications.

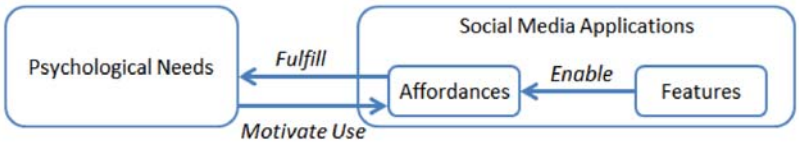

Figure 1. Logic of the NAF Perspective

of competence through their exploration, learning, and adaptation (Deci and Ryan 2002) when they take on and meet what they view as an optimal challenge (Deci 1995).

Need for relatedness is an individual's innate psychological need to interact, be connected to, and experience caring for others (Deci and Ryan 1991), "to love and care and to be loved and cared for" (Deci and Ryan 2000, p. 231). Thus, the need for relatedness involves both receiving and giving love and care (Maslow 1943) and people tend to prefer relationships in which this is mutual (Baumeister and Leary 1995; Clark et al. 1987; Hays 1985). People experience relatedness and belonging when they interact with social partners who love them, who are involved and emotionally available, and who express affection, warmth, caring, and nurturance (Deci and Ryan 2002).

Psychological Ownership

When individuals devote effort to generate content on social media, they develop a *feeling of ownership*, or "psychological ownership" (Pierce et al. 2001). Psychological ownership theory (POT) contends that people have an innate need to possess (Burk 1900; Dittmar 1992; Porteous 1976). The psychology of possession suggests that legal ownership is not necessary in feeling "ownership" toward an object. *Psychological ownership* can exist in the absence of formal ownership and refers to "the state in which individuals feel as though the target of ownership or a piece of that target is 'theirs'" (Pierce et al. 2003, p. 86). Pierce et al. (2001) identify three psychological needs that are the roots of psychological ownership: *need for having a place*, *need for self-identity*, and *need for efficacy and effectance*. Pierce et al. (2009) argue that "individuals can develop feelings of ownership for a variety of objects as long as these objects allow this set of motives to operate and be satisfied" (p. 481).

Need for having a place is an individual's innate psychological need to possess a certain territory or space to have a "home" in which to dwell (Ardrey 1966; Burk 1900; Weil 1952). The need for having a place is not limited to a physical place; it reflects an individual's sense of comfort and personal meaning in placing oneself in time and space (Pierce and Jussila 2011). This psychological need is fulfilled as individuals invest themselves (their time, energy, and resources) and personalize their space such that it is no longer an object but rather it becomes part of the individual (Heidegger 1967).

Need for self-identity is an individual's innate psychological need to have a clear sense of self (Pierce et al. 2001) that distinguishes oneself from others. Self-identity involves an individual's self-appraisal of their physical, cognitive, and emotional attributes, personality traits, and social roles (Whitbourne and Connolly 1999). That is, it is how people define who they are. In the context of POT, "people use ownership for the purpose of defining themselves, expressing their self-identity to others, and ensuring the continuity of the self across time" (Pierce et al. 2001, p. 300). As such, the need for self-identity has three distinct aspects (Pierce et al. 2003): *coming to know the self*, *expressing self-identity*, and *maintaining continuity of self-identity*.

(1) *Coming to know the self* refers to an individual's psychological need for self-definition and self-knowledge, to define who one is and to learn about ourselves. Through exploring and interacting with our environment we learn about ourselves (e.g., about our skills and preferences). Further, social context plays a significant role in defining oneself and in gaining accurate self-evaluations. We develop a sense of self-identity by looking at ourselves through the eyes of others, and experiencing and understanding how others see us (a process called *reflected appraisal*; Mead 1934). We also come to understand ourselves through a process of *social comparison* (e.g., Festinger 1954), by comparing ourselves (on physical and cognitive abilities, opinions, values, etc.) to others in our social context.

(2) *Expressing of self-identity* refers to an individual's psychological need to communicate his/her identity to others. By communicating our identity to others, we share information about the self or project a self-image to others, achieving shared understanding, recognition, and social prestige (Goffman 1959). We also communicate our self-identity through our possessions (e.g., house, automobile, certificates, awards, pictures, etc.) that function

as symbols of our identity and express who we are (e.g., social class, social affiliations, group membership, education, achievements, personal values) to others (Dittmar 1992; Pierce and Jussila 2011).

(3) *Maintaining the continuity of self-identity* refers to an individual's psychological need to maintain an emotional connection between self-identity and his/her past (Pierce et al. 2001, 2003). As we age, our past becomes an increasingly important part of who we are. People use mementoes, photographs, videos, diaries, and gifts from others to maintain self-continuity, in that they are concrete reminders of who they were (Cram and Paton 1993; Pierce and Jusilla 2011; Rochberg-Halton 1984), of their relationships, and of places they have lived or been at (Pierce et al. 2001).

Finally, the *need for efficacy and effectance* refers to an individual's psychological need to be able to control and be effectant in altering the environment. This is the same as the need for competence from SDT, which is based on White's (1959) effectance motivation.

Social media provide individuals with personal spaces they can call their own (e.g., own profile page on Facebook). Additionally, individuals can express who they are (e.g., personal profiles on social networking sites, avatars, etc.), explore and learn about themselves (e.g., in virtual game worlds), sense how they are perceived by others (e.g., via feedback, comments, likes, etc.), and maintain continuity of their self-identity through time (e.g., Facebook's timeline). Therefore, social media provide affordances to satisfy POT's psychological needs for having a place, efficacy and effectance, and self-identity needs of coming to know the self, expressing self-identity, and maintaining continuity of self-identity.

A Synthesis and Categorization of Needs

Synthesizing SDT and POT suggests five psychological needs—autonomy, competence, relatedness, having a place, and self-identity (with three sub-aspects)—that tap into salient affordances of social media. Table 1 presents these needs and their definitions.

Support from Prior Research on Needs and Social Media

Our integrative approach has also led us to review prior research on social media use. Several prior studies also examined some of these needs, although none has included all five, and offered support for their role in the context of social media use (see Table B1 and Appendix B). A small number of studies used SDT to examine the effect of need satisfaction (i.e., satisfaction of the need for autonomy, competence, and relatedness) on social media use. Yoon and Rolland (2012) examined the effect of perceived autonomy, competence, and relatedness (i.e., need satisfaction) on knowledge sharing in virtual communities and found effects by competence and relatedness but not by autonomy. Sachdev (2011) examined these in the context of social networking sites (Myspace and Facebook) and found significant effects of all three on self-determined motivation. Partala (2011) had users of Second Life rate how using Second Life satisfied 10 needs. Three of these needs were the SDT psychological needs; the rest were not basic psychological needs but rather needs such as physical thriving, money-luxury, and pleasure-stimulation. The three SDT needs were among the four needs with the highest need satisfaction.

Basic psychological needs were included in some other social media studies as well. Sheldon et al. (2011) examined relatedness need satisfaction and relatedness need dissatisfaction with respect to using Facebook and concluded that more frequent Facebook use correlates with both relatedness satisfaction and with relatedness dissatisfaction. Nadkarni and Hoffmann (2012) reviewed Facebook studies and concluded that Facebook use is primarily motivated by the need to belong and the need for self-presentation (impression management). Although not using a needs perspective or identifying these as needs, Krasnova et al. (2010) used a privacy calculus framework to identify factors that influenced self-disclosure on a social networking site. She found that the convenience of maintaining relationships and the benefits of building relationships (akin to need for relatedness satisfaction) were significant factors, but not the desire of self-presentation which was operationalized as impression management (which is somewhat related to the need for expressing self-identity). Kim et al. (2012) examined the effect of the desire for online self-presentation (akin to the need for expressing self-identity) on purchasing virtual items (e.g., avatars, furnishings, etc.) on an online community. Finally, Xu et al. (2012) and Yee (2006) included need for advancement, need for mastering the mechanics (both related to need for competence), and need for relationships in examining online game playing and addiction.

Literature Gaps and our Contributions

A few observations are worth making following the above literature review. First, there has been limited attention to the role of psychological needs in motivating use of social media. Particularly, there has been no *theory-based comprehensive*

attempt to identify the set of psychological needs that are salient in a social media context. In the majority of the studies, the focus was not on theorizing around psychological needs but, rather, needs variables were one of many variables included in the research models.

Second, with the exception of the study by Yoon and Rolland (2012) which focused on online communities, existing studies have focused on virtual worlds, social networking sites, or online games but not on a broad range of social media.

Third, studies have not engaged in a systematic approach to identify the affordances of social media that fulfill these needs. Rather, the majority measured need satisfaction (e.g., "I felt close and connected with other people who are important to me"; Sheldon et al. 2011) to examine whether the social medium fulfills the need. A focus on affordances provides actionable design guidelines of value to IS researchers and practitioners alike. Our study is positioned to address these gaps.

Finally, no research, to the best of our knowledge, has tried to categorize salient psychological needs in the social media context. Basic psychological needs can be categorized based on whether they are driven by self-focused or other-focused motivations. Indeed, research on human motivation suggests that "motivation can be conceived as a duality" (Hermans and Hermans-Jansen 1995, p. 28) where, on one hand, individuals focus on self and strive for self-enhancement and on the other they strive for relationships between the self and others. Hermans (1987) refers to the former basic motive as the *S-motive* and to the latter as the *O-motive*. Similarly, Freud (1930), states that

> the development of the individual seems to be a product of the interaction between two urges, the urge toward happiness, which we usually call "egoistic", and the urge toward union with others in the community, which we call "altruistic" (p. 140).

He relates the former to aggressive instincts for autonomy, mastery, and self-definition, and the latter to attachment instincts for interpersonal relationships.[4]

The psychological needs that we have identified through the SDT and POT theory span the two polarities and address both the individual's self-focused motivations as well as the individual's other-focused motivations. Using Hermans' (1987) terminology, we term the *self-focused* group of psychological needs as *S-needs* and the *other-focused* group of psychological needs as *O-needs*. As indicated in Table 1, S-needs that are salient in the social media context include need for competence, having a place, and self-identity; O-needs that are salient in the social media context include need for relatedness and one aspect of the need for self-identity (i.e., expressing self-identity).

Social Media Affordances

Social media affordances are action possibilities permitted by social media features (e.g., Gibson 1979). Although, it is use of specific social media features that fulfills psychological needs, from a theoretical perspective, it is more useful to abstract these features to a set of more general affordances that social media provide. For example, the self-presentation affordance can be provided by such features as creating a Facebook profile page and creating an avatar in virtual worlds. There is more utility in theorizing a relationship between psychological needs and affordances rather than between psychological needs and specific social media features since the former *generalizes across social media applications* and can be provided through the use of a variety of features whereas the latter is application specific.

To generate a comprehensive set of social media affordances, we engaged in an integrative approach to synthesize (1) affordances examined by prior research and (2) affordances emerging from a review of features of popular social media (see Appendix D for details). Specifically, we started with a comprehensive review of prior literature that had identified affordances of various social media applications. We then synthesized, consolidated, and integrated the identified affordances to generate a list of distinct social media affordances. First, there were cases where the same affordance was labeled differently across studies. For instance, Mesgari and Faraj (2012) define *self-presentation* as "to create and demonstrate a personal image and identity" (p. 7) while the same affordance is labeled as *identity* by Kietzmann et al. (2011) and as *identifiability* by Halpern and Gibbs (2013). Second, some studies examine an affordance broadly and others in a more specific context. For instance, with respect to the *collaboration* affordance, Davis et al. (2009) describe that social media in general can afford users to work as a team, while Sigala (2012) focuses specifically on collaborating to plan a trip. Third, different studies capture distinct but different aspects of the same affordance or at different levels of abstraction.

[4]These so-called two polarities models, with a focus on self at one end and a focus on the relationship between the self and others at the other end, are consistent with a wide range of personality theories from fundamental psychoanalytic conceptualizations to basic empirical investigations of personality development (Blatt and Felsen 1993; Luyten and Blatt 2013). For example, the two dimensions have been referred to as communion and agency (Bakan 1966); autonomy and sociotropy (Beck 1983); self-definition and interpersonal relatedness (Blatt 1991); introjective and anaclitic (Blatt 1995); individuality and togetherness (Bowen 1966); attachment anxiety and attachment avoidance (Mikulincer and Shaver 2007); autonomy and homonomy (Angyal 1951); and attachment avoidance and anxiety (Mikulincer and Shaver 2007) (see Appendix C for a table describing these).

Table 1. Salient Psychological Needs in the Social Media Context

Psychological Needs		Definitions	Needs in Prior Social Media Studies
Autonomy (S)		An individual's innate psychological need to be a causal agent of one's own life and act in harmony with one's integrated self (Deci and Ryan 1991). That is, to act *authentically* consistent with one's true self, and engage in activities not because one should or must (e.g., because of social pressures, norms, or obligation, or to look good) but rather volitionally because one freely chooses to (Deci 1995).	• Satisfaction of need for autonomy—virtual social world (Partala 2011) • Perceived autonomy—virtual community (Yoon and Rolland 2012) • Satisfaction of need for autonomy—social networking sites (Sachdev 2011)
Relatedness (O)		An individual's innate psychological need to interact, be connected to, and experience caring for others (Deci and Ryan 1991) - "to love and care and to be loved and cared for" (Deci and Ryan 2000, p. 231)	• Benefits of maintaining and building relationships—social networking sites (Krasnova et al. 2010) • Need for relationships—virtual game world (Xu et al. 2012; Yee 2006) • Satisfaction of need for relatedness—social networking sites (Sheldon et al. 2011) • Satisfaction of need for relatedness—virtual social world (Partala 2011) • Perceived relatedness—virtual community (Yoon and Rolland 2012) • Satisfaction of need for relatedness—social networking sites (Sachdev 2011)
Competence (S)		An individual's innate psychological need of being effective in dealing with the environment in which the person finds oneself (Deci and Ryan 1991); to have a personal impact on the environment, self, and others, and to achieve valued outcomes (Bauer and McAdams 2000; Deci and Ryan 2000).	• Needs for advancement—virtual game world (Xu et al. 2012; Yee 2006) • Satisfaction of need for competence—virtual social world (Partala 2011) • Perceived competence—virtual community (Yoon and Rolland 2012) • Satisfaction of need for competence—social networking sites (Sachdev 2011)
Having a place (S)		An individual's innate psychological need to possess a certain territory or space to have a "home" in which to dwell (Pierce et al. 2001).	
Self-identity	**Coming to know the self (S)**	An individual's innate psychological need for self-definition and self-knowledge - to define who one is and to learn about oneself (Pierce et al. 2003).	• Desire to self-present—social networking sites (Krasnova et al. 2010) • Desire for online self-presentation—social networking sites (purchasing digital items) (Kim et al. 2012)
	Expressing self-identity (S & O)	An individual's innate psychological need to communicate his/her identity to others (Pierce et al. 2003).	
	Maintaining continuity of self-identity (S)	An individual's innate psychological need to maintain an emotional connection between self-identity and his/her past (Pierce et al. 2003).	

Note: S: Self-focused psychological need; O: Other-focused psychological need.

For example, the *self-presentation* affordance refers to the ability offered to users by social media to reveal and present information related to themselves (Mesgari and Faraj 2012). One aspect of this, in the context of virtual worlds, is the ability to create life-like avatars, an affordance identified as *rendering* by Davis et al. (2009). Another aspect of this is for the avatars to engage in practices of the body that express the user (e.g., sit, smile, dress appropriately) an affordance identified as *embodiment* by Schultze (2010). Yet another aspect of this in virtual worlds is *representation support* (Junglas et al. 2013). In virtual communities, one aspect of self-presentation is *persistent labeling* (e.g., screen names; Ma and Agarwal 2007). Fourth, some affordances were not necessarily *action* affordances (i.e., action possibilities) but rather *general* affordances (Gibson 1979; for a discussion, see Michaels 2003) where actions are absent. We removed these affordances from our list. For example, Treem and Leonardi (2012) identify *persistence*, the fact that in social media the contents are usually available to users and do not expire or disappear when the user logs out, as an affordance. Given that this does not indicate a direct action possibility by the user, we removed this affordance, but used the spirit of the affordance (i.e., this can enable browsing of others' content) to inform our final list of affordances. In summary, our approach to consolidation involved grouping similar affordances together and generating a set of affordances at a more abstract level such that affordances are not specific to one social medium but rather generalize across social media. Table D2 in Appendix D documents how we consolidated the affordances.

Finally, to assess the comprehensiveness of our social media affordances, we triangulated the list by examining 21 popular social media applications spanning the six types of social media identified by Kaplan and Haenlein (2010): blogs, social networking sites, content communities, collaborative projects, virtual social worlds, and virtual game worlds. In addition, we added crowdsourcing sites as a new type of social media application not present in Kaplan and Haenlein's framework. For each social media type, we identified its most popular applications (e.g., for social networking sites we included Facebook, Twitter, LinkedIn, Pinterest, Tumblr, Myspace, Google+) and, for each application, we identified its salient features. This resulted in a list of 140 features. Three of the authors then independently mapped each feature to the list of affordances we had identified to see if our affordances collectively accounted for these salient features (see Table D3 for the mapping). This resulted in the identification of two additional affordances. Collectively, the entire process resulted in the following social media affordances:

(1) *Self-presentation* refers to the affordance that enables users to reveal and present information related to themselves in a social media setting. This affordance was labeled as identity by Kietzmann et al. (2011) and as identifiability by Halpern and Gibbs (2013). Our definition of self-presentation subsumes the affordances of rendering or role taking (Davis et al. 2009; Majchrzak et al. 2013; Nardon and Aten 2012), embodiment (Schultze 2010), and representation support (Junglas et al. 2013).

(2) *Content sharing* refers to the affordance that enables users to share and distribute content *unrelated to self* to others in a social media setting. This affordance was labeled by previous studies as sharing (Kietzmann et al. 2011) and contribution/broadcasting (Mesgari and Faraj 2012) and subsumes the affordances of editability/visibility (Treem and Leonardi 2012), and broader bandwidth (Wellman et al. 2003).

(3) *Interactivity* refers to the affordance that enables users to move around and alter their virtual environment in real time (Davis et al. 2009).

(4) *Presence signaling* refers to the affordance that enables users to either indicate their presence or know if other users are accessible (Goel et al. 2013; Junglas et al. 2013; Kietzmann et al. 2011; Nardon and Aten 2012; Schultze 2010).

(5) *Relationship formation* refers to the affordance that enables users to form relationships with other users in a social media setting (Kietzmann et al. 2011). It also includes a specific aspect—joining groups and online communities—which had been discussed by Treem and Leonardi (2012).

(6) *Group management* refers to the affordance that enables users to form groups and online communities, and administer and manage these. It is a synthesis of the concepts of management and administration of groups or online communities identified by Kietzmann et al. (2011) and Mesgari and Faraj (2012).

(7) *Browsing others' content* refers to the affordance that enables users to receive alerts that trigger their attention to others' content and view content provided by others in a social media setting. It is a synthesis of affordances identified by previous studies: information processing (Davis et al. 2009), networked information access (Halpern and Gibbs 2013), sharing (Kietzmann et al. 2011), triggered attending (Majchrzak et al. 2013), visibility (Treem and Leonardi 2012), and personalization (Wellman et al. 2003).

(8) *Meta-voicing* refers to the affordance that enables users to engage in the online conversation by *reacting* online to others' presence, profiles, content and activities and seeing how others react to their own presence, profiles, content, and activities (Majchrzak et al. 2013). It subsumes affordances that focus on adding meta-knowledge to online contents: recombinability/ experimentation (Faraj et al. 2011) and reputation (Kietzmann et al. 2011).

(9) *Communication* refers to the affordance that enables users to directly communicate with each other in a social media setting (Davis et al. 2009; Goel et al. 2013; Junglas et al. 2013; Kietzmann et al. 2011; Nardon and Aten 2012; Wellman et al. 2003).

(10) *Collaboration* refers to the affordance that enables users to collaborate with each other to create content in a social media setting (Davis et al. 2009; Faraj et al. 2011; Junglas et al. 2013; Majchrzak et al. 2013; Mesgari and Faraj 2012; Sigala 2012).

(11) *Competition* refers to the affordance that enables users to compete with each other, either individually or in groups.

(12) *Sourcing* refers to the affordance that enables users to either create a request for resources or funds or satisfy another's request for resources or funds.

We provide detailed descriptions of each affordance, as well as the anchoring literature and example features, in Table 2. Each affordance may be provided by multiple features of social media, and the same affordance may be provided by different features in different social media. For example, on Facebook, the self-presentation affordance is actualized through one's own profile and through posting one's status and pictures. On Twitter, it is actualized through one's tweets and profile. And in online games, it is actualized through creating avatars.

The identified social media affordances can be categorized into two groups. One group, labeled *egocentric* affordances, contains affordances that reflect action possibilities that are *solitary* in nature and do not necessarily involve others to be actualized. This group includes the affordances of self-presentation, content sharing, and interactivity. The other group, labeled, *allocentric* affordances, contains affordances that reflect action possibilities that are social in nature and include the involvement of others. This group includes relationship formation, presence signaling, browsing others' content, meta-voicing, communication, collaboration, competition, and sourcing.

Propositions: Psychological Needs, Affordances, and Social Media Use

The NAF perspective, based on motivation-needs theories as reviewed above, submits that people high on a psychological need (e.g., relatedness) will be motivated to use social media applications that have affordances (e.g., relationship formation) that can satisfy that need, which we formally state as Proposition 1A. Further, different social media applications vary in their salient affordances (e.g., Kaplan and Haenlein 2010; Kietzmann et al. 2011). Our literature review to identify social media affordances provides supporting evidence, as we find that studies examining different social media applications identified different affordances. For example, for virtual worlds, Nardon and Aten (2012) identified interaction, presence, and rendering as salient affordances, whereas for Wikipedia, Mesgari and Faraj (2012) identified self-presentation, management, control, contribution, broadcasting, and collaboration. Given their different salient affordances, different social media applications are likely to be motivated by different subsets of psychological needs as the driving force for use. We posit this as Proposition 1B.

> ***Proposition 1A****: Individuals' psychological needs will motivate use of those social media applications that have salient affordances to fulfill these needs.*
>
> ***Proposition 1B****: Because different social media applications generally vary in their salient affordances, different subsets of psychological needs will motivate use of different social media applications.*

The question then becomes identifying which affordances fulfill which psychological needs. As a result, our subsequent theoretical development involves mapping social media affordances to the psychological needs that they can fulfill. Table 3 provides the mapping resulting from our theorizing and independent corroboration by five social media researchers.[5] We next discuss in detail the rationale for the

[5]Our theorizing of the mapping of affordances to the needs they satisfy was determined by a two step process. First, based on theoretical rationale, three of the authors independently mapped the psychological needs to the affordances that satisfy these needs. All three researchers placed checkmarks in 24 out of the 31 cells where a checkmark was placed (raw agreement is 77%); two researchers placed checkmarks in 5 cells, and there were 2 cells where only one researcher placed a checkmark. The seven disagreements were resolved through a discussion. Our discussion also led to the addition of one additional relationship. Second, we gave the definitions of psychological needs and affordances to four faculty and one doctoral student with research expertise in social media and asked them to independently map the affordances to the psychological needs they satisfy. Their agreement with our mapping was 77.3%. We resolved the disagreements between their mapping and ours through discussion.

Table 2. Social Media Affordances

Affordances	Definitions	Related Affordances in Prior Literature	Example Features
Egocentric Affordances			
Self-presentation	Users can reveal and present information *related to themselves* in a social media setting. This involves sharing information that portrays the users in certain ways and shows what kind of people they are, their values and preferences, what they like, their expertise, etc. This includes, among others, creating avatars; revealing descriptive information about themselves such as gender, profession, and location; and sharing posts, pictures and videos related to self (including showcasing their expertise).	Rendering (Davis et al. 2009); Identifiability (Halpern and Gibbs 2013); Representation support (Junglas et al. 2013); Identity (Kietzmann et al. 2011); Generative role taking (Majchrzak et al. 2013); Self-presentation (Mesgari and Faraj 2012); Rendering (Nardon and Aten 2012); Embodiment (Schultze 2010)	• Creating avatars in Second Life • Sharing my own videos on Facebook • Updating my profile on Facebook • Uploading my own photos on Flickr • Uploading Pins on Pinterest • Writing personal experiences or opinions on my blog
Content Sharing	Users can share and distribute content *unrelated to self* to others in a social media setting (e.g., sharing a news item, a funny video, etc.).	Sharing (Kietzmann et al. 2011); Contribution/Broadcasting (Mesgari and Faraj 2012); Editability/Visibility (Treem and Leonardi 2012); Broader bandwidth (Wellman et al. 2003)	• Sharing links of others' videos, photos, or blogs with others on Facebook • Sharing a link to a news item on Twitter
Interactivity	Users can move around (e.g., fly) and alter their virtual environment (e.g., build in-world artifacts) in real time.	Interactivity (Davis et al. 2009)	• Moving around in World of Warcraft • Building/Creating in Second Life
Allocentric Affordances			
Presence Signaling	Users can (a) indicate their presence and (b) know if other users are accessible.	Social perception (Goel et al. 2013); Context support (Junglas et al. 2013); Presence (Kietzmann et al. 2011); Presence (Nardon and Aten 2012); Presence (Schultze 2010)	• Moving around in Second Life • "Who is available to chat" on Facebook
Relationship Formation	Users can form relationships with other users in a social media setting (e.g., friending, following, etc.) including joining groups and online communities.	Relationships (Kietzmann et al. 2011); Association (Treem and Leonardi 2012)	• Friending on Facebook • Following other users on Twitter • Joining an online community
Group Management	Users can form groups (e.g., player guilds, groups on Facebook) and online communities, and administer and manage these. The focus is on activities involving the management and administration of groups/online communities.	Groups (Kietzmann et al. 2011); Management (Mesgari and Faraj 2012)	• Village pump (including policy making discussion) on Wikipedia • Guild Managing in World of Warcraft
Browsing Others' Content	Users can receive alerts that trigger their attention to others' content and *view* content provided by others (e.g., others' behaviors, knowledge, preferences, contents, and network connections) in a social media setting.	Information processing (Davis et al. 2009); Networked information access (Halpern and Gibbs 2013); Sharing (Kietzmann et al. 2011); Triggered attending (Majchrzak et al. 2013); Visibility (Treem and Leonardi 2012); Personalization (Wellman et al. 2003)	• Browsing other's content on Facebook • Watching videos on YouTube • Receiving notifications on Facebook

Table 2. Social Media Affordances (Continued)

Affordances	Definitions	Related Affordances in Prior Literature	Example Features
Meta-voicing	Users can engage in the online conversation by *reacting* online to others' presence, profiles, content and activities (e.g., retweeting, voting on a post, commenting on someone's post, responding to someone's question, voting on the comment, ''liking'' a profile, etc.) and *seeing how others react* to their own presence, profiles, content, and activities (e.g., others' comments on the user's posts, likes, shares, profile views, etc). Unlike self-presentation and content sharing, in meta-voicing the user "is not simply voicing his or her opinion, but adding metaknowledge to the content that is already online." (Majchrzak et al. 2013, p. 41).	Recombinability/Experimentation (Faraj et al. 2011); Reputation (Kietzmann et al. 2011); Meta-voicing (Majchrzak et al. 2013)	• Commenting Pins on Pinterest • Congratulating other users on LinkedIn • Answering questions on Quora • Leaving comments for other people on Facebook • Liking what others have posted on Facebook • Rating others' videos on YouTube • Reacting to others' achievement in virtual game world • Retweeting on Twitter • Tagging others' microblogs on Tumblr
Communication	Users can *directly* communicate with each other in a social media setting (e.g., chatting or sending a private message on Facebook).	Communication (Davis et al. 2009); Social awareness (Goel et al. 2013); Activity support (Junglas et al. 2013); Conversations (Kietzmann et al. 2011); Interaction (Nardon and Aten 2012); Connected (Wellman et al. 2003); Wireless portability/ Globalized connectivity (Wellman et al. 2003)	• Chatting via personal message on Facebook • Chatting with each other in a virtual game world • Communicating via user talk page on Wikipedia • Conversation with other users on Google+
Collaboration	Users can collaborate with each other. This includes collaborative creation where users collaborate with others to create contents in a social media setting. It also includes collaborating in online multi-player games through game playing.	Team process (Davis et al. 2009); Reviewability/Recombinability/ Reviewability/Experimentation (Faraj et al. 2011); Insight support (Junglas et al. 2013); Network-informed associating (Majchrzak et al. 2013); Collaboration (Sigala 2012); Control/ Collaboration (Mesgari and Faraj 2012)	• Adding, deleting, editing content on Wikipedia • Completing tasks together in a virtual game world • Watchlist (monitoring changes) on Wikipedia
Competition	Users can compete with each other, either individually or in groups. This includes competing in online multi-player games.		• Completing tasks in World of Warcraft • Progression in World of Warcraft • Trading in Second Life
Sourcing	Users can (a) create a request for resources or funds and (b) satisfy another's request for resources or funds (e.g., crowdfunding).		• Offering couch on CouchSurfing • Posting a problem on Innocentive

Table 3. Mapping of Psychological Needs to Social Media Affordances That Satisfy These Needs

		Needs						
		S-Needs					O-Needs	
	Affordances	A	C	HP	CK	MC	ES	R
Egocentric	Self-presentation	✓		✓		✓	✓	✓
	Content Sharing	✓		✓		✓	✓	
	Interactivity	✓		✓				
Allocentric	Presence Signaling							✓
	Relationship Formation	✓					✓	✓
	Group Management		✓					✓
	Browsing Others' Content	✓			✓			✓
	Meta-voicing		✓		✓		✓	✓
	Communication						✓	✓
	Collaboration		✓		✓			✓
	Competition		✓		✓			
	Sourcing	✓	✓					

Note: A = autonomy; C = competence; HP = having a place; CK = coming to know the self; MC = maintaining continuity of self-identity; ES = expressing self-identity; R = relatedness

mapping and posit propositions. We provide our rationale of not positing certain relationships between psychological needs and affordances in Appendix E.

Need for Autonomy

We posit that the self-presentation, content sharing, interactivity, relationship formation, browsing others' content, and sourcing affordances help users fulfill their *autonomy* need by enabling individuals to freely choose what to share (e.g., Halpem and Gibbs 2013) and how to present themselves (Kaplan and Haenlein 2010), with whom to connect, what to read, listen to, or watch, to freely move around in or modify their virtual environments (e.g., Davis et al. 2009), and to freely choose which requests to respond to on sourcing platforms (e.g., Deoker et al. 2015).[6] For example, social networking sites such as Facebook, through the affordances of *self-presentation*, *content sharing*, *relationship formation*, and *browsing others' content*, afford individuals the opportunity to freely choose how to present themselves (e.g., on their profile page, by disclosing their current location, by sharing their pictures, etc.), what to share (e.g., interesting articles, funny videos, etc.), whom to friend, and what to browse. As another example, Second Life and online games, through the salient affordances of self-presentation and interactivity, allow users to choose avatars, clothing, etc., interact with others, and engage in behaviors that reflect true self without worrying about norms that guide or constrain their behavior as they do in their real-life social or professional contexts (Kaplan and Haenlein 2010). Further, the sourcing affordance on platforms like InnoCentive enables users to freely choose "challenge problems" they would like to solve. This discussion leads to the following proposition:

> ***Proposition 2****: Individuals' need for autonomy will motivate use of social media applications that have these affordances: self-presentation, content sharing, interactivity, relationship formation, browsing others' content, and sourcing.*

Need for Relatedness

We argue that a set of social media affordances—*self-presentation*, *presence signaling*, *relationship formation*, *group management*, *browsing others' content*, *meta-voicing*, *communication*, and *collaboration*—can help fulfill users' need for relatedness by creating *broader social connections*.

[6]It is important to note that truly autonomous self-determined behaviors are those that are not determined by external controls, such as when individuals behave in accordance to social norms or social pressures, out of obligation or guilt, or to manage impressions. Self-determination theory makes a distinction between social norms that are internalized and result in authentically autonomous behaviors where the locus of initiation is truly within oneself, and norms that are introjected where the locus of initiation of the behavior is some external control. The distinction is important because social media applications vary on the extent to which social norms are salient.

This is achieved by letting users know who is around and available for interaction (e.g., Goel et al. 2013; Malhotra and Majchrzak 2012; Nardon and Aten 2012), reaching a broad range of people and enabling new social connections (e.g., Jenkins-Guarnieri et al. 2012; Seder and Oishi 2009), enabling participation in group activities (e.g., Sigala 2012), knowing what other people are doing (e.g., Kietzmann et al. 2011), reacting to their posts (Majchrzak et al. 2013), and collaborating with others in social settings (e.g., Zhu and Zhang 2010). For example, on Facebook people can establish broader social connections by "friending" others or connecting to unknown others based on shared interests (Jenkins-Guarnieri et al. 2012; Seder and Oishi 2009) (relationship formation). In multiplayer online virtual game worlds (e.g., World of Warcraft), players may join a group to complete tasks (e.g., a guild), make friends through joining guilds (relationship formation), share adventures (collaboration), and interact (communication) with other players whom they may never meet in person (Graham and Gosling 2012).

Those affordances also help increase the *intensity of social interactions* that users have with others. This satisfies the need for relatedness in two ways. First, as frequency of interactions increases by self-presentation, meta-voicing, browsing others' content, and communication, so does the feeling of relatedness due to increased familiarity and possibly liking for one another (Newcomb 1961). For instance, using Facebook individuals can share their personal information with others, comment on others' posts, "like" others' posts (meta-voicing), browse others' albums or videos, and exchange personal messages or instant messages with others (communication). These features allow for increased and often instantaneous social interactions, which enhance social bonds among individuals. Second, peer acceptance enhances the feeling of connecting to "peers," which helps strengthen relatedness (Deci and Ryan 1991). For instance, on Facebook, individuals experience peer acceptance from those who "like" their posts, comments, videos, or photos (Kim et al. 2012) or comment positively on these (meta-voicing). This discussion leads to Proposition 3.

> ***Proposition 3****: Individuals' need for relatedness will motivate use of social media applications that have these affordances: self-presentation, presence signaling, relationship formation, group management, browsing others' content, meta-voicing, communication, and collaboration.*

Need for Competence

Feeling competent entails the ability to effectively control and alter one's environment (White 1959) and to seek opportunities to acquire or maintain skills, knowledge, and capabilities. Thus, individuals high on the need for competence seek affordances that offer them opportunities to *expand and demonstrate knowledge and capabilities* in environments.[7] We suggest that *group management, meta-voicing, collaboration, competition*, and *sourcing* affordances help users fulfill *competence* needs by enabling them to apply and hone their skills when they organize and manage online communities, provide feedback or respond to questions posted by others, collaborate on creating content, compete in games, or source their talent and expertise on crowdsourcing platforms (Arazy et al. 2011; Malhotra and Majchrzak 2012; Mesgari and Faraj 2012; Shirky 2008; Zhang and Zhu 2011).

For example, on Wikipedia, by creating or editing a Wikipedia entry, creating project and portal pages, or sharing opinions on article discussion pages, an individual can apply his/her knowledge on a topic (Arazy et al. 2011; Mesgari and Faraj 2012; Shirky 2008). By using group management affordances, users can propose and discuss new policies, change current policies, summarize discussions, resolve conflict, and "define how the work processes should be organized around the job" (Mesgari and Faraj 2012, p. 6), exhibiting their skills in organizing the community and the task at hand. Gaming contexts, in which competition affordances are salient, can offer challenges that do not even have counterparts in the real world, thus providing a unique environment for individuals to challenge their competence and demonstrate efficacy and effectance (Xu et al. 2012). Crowdsourcing platforms, for example, open innovation communities that crowdsource talent (e.g., Innocentive, Challenge.gov, Innovation Jam) offer challenging tasks and opportunities for users to demonstrate their expertise and to experience competence through problem solving (Deoker et al. 2015). On these sites (Wikipedia, multiplayer gaming, crowdsourcing platforms), users may also engage in collaboration (e.g., group work to write an article, conquer challenges in games, satisfy others' requests) (Zhang and Zhu 2011), which helps them demonstrate their ability in a collaborative context, thus satisfying their need for competence (Malhotra and Majchrzak 2012). Hence, we posit

> ***Proposition 4****: Individuals' need for competence will motivate use of social media applications that have these affordances: group management, meta-voicing, collaboration, competition, and sourcing.*

[7] It is important to make one distinction: showing off competence by posting a video, for example, that shows how one has conquered a challenge (e.g., climbing a mountain), or posting about the acceptance of one's paper in a top journal, or posting a tutorial about some statistical technique do not satisfy the need for competence. Doing these things (climbing, revising the paper, putting together the tutorial) does. Posting these is an example of self-presentation and fulfills the need for expressing self-identity.

Need for Having a Place

The need to possess a place leads individuals to create their own "territory" (Barki et al. 2008; Harrison and Barthel 2009). According to Pierce and Jussila (2011), a sense of having a place "is, in part, achieved as a result of an individual's interaction with his/her surroundings and the personalization of these surroundings" (p. 44). We apply this logic to the cyber space and argue that *interactivity* affordances help users fulfill *the need for having a place* by enabling them to create, modify, and have control over their own "cyber" space. For example, through the interactivity affordance in virtual worlds, individuals are able to construct "home" and "work" posts and thus feel that they have a place of their own in these worlds (Animesh et al. 2011; Goel et al. 2011; Nah et al. 2011; Saunders et al. 2011).[8] Many users spend time and energy personalizing their place by, for example, designing and building their dream house, furnishing the house, and decorating it. Psychologically, places in which the individual has made a considerable investment (e.g., time, energy, emotion, etc.) may be experienced as his/her own (Lee and Chen 2014, Porteous 1976). In the same vein, through *self-presentation* (through sharing personal videos, photos, blogs, etc.) and *content sharing* (through sharing interesting content, such as news items, videos, etc., on their personal space), people engage in personalizing their cyber space, thus increasing the sense of having a place of their own (Pierce et al. 2001). Therefore,

> ***Proposition 5****: Individuals' need for having a place will motivate use of social media applications that have these affordances: self-presentation, content sharing, and interactivity.*

Need for Self-Identity

The need for *self-identity* refers to an individual's psychological need to have a clear sense of self. This includes the three psychological needs of coming to know the self, expressing self-identity, and maintaining continuity of self-identity. First, people develop their self-identity (*coming to know the self*) through self-awareness as they interact with their environment and with others, compare themselves to others (Festinger 1954), receive feedback from others, and see how others see them via meta-voicing (a process called reflected appraisal; Mead 1934). By doing so, people observe and reflect on their thoughts, feelings, and behaviors. As such, *browsing others' content* (which enables people to compare themselves to others), *meta-voicing*, *collaboration*, and *competition* affordances help users fulfill this need by affording a breadth of opportunities for individuals to interact with others, receive feedback from others, and discover, use, and reflect upon their skills and abilities. Thus, we posit

> ***Proposition 6A****: Individuals' need for coming to know the self will motivate use of social media applications that have these affordances: browsing others' content, meta-voicing, collaboration and competition.*

Second, *self-presentation, content sharing, relationship formation, meta-voicing,* and *communication* affordances help users fulfill their need to express self-identity by allowing them to present and communicate their identity to others through their profile pages; through their selection of avatars and other objects in virtual worlds (e.g., home, furnishings) which help others understand who they are (Golder and Donath 2004; Jordan 1999; Kafai et al. 2007; Smith et al. 2000; Suh et al. 2011); through sharing their pictures, videos, links, experiences of life and work (Aggarwal et al. 2012), and political viewpoints (Wattal et al. 2010), among others; through revealing their group identities (e.g., joining online communities) and through with whom they associate (e.g., "Friends list" on Facebook) (Ma and Agarwal 2007); and through online social interactions including communication and meta-voicing (e.g., commenting on others' posts, "liking," etc.).

On Facebook, for example, through the self-presentation affordance, people can share who they are through disclosing personal information (e.g., name, gender, home city, education, etc.) and what they like (e.g., movies, etc.) on their profile page and through posting their photos, videos, opinions, and experiences (Back et al., 2010; Gosling et al. 2011; Java et al. 2007; Konrath et al. 2011; Naaman et al. 2010; Yee et al. 2011). Further, people can post articles or news items (content sharing), friend others, and join Facebook groups (relationship formation), express their opinions by commenting or "liking" others' posts (meta-voicing), and by communicating directly with others via messenger. Thus, we posit

> ***Proposition 6B****: Individuals' need for expressing self-identity will motivate use of social media applications that have these affordances: self-presentation, content sharing, relationship formation, meta-voicing, and communication.*

Third, *self-presentation* and *content sharing* affordances help users fulfill their need to maintain continuity of self-identity

[8] Second Life, for instance, promotes its virtual world by stating that users can create "A Place to Call [your] Own," and encourages users to think of it as their "home away from home" and "make it look and feel just like [you] want it to" (http://secondlife.com/land/learn/).

by maintaining a repository that chronicles through time how individuals present who they are and what they share (e.g., one's time line on Facebook). These contents become part of the individual's identity; they are symbols of the self and can tell others who the individual was, who the individual is, and who or what the individual might become (Golder and Donath 2004; Ma and Agarwal 2007; Smith et al. 2000).

On Facebook, for example, in addition to chronicling the present, people can also share pictures and videos of their past. Therefore, what people share on Facebook can remind them of their past and chronicle their present for posterity (e.g., Facebook's Timeline), thus maintaining continuity of their self-identity. Thus, we posit

> ***Proposition 6C****: Individuals' need for maintaining continuity of self-identity will motivate use of social media applications that have these affordances: self-presentation and content sharing.*

Theoretical Implications and Future Research

Research on Social Media

Using NAF to Identify Psychological Needs Motivating Use of Specific Social Media Applications

Features of a specific social media application provide insights into affordances provided by the application, and, from the logic of NAF, into the psychological needs that use of the application can potentially fulfill. Thus, one can *predict* the psychological needs that motivate use of specific social media applications based on the features they provide. Conversely, given an individual's level of psychological needs, one can predict which affordances and features of a social media application he or she is likely to use.

We offer one illustration. We apply the NAF perspective to identify salient psychological needs driving Facebook use. To do so, we first identify Facebook's salient affordances through examining Facebook's salient features (see Table F1 in Appendix F). Building upon the mapping of these affordances to the psychological needs they fulfill (Table 3), we develop a model to predict which psychological needs would motivate use of Facebook (see Figure F1 in Appendix F) in general, and of specific affordances in particular (see Figure F2 in Appendix F). We empirically test the NAF-derived Facebook models using data collected through a longitudinal online survey. The empirical results suggest that the salient psychological needs that motivate Facebook use are autonomy, relatedness, and expressing self-identity (see Table F9 in Appendix F) and that these are fulfilled by the affordances of browsing other's content (for autonomy), relationship formation and communication (for relatedness), and self-presentation, content sharing, and meta-voicing (for expressing self-identity) (see Table F10 in Appendix F). We report full details of the empirical study in Appendix F. The empirical test demonstrates both how NAF can be used to derive models for specific social media applications and it provides an empirical test of our mapping of psychological needs to affordances.

As another illustration, the salient affordances Wikipedia can provide are collaboration (enabled by features of adding/deleting/editing content, article discussion page, history page, village pump and voting, and other administration features), communication (enabled by user talk page), group management (enabled by village pump and voting), browsing others' content (enabled by browsing others' editing history), and meta-voicing (enabled by voting). Given these salient affordances of Wikipedia, one can predict that the psychological needs that motivate the use of Wikipedia include the needs for autonomy, competence, relatedness, and self-identity. It is worth noting that Wikipedia provides some archival statistics to describe individuals' use of certain features (such as editing, talking on user talk pages, voting, etc.). One can test the prediction by using these archival statistics for feature use and survey data for users' psychological needs.

Using NAF for Design Science Research on Social Media

First, design science research can draw upon our results to provide guidelines for how to develop effective social media features. Such features should enable affordances that can satisfy users' innate psychological needs. Second, although we examined how each affordance separately fulfills a specific psychological need, it is also possible that affordances have joint complementary effects. Therefore, future research can explore whether *specific combinations of affordances* provide superior means to fulfill a psychological need, or whether *specific combinations of features* provide a specific affordance in a superior way. Third, it is not clear whether social media applications, in order to be successful, should strive to provide multiple affordances to fulfill a *single* need, or to provide multiple affordances to fulfill *multiple* needs. For example, our empirical study in the context of Facebook showed that although Facebook provides multiple affordances to fulfill the need for relatedness (relationship formation, communication self-presentation, browsing others' content, and meta-voicing), only use of two of these (relation-

ship formation and communication) significantly relates to the need for relatedness. Although the other affordances may also help individuals develop relationships with others, our results seem to suggest that this is not why Facebook users utilize them. It could be that when individuals are offered multiple affordances that can serve the same psychological need, they select the ones that most directly fulfill the psychological need. This merits further examination. Finally, psychological needs can be fulfilled online via social media or offline in complementary or substitutive ways. Whether users fulfill needs online or offline may depend on whether social media provide affordances that fulfill a need better than offline. These issues are interesting directions for future design science research and provide potentially fruitful avenues for future social media research to uncover how to effectively engage users.

NAF and Research on Technology Acceptance and Use

To date, the dominant theoretical perspectives in the technology acceptance literature are rooted in the theories of reasoned action and planned behavior. As use of information technology has become ubiquitous, personal, and voluntary, our theorizing of why people use technology has to embrace other theoretical perspectives of what motivates human action. The ubiquitous, volitional, and personal use of many applications, including many social media, makes salient those perspectives that focus on intrinsic motivation and innate needs that are universal and transcend contexts. Drawing from motivational needs theories in psychology, the NAF perspective complements extant theories to posit that innate psychological needs motivate people to use applications that have affordances that can satisfy these needs.

Future research can use our theorizing to enrich existing models for technology acceptance and use in the specific context of social media. As an illustration, people high on the need for relatedness would perceive social networking sites as highly useful and, thus, perceived usefulness may (partially) mediate between their need for relatedness and use of social networking sites. Similarly, people high on the need for competence may perceive Wikipedia as more useful. As another example, the extent to which social norms are salient on a social media application may moderate the degree to which the need for autonomy is fulfilled by the hypothesized affordances since use of the affordance may not be truly autonomous but rather influenced by social norms and impression management. These examples illustrate theorizing of mediating and moderating relationships that open up the mechanisms through which psychological needs lead to use in the context of social media.

In addition, NAF provides a lens to look into user attitudes and behaviors related, but not limited, to use. For example, through interactions with specific applications over time, users can become more or less satisfied, depending on the extent to which social media applications provide affordances to meet their psychological needs. This, in turn, can predict user behaviors like dependence on the application, continuance/discontinuance of use, recommendation of the application to others, etc. All in all, we believe that the NAF logic has wide implications for research on technology acceptance and use given the fundamental and universal role played by psychological needs in the functioning of human beings.

Extending NAF

Our theoretical premises can be elaborated in different contexts to develop context-specific theories. This involves identifying (1) the salient affordances of other classes of information technology applications (e.g., mobile technologies, clinical information systems) and of specific applications or platforms and (2) the needs that these affordances fulfill. Thus, NAF provides a theoretical lens that future studies can leverage to generate models that explain use of various types of technologies.

Specifically, future research can extend NAF in four ways. First, depending on their affordances and context of use, we would expect different types of technologies to fulfill different psychological needs. Additional or different psychological needs may be salient for other types of technologies and other psychological needs theories—in addition to, or in lieu of, SDT and POT—may be used to derive these needs. Second, while we derived a set of affordances provided by social media, future research can examine the generalizability of these affordances across applications and also derive new affordances both in the context of social media and for other types of systems. This is a worthy avenue for future research because in the dynamic IT arena, new social media applications and, generally, new IT applications keep emerging. Third, future research can elaborate on those contextual factors that differ across social media and may influence the mapping between psychological needs and affordances. Take Facebook as an example. Characteristics of Facebook's social network (such as non-anonymity and connections to others with whom one has relationships offline as well) creates certain social norms and behavioral expectations that may preclude users from expressing their opinions freely. This creates a context where use of Facebook may not fulfill the need of autonomy. Therefore, a fruitful direction for future research would be to identify such moderating contextual factors that emanate from the nature of different social media types and applications and can influence the extent to

which the NAF mapping applies to a specific social media application. Finally, we mapped the social media affordances to the psychological needs that their use satisfies. This mapping was independently corroborated by five social media researchers. Future research should test these relationships to provide empirical support for the propositions or theorize additional relationships. The ultimate goal is to leverage and extend NAF as a lens to accumulate a comprehensive list of affordances provided by information systems, and to understand the psychological needs that they fulfill.

Acknowledgments

We thank the senior editor, Mariam Zahedi, the associate editor, Harrison McKnight, and four anonymous reviewers whose constructive feedback enhanced the development of the paper. Sean Xin Xu acknowledges financial support from the National Natural Science Foundation of China (#71225001 and #71490724). Yan Xu acknowledges support from the University Grants Committee of Hong Kong (#DAG_S09/10.BM02). Nan (Andy) Zhang acknowledges partial support from NKBRPC (#2014CB340506) and the National Natural Science Foundation of China (#71532004, #71490724).

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MIS Quarterly

RESEARCH ARTICLE

THE NEEDS–AFFORDANCES–FEATURES PERSPECTIVE FOR THE USE OF SOCIAL MEDIA

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Appendix A

Motivation–Need Theories

Table A1 summarizes the major motivation-needs perspectives from psychology[1] and shows how the innate psychological needs derived from self-determination (SDT) and psychological ownership (POT) theories map to the needs identified in other motivation-needs perspectives. Given that the focus of our study is on innate psychological needs, Table A1 also classifies these theories in terms of their focus on psychological versus physiological needs and on innate versus learned needs. Three major theoretical perspectives were identified. Maslow's (1938) hierarchy of needs theory is the most comprehensive in terms of capturing human needs—both physiological and psychological. He classifies needs in a hierarchy of five categories. From the bottom up, these are physiological (e.g., food, water), safety (e.g., security of body, family, property), love/belonging (e.g., friendship, family), esteem (e.g., a "lower" version of external esteem such as a need for status, recognition, prestige and attention, and a "higher" version of internal esteem such as a need for achievement, confidence, independence, and freedom), and self-actualization (e.g., morality, creativity). Alderfer's (1972) ERG perspective identifies three needs—existence, relatedness, and growth—that can be largely mapped to Maslow's hierarchy (existence encompasses Maslow's physiological and safety needs; relatedness encompasses Maslow's love/belonging and external esteem needs; and growth encompasses Maslow's internal esteem and self-actualization needs). McClelland (1987) focuses on three learned needs: need for achievement, power, and affiliation. He posits that everybody has these needs (i.e., they are innate) but that based on our culture and life experiences, one of these needs will be dominant (thus "learned"). This perspective has been mainly applied to work contexts to identify employees' motivations. SDT and POT examine *innate psychological* needs.

[1] Murray (1938) developed a theory of psychogenic needs related to personality that provided the theoretical basis for McClelland's (1987) and Maslow's (1938) need theories. Herzberg's (1959) two-factor theory states that hygiene factors (e.g., job security, salary, work conditions) and motivators (e.g., challenging work, recognition) cause job satisfaction/dissatisfaction. Although Herzberg's theory suggests that presence of motivators leads to satisfaction and absence of hygiene factors to dissatisfaction, the actual hygiene-motivation factors parallel those in Maslow's need hierarchy. Thus, for parsimony, our table shows McClelland's and Maslow's needs.

SDT identifies the needs for autonomy, competence, and relatedness while POT identifies the needs for effectance, self-identity, and having a place as innate human needs. As we discuss in the paper, we focus on the needs suggested by SDT and POT because they are universal in nature (rather than being acquired through one's life experiences) and because social media have affordances that can satisfy these psychological needs. As Table A1 shows, these needs map well to innate psychological needs encompassed in the other theoretical perspectives.

Table A1. Motivation–Needs Theories

	ERG Theory (Alderfer 1972)	Hierarchy of Needs (Maslow 1938)	Learned Needs Theory (McClelland 1987)	Self-Determination Theory (Deci and Ryan 1985)	Psychological Ownership Theory (Pierce et al. 2001)
Nature of needs	Physiological/ psychological	Physiological/ psychological	Psychological	Psychological	Psychological
	Innate/learned	Innate/learned	Innate/learned	Innate	Innate
Mapping of needs across theories	Growth	Self-actualization	Achievement	Autonomy/ Competence	Self-identity/ Effectance
		Internal esteem			
	Relatedness	External esteem	Power	Relatedness	
		Love/belonging	Affiliation		
	Existence	Safety			Having a place
		Physiological			

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Appendix B

Review of Prior Research on Psychological Needs in the Social Media Context

Table B1. Literature on Psychological Needs in the Social Media Context

Study	Objectives	Methods	Needs	Main Findings	Sample Items
Kim et al. 2012	To develop a model to explain the intention to purchase digital items.	Survey	Desire for online self-presentation	The intention to purchase digital items is determined by the desire for online self-presentation.	• I want to establish a preferred image for myself in Cyworld/Habbo. • I want to present my image in Cyworld/Habbo.
Krasnova et al. 2010	To identify factors that influenced self-disclosure on a social networking site.	Survey	Self-presentation Relationship building	Convenience of maintaining and developing relationships and platform enjoyment motivate information disclosure.	• I try to make a good impression on others on the OSN. • The OSN helps me to expand my network.
Nadkarni and Hoffmann 2012	To identity factors that motivate Facebook use.	Literature Review	Need to belong Need for self-presentation	Facebook use is motivated by the need to belong and the need for self-presentation.	N.A.
Partala 2011	To identify how using Second Life satisfied needs.	Survey Case Study	Autonomy Competence Relatedness	Usage of Second Life is motivated by the need for relatedness.	• In Second Life I feel that my choices are based on my true interests and values. • In Second Life I feel that I am successfully completing difficult tasks and projects.
Sachdev 2011	To identify the psychological reasons of the use of Web 2.0 websites.	Survey	Autonomy Competence Relatedness	Fulfillments of the three needs motivate users to use Facebook and MySpace.	N.A.
Sheldon et al. 2011	To determine whether using Facebook helps people meet their relatedness needs.	Survey	Relatedness need satisfaction	More frequent Facebook usage paradoxically correlates with more relatedness satisfaction and more relatedness dissatisfaction.	• I felt a sense of contact with people who care for me, and for whom I care. • I felt close and connected with other people who are important to me. • I felt a strong sense of intimacy with the people I spent time with. • I felt unappreciated by one or more important people.
Xu et al. 2012	To identify the antecedents of online game addiction among adolescents.	Survey	Need for Advancement Need for Relationship	Need for relationship and need for escapism can motivate online game playing.	• It is important for me to level up my game character as fast as possible. • I often have interesting conversations with other online players.
Yee 2006	To develop a model of player motivations in online games.	Survey Components Analysis	Advancement Relationship	The analysis revealed ten motivations that grouped into achievement, social, and immersion components.	N.A.
Yoon and Rolland 2012	To identify the effect of perceived autonomy, competence, and relatedness on knowledge sharing in virtual communities.	Survey	Perceived autonomy Perceived relatedness Perceived competence	Perceived competence and perceived relatedness influence knowledge sharing behaviors.	* I have been able to provide useful knowledge in this virtual community. * I feel like I can pretty much be myself in this virtual community.

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Appendix C

Two Polarities Models

Table C1. Two Polarities Models in Psychology

Studies	Polarities	
Angyal 1951	***Autonomy*** refers to the wish to have a self-governed organismic process.	***Homonomy*** refers to the wish to be in harmony with a unit one regards as extending beyond one's individual self.
Bakan 1966	***Agency*** refers to an individual's striving to master the environment, to assert the self, to experience competence, achievement, and power.	***Communion*** refers to a person's desire to closely relate to, cooperate, and merge with others.
Beck 1983	***Autonomy*** refers to an individual's emphasis on individuality, self-reliance, and a sense of power to do what one wants.	***Sociotropy*** refers to an individual's emphasis on interpersonal interactions involving intimacy, sharing, empathy, understanding, approval, affection, protection, guidance, and help.
Blatt 1991	***Self-definition*** refers to the development of a realistic, essentially positive and increasingly integrated self-definition and self-identity.	***Interpersonal relatedness*** refers to the capacity to establish increasingly mature, reciprocal and satisfying interpersonal relationships.
Blatt 1995	***Introjective*** or ***self-definitional*** refers to the development of a consolidated, realistic, essentially positive, differentiated, and integrated self-identity.	***Anaclitic*** or ***relatedness*** refers to the development of the capacity to establish increasingly mature and mutually satisfying interpersonal relationships.
Bowen 1966	***Individuality*** or ***differentiating*** refers to the force that involves the impetus to define a separate self from others.	***Togetherness*** refers to the force that entails the pressure and desire to be like others, to agree on beliefs, principles, values, and feelings.
Freud 1930	***Egoistic*** refers to the urge toward happiness.	***Altruistic*** refers to the urge toward union with others in the community.
Hermans 1987	***S-motive*** refers to the striving for self-enhancement, i.e., self-maintenance and self-expansion.	***O-motive*** refers to the longing for contact and union with other people.
Mikulincer and Shaver 2007	***Attachment avoidance*** refers to a tendency to be uncomfortable with closeness, self-disclosure, feelings and expressions of vulnerability, and dependency.	***Attachment anxiety*** refers to the predisposition for an intense need to be close, accepted, supported, and reassured.

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Appendix D

Identifying Social Media Affordances

We generated a comprehensive set of social media affordances by following a three-step process: (1) a comprehensive review of the prior literature on social media affordances (Table D1), (2) synthesis of the literature (Table D2), and (3) triangulation by cross checking with major social media applications used in practice (Table D3). This process yielded a list of the 12 affordances shown in Table 2 in the main text. We describe these steps in detail below.

To start with, we engaged in a comprehensive review of prior literature that had identified affordances for different social media.[2] Our review identified 14 studies as listed in Table D1; among them 13 studies explicitly identified affordances, and one (Ma and Agarwal 2007) identified IT features for perceived identity verification on online communities, which we deemed to be relevant. Five of these studies identified affordances for virtual worlds (Davis et al. 2009; Goel et al. 2013; Junglas et al. 2013; Nardon and Allen 2012; Schultze 2010); two for online communities (Faraj et al. 2011; Ma and Agarwal 2007); two for social media in general (Halpern and Gibbs 2013; Kietzmann et al. 2011); one for social media in organizations (Treem and Leonardi 2012); one for social media for knowledge sharing in organizations (Majchzak et al. 2013); one for Wikipedia (Mesgari and Faraj 2012); one for geoportals (Sigala 2012); and one for the Internet in general (Wellman et al. 2003).

Then, we took several steps to synthesize these affordances to derive a set of distinct social media affordances. First, there were cases where the same affordance was labeled differently across studies. For instance, Mesgari and Faraj (2012) define *self-presentation* as "to create and demonstrate a personal image and identity" (p. 7) while the same affordance is labeled as *identity* by Kietzmann et al. (2011) and as *identifiability* by Halpern and Gibbs (2013). Second, some studies examine an affordance broadly and others in a more specific context. For instance, with respect to the *collaboration* affordance, Davis et al. (2009) describe that social media in general can afford users to work as a team, while Sigala (2012) focuses specifically on collaborating to plan a trip. Third, different studies capture distinct but different aspects of the same affordance or at different levels of abstraction. For example, the *self-presentation* affordance refers to the ability offered to users by social media to reveal and present information related to themselves (Mesgari and Faraj 2012). One aspect of this, in the context of virtual worlds, is the ability to create life-like avatars, an affordance identified as *rendering* by Davis et al. Another aspect of this is for the avatars to engage in practices of the body that express the user (e.g., sit, smile, dress appropriately) an affordance identified as *embodiment* by Schultze (2010). Yet another aspect of this in virtual worlds is *representation support* (Junglas et al. 2013). In virtual communities, one aspect of self-presentation is *persistent labeling* (e.g., screen names; Ma and Agarwal 2007). Fourth, some affordances were not necessarily *action* affordances (i.e., action possibilities) but rather *general* affordances (Gibson 1979; for a discussion, see Michaels 2003) where actions are absent. We removed these affordances from our list. For example, Treem and Leonardi (2012) identify *persistence*, the fact that in social media the contents are usually available to users and do not expire or disappear when the user logs out, as an affordance. Given that this does not indicate a direct action possibility by the user we removed this affordance, but used the spirit of the affordance (i.e., this can enable browsing

[2]We used the term *affordance* as the keyword for our literature search of peer reviewed journal articles. We manually went through the search results and selected papers examining affordances in the context of social media. We also went through the references of the selected papers to identify other relevant prior studies that our search may have missed.

of others' content) to inform our final list of affordances. In summary, our approach to consolidation involved grouping similar affordances together and generating a set of affordances at a more abstract level such that affordances are not specific to one social medium but rather generalize across social media. Table D2 documents how we consolidated the affordances. This process resulted in 10 of the 12 social media affordances described in Table 2 in the main text.

Finally, we triangulated the list of affordances derived from our literature review by going through a list of 21 major social media applications spanning the six types of social media applications identified by Kaplan and Haenlein (2010): blogs, social networking sites, content communities, collaborative projects, virtual social worlds, and virtual game worlds. Our triangulation included the most popular websites and applications for each type. In addition, we added crowdsourcing sites as a new type of social media application not present in the Kaplan and Haenlein framework. To construct the list of most popular websites in each category, we started from Alexa.com's top 500 websites (based on global website traffic) and eliminated those that were not social media sites (e.g., Apple.com). We combined these with Wikipedia's[3] list of social networking sites and with Pew Research Center's list of top social media sites.[4] This resulted in 19 social media websites for the first 4 types of social media. Considering the popularity of Second Life and World of Warcraft, we selected these two applications as the representatives of virtual social worlds and virtual game worlds. For each social media application, we identified its salient features by (1) going through the website for the application and reading its vision and description; (2) using the application; (3) browsing the application's page on Wikipedia; and (4) reading previous literature discussing the features of the application. This resulted in a list of 140 features in total. Three of the authors then independently mapped each feature to the affordances we had identified to see if our affordances collectively accounted for these salient features (see Table D3 for the results of this mapping). The interrater reliability for this mapping across members of the research team was .916. The purpose of this triangulation is twofold. First, to verify whether the list of social media affordances we identified comprehensively covers salient affordances provided by the major social media applications on the market. Second, to examine the relevance of the affordances derived from the literature to today's social media. Our triangulation provided evidence in support of both objectives with two exceptions. We added a *competition* affordance and a *sourcing* affordance because the set of affordances we had identified from the literature did not sufficiently capture features of virtual game worlds and crowdsourcing sites. This whole procedure produced the list of 12 affordances shown in Table 2 in the main text.

[3] https://en.wikipedia.org/wiki/List_of_social_networking_websites.

[4] http://www.pewinternet.org/2013/12/30/social-media-update-2013/ and http://www.pewinternet.org/2015/01/09/social-media-update-2014/.

Table D1. Descriptions of Social Media Affordances in Prior Studies

Study	Context	Social Media Affordances and Descriptions
Davis et al. 2009	Virtual world	**Rendering:** users can create or execute life-like images. **Interactivity:** users can modify the contents, move around, and use contents in a social media setting. **Communication:** users can communicate with each other. **Team process:** users can collaborate with each other as a team to cocreate contents.
Faraj et al. 2011	Online community	Affordances for **Knowledge Collaboration:** **Reviewability**: users can view and manage the content of front and back narratives over time. **Recombinability**: users can borrow and build on each other's contributions. **Experimentation**: users can try out novel ideas or provide comments or rate the creativity, potential, and excitement of a posted idea
Goel et al. 2013	Virtual world	**Social perception:** users can generate the social perception of others as being in the same space. **Social awareness:** users can generate social awareness that one can understand and interact with others in the same space in a social sense.
Halpern and Gibbs 2013	Social media	**Identifiability**: the level of identifiability versus anonymity of a user. Users can have a public space on their profiles, where they share personal information, post links, and share personal videos or pictures openly. **Networked information access**: users can have greater information access to their social networks by being automatically notified about content updates and having immediate access to information posted by their contacts.
Junglas et al. 2013	Virtual world	**Activity support**: users can observe others' presence and their actions and reciprocate them appropriately. **Context support:** a person's sense about his or her situation or where he or she is in a virtual world environment; users can have a metaphorical sense of "place." **Representation support:** users can have a sense of the meaning of artifacts in a virtual world environment. **Insight support:** users can have a sense of what others mean when communicating in a virtual world.
Kietzmann et al. 2011	Social media	**Identity**: the extent to which users reveal themselves. **Presence**: the extent to which users know if others are available. **Relationships**: the extent to which users relate to each other. **Groups**: the extent to which users are ordered or form community. **Reputation**: the extent to which users know the social standing of others and content. **Sharing**: the extent to which users exchange, distribute and receive content. **Conversation**: the extent to which users communicate with each other.
Majchrzak et al. 2013	Social Media for Knowledge Sharing in Organizations	**Generative role taking**: users can engage in the online knowledge conversation by enacting patterned actions and taking on community-sustaining roles in order to maintain a productive dialogue among participants. **Meta-voicing**: users can engage in the ongoing online knowledge conversation by reacting online to others' presence, profiles, content and activities. **Triggered attending**: users can engage in the online knowledge conversation by remaining uninvolved in content production or the conversation until a timely automated alert informs the individual of a change to the specific content of interest. **Network-informed associating**: users can engage in the online knowledge conversation informed by relational and content ties.
Mesgari and Faraj 2012	Wikipedia	**Self-presentation:** users can create and demonstrate their personal image and identity. **Management**: users can organize the community and define how the job should be done. **Control**: users can observe the changes, others' behaviors, and their contributions. The control affordance provides a variety of possible actions such as watchlisting Wikipedia pages, checking for the previous versions of any page, protecting or unprotecting article pages, blocking or unblocking vandal users, etc. **Contribution:** users can add, remove, and edit every piece of information on the wiki. **Broadcasting**: users can circulate content or knowledge and share it with an appropriate number of audiences. **Collaboration:** users can cooperate and handle interdependent activities in the Wikipedia community.

Table D1. Descriptions of Social Media Affordances in Prior Studies (Continued)

Study	Context	Social Media Affordances and Descriptions
Nardon and Aten 2012	Virtual world in organizations	**Interaction:** users can interact with other people, places and real or imagined situations. **Presence:** users can "feel" as if they are there with the other participants. **Rendering:** users can create avatars and virtual places that closely resemble real life.
Schultze 2010	Virtual world	**Embodiment:** users can engage in practicing embodiment (e.g., sit, smile, and dress appropriately). **Presence:** users can have the sense of others' existing in a given setting.
Sigala 2012	Geoportals	**Collaboration**: users can collaborate to plan a trip through collaborative exploration, collaborative synthesis/review, collaborative analysis and collaborative presentation.
Treem and Leonardi 2012	Social media in organizations	**Visibility:** social media afford users the ability to make their profiles, behaviors, knowledge, preferences, postings, and network connections visible to others. **Persistence:** in social media, the contents are usually available to users and do not expire or disappear when the poster logs out. **Editability:** in social media, individuals can spend time and effort crafting and re-crafting a communicative act before it is viewed by others. **Association:** social media can help individuals to establish connections between each other, between contents, and between an actor and a presentation.
Wellman et al. 2003	Internet	**Broader bandwidth:** on the Internet, users can go from sending short, simple text messages to posting and sending political manifestos, images, graphics, and videos. **Always connected:** on Internet, communication can be sent immediately and easily. **Personalization:** on Internet, users have control over the sources people want to get messages from, when, and about what. **Wireless portability:** wireless connectivity enables telephone and Internet access anywhere and on the go. **Globalized connectivity:** Internet facilitates transnational connectivity.

Table D2. Synthesis of Prior Literature on Social Media Affordances

No.	Affordances	Davis et al. 2009	Faraj et al. 2011	Goel et al. 2013	Halpern and Gibbs 2013	Junglas et al. 2013	Kietzmann et al. 2011	Ma and Agarwal 2007
1	Self-presentation	Rendering			Identifiability	Representation support	Identity	Self-presentation Persistent labeling
2	Content Sharing						Sharing	
3	Interactivity	Interactivity						
4	Presence Signaling			Social perception		Context support	Presence	Virtual co-presence
5	Relationship Formation						Relationships Groups	
6	Group Management						Groups	
7	Browsing Others' Content	Information processing			Networked information access		Sharing	
8	Meta-voicing		Experimentation				Reputation	
9	Communication	Communication		Social awareness		Activity support	Conversations	
10	Collaboration	Team process	Recombinability Reviewability Experimentation			Insight support		
11	Competition							
12	Sourcing							

No.	Affordances	Majchrzak et al. 2013	Mesgari and Faraj 2012	Nardon and Aten 2012	Schultze 2010	Sigala 2012	Treem and Leonardi 2012	Wellman et al. 2003
1	Self-presentation	Generative role taking	Self-presentation	Rendering	Embodiment			
2	Content Sharing		Contribution Broadcasting				Editability Visibility	Broader bandwidth
3	Interactivity							
4	Presence Signaling			Presence	Presence			
5	Relationship Formation						Association	
6	Group Management		Management					
7	Browsing Others' Content	Triggered attending	Control				Visibility	Personalization
8	Meta-voicing	Meta-voicing						
9	Communication			Interaction				Connected Personalization Wireless portability Globalized connectivity
10	Collaboration	Network-informed associating	Collaboration			Collaboration		
11	Competition							
12	Sourcing							

Table D3. Mapping of Popular Social Media Applications Features to Social Media Affordances

Types	Applications	Descriptions	Main Features	Affordances											
				1	2	3	4	5	6	7	8	9	10	11	12
Blog	LiveJournal	LiveJournal, is a weblogs service where Internet users can keep a blog, journal or diary.	browsing							✓					
			commenting								✓				
			friending					✓							
			joining and creating communities					✓	✓						
			personal message									✓			
			posting blogs	✓	✓										
			profile pages	✓											
			tagging blogs								✓				
	Xanga	Xanga is a website that hosts weblogs, photoblogs, and social networking profiles.	browsing							✓					
			commenting								✓				
			following					✓							
			posting blogs	✓	✓										
			profile pages	✓											
	Blogster	Blogster is a blogging community that features specific-interest blogs.	browsing							✓					
			commenting								✓				
			friending					✓							
			joining and creating communities					✓							
			personal message									✓			
			posting blogs	✓	✓										
			profile pages	✓											
			rating								✓				
Social Networking Site	Facebook	Facebook is an online social networking service.	browsing other people's albums							✓					
			chatting									✓			
			commenting								✓				
			friending					✓							
			liking								✓				
			sharing links of contents		✓										
			sharing my own photos	✓											
			sharing my own videos	✓											
			tagging photos								✓				
			updating my geographic location	✓											
			updating my new status	✓											
			watching videos shared by others							✓					
	Twitter	Twitter is an online social networking service that enables users to send and read short 140-character messages called "tweets."	following					✓							
			liking								✓				
			posting tweets	✓	✓										
			profile pages	✓											
			reading tweets							✓					
			retweet		✓						✓				
			twitter polls									✓			
	LinkedIn	LinkedIn is a business-oriented social networking service.	congratulate								✓				
			connections					✓							
			get introduced					✓							
			join a group					✓							
			news "signals"				✓								
			profile pages	✓											
			recommendations								✓				
			who has visited								✓				

Table D3. Mapping of Popular Social Media Applications Features to Social Media Affordances (Continued)

Types	Applications	Descriptions	Main Features	Affordances											
				1	2	3	4	5	6	7	8	9	10	11	12
Social Networking Site	Pinterest	Pinterest is a web and mobile application that offers a visual discovery, collection, sharing, and storage tool.	browsing							✓					
			commenting								✓				
			following					✓							
			liking								✓				
			personal message									✓			
			uploading pins	✓	✓										
	Tumblr	Tumblr is a micro-blogging platform and social networking website.	browsing							✓					
			chatting									✓			
			commenting								✓				
			following					✓							
			liking								✓				
			posting microblogs	✓	✓										
			reblogging		✓						✓				
			tagging microblogs								✓				
	Myspace	Myspace is a social networking service with a strong music emphasis.	connections					✓							
			listening to music							✓					
			personal message								✓				
			uploading songs/videos	✓	✓										
			watching videos							✓					
	Google+	Google+ is a social networking and identity service	browsing							✓					
			commenting								✓				
			conversation									✓			
			friending					✓	✓						
			liking								✓				
			posting contents	✓	✓										
			profile pages	✓											
			sharing links of contents		✓										
Collaborative Project	Wikipedia	Wikipedia is a free-access, free-content Internet encyclopedia. Anyone who can access the site can edit almost any of its articles.	adding, deleting, editing content										✓		
			article discussion page										✓		
			browsing							✓					
			history pages										✓		
			page protection										✓		
			user blocking										✓		
			user talk page									✓			
			village pump						✓				✓		
			voting features						✓		✓		✓		
			watchlist										✓		
	Yelp, Inc.	Yelp publishes crowd-sourced reviews about local businesses.	browsing							✓					
			connecting								✓				
			friending					✓							
			personal message									✓			
			posting reviews	✓											
			profile pages	✓											
			rating system								✓				
	Wikispecies	Wikispecies is a wiki-based online project aimed at creating a catalogue of all species.	editing content									✓			
			personal message								✓				
			reading						✓						

Table D3. Mapping of Popular Social Media Applications Features to Social Media Affordances (Continued)

Types	Applications	Descriptions	Main Features	Affordances											
				1	2	3	4	5	6	7	8	9	10	11	12
Content Community	YouTube	YouTube is a video-sharing website.	commenting								✓				
			liking								✓				
			subscribing					✓		✓					
			uploading videos	✓	✓										
			watching videos							✓					
	Instagram	Instagram is an online photo-sharing, video-sharing, and social networking service.	browsing							✓					
			following					✓							
			geotag images	✓	✓										
			leaving comments								✓				
			liking								✓				
			uploading images	✓	✓										
			web profiles	✓											
	Imgur	Imgur is an online image hosting service.	browsing							✓					
			commenting								✓				
			liking								✓				
			meme generator	✓	✓										
			tagging images								✓				
			uploading images	✓	✓										
	Flickr	Flickr is an image hosting and video hosting website.	browsing							✓					
			commenting								✓				
			following					✓							
			group					✓							
			liking								✓				
			uploading images	✓	✓										
Virtual Social World	Second Life	Second Life is an online virtual world.	building/creating			✓							✓	✓	
			chatting									✓			
			creating avatars	✓											
			group					✓	✓						
			meeting others					✓							
			moving around			✓	✓								
			trading											✓	
Virtual Game World	World of Warcraft	World of Warcraft (WoW) is a massively multiplayer online role-playing game (MMORPG) in which a very large number of players interact with one another within a virtual world.	achievement system								✓			✓	
			building/creating			✓							✓	✓	
			chatting									✓			
			completing tasks										✓	✓	
			creating a character	✓											
			guild					✓	✓						
			moving around			✓	✓								
			progression	✓										✓	
			trading											✓	
Crowdsourcing Platforms	CouchSurfing	CouchSurfing is a hospitality exchange and social networking website.	joining a group					✓							
			joining an event					✓							
			offering a couch												✓
	InnoCentive	InnoCentive is a crowdsourcing platform.	posting a problem												✓
			solving a problem												✓

Notes: 1 = Self-presentation, 2 = Content Sharing, 3 = Interactivity, 4 = Presence Signaling, 5 = Relationship Formation, 6 = Group Management, 7 = Browsing Others' Content, 8 = Meta-voicing, 9 = Communication, 10 = Collaboration, 11 = Competition, 12 = Sourcing

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Appendix E

A Brief Discussion on Why Some Psychological Needs Are Not Fulfilled by Certain Affordances

As shown in our propositions (also see Table 3 in the main text), each psychological need is fulfilled by some, but not all, affordances. We provide brief explanations for instances where a psychological need is not fulfilled by a specific affordance (that is, for all empty cells in Table 3).

The need for *autonomy* refers to people's desire to engage in activities not because one should or must (e.g., because of social pressures, norms, or obligation) but rather volitionally because one freely chooses to. Not all social media affordances can support this. For some actions on social media, users must comply with rules (e.g., how to manage group, how to compete) and restrictions (e.g., how to move around and signal presence in virtual worlds). For some other actions, there may exist social pressures and norms (e.g., clicking "like" on a post) and users may need to compromise with others' suggestions (e.g., discussing topics that others want in a conversation, taking others' suggestions during collaborations). As a result, we did not map the need for autonomy to the affordances of presence signaling, group management, competition, meta-voicing, communication, and collaboration.

The need for *competence* refers to people's desire to achieve the feeling of competence and effectance in action by applying and honing their skills. Therefore, people seek challenges that are optimal for their capacities in the context of social media. Affordances that cannot provide optimal challenge for the individual to conquer (i.e., self-presentation, content sharing, browsing others' content, interactivity, presence signaling, relationship formation, and communication) cannot fulfill the need for competence. As we state in the paper, showing off competence by posting a video, for example, that shows how one has conquered a challenge (e.g., climbing a mountain), or posting about the acceptance of one's paper in a top journal, or posting a tutorial about some statistical technique does not satisfy the need for competence. Doing these things (climbing, revising the paper, putting together the tutorial) does. Posting these is an example of self-presentation and fulfills the need for expression of self-identity, not competence.

In the context of social media, the need for *having a place* refers to people's desire to possess a virtual territory. As indicated in Table 3 in the main text, affordances that focus on interpersonal interactions (that is, allocentric affordances) cannot fulfill the need; rather, it is those affordances that engage users in personalizing their surroundings (i.e., interactivity such as creating furnishings, self-presentation such as profile page and posting own pictures, and content sharing such as posting videos on my blog) that can fulfill the need. As a result, we do not map the need for having a place as being satisfied by any of the allocentric affordances.

The need for *relatedness* refers to people's desire to develop interpersonal relationships. As such, affordances that do not focus on forming and developing interpersonal relationships cannot fulfill the need. For example, content sharing focuses on the distribution of content, interactivity focuses on interactions with the external virtual environment, and competition and sourcing focus on completing tasks. The *primary* focus of these affordances is not developing interpersonal relationships, that is, users do not use these affordances aiming to relate to others in the way they use relationship formation, presence signaling, or communication affordances, which aim to relate to others. For example, the purpose of posting content on YouTube may not necessarily be to relate to other people. Although it is possible that other features and affordances of the social media platform may interact with content sharing to satisfy the need for relatedness, this is not the primary purpose of the content sharing affordance. The same reasoning can be applied to other affordances such as interactivity, competition, and sourcing. That is, through these affordances, individual users do not fulfill their need to develop interpersonal relationships, although these affordances can interact with other features and affordances of the platform to enable this as a by-product. Therefore, they are unlikely to fulfill the need for relatedness.

Finally, the need for self-identity refers to people's desire to have a clear sense of self-appraisal of their physical, cognitive, and emotional attributes, personality traits, and social roles. Thus, affordances that have nothing to do with appraising, communicating, and sharing of self-identity cannot fulfill the need. For example, moving around in a virtual world (interactivity) and signaling one's presence do not directly help satisfy one's need for self-identity. The primary purpose of group management activities is not identity related in that the purpose of these activities are neither to discover the self nor to express self-identity. On crowdfunding (more broadly crowdsourcing) platforms, the primary goal of projectors is to obtain the needed funds and the primary goal of backers is to obtain expected returns, both of which are economic-oriented rather than identity-related goals (Agrawal et al. 2014; Kleemann et al. 2008). In practice, backers may even be concerned about releasing their individual information because it can include sensitive elements related to real personal identity and financial information. Some platforms provide features that allow backers to remain anonymous to mitigate such concerns (Burtch et al. 2015). We thus do not expect that the sourcing affordance will fulfill the need for self-identity.

Some other affordances satisfy some self-identity sub-dimensions but not others. In terms of *maintaining continuity of self-identity*, any affordance that does not allow storage of self-identity expression through time does not fulfill this need. In terms of *coming to know the self*, we did not posit any relationships with affordances that did not allow for reflected appraisals, social comparison, or understanding the self through exploration of one's environment. Finally, the *need for expressing self-identity* cannot be fulfilled with affordances that do not allow for expression of the self. As a result, we omitted links to these affordances.

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Appendix F

Empirical Study in the Context of Facebook

We conducted an empirical study in the context of Facebook to illustrate the use of the NAF perspective. Below we report details of the model development, empirical method, and results.

A NAF Model for Facebook

We took three steps to develop a NAF model for Facebook. First, as we have discussed, to identify what psychological needs motivate use of a specific social media application, one has to identify the social media affordances provided by the social medium. To identify the salient affordances provided by Facebook, we started with Facebook's mission: "Facebook's mission is to give people the power to share and make the world more open and connected. People use Facebook to stay connected with friends and family, to discover what's going on in the world, and to share and express what matters to them."[5] This suggests that self-presentation, content sharing, browsing others' content, relationship formation, and communication are salient affordances. Second, given that affordances are provided through specific features (Leonardi 2011), we selected the most popular features of Facebook based on a synthesis of relevant research (e.g., Hughes et al. 2012; Kietzmann et al. 2011; Tong et al. 2008; Zhao et al. 2008). We then asked five social media researchers (four faculty and a doctoral student) to map these features to the 12 social media affordances listed in Table 2 in the main text. Table F1 shows the result of the mapping (the raw agreement was 0.97). The only other affordance included by the raters was meta-voicing. As such, the salient social media affordances provided by Facebook are *self-presentation, content sharing, relationship formation, browsing others' content, meta-voicing,* and *communication*. Third, given these salient Facebook affordances, we used our propositions (also Table 3 in the main text) to predict which psychological needs motivate use of Facebook in general (Figure F1) and which psychological needs motivate use of specific Facebook affordances (Figure F2). This resulted in testable models shown in Figures F1 and F2.

Table F1. Mapping of Facebook Features to Facebook Affordances

Facebook Features	1	2	3	4	5	6
Updating my geographic locations	✓					
Sharing my own videos	✓					
Watching videos shared by others				✓		
Leaving comments for other people					✓	
Updating my new status	✓					
Liking what others have posted					✓	
Friending			✓			
Sharing my own photos	✓					
Browsing other people's albums				✓		
Chatting						✓
Sharing links of videos, photos, or blogs with others		✓				

Notes: 1 = Self-presentation; 2 = Content Sharing; 3 = Relationship Formation; 4 = Browsing Others' Content; 5 = Meta-voicing; 6 = Communication

[5]https://www.facebook.com/facebook/info?tab=page_info.

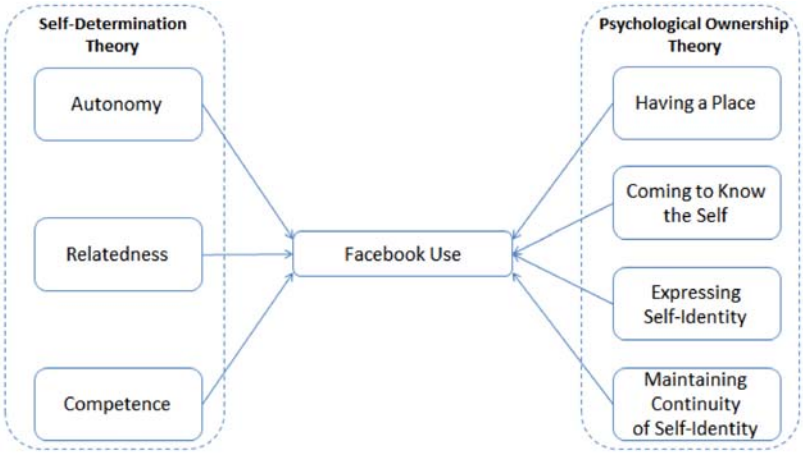

Figure F1. NAF Model for Facebook Use

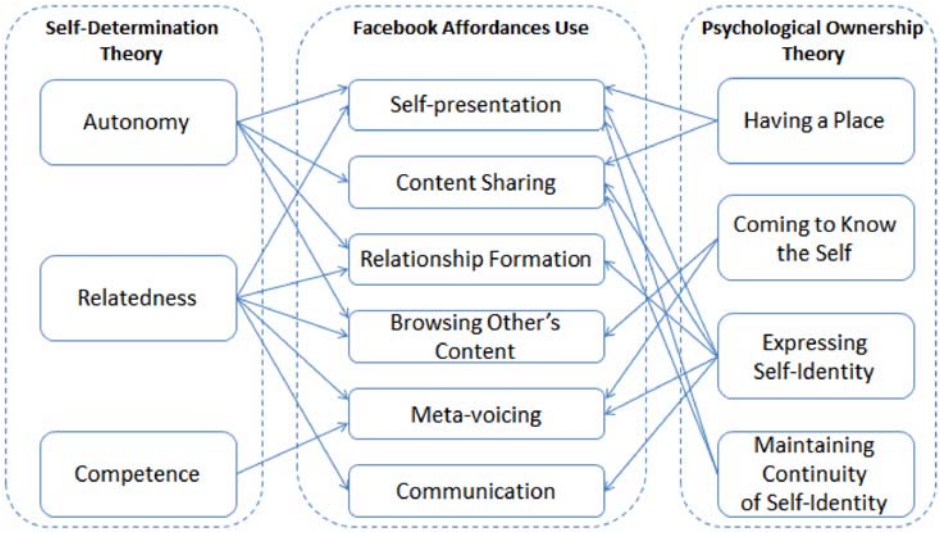

Figure F2. NAF Model for Facebook Affordances Use

Data and Sample

To test the model, we collected data through a longitudinal online survey. We used a market research firm (eSearch) to survey a broad range of individuals about their psychological needs and their use of Facebook features. To control for common methods bias, we created temporal separation between the measurement of psychological needs (independent variables) and use of Facebook features (dependent variables) (Podsakoff et al. 2003). The first questionnaire (wave 1) collected data on psychological needs. Four weeks later, individuals who completed the first questionnaire were sent a second questionnaire (wave 2) that measured Facebook use. In total, 302 individuals accessed our first survey and 240 of these completed it. Of the 240 individuals who completed the first questionnaire, 151 provided us with an identifier that enabled us to send them a second questionnaire.[6] Of these, 110 respondents completed the second questionnaire, which constitutes our final sample.

[6]The respondents were not aware that a follow-up questionnaire was going to be sent. The identifier provided was an eSearch identifier and the respondents knew via the consent letter that their responses were anonymous to the researchers. Therefore, whether or not they provided an identifier was not linked to not wanting to participate in a follow up questionnaire (since they did not know it was coming) or to our being able to tie responses to respondents, since this was anonymous to us.

We assessed the representativeness of our sample by comparing it with the population of U.S. Internet users (Table F2) and with the eSearch panel, our sampling frame (Table F3). We also compared earlier and later respondents (Table F4). Table F5 presents the descriptive statistics of use of Facebook features by our sample (five-point Likert scale).

Table F2. Demographics of Participants and Comparison with U.S. Internet Users (N = 3946 for eSearch Panel, N = 240 for Wave 1, N = 110 for Wave 2)

Variable	Category	Frequency (%)			
		e-Search Panel	Wave 1	Wave 2 (Final Sample)	U.S. Census Bureau[a] (N = 231276*)
Gender	Male	1977 (50.1)	119 (49.6)	55 (50.0)	143780 (49.0)
	Female	1969 (49.9)	121 (50.4)	55 (50.0)	149634 (51.0)
Age	18-34	1441 (36.5)	65 (27.1)	26 (23.6)	71210 (30.8)
	35-44	540 (13.7)	34 (14.2)	12 (10.9)	39478 (17.1)
	45-64	1459 (37.0)	101 (42.1)	51 (46.4)	80947 (35.0)
	Above 65	506 (12.8)	40 (16.7)	21 (19.1)	39641 (17.1)
Internet experience (years)		Mean (S.D.)			
		Panel	Wave 1	Wave 2	U.S. Census Bureau
		N/A	14.2 (4.2)	14.8 (5.6)	N/A

[a]http://www.census.gov/hhes/computer/

Table F3. Sample Comparisons with eSearch Panel (N = 3946 for eSearch Panel, N = 240 for Wave 1, N = 110 for Wave 2)

	Panel Mean (S.D.)	W1 Mean (S.D.)	W2 Mean (S.D.)	Panel vs. W1	Panel vs. W2	W1 vs. W2
Gender	0.50 (0.50)	0.50 (0.50)	0.50 (0.50)	t = 0.054 n.s.	t = 0.061 n.s.	t = 0.047 n.s.
Age	45.12 (17.21)	50.10 (16.70)	49.40 (16.48)	t = 0.723 sig.	t = 0.820 n.s.	t = 0.345 n.s.
Internet experience	N/A	14.4 (5.0)	14.8 (5.6)	N/A	N/A	t = 0.682 n.s.

Notes: sig. = significant; n.s. = not significant; W1 = Wave1, W2 = Wave 2

Table F4. Assessment of Non-Response Bias (N = 94 for Early Respondents, N = 16 for Late Respondents)

	Early Respondents Mean (S.D.)	Late Respondents Mean (S.D.)	Early vs. Late
Gender	0.50 (0.50)	0.50 (0.52)	t = 0.001 n.s.
Age	49.22 (16.34)	50.44 (17.82)	t = 0.271 n.s.
Internet experience	14.8 (5.6)	15.1 (6.1)	t = 0.197 n.s.

Notes: n.s. = not significant
The table presents t-tests on demographics. T-tests on constructs of the study were also nonsignificant.

Table F5. Descriptive Statistics of Use of Facebook Features			
Facebook Features	**Min/Max**	**Mean**	**Std.**
Updating my geographic locations	1.00/4.00	1.43	0.70
Sharing my own videos	1.00/5.00	1.46	0.88
Watching videos shared by others	1.00/5.00	2.46	1.27
Leaving comments for other people	1.00/5.00	3.16	1.17
Updating my new status	1.00/5.00	2.51	1.15
Liking what others have posted	1.00/5.00	3.29	1.27
Friending	1.00/5.00	2.87	0.93
Sharing my own photos	1.00/5.00	2.55	1.22
Browsing other people's albums	1.00/5.00	3.18	1.15
Chatting	1.00/5.00	2.16	1.06
Sharing links of videos, photos, or blogs with others	1.00/5.00	2.30	1.18

Measurement Model

We developed multi-item scales to measure our model constructs. Table F6 presents our scale items. We used covariance-based structural equation modeling in AMOS to test the measurement model. The fit statistics for the measurement model ($\chi^2 = 330.335$, df = 164, $\chi^2/df = 2.01$, RMR = 0.13, GFI = 0.79, NFI = 0.84, CFI = 0.91, RMSEA = 0.10) indicate acceptable fit. Further, as shown in Table F7 and Table F8, the scales exhibit good reliability (composite reliabilities range from .855 to .948), good convergent validity (all item loadings are above .707 and the AVE is greater than .5 for all constructs), and good discriminant validity (AVE greater than inter-construct correlations).

Table F6. Scale Items

Construct	Abbr.	Items
Psychological Needs*		
Autonomy	A	I need to be able to decide for myself how to live my life. I need to be able to freely voice my ideas and opinions. In my daily life, I have the need to act freely.
Relatedness	R	I feel the need to socially interact with people. I feel the need to have a lot of social contacts. I feel the need to develop friendships with people I regularly interact with. I feel the need to be close to many people.
Competence	C	I need to feel competent. I need to feel capable in what I do. I need to have opportunities to show how capable I am.
Having a place	HP	I need to have a safe and secure place like home. I need places that feel like home to me.
Coming to know the self	CK	I feel a need to develop a sense of self-identity. I feel a need to discover what kind of person I am. I feel a need to learn about myself.
Expressing self-identity	ES	I feel a need to express who I am. I feel a need to express my personality. I feel a need to express my self-identity.
Maintaining continuity of self-identity	MC	I have a need that who I am today also incorporates my past. I have a need that my past be an important part of my self-identity. I feel a need that who I am today does not ignore my past.
*All needs items were measured on a 7-point scale: 1 = strongly disagree and 7 = strongly agree.		
Use of Facebook Features#		
Frequency of use of Facebook (aggregate of use across features)	Please indicate the extent to which you use each of the following Facebook features	
	F1	Updating my geographic locations
	F2	Sharing my own videos
	F3	Watching videos shared by others
	F4	Leaving comments for other people
	F5	Updating my new status
	F6	Liking what others have posted
	F7	Friending
	F8	Sharing my own photos
	F9	Browsing other people's albums
	F10	Chatting
	F11	Sharing links of videos, photos, or blogs with others
#All use items were measured on a 5-point scale: 1 = never and 5 = very often.		

Table F7. Summary Statistics

	Constructs	Mean (S.D.)	Correlation Matrix (1)	(2)	(3)	(4)	(5)	(6)	(7)
Self-Determination	(1) A	5.56 (1.13)	.82						
	(2) R	4.14 (1.35)	.43***	.83					
	(3) C	5.25 (1.18)	.79***	.41***	.85				
Psychological Ownership	(4) HP	5.82 (1.02)	.56***	.18	.64***	.91			
	(5) CK	4.01 (1.43)	.51***	.50***	.75***	.34**	.81		
	(6) ES	4.71 (1.49)	.60***	.57***	.72***	.38***	.67***	.93	
	(7) MC	5.15 (1.18)	.76***	.36**	.62***	.48***	.34**	.63***	.84

Notes: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

A = autonomy; R = relatedness; C = competence; HP = having a place; CK = coming to know the self; ES = expressing self-identity; MC = maintaining continuity of self-identity.

The diagonal elements represent the square root of the AVE.

Table F8. Measurement Model Results

Constructs	Items	Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Autonomy	A1	0.842	0.855	0.860	0.674
	A2	0.885			
	A3	0.728			
Relatedness	R1	0.836	0.894	0.895	0.681
	R2	0.863			
	R3	0.757			
	R4	0.840			
Competence	C1	0.890	0.873	0.882	0.715
	C2	0.885			
	C3	0.755			
Having a place	HP1	0.961	0.897	0.902	0.822
	HP2	0.849			
Coming to know the self	CK1	0.830	0.853	0.855	0.664
	CK2	0.856			
	CK3	0.755			
Expressing self-identity	ES1	0.859	0.946	0.948	0.859
	ES2	0.964			
	ES3	0.953			
Maintaining continuity of self-identity	MC1	0.807	0.869	0.876	0.704
	MC2	0.749			
	MC3	0.948			

Results of Hypotheses Testing

First, we tested the NAF model for Facebook use by running regressions. Facebook use was measured as an aggregate of feature use. The advantage of an aggregate measure is that random noise in individual measures can be averaged out (Fichman 2001). The results are shown in Table F9. Second, we tested a NAF model of use of Facebook affordances. For this model, our dependent variables are affordances' usage

determined by aggregating use of Facebook features grouped by the affordance they provide. This provides a test of our mapping of psychological needs to affordances as per Table 3 in the main text. We used seemingly unrelated regression (SUR) (Zellner 1962) for this analysis because our dependent variables, use of different affordances, may be correlated. This is because individuals' use of different features may co-vary due to individual characteristics, such as personal interests. In addition, due to the limitation of one's time and cognitive resources, it is possible that the use of a particular feature reduces the time one can allocate to others. Thus, it is appropriate to use SUR since it correlates regression error terms across a set of regression equations. The SUR results of this analysis are shown in Table F10. Both regressions include the control variables of age, gender, and Internet experience for the following reasons. Although SDT posits the same innate needs for males and females, research alludes to possible societal influences that may make different needs more salient for each gender (for a discussion, see Deci and Ryan 1985). Furthermore, age, gender, and Internet experience have been found as significant demographic influences in models that examine technology use (e.g., Venkatesh el al. 2003).

Table F9. Regression Results (N = 110)

	Facebook Use[#]
Psychological Needs	
Autonomy	.295[*] (.131)
Relatedness	.221[*] (.101)
Competence	-.210 (.154)
Having a Place	-.055 (.110)
Coming to Know the Self	.020 (.124)
Expressing Self-Identity	.322[*] (.140)
Maintaining Continuity of Self-Identity	.055 (.120)
Controls	
Age	-.114 (.098)
Gender	.186[*] (.093)
Internet Experience	.083 (.098)
R^2	.401
Adjusted R^2	.337

Notes: [*]$p < 0.05$; [#]betas (standard errors); Gender: 0 = Male, 1 = Female

We have two high-level observations: each of the Facebook affordances is related to fulfilling some psychological needs, and the salient psychological needs that are use drivers in the Facebook context are *autonomy*, *relatedness*, and *expressing self-identity*. A detailed discussion follows.

Table F10. SUR Results (N = 110)

	Self-presentation	Content Sharing	Relationship Formation	Browsing Others' Content	Meta-voicing	Communication
Psychological Needs						
A	.061 (.088)	-.098 (.102)	.130 (.088)	.181* (.092)		
R	.172 (.090)		.197* (.099)	.137 (.092)	.123 (.093)	.293** (.091)
C					-.043 (.097)	
HP	-.119 (.071)	-.155 (.087)				
CK				.133 (.094)	.031 (.090)	
ES	.356*** (.107)	.403*** (.106)	.091 (.109)		.231* (.114)	.082 (.096)
MC	-.138 (.083)	.114 (.101)				
Controls						
Age	-.038 (0.95)	-.090 (.093)	.065 (.097)	-.117 (.098)	.070 (0.96)	-.151 (.093)
Gender	.164 (.093)	.261** (.091)	-.006 (.093)	.224* (.088)	.256** (.091)	.124 (.090)
IE	.063 (.099)	-.033(.097)	-.009 (.099)	.208* (.096)	.128 (.099)	-.101 (.096)
R^2	.235	.285	.203	.265	.246	.263
Adj. R^2	.171	.233	.154	.220	.191	.225

Notes: *p < 0.05, **p < 0.01, ***p < 0.001. Table entries are estimated coefficients (standard errors).
Gender: 0 = Male, 1 = Female.
A = autonomy; R = relatedness; C = competence; HP = having a place; CK = coming to know the self; ES = expressing self-identity; MC = maintaining continuity of self-identity; IE = Internet Experience (in years).

Our results support links between the need for *relatedness* and use of relationship formation and communication affordances. We find nonsignificant links from the need for relatedness to the self-presentation, browsing others' content, and meta-voicing affordances. Although these three affordances may also help individuals develop relationships with others, our results seem to suggest that this is not why Facebook users employ these. It could be that when individuals are offered multiple affordances that can fulfill the same psychological need, they select the ones that most directly fulfill the psychological need. Based on our results, the "friending" feature (enabling the relationship formation affordance) and the "chatting" feature (enabling the communication affordance) are the ones used to fulfill the need for relatedness on Facebook.

The need for *autonomy* is significantly related to the browsing others' content affordance, but not to other expected affordances. This suggests that, while Facebook users can indeed freely determine what to browse and when, some restrictions may limit the degree of freedom to which users present themselves, share content, and form relationships. People on Facebook, which enforces a strict "real name" policy in all versions of its application, may feel constrained by social norms that arise from their social network (e.g., family, friends, colleagues, etc.) and by the need to engage in impression management. Therefore, users' behaviors may not be truly self-determined, and as a result, they may not find that Facebook fulfills their need for autonomy. In other words, the constraint set by social norms and users' impression management may set boundaries when users present themselves, share content, and form relationships. A stark comparison may be Twitter or virtual game worlds where users can be anonymous and thus can engage more freely in authentically autonomous behaviors. For example, research has found that the reduction of social pressure brought about by anonymity on Twitter makes people express more freely (Huberman et al., 2008; Hughes et al. 2012). This suggests that how an affordance is provided (e.g., in this case, with or without anonymity; in the context of one's social network or among strangers) may influence whether the affordance fulfills a specific need, suggesting that future research should examine the role of moderators on these relationships. We also did not find a link between coming to know the self and browsing others' content. The logic for positing this link was one of social comparison: by comparing oneself with others (as reflected by their postings), one is able to better appraise one's own abilities and standing. The social nature of postings on Facebook may preclude more meaningful social comparisons.

The link between meta-voicing and the need for *competence* is nonsignificant. One possible interpretation is that on Facebook there is less of an opportunity to provide feedback to others that requires competence. Indeed, much of the meta-voicing on Facebook is in the form of "likes" or social comments. This may also explain why meta-voicing does not fulfill the need of coming to know the self on Facebook.

Further, our results support that individuals high on the need to *express self-identity* will use Facebook features that provide self-presentation, content sharing, and meta-voicing affordances that enable them to fulfill this psychological need. Use of the relationship formation and

communication affordances are not found to be driven by that psychological need. The nature of Facebook's social network (which consists of many offline friends and family) and the social pressure to accept "friend" requests from offline friends, may constrain the opportunity for relationship formation (enabled by "friending") to truly express one's self-identity through connections. Further, the information communicated regarding self through the chatting feature (enabling communication) may not be as rich as compared to sharing videos, photos, or blogs (i.e., self-presentation and content sharing affordances). In other words, if people want to use Facebook features to fulfil the need for expressing self-identify, they may be more likely to use features for self-presentation and sharing, rather than use the friending and chatting features.

The *need for having a place* plays a nonsignificant role in driving Facebook use. Our expectation was that, by sharing self-related videos and photos, or other content people may come to see Facebook as their own place. This expectation, however, is not supported by our empirical evidence. Prior research (Davis et al. 2009; Saunders et al. 2011) suggests that, in order to create "own place" on social media, users need to engage with the environment (e.g., changing their "home" by personalizing it). It may be that, on Facebook, people are mainly immersed in social activities with others, rather than engaged in developing Facebook to be a place of their own.

Finally, the need for *maintaining continuity of self-identity* may not be what drives people to use Facebook. Instead, satisfaction of this psychological need may be a byproduct of engaging in Facebook use. For example, people will post and share material to express their self-identity on Facebook. Over time, the persistent nature of this material (i.e., it stays on one's wall unless one erases it) provides a retrospective view and temporal continuity for the identity. This may explain the nonsignificant effect.

In sum, our empirical results suggest that the salient psychological needs that motivate Facebook use are autonomy, relatedness, and expressing self-identity. These are fulfilled by the affordances of browsing other's content for autonomy, relationship formation and communication for relatedness, and self-presentation, content sharing, and meta-voicing for expressing self-identity.

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