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The Central Role of Engagement in Online Communities

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Online communities are new social structures dependent on modern information technology, and they face equally modern challenges. Although satisfied members regularly consume content, it is considerably harder to coax them to contribute new content and help recruit others because they face unprecedented social comparison and criticism. We propose that engagement—a concept only abstractly alluded to in information systems research—is the key to active participation in these unique sociotechnical environments. We constructed and tested a framework that demonstrates what engagement is, where it comes from, and how it powerfully explains both knowledge contribution and word of mouth. Our results show that members primarily contribute to and revisit an online community from a sense of engagement. Nonetheless, word of mouth is partly influenced by prior satisfaction. Therefore, engagement and satisfaction appear to be parallel mediating forces at work in online communities. Both mediators arise from a sense of communal identity and knowledge self-efficacy, but engagement also emerges from validation of self-identity. Nevertheless, we also found signs that the contributions of the most knowledgeable users are not purely from engagement, but also from a competing sense of self-efficacy. Our findings significantly contribute to the area of information systems by highlighting that engagement is a concrete phenomenon on its own, and it can be directly modeled and must be carefully managed.

Keywords: online communities; engagement; self-identity verification; knowledge self-efficacy; community identification; knowledge contribution; word of mouth
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1. Introduction

Over the past decade, managers and researchers have taken great interest in how online communities can galvanize Internet users to engage in more collaboration, promotion, and purchases (Algesheimer and Dholakia 2006, Ma and Agarwal 2007, Brandtzæg and Heim 2008, Lee et al. 2003). Members of online communities benefit from access to a greater diversity of knowledge and a larger number of people than they can find in their own social or professional networks (Constant et al. 1996). Yet despite these potential benefits and despite the many anecdotal examples of serendipitously successful online communities, systematic reviews find that most of them lack participants and lie dormant (Ludford et al. 2004). The difficulty seems to lie in the voluntary and anonymous nature of online communities that creates an atmosphere of unregulated social comparison that inhibits thoughtful participation and deters newcomers. Simply creating an Internet-mediated environment does not yield active collaboration. Online communities must repurpose the calculus of social comparison to create a sense of engagement between members that encourages them to sustain value-adding interactions and even recruit new members (Chen et al. 2010).

Ma and Agarwal (2007) offered a framework that helped us understand the dynamics of interactions in online communities by tying together information artifacts, members' perceptions, and ultimately prosocial behavior. Their framework was built on prior studies of technologically mediated groups that suggest that knowledge contribution is a function of such factors as their group identity and knowledge self-efficacy (Chiu et al. 2006, Kankanhalli et al. 2005, Wasko and Faraj 2005). Ma and Agarwal (2007) additionally proposed that a sense of self-identity could directly boost knowledge contribution, and such a relationship is partially mediated by community members' satisfaction with participating in their online community. Although researchers implicitly concur on the significance of engagement in the context of online communities, the notion of engagement itself remains relatively little understood in the information systems literature. To develop a deeper understanding of how to engage members, we sought to extend

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Ma and Agarwal's (2007) framework by delving into what precisely engagement is, how it relates to the well-understood dynamics of satisfied social exchange, and whether satisfaction and engagement might have different outcomes on contribution and word of mouth.

This study contributes to the research on online communities by explicitly introducing engagement as a powerful and parsimonious construct. Engagement has been largely treated as an abstract concept in information systems research but has emerged in other fields as a theoretically and empirically validated construct in its own right (Algesheimer et al. 2005, Bakker et al. 2008, Kahn 1990). Group engagement is a heightened state of mind that fully energizes people to undertake prosocial tasks that benefit others in a group. Engaged individuals not only believe that their contributions carry impact but also find them to be meaningful and challenging (Kahn 1990). Engagement explains good citizenship in environments without barriers to entry or exit and so should play an especially important role in online communities. Furthermore, it explains proactive behavior rather than treating all interactions as simple exchange propositions enforced by compensation and punishment. We propose that engagement is a central element in online communities, where it should mediate beliefs of identity and ability, and so promote truly prosocial behavior.

We conducted an empirical test of our conceptual model that largely supported our propositions but also yielded unexpected findings. We found that engagement, instead of satisfaction, parsimoniously explains knowledge contribution intentions in online communities. But engagement and satisfaction jointly explain word-of-mouth intentions to promote communities. We also discovered a critical formative difference between engagement and satisfaction. Both are enhanced by a communal identity and by knowledge expertise, but a sense of engagement is uniquely enhanced when one is appreciated for playing a distinct role in an online community. Finally, we found that engagement's effect on knowledge contribution decreases with an increase in knowledge self-efficacy. Altogether, this study helps crystallize the heretofore abstract notion of engagement in online communities and offers strategic directions for their management.

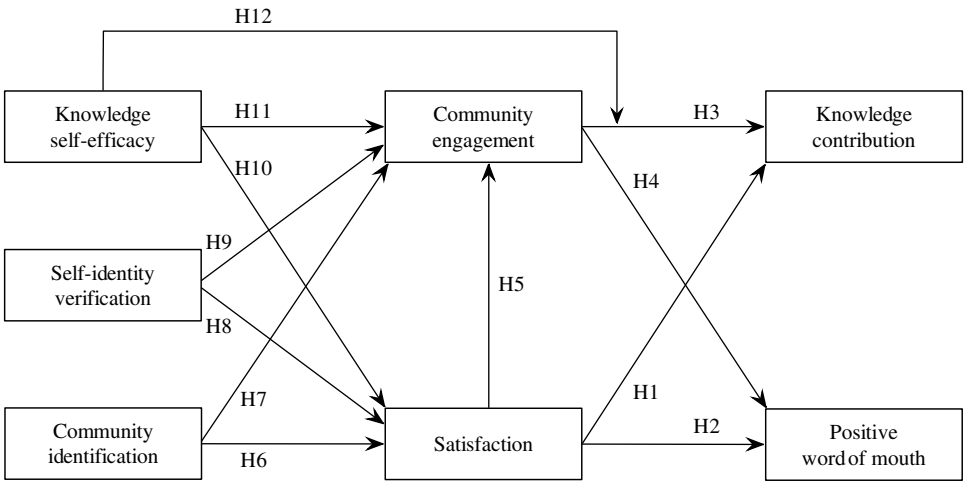
2. Engaging Online Communities

Figure 1 illustrates our conceptual model of engaged behavior in online communities. It reflects the understanding gained from extant research (Ma and Agarwal 2007) that knowledge contribution arises from antecedent beliefs of identity that are partially mediated by satisfaction. To this we added the intention to spread positive word of mouth about one's online community and the mediating role of engagement. We then anticipated that knowledge self-efficacy both antecedes and interacts with engagement.

2.1. Online Communities and Prosocial Behavior

Members of online communities primarily meet and exchange knowledge in web-based discussion forums rather than through existing social networks. Although members may personally know others who have joined the community, we expect the majority of interactions to be between strangers who do not generally share strong interpersonal ties. Instead, they share a sense of collective belonging and mutual responsibility, they develop their own rituals and traditions, and they have a sense of obligation toward fellow members and toward the community as a whole (Muniz and O'Guinn 2001, Tönnies 1957, Wellman et al. 1996). Many earlier studies similarly conceptualized online communities as discussion forums of strangers whose communal identity revolves around professional interests (Chiu

Figure 1 Conceptualization of Proposed Model



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et al. 2006, Wasko and Faraj 2005), specific personal interests (Ma and Agarwal 2007), or just a large set of general interests (Bateman et al. 2011).

As information-technology mediated social phenomena, online communities present unique challenges rarely observed in other settings. Their members depend on the Internet to share information with each other and primarily derive value from the content that other members contribute (Chen et al. 2010). The lack of formal obligations means that these knowledge contributions are voluntary. This allows members to remain anonymous and distant from one another, which results in less normative pressure than in social networks. The relative lack of normative pressure in turn enables impulsive or extreme behavior, delays in communication, and lurking by members who consume information without contributing their own knowledge in return (Kiesler and Sproull 1992, Rafaeli et al. 2004).

In such free and anonymous conditions, it is difficult to encourage members to perform prosocial behavior, which is action that not only benefits individual members but also the community as a whole (Algesheimer et al. 2005, McAlexander et al. 2002, Muniz and O'Guinn 2001). The most studied of such prosocial behaviors across computer-mediated group settings is *knowledge contribution* (Chiu et al. 2006, Kankanhalli et al. 2005, Ma and Agarwal 2007, Wasko and Faraj 2005). Online communities are especially dependent on their members to share the knowledge that they themselves consume and thereby add value for existing members. But for a community to combat attrition in membership, individual members must also promote the image of their community and recommend membership to outsiders by spreading *positive word of mouth* (Algesheimer et al. 2005, Yen et al. 2011). Word of mouth is drawing increasing interest in research on Internet services as a distinguishing asset of successful online services (e.g., Kim and Son 2009, Hennig-Thurau et al. 2004). We examined why members undertake both of these prosocial behaviors.

2.2. Satisfaction and Engagement

Prosocial action, like knowledge contribution, is often examined in studies of electronically mediated groups through the lens of social capital and social exchange (Chiu et al. 2006, Law and Chang 2008, Wasko and Faraj 2005). Furthermore, satisfaction has been previously seen as an evaluation of the exchange proposition of the community as a whole and found to partially mediate the influence of key identity beliefs on behavior (Ma and Agarwal 2007). Although satisfaction can strongly explain prosocial behavior in online communities, we found that it does not sufficiently explain voluntary efforts to share expertise in situations in which an extrinsic reward is absent and a direct reciprocal exchange is uncertain.

2.2.1. Outcomes of Online Community Satisfaction.

Satisfaction results from a cost-benefit assessment of one's prior expectations of how well one's needs might be fulfilled (Anderson and Sullivan 1993). Satisfaction influences intentions because people perceive it to be an important indicator of future value (Anderson et al. 1994). The mediating role of satisfaction between expected benefits and future intentions is highlighted across information system contexts (DeLone and Mclean 2003, McKinney et al. 2002, Wixom and Todd 2005). In the context of online communities, *online community satisfaction* comprises members' overall evaluation of earlier interactions at their community website (Ma and Agarwal 2007).

Social exchange abounds in online communities because members know they must cocreate value. They are aware that to consume knowledge, they must also contribute so that others may consume and return knowledge (Molm 1991). Such reciprocity is a key social norm that encourages people to continually get and return favors in generalized exchanges (Molm 1991, Nahapiet and Ghoshal 1998). Satisfaction with social interactions is a positive assessment of prior benefits that signals that one must now reciprocate in exchange (Bateman and Organ 1983, Rusbult et al. 1988). We hypothesize that satisfaction promotes prosocial behavior such as knowledge contribution by triggering feelings of reciprocity.

Hypothesis 1 (H1). *Satisfaction positively influences knowledge contribution intentions*.

The norms of social exchange that satisfaction triggers may also promote prosocial behavior such as recommending membership to others. In studies of consumer behavior, positive word of mouth is treated as a prosocial behavior attributed to a "helping the company" motivation, wherein people's satisfaction with prior consumption experience influences their subsequent desire to say positive things about the company (Hennig-Thurau et al. 2007). By recommending potential visitors, current members can help their online community to counter member attrition and improve its diversity and depth of knowledge.

Providing word-of-mouth referral is one of the most telling user behaviors in information systems research because it potentially risks a recommender's social image (Gefen 2002, Kim and Son 2009, Reichheld 2003). We feel that the impact of satisfaction on word of mouth in the context of online communities will be as significant as, if not stronger than, the relationship found in general online service settings. Unlike online service customers whose identity can remain largely independent of companies, online community members share common goals and interests with their communities (Ma and Agarwal 2007). Therefore, community members will attach extra personal meaning to their

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recommendations to outsiders who may, rightly or wrongly, associate recommenders with the characteristics of the community.

Recommending an online service allows us to give "something in return for a good experience" (Hennig-Thurau et al. 2007, p. 42), and thus constitutes a form of social exchange. Recommending an online community to outsiders allows its satisfied members to reciprocate for having received useful information. Recommending an online community from a sense of satisfaction fulfills normative obligations to reciprocate and also assures members that their recommendations will not bring undesirable results. Accordingly, we hypothesize that satisfaction with interaction makes members more likely to promote their online community through word of mouth.

Hypothesis 2 (H2). *Satisfaction positively influences word-of-mouth intentions*.

Although satisfaction reflects how members appraise their interactions with their online community, we found it only partially explained the prosocial actions of members. Satisfaction mainly reflects one's role as a consumer seeking new value to satiate needs. Even if there is a correlation between one's satisfaction and contributions, satisfaction still largely reflects one's response to earlier satiation of personal needs rather than a full appraisal of one's involvement and enthusiasm with the tasks at hand (Rich et al. 2010).

The constant creation of new value in online communities requires existing members to regularly produce value with a degree of zeal typically associated with employees of an organization (Yen et al. 2011). Even though members of informal online communities recognize some obligation to contribute, they cannot be formally required to do so. Organizational theory tells us that members of a group with task obligations are keenly aware of the difference between essential actions that are formally required versus those that constitute going the extra mile to be a good citizen (Bateman and Organ 1983). But what is more, the asynchronous nature of communication in discussion forums and the relative anonymity granted through the use of pseudonyms combine to permit members to consume unobserved. This means that members are even safe from the normative pressure to participate that pervades informal groups in face-to-face contexts. Thus, we must examine why members of online communities might go the extra mile to engage in informal, voluntary contributions when they are unobserved and their actions unrewarded.

2.2.2. Outcomes of Online Community Engagement. The array of traits that underlie continual contribution in the unconstrained but risky environment of online communities needs a holistic explanation that ties personal inspiration to group needs and emphasizes agency over obligation. An exploration of such uninhibited and helpful behavior is found in the emerging research on engagement. Group engagement is a heightened state of mind in which people are ready to completely and simultaneously invest their full range of energies in challenging tasks that are perceived to be socially important and personally meaningful (Kahn 1990, Maslach et al. 2001). Engagement was initially framed as a state of positive work psychology that mitigates employee attrition and burnout (Hakanen et al. 2006, Harter et al. 2002, Maslach et al. 2001, Schaufeli and Bakker 2004). Recently, it has reemerged as a powerful explanation for the sustained conduct of exemplary performance (Bakker et al. 2008, Rich et al. 2010).

Engagement is a holistic psychological state in which one is cognitively and emotionally energized to socially behave in ways that exemplify the positive ways in which group members prefer to think of themselves (Kahn 1990, Rich et al. 2010). Such exemplary behavior certainly includes being heedful of the need to produce immediate value for others. But engaged people go beyond dutiful delivery of results by voluntarily pursuing good citizen behaviors that are informal, emergent, helpful, and conscientious (Rich et al. 2010). Equally important, because engaged people seek to harness their full energies in helpful ways, they accomplish relevant tasks in ways that are innovative and interpersonally collaborative (Kahn 1990). Empirical evidence suggests that engagement explains many community-oriented behaviors both in informal and formal social contexts (Algesheimer et al. 2005, Rich et al. 2010). But an engagement construct has not been explicitly studied in an information systems context.[1]

In this study, we adapted the concept of community engagement (Algesheimer et al. 2005) toward prosocial contributions in online communities. We conceptualized *online community engagement* as the enthusiasm of members for contributing to their community because they feel it is an action that is effective, meaningful, and challenging. The key attributes of engaged actions, namely, conscientiousness toward social value, innovation, and collaboration, are highly

[1] Our study emphasizes the contrast between engagement and satisfaction. Ma and Agarwal (2007) previously demonstrated the role of satisfaction. Prominent studies of Internet-mediated knowledge sharing have also mentioned two other psychological forces that seem highly related to engagement: multidimensional commitment (Bateman et al. 2011) and intrinsic motivation (Kankanhalli et al. 2005, Wasko and Faraj 2005). We conducted a small exploratory study to contrast our conceptualization and measurement of engagement against three dimensions of commitment and intrinsic motivation. Engagement proved to be a cohesive concept that was related to, but distinct from, these other factors. Details of the exploratory study can be found in the online appendix (available as supplemental material at http://dx.doi.org/10.1287/isre.2014.0525).

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relevant to knowledge contribution because new knowledge only becomes valuable to others if it entails a novel combination of existing information that is interpersonally exchanged (Nahapiet and Ghoshal 1998). Furthermore, engagement yields an extraordinary mix of helpful, diligent, and socially integrative efforts that precisely address the challenging elements of online communities. Engaged members are more likely to contribute in the purely voluntary environment of online communities because they seek tasks that are informal and have impact. They sustain their efforts and remain proactive even in the anonymity afforded to them because they routinely seek to perform prosocial actions. Thus, we hypothesize that online community engagement provides an integrative explanation for knowledge contribution, reflects a personal drive to fulfill community needs, and is distinct from the more calculated and obligatory exchange proposition of satisfaction.

Hypothesis 3 (H3). *Community engagement positively influences knowledge contribution intentions*.

Apart from directly contributing knowledge, engaged members can also indirectly contribute by promoting their community. Empirical evidence suggests that engaged members of organizations develop a mental framework in which they not only volunteer for essential tasks but also participate in broader behaviors. These behaviors include defending their group from criticism, displaying pride when their organization is represented in public, expressing loyalty to it, and showing concern for its image (Rich et al. 2010, Lee and Allen 2002). Studies of online communities often consider a recommendation of one's community to be a significant extra-role action that helps define good citizenship behavior (Yen et al. 2011). By undertaking more abstract, promotional tasks, engaged members believe they help facilitate a more socially and psychologically positive environment (Christian et al. 2011).

Although we expect satisfaction to drive members to promote their community as "something in return," we believe engagement drives word of mouth for a different reason. Engaged people experience a heightened state in which their full energies are activated (Kahn 1990). Such a sustained positive imbalance of energy often leads people to indulge in word of mouth because they want to "share the joy" with others and thereby restore balance in their life (Hennig et al. 2004). In this sense, promoting one's online community offers an effective release of positive energy, much like contributing worthwhile knowledge. Moreover, members share a sense of kinship with their community because of their shared identity. Therefore, sharing news about the community with outsiders is essentially sharing a personally meaningful experience. Given that spreading word of mouth about an online community can be effective and meaningful, we predict that engagement makes members perceive telling others about their website as a joyful proposition whose motivations are distinct from the reciprocity triggered by satisfaction.

Hypothesis 4 (H4). *Community engagement positively influences word-of-mouth intentions*.

2.2.3. Satisfaction and Engagement. We find both satisfaction and engagement to be compelling mediating factors that explain behavior in online communities, albeit in two very different ways. Community satisfaction is an affective reaction to need fulfillment that can trigger exchange-based normative behavior. In contrast, online community engagement is a proactive psychological state geared toward performing helpful activities. In their respective empirical literatures, satisfaction and engagement are independently positioned as important mediators of behavior (Anderson and Sullivan 1993, Rich et al. 2010). We are not aware of studies that explore the relationship between satisfaction and engagement, but we believe that these two mediators ought to be related to each other in the context of online communities. As we will elaborate on later, engagement requires a sense of safety and assuredness about one's investment of energy in prosocial tasks (Kahn 1990). Formal organizations and face-to-face settings can give members a sense of safety from neglect or abuse by regulating behavior and establishing normative bounds. In the informal setting of the Internet, people's behavior can only be minimally regulated. Members can willfully ignore others or openly, yet anonymously, criticize their contributions. As a result, new visitors to an online community cannot be assured that they will not be criticized or ignored. But members can develop a sense of safety from a history of satisfactory experiences in that community. Therefore, we hypothesize that members who are highly satisfied with prior interactions in their online communities are likely to be more engaged than others because they have had more positive opportunities to develop engagement.

Hypothesis 5 (H5). *Satisfaction positively influences community engagement*.

2.3. Antecedents of Satisfaction and Engagement

A formal organization can encourage electronically mediated interaction by offering rewards or by fostering cooperative norms between its already interconnected members (Kankanhalli et al. 2005). It is less clear how engagement arises on online community websites, where social interactions are informal and weak ties prevail (Constant et al. 1996). Furthermore, normative pressure is ineffective in online communities because of their large numbers of anonymous participants (Algesheimer et al. 2005).

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Engagement theory asserts that two of the major conditions generally required for a member of a group to feel engaged are a congruence of personal and group values and support from others for one's preferred identity (Kahn 1990, Rich et al. 2010). We find that these two antecedent conditions of engagement theoretically correspond with the antecedent beliefs of community identification and self-identity verification that are considered precursors to knowledge contribution by online community members (Ma and Agarwal 2007). However, a third condition for engagement is that members possess a certain degree of confidence in their ability to perform relevant tasks (Kahn 1990, Rich et al. 2010). In online communities, this sense of confidence corresponds to one's self-efficacy with contributing knowledge. We posit that the mediating factors of satisfaction and engagement require antecedent levels of perceived community identification, self-identity verification, and knowledge self-efficacy.

2.3.1. Community Identification. *Community identification* refers to the extent to which one's personal identity overlaps with the positive traits, abilities, and values of a community (Bhattacharya et al. 1995, Tajfel 1974). This perceived overlap leads to a conflation of one's self-identity with a social identity. In studies of electronically mediated groups, community identification has been found to be more strongly related to user behavior rather than to other relational factors such as compliance with subjective norms or trust in others (Bagozzi and Dholakia 2002, Chiu et al. 2006, Kankanhalli et al. 2005, Law and Chang 2008). Here we examine the prospect that community identification is theoretically antecedent to satisfaction and engagement.

Organizational studies have found that people who strongly identify with a group are known to derive satisfaction from interactions congruent with their social identity (Ashforth and Mael 1989). In general, people perceive benefits from identifying themselves along broad social categories because this allows them to make sense of their social environment (Tajfel 1974). Such categorization helps people to see themselves as exemplary members of their group and to distinguish themselves from outsiders. Studies of online communities have not explicitly proposed that identification directly influences satisfaction, but Ma and Agarwal's (2007) empirical study controlled for a similar effect and found it significant. We propose that members of online communities should especially draw satisfaction from interactions that promote common values. Unlike formal organizations, online communities can do little to penalize nonconformity by anonymous members who are free to enter and exit. In such an environment, interactions that seem to promote common identity and common values help reconfirm the social logic of the community to members and so should enhance their satisfaction.

Hypothesis 6 (H6). *Community identification positively influences satisfaction.*

The perceived congruence of values reflected in feelings of identification also makes the membership experience more meaningful and thus engaging (Kahn 1990). Members who identify with a community begin to see themselves as an embodiment of its norms and values (Stets and Burke 2000). When members conflate communal identity with their own self-identity, they feel that their prosocial actions not only reflect communal values but also express personal values (Algesheimer et al. 2005). Thus, identifying with one's community generally engages members because socially helpful courses of action seem to further personal goals. In this way, community identification will make voluntary contributions feel like an expression of personal agency and not like an obliged reaction to reciprocal norms. The engaging effect of identification should be especially salient in the context of online communities because members are primarily bound together by a common sense of purpose instead of a formal obligation. Thus, we expect that community identification should foster great engagement in the context of online communities.

Hypothesis 7 (H7). *Community identification positively influences community engagement.*

Community identification gives us a perspective on how social identity, molded along the broad characteristics of an online community, both satisfies and engages its members. Community identification increases satisfaction with interactions because people desire an authentic sense of value congruency, and it increases engagement by making prosocial tendencies seem like personal agency rather than communal obligations. But community identification only captures the communality of identity across members and does not help us capture the uniquely personal components of each member's self-identity.

2.3.2. Self-Identity Verification. In contrast to community identification, which reflects how individuals relate to their community at large, *self-identity verification* captures the cognitive processes by which people analyze interpersonal interactions to determine whether their unique self views and self behavior match how others see them (Stets and Burke 2000). Self-identity verification confirms for recipients that their role in their community is as expected and signals that future interactions will proceed safely (Swann et al. 2004). Finding that a given situation meets one's expectations generally increases satisfaction (Anderson and Sullivan 1993). Accordingly, self-identity verification is found to generally increase people's satisfaction with social interactions (Swann et al. 2000).

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Most studies of behavior in electronically mediated contexts do not focus on how members are affected by identity feedback from others. Instead, these studies have largely focused on relevant self-evaluations, such as knowledge self-efficacy (Kankanhalli et al. 2005, Wasko and Faraj 2005). However, Ma and Agarwal (2007) successfully demonstrated that self-identity verification is a novel and important antecedent of satisfaction in the context of online communities. The perception of self-identity verification reduces conflict in social interactions, enhances control and predictability in future interactions, and increases feelings of being understood and well treated. Thus, we, too, propose that self-identity verification will lead to increased satisfaction, even when the other powerful antecedent factors of our model are controlled for.

Hypothesis 8 (H8). *Self-identity verification positively influences satisfaction*.

Unlike its influence on satisfaction, self-identity verification's effect on engagement is relatively unstudied. But a comparison of the seminal works of self-verification theory (Swann 1983, Swann et al. 2000) with key developments in engagement theory (Christian 2011, Kahn 1990, Rich et al. 2010) suggests a strong link between them. In contrast to community identification, which often entails downplaying one's unique traits to highlight communal ones, self-identity verification brings overt recognition that others understand and appreciate one's unique characteristics. Verification of one's unique self-role allows one to freely and uninhibitedly participate in social activities without fear of sowing confusion or provoking undesirable social results (Swann et al. 2000). Thus, self-identity verification reassures members that they are free to perform the roles they desire, beyond common group rituals.

Along strikingly similar lines, the engagement literature has found that assuring people that they can safely and freely exhibit their preferred identity greatly enhances their personal engagement (Kahn 1990). The unrestricted engagement of one's personal energies in a task is seen as an act of self-expression that can reveal one's preferred identity to others. But one's preferred personal identity may not always coincide with the common values of the group. Thus, before people can feel engaged, they must believe that expressing their preferred identity will not bring harm or ridicule. Members of an organization must partly develop engagement through interactions that assure them that their unique methods and efforts are valued and do not overstep boundaries (Rich et al. 2010). In online communities, this kind of reassurance is precisely provided through self-identity verification. If online community members do not feel that others understand their unique roles, they will likely be insecure about committing to novel contributions that others might ignore or, worse yet, deride. Thus, we hypothesize that those online community members who perceive self-identity verification should feel a heightened sense of engagement.

Hypothesis 9 (H9). *Self-identity verification positively influences community engagement*.

2.3.3. Knowledge Self-Efficacy. Together, community identification and self-identity verification create the proper social conditions for members to feel engaged in online communities. Community identification entails a sense of value congruence that makes prosocial activities more meaningful, and self-identity verification brings a sense of support that makes prosocial tasks seem safe to invest in.

Even in a meaningful and safe social environment, people can struggle with individual insecurities that rob them of the energy to contribute (Nicholls 1984). People need inner resources of ability and confidence to overcome social comparisons that make them overly aware of their deficiencies (Kahn 1990). One's ability to impart domain-specific knowledge is the most relevant inner resource in online communities because "knowledge is deeply integrated in an individual's personal character and identity" (Wasko and Faraj 2005, p. 40). *Knowledge self-efficacy* is the belief that one has the ability and expertise to contribute to discussions, to solve problems for others, or to otherwise make a difference by participating (Kankanhalli et al. 2005). Such specific self-efficacy beliefs enable people to overcome particular difficulties and predictably achieve desired outcomes (Gist and Mitchell 1992).

Knowledge self-efficacy has been linked to contributory behavior in studies of electronically mediated groups (Kankanhalli et al. 2005); however, it is not known if satisfaction mediates its influence. In even the earliest seminal works on efficacy (Bandura 1993, White 1959), researchers have understood that we derive satisfaction from believing in our ability to manipulate and master our environment and that this satisfaction helps reinforce our future efforts. For example, those with social self-efficacy gain satisfaction from relationships that help them model and learn from complex social situations (Bandura 1993). Similarly, job satisfaction is believed to come, in part, from the task-specific self-efficacy gained from achievements and accomplishments in the workplace (Judge et al. 2001). In the information exchanges that take place in online communities, knowledge self-efficacy reflects how well members believe they can impart useful information to others. Here, too, it follows that gains in knowledge self-efficacy should enhance satisfaction with one's experience in the community and reinforce behavior that will advance one's knowledge mastery even further. Thus, we hypothesize that knowledge self-efficacy is linked to satisfaction with one's community.

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Hypothesis 10 (H10). *Knowledge self-efficacy positively influences satisfaction*.

It is also not yet known whether self-efficacy distinctly engages members of online communities beyond the engaging influence of community identification and self-identity verification. Again, past studies have directly linked knowledge self-efficacy to contributory behaviors (Kankanhalli et al. 2005). We surmise that highly efficacious online community members should find the opportunity to synthesize and contribute knowledge to others to be a very engaging proposition because it challenges their self-expectations. Although the antecedent beliefs of identity can create the right environment for contributions, engaged members must have a persistent sense of agency if they are to contribute at a moment's notice (Kahn 1990). The immediate willingness to engage one's energies is largely dependent on one's confidence in one's perceived abilities (Rich et al. 2010). People with more positive self-evaluations of efficaciousness generally tend to be more receptive to demands for their efforts, and they feel they have more energy to invest (Bandura 1993). Thus, knowledge self-efficacy engages online community members partly because members with knowledge self-efficacy perceive they have the energy and resources to invest in contributions.

However, self-efficacy beliefs are more than just the availability of energy resources—they reflect an inherent drive for mastery and an expression of agency (Bandura 1993, White 1959). We find that the intrinsic need to further one's mastery is intimately tied to engagement because this drive marshals cognitive as well as affective energies (Bandura 1977). Studies in electronically mediated contexts also posit that "self-evaluation based on competence and social acceptance is an important source of intrinsic motivation that drives engagement" (Wasko and Faraj 2005, p. 40). Thus, online community members with high knowledge self-efficacy should feel that they have energy to invest in contributions, and they will actively seek to expend these energies in their drive for mastery. Finally, online community members are not under any contractual obligations to contribute, and so their personal sense of agency is perhaps a more influential motivating factor than in other contexts. Hence, we hypothesize that perceived knowledge self-efficacy has a uniquely engaging effect independent of community identification and self-identity verification.

Hypothesis 11 (H11). *Knowledge self-efficacy positively influences online community engagement*.

Self-efficacy is itself a powerful determinant of behavior in general (Bandura 1993). It is also known to specifically influence the use of information technology (Compeau and Higgins 1995). We argue that knowledge self-efficacy can moderate the effect of online community engagement on knowledge contribution. Research suggests that members with high knowledge self-efficacy tend to contribute high levels of knowledge in general (Kankanhalli et al. 2005), whereas members who lack knowledge self-efficacy tend to contribute little. However, even members with less topical knowledge but who feel engaged can try to contribute (Algesheimer et al. 2005). Thus, we argue that engagement is an important variable that affects how members with low knowledge self-efficacy contribute to their online community. In contrast, the level of engagement will have little effect on the strong knowledge contributions of members with high knowledge self-efficacy. Taken together, we expect that the magnitude of engagement's effect on knowledge contribution is contingent on the level of knowledge self-efficacy.

Hypothesis 12 (H12). *When knowledge self-efficacy increases* (*versus decreases*), *the positive relationship between community engagement and knowledge contribution decreases* (*versus increases*).

2.4. Control Variables

We confined our study to the setting of online communities, excluding social networking sites and organizational knowledge-sharing forums. But we recognize that online communities vary greatly because of different design choices. Studies of online communities have previously looked at artifacts and practices that can influence perceptions of personal identity, community identity, and community administration (Law and Chang 2008, Ma and Agarwal 2007). Such artifacts and practices are believed to primarily influence antecedent beliefs rather than mediating attitudes or behavioral outcomes. Nonetheless, to provide some control over the diversity in online communities, we considered five artifacts that vary across online communities: *profile depth*, *virtual copresence*, *past postings*, *user moderation*, and *regulatory practices* (see items in online Appendix 1). In the absence of a strong theory to distinguish differences in how artifacts affect factors of our model, we added control paths from all five artifacts onto all endogenous constructs of our model.

We also included more general control variables that measured user characteristics such as gender and age. Furthermore, a high volume of interaction or a lengthy tenure with an online community could foster a habit of cooperation (Wasko and Faraj 2005) that might override the factors we considered. Therefore, we included two controls of members' prior activity based on prior studies (Ma and Agarwal 2007): *visitation frequency* and *length of tenure*.

3. Empirical Study

To assess the validity of our proposed model, we surveyed Internet users who visit online discussion

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communities. Before deploying a main survey instrument, we conducted a pilot study to collect qualitative feedback on our measurement items. The data were first analyzed for measurement quality using exploratory and confirmatory factor analysis. We then used structural equation modeling to verify our hypotheses and examine the implied structure of our proposed model.

3.1. Online Discussions

Online discussion forums are websites where members can asynchronously share messages. These messages are primarily text but can include hyperlinks or inline multimedia. Studies of online communities typically examine discussion communities (Chiu et al. 2006, Ma and Agarwal 2007, Wasko and Faraj 2005). Instead of studying users of one or two online discussion communities, our survey targeted a broad set of Internet users who might have used many online discussion communities. Allowing for a large set of online communities permitted us to analyze a range of personal characteristics and perceptions. Although researchers have offered typologies of online discussion communities (Armstrong and Hagel 1996), empirical studies that have examined different purported types of online communities have only found minor nomological differences between them, and the relationships between constructs are thought to be generalizable across online communities (Ma and Agarwal 2007). For added surety, we also controlled for differences in IT design artifacts, regulatory practices, and user characteristics.

Our surveys asked respondents to consider an online discussion community website they might have recently visited. By asking them to ignore online discussions at social networking websites, our study limited respondents to considering only online discussion communities in which users primarily meet and interact on the community's website. Respondents were given descriptions and examples to help them distinguish between online discussion websites and social networking websites.

3.2. Survey Development

Online Appendix 1 lists our choices of measurement items. Measurement items for our major constructs largely resemble items from scales or definitions found in the literature. We measured community engagement using items used in a prominent marketing study on brand communities (Algesheimer et al. 2005). The three measurement items, respectively, reflected the affective, cognitive, and prosocial characteristics that are simultaneously involved in engagement. Measures for satisfaction are based on the relational literature in marketing (Lam et al. 2004) and satisfaction with information systems (McKinney et al. 2002). These items measured overall satisfaction with the benefits derived from using an online community.

The items used to measure knowledge self-efficacy were drawn from items previously used to study knowledge self-efficacy in organizational electronic exchanges (Kankanhalli et al. 2005), although one item was added from a more general study of technological self-efficacy (Compeau and Higgins 1995). Measures for community identification came from items and definitions found in the literature on social capital (Chiu et al. 2006, Tsai and Ghoshal 1998) and online communities (Ma and Agarwal 2007, Wasko and Faraj 2005). We avoided items that measured affective ties in favor of items that reflected the definition of identification as the commonality of values, vision, and goals between respondents and their respective online communities. From the conceptualization of identity verification in the identity literature, we derived measures of self-identity verification (Hogg et al. 1995, Stets and Burke 2000). Unlike the self-identity verification items found in studies that allow users to select which traits to self-report (Ma and Agarwal 2007), we chose global items that asked whether other community members understood and appreciated the particular role of respondents and the uniqueness of their identity. This measurement approach produced items that were consistent for all respondents and, therefore, more appropriate for our confirmatory, reflective measurement model.

Knowledge contribution items, from the literature on online communities (Ma and Agarwal 2007), asked respondents whether they would help, contribute, or otherwise actively participate in their online community in the coming months. Word-of-mouth items came from past studies in information systems (Kim and Son 2009) and marketing (Algesheimer et al. 2005). These items measured respondents' willingness to refer or recommend a community to others, both when asked for advice and without being asked.

We created five single-item controls for artifacts and several user characteristics for this study. We measured each artifact control with a single item that asked whether that particular artifact, practice, or design choice was present at the website. This measurement approach contrasted with studies of online community website artifacts that chose to measure more abstract perceptions about the purpose of artifacts (Law and Chang 2008, Ma and Agarwal 2007). We sought a measurement approach that was more objective and only related to artifacts and practices available to respondents. Two of the five artifacts represented were discovered from our own investigation of online communities and from our pilot survey. The remaining three artifacts related to identity artifacts and regulatory practices mentioned in the literature (Law and Chang 2008, Ma and Agarwal 2007). Finally, our survey instrument included single-item demographic measurements of gender and age as well as frequency of visits to the online community and length of tenure.

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3.3. Data Collection

Potential respondents for the pilot survey and the final survey received invitations from a marketing research firm that maintains a diverse panel of Internet users. The invitations led respondents to web-based survey instruments. In both cases, invitees were asked to take an online survey in return for a small dollar amount deposited into their PayPal accounts.

The pilot study helped us determine the feasibility and clarity of several aspects of our final survey instrument. The pilot study allowed us to determine whether respondents were familiar with our conceptualization of online discussion community websites and whether they visited such websites. We also gauged whether users understood our distinction between online discussion community websites and social networking websites, where users primarily know each other through offline social interactions. We also took the opportunity to see whether respondents could identify the relevant artifacts we introduced as controls. At several points in the pilot survey, we allowed respondents to give us open feedback about the clarity of our instructions and measurement items and about any relevant concepts or artifacts they felt were missing. The pilot survey collected 50 responses. Although almost every respondent claimed to understand what online discussion communities were, several responses considered well-known social networks to be examples of online discussion communities. The final survey instrument was refined with improved wording of items and a clearer distinction between online discussion communities and social networking sites.

We sent invitations to take the main survey instrument to 6,000 potential respondents who had not participated in the pilot survey. This main survey was kept open for eight days with a reminder sent to nonrespondents after six days. A total of 778 visitors, approximately 13% of those invited, accepted the invitation and opened the survey instrument. At least 717 of these visitors, or over 92%, read the detailed instructions and started the survey. We examined the 410 responses, or 57% of those who started, who could actively recall an online discussion community they had visited in the past year. Finally, we removed 109 responses by people who either did not complete the full survey, who hurriedly completed it within a few minutes, or whose stated community did not reflect our conceptualization of an online discussion community. This produced 301 usable responses with a median age of 41 years; 53% were female.

Respondents were given the option to identify their online community of choice and qualitatively state its purpose. We evaluated such information to determine if it matched our conceptualization of an online community. Members reported using a range of online communities oriented toward hobbies, health support, ethnic concerns, sexual orientation, and more. However, we did not obtain a sufficient number or variety of qualitative responses to be able to conduct quantitative coding and control. We did check that the online communities on which we received information were legitimate and currently active. In online Appendix 2, we have included screenshots of two examples of the online communities we identified, along with the name and description provided by those respondents.

3.4. Measurement Model

We conducted a preliminary exploratory factor analysis (EFA) of the measurement items of our proposed constructs; we used maximum likelihood extraction, which we also used later for our confirmatory tests. We used two statistical software applications, SPSS and R, to conduct our exploratory analyses. We used a variety of methods to understand how to identify enough underlying factors to accurately reflect our latent constructs and to extract sufficient variance. When factors are believed to be uncorrelated orthogonal components, eigenvalues are often examined to find components with values greater than 1.0 (Fabrigar et al. 1999). This criterion yielded four components that together explained 69.76% of the variance of our measurement items. However, our factors are conceived as correlated latent variables, and the recommended assessment technique in this situation is a parallel analysis in which eigenvalues of the sample data are compared with those obtained from random, simulated data sets (Costello and Osborne 2005, Fabrigar 1999). A parallel analysis suggested seven major factors that explained a total of 82.69% of the variance. We chose to use seven factors to represent our measurement items. Table 1 shows the EFA item loadings and cross-loadings with oblimin rotation to produce correlated factors. In an EFA, items should generally load above 0.30 with their corresponding conceptualized factors and have poorer cross-loadings on other factors (Costello and Osborne 2005, Fabrigar et al. 1999). All of our item loadings were higher than 0.50, and all of the item loadings exceeded cross-loadings. With these values, we felt confident in proceeding with a more rigorous confirmatory analysis of our measurement and structural models.

Many major studies of electronic communities have used a partial least squares modeling approach (Kankanhalli et al. 2005, Law and Chang 2008, Ma and Agarwal 2007, Wasko and Faraj 2005) because of its suitability for examining the predictive validity of relatively untested theory (Fornell and Bookstein 1982). However, most of our measures have been tested repeatedly in prior studies, and we based our model on established theoretical frameworks. Consequently, we conducted our main data analysis using a LISREL modeling approach that can test confirmatory measurement, goodness-of-fit, and common method bias.

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Table 1 Item Loadings from Exploratory Factor Analysis

	Exploratory components						
	1	2	3	4	5	6	7
EFF1	0.751	0.189	0.242	0.158	0.128	0.254	0.181
EFF2	0.814	0.179	0.173	0.239	0.128	0.130	0.276
EFF3	0.757	0.188	0.174	0.144	0.178	0.207	0.057
KC1	0.195	0.603	0.170	0.128	0.244	0.122	0.296
KC2	0.088	0.838	0.121	0.102	0.257	0.113	0.198
KC3	0.255	0.845	0.148	0.103	0.149	0.124	0.151
SIV1	0.155	0.115	0.700	0.151	0.021	0.107	0.405
SIV2	0.216	0.164	0.844	0.194	0.208	0.166	0.126
SIV3	0.209	0.160	0.678	0.261	0.148	0.201	0.249
CI1	0.178	0.097	0.212	0.741	0.233	0.257	0.259
CI2	0.165	0.119	0.163	0.797	0.204	0.218	0.229
CI3	0.200	0.125	0.264	0.620	0.152	0.227	0.251
WOM1	0.134	0.273	0.067	0.157	0.714	0.130	0.117
WOM2	0.124	0.222	0.140	0.135	0.749	0.298	0.109
WOM3	0.122	0.107	0.146	0.230	0.677	0.262	0.134
SAT1	0.121	0.134	0.143	0.179	0.191	0.927	0.130
SAT2	0.209	0.050	0.106	0.208	0.262	0.642	0.139
CE1	0.224	0.271	0.153	0.238	0.093	0.247	0.564
CE2	0.350	0.284	0.237	0.202	0.156	0.207	0.567
CE3	0.001	0.123	0.261	0.231	0.114	0.072	0.519

Note. The oblimin method was used to rotate items; CI: community identification; SIV: self-identity verification; EFF: knowledge self-efficacy; CE: online community engagement; SAT: satisfaction; KC: knowledge contribution; WOM: positive word of mouth.

We conducted a confirmatory factor analysis of our major constructs, single-item controls, and an interaction term. All multi-item constructs were defined reflectively. To measure the interaction between engagement and knowledge self-efficacy, we created a single-item, orthogonalized product term in three steps. First, the means of engagement and knowledge self-efficacy's measures were multiplied into a single product term; second, the product term was then regressed over the means of engagement and self-efficacy measures; and finally, the standardized residual of this regression was saved as the single-item interaction term (Little et al. 2006, Draper and Smith 1981). In our overall measurement model, we set the error terms of all single-item measures to zero to ensure that they had a perfect relationship with their corresponding factors.

The results of our confirmatory factor analysis (summarized in Table 2) allowed us to gauge model fit, construct reliability, convergent validity, and discriminant validity. The fit indices reported by LISREL ($\chi^2 = 508.31$, df $= 279$, $p \approx 0.00$; root mean square error of approximation (RMSEA) $= 0.049$; SRMR $= 0.034$; NNFI $= 0.97$; CFI $= 0.98$; IFI $= 0.98$) all showed very good model fit. The composite reliability of each factor exceeded 0.70, and the average variance extracted of each factor was above 0.50—both of which indicated good construct reliability (Bagozzi and Yi 1988, Fornell and Larcker 1981). Furthermore, all item loadings exceeded 0.60, which suggested good convergent validity (Bagozzi and Yi 1988, Chin et al. 1997). Finally, we made sure that the square root of each factor's average variance extracted exceeded that factor's correlation with any other factor, thereby ensuring that the factors exhibited discriminant validity (Fornell and Larcker 1981).

Table 2 Measurement Quality and Correlations

	Mean	SD	CR	AVE	$\sqrt{}$AVE	CI	SIV	EFF	CE	SAT	KC	WOM
CI	5.17	1.19	0.90	0.75	0.86	1.00						
SIV	4.91	1.23	0.90	0.75	0.86	0.64	1.00					
EFF	5.51	1.08	0.91	0.78	0.88	0.59	0.59	1.00				
CE	5.11	1.23	0.79	0.56	0.75	0.72	0.72	0.72	1.00			
SAT	5.82	0.95	0.86	0.76	0.87	0.61	0.50	0.53	0.59	1.00		
KC	5.49	1.22	0.90	0.75	0.87	0.50	0.52	0.56	0.69	0.43	1.00	
WOM	5.86	0.95	0.86	0.68	0.82	0.55	0.51	0.52	0.64	0.63	0.46	1.00
Artifacts												
aVC						0.16	0.27	0.28	0.28	0.04	0.25	0.05
aPD						0.26	0.36	0.34	0.20	0.21	0.27	0.25
aPP						0.17	0.25	0.22	0.16	0.17	0.26	0.16
aRP						0.29	0.19	0.19	0.17	0.33	0.14	0.26
aUM						0.14	0.19	0.05	0.09	−0.03	0.02	0.02
Controls												
cGEN						0.04	0.03	−0.06	0.00	0.05	−0.07	0.03
cAGE						0.15	0.20	0.16	0.11	0.07	0.04	0.07
cFREQ						0.21	0.28	0.27	0.29	0.30	0.42	0.23
cTENURE						−0.07	−0.01	0.10	−0.05	0.14	0.03	0.05

Note. CI: community identification; SIV: self-identity verification; EFF: knowledge self-efficacy; CE: online community engagement; SAT: satisfaction; KC: knowledge contribution; WOM: positive word of mouth; aVC: virtual copresence; aPD: profile depth; aPP: past postings; aRP: regulatory practices; aUM: user moderation; cGEN: gender; cAGE: age; cFREQ: frequency of past visitation; cTENURE: tenure at online community.

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3.5. Common Method Variance

We performed a series of tests to ensure that our study does not suffer from excessive common method variance (Malhotra et al. 2006). First, we conducted Harman's single-factor test to determine if the variance of our data comes largely from a common method source (Podsakoff et al. 2003). We subjected all of the measurement items of our major constructs, artifacts, and controls to a principal component analysis to see how many orthogonal components would emerge to explain the variance of our data. The results showed that the largest single component could not explain the majority of the variance in our data (it accounted for slightly over 31%). Instead, we found that our data consisted of at least eight components with eigenvalues of more than 1.0 and that these components collectively explained over 66% of the total variance.

We then conducted a common-method-factor test that measured the degree of common method variance in our results (Podsakoff et al. 2003). The measurement model of this test allowed the measurement items of our seven major latent constructs to simultaneously load upon their proper construct as well as on a new common-method factor. We excluded single-item artifacts and controls because they are modeled as error-free. The sum of squared item-loadings of this test showed that the major constructs of our study explained, on average, over 62% of item variance. In comparison, measurement error accounted for 27% of item variance, and common method variance explained only 10.6% of total variance. This level of common-method variance is considerably lower than in comparable studies of online communities (e.g., Ma and Agarwal 2007), and we concluded that common-method bias is not a significant concern in our study.

3.6. Structural Models

We tested three different structural models based on the measurement model described above. We first tested the structural paths proposed by our hypotheses and controls. We then tested an alternative model that omitted the two mediators, followed by a second alternative model that included all major constructs but did not assume mediation. The full results of all three structural models are shown in Table 3.

The results of our proposed model showed very good fit ($\chi^2 = 545.75$, df $= 288$, $p \approx 0.00$; RMSEA $= 0.052$; SRMR $= 0.039$; NNFI $= 0.97$; CFI $= 0.98$). Figure 2 shows the results of the proposed model and research hypotheses. Many of our hypothesized direct effects between our latent constructs were highly significant at the $p < 0.001$ level, strongly supporting hypotheses H2–H4, H6, H7, H9, and H11. The hypothesized interaction between knowledge self-efficacy and engagement was also supported at the significance level of 0.05 (H11: -0.10 at $p < 0.05$). Two hypothesized paths were not significant.[2] These were the effect of satisfaction on knowledge contribution (H1) and the effect of self-identity verification on satisfaction (H7). The total variances explained (R^2) for the endogenous variables were 0.76 for engagement, 0.50 for satisfaction, 0.57 for knowledge contribution, and 0.54 for word of mouth. Several control variables had significant effects as shown in Table 3. The most notable of these control effects was visitation frequency's influence on knowledge contribution (0.23, $p < 0.001$). Length of tenure and our control artifacts also had small and slightly significant effects on our major constructs.

We also analyzed two alternative models to test the mediating strength of engagement and satisfaction. Our first alternative model removed engagement and satisfaction from the proposed baseline model and considered direct effects between the three antecedent factors and two outcomes. The results of this first alternative demonstrated good fit ($\chi^2 = 596.99$, df $= 287$, $p \approx 0.00$; RMSEA $= 0.057$; SRMR $= 0.045$; NNFI $= 0.97$; CFI $= 0.98$). Five of the six possible direct effects between antecedents and outcomes were significant. However, the explained variance of knowledge contribution dropped considerably (a 15.79% drop from the proposed model), as did that of word of mouth (a 16.67% drop from the proposed model). These results show that our antecedent factors are significantly related to outcomes when engagement and satisfaction are omitted, but that this omission produces a considerable loss of variance explained.

Our second alternative model had all of the constructs and structural paths of our proposed model but added five more direct, overriding paths from the three antecedent factors to the two outcome factors. The results of this second alternative model showed good fit ($\chi^2 = 543.00$, df $= 284$, $p \approx 0.00$; RMSEA $= 0.053$; SRMR $= 0.037$; NNFI $= 0.97$; CFI $= 0.98$). However, we observed that all six overriding paths between antecedents and outcomes were nonsignificant. Furthermore, the additional variance of knowledge contribution gained was minimal (a 7.02% increase over

[2] Because our proposed model yielded nonsignificant estimates for certain hypothesized structural paths, we were interested in conducting a post-hoc analysis of our overall model's ability to reject ill fit (Hancock 2006). We followed MacCallum et al.'s (1996) recommended procedure of examining the confidence interval of the RMSEA and then computing power from a test of close-versus-adequate fit of the RMSEA by using a noncentral χ^2 distribution. The LISREL output of the proposed model shows that the RMSEA falls within a narrow 90% confidence interval from 0.043 to 0.056, suggesting that our RMSEA value is a fairly precise indicator of fit. Furthermore, our high degrees of freedom (356) and small RMSEA (0.049) mean that our model test would only need a sample size of 80 to achieve 90% power against an alternative, ill-fitting model with a RMSEA of 0.080. Given our actual sample size of 301, our analysis was very powerful (> 0.99) against type II error.

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Table 3 Structural Results of Proposed and Alternative Models

	Proposed model				First alternative				Second alternative			
	CE	SAT	KC	WOM	CE	SAT	KC	WOM	CE	SAT	KC	WOM
R^2	0.76	0.50	0.57	0.54			0.48	0.45	0.78	0.50	0.61	0.55
CI	0.26***	0.39***					0.14	0.37***	0.27***	0.38***	−0.13	0.07
SIV	0.30***	0.12					0.15*	0.17*	0.31***	0.13	−0.09	−0.04
EFF	0.34***	0.19**	0.03				0.32***	0.19*	0.34***	0.19**	0.00	−0.07
CE			0.61***	0.47***							0.81***	0.53***
SAT	0.16**		−0.05	0.30***					0.15*		−0.04	0.27**
CE × EFF			−0.10*								−0.09*	
Artifacts												
aVC	0.15**	−0.14**	0.01	−0.17**			0.09	−0.14*	0.15**	−0.14*	−0.01	−0.17**
aPD	−0.16***	0.03	0.09	0.14**			−0.01	0.07	−0.16**	0.02	0.12	0.16*
aPP	−0.04	0.04	0.12**	0.02			0.10	0.02	−0.04	0.04	0.13**	0.03
aRP	−0.07*	0.15**	0.00	0.08			−0.03	0.09	−0.07	0.15**	0.02	0.08
aUM	0.00	−0.07	−0.09*	−0.01			−0.08	−0.04	0.00	−0.07	−0.08	−0.02
Controls												
cGEN	0.01	0.06	−0.03	0.01			−0.02	0.03	0.00	0.06	0.03	0.01
cAGE	−0.04	−0.02	−0.05	−0.01			−0.08	−0.04	−0.05	−0.02	−0.04	−0.01
cFREQ	0.08	0.10*	0.23***	−0.03			0.27***	0.04	0.07	0.10	0.21***	−0.03
cTENURE	−0.11**	0.14**	−0.02	0.05			−0.09	0.05	−0.11*	0.14**	−0.01	0.06

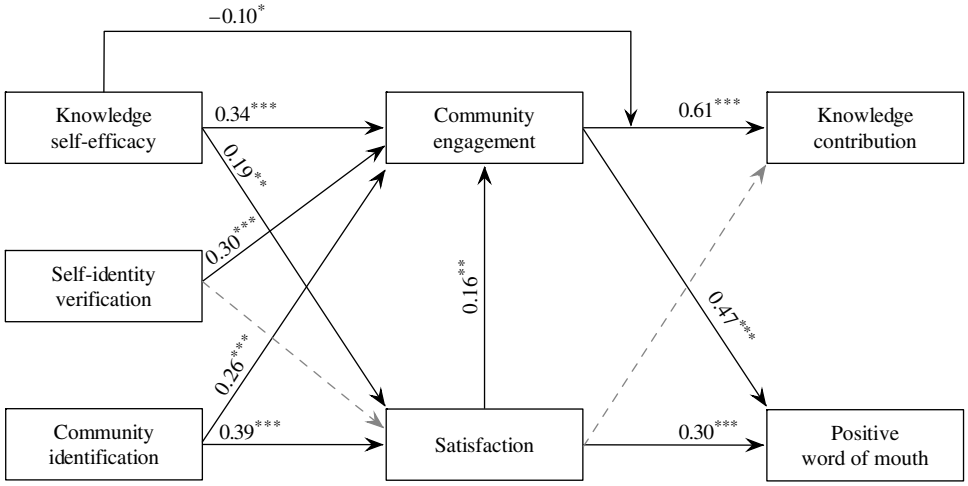
Note. CI: community identification; SIV: self-identity verification; EFF: knowledge self-efficacy; CE: community engagement; SAT: satisfaction; KC: knowledge contribution; WOM: positive word of mouth; aVC: virtual copresence; aPD: profile depth; aPP: past postings; aRP: regulatory practices; aUM: user moderation; cGEN: gender; cAGE: age; cFREQ: frequency of past visitation; cTENURE: tenure at online community.

Path significances: $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

our proposed model), as was that of word-of-mouth (a 1.85% increase over our proposed model). Thus, engagement and satisfaction appear to fully mediate (Baron and Kenny 1986) the influence of identity factors on prosocial intentions.

Overall, the results strongly uphold the main principles of our proposed model. Specifically, the identity factors that earlier studies focused on appear to be antecedent to the more powerful mediating conditions of engagement and satisfaction that ultimately determine prosocial outcomes in online communities. The theory-free alternative models did not yield any additional advantage when both power and parsimony were considered. We also note the failed hypotheses and unexpectedly significant control effects found in our empirical results. First, satisfaction does not directly influence knowledge contribution intentions, although it does influence word-of-mouth intentions. Second, self-identity verification did not have a significant relationship with satisfaction. Our artifact measures

Figure 2 Structural Results of Proposed Model



Note. Nonsignificant hypothesized paths are dashed.

Path significances: $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

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also had small but significant effects on engagement, satisfaction, and intentions. Finally, we feel greater scrutiny should be directed toward the significant and strong effect of prior visitation frequency on future behavioral intentions that hints at a habitual component of prosocial behavior.

4. Discussion

The objective of this study was to explicitly introduce the concept of online community engagement, which drives prosocial behaviors in the context of open, nonbinding online communities. Building on the framework of Ma and Agarwal (2007), we proposed a comprehensive theoretical model that describes the mediating role of engagement in online community behavior. Structural equation modeling was used to test the proposed model against data collected from 301 actual users of online communities. Both the proposed and unexpected results of our study paint a picture of engaged behavior that differs from prior studies.

The new framework developed in this study recognizes that online communities are unique sociotechnological environments in which engagement must prevail. In particular, we found that members primarily contribute to and revisit an online community from a sense of engagement. Nonetheless, word of mouth is partly influenced by prior satisfaction. Therefore, engagement and satisfaction appear to be parallel mediating forces at work in online communities. Both mediators arise from a sense of communal identity and knowledge self-efficacy, but engagement also emerges from validation of self-identity. Furthermore, we established a moderating effect of knowledge self-efficacy such that the relationship between engagement and knowledge contribution increases as knowledge self-efficacy decreases.

This paper contributes to the research in information systems by establishing a formal construct of engagement in online communities that parsimoniously and powerfully mediates constructs previously thought to directly influence knowledge contribution. Omitting engagement can produce potential biases in research toward other mediators such as satisfaction, and appreciating the role of engagement furthers our understanding of how successful online communities should be crafted and managed.

4.1. Theoretical Implications

The critical research gap we sought to address in the study of online communities was that the very nature of engagement was not clearly understood and so its mediating role compared with other forces could not be modeled. To address this, we extended Ma and Agarwal's (2007) framework of engaged behavior in online communities in four critical ways: We explicitly positioned engagement as a central, mediating concept in the study of online communities; we demonstrated how engagement and satisfaction differ in affecting individuals' behavior; we reevaluated the important role of self-identity verification; and we highlighted the complex role of knowledge self-efficacy in online communities.

The term engagement has been consistently, yet abstractly, used in information systems research to describe the multifarious reasons for contributions to online communities (Bateman et al. 2011, Ma and Agarwal 2007, Wasko and Faraj 2005). Online community engagement has not previously been explicitly conceptualized, modeled, measured, or analyzed as a mediating construct in the information systems literature. We drew on the extant research on engagement in reference disciplines (Algesheimer et al. 2005, Bakker et al. 2008, Kahn 1990). We integrated engagement theory with key theories of social psychology more commonly used in information systems research. We showed the central role of engagement as a mediating force that synthesizes notions of identity and ability into a heightened psychological state that predisposes members to contribute meaningfully to online communities. We found that the notion of engagement is meaningful in its own right, and it is theoretically and empirically distinguishable from related constructs such as intrinsic motivation and commitment (see online Appendix 3) that research in information systems has previously considered.

Information systems researchers have often modeled satisfaction as an important mediator that precedes online behavior and specifically leads to contributory behavior in online communities (Devaraj et al. 2002, Ma and Agarwal 2007, Wixom and Todd 2005). Consistent with the literature, we also hypothesized the relationship between satisfaction and knowledge contribution. However, contrary to conventional wisdom and our hypothesis, we did not find a significant effect of satisfaction on knowledge contribution (-0.05, $p = \text{ns}$). Instead, engagement was shown to be the only factor that significantly affects knowledge contribution (0.61, $p < 0.001$). These results suggest mere satisfaction is not the primary driver of active contribution—based on the assessment of the costs and benefits of group membership; active contributions are driven instead by a heightened sense of engagement that motivates members to help others in ways that are personally meaningful and challenging. Meanwhile, despite the lack of effect on knowledge contribution, satisfaction was still found to exert its positive influence on another type of behavior, i.e., word of mouth (0.61, $p < 0.001$). These findings imply that members must feel engaged with their communities if they are to actually contribute (i.e., knowledge contribution), but satisfied members may still help their online community by saying positive things that might recruit others. These findings

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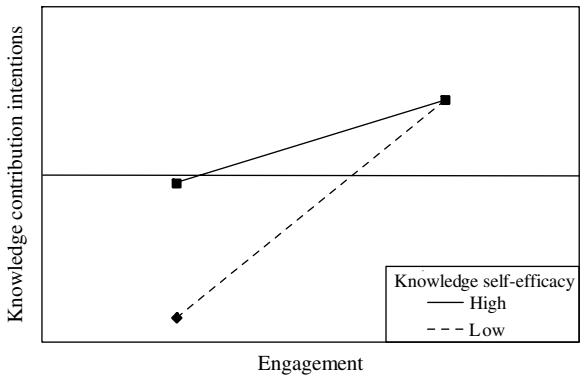
contribute to the literature by distinguishing between the mechanisms of an engaged act and a satisfied exchange in the context of online communities.

Ma and Agarwal (2007) previously demonstrated that self-identity verification could lead to eventual knowledge contribution in online communities. We extended this finding by clarifying that self-identity verification exerts an indirect effect on knowledge contribution through the fully mediating effect of online community engagement. Interestingly, self-identity verification was not a significant antecedent of satisfaction (0.12, $p = \text{ns}$) in this study. A potential explanation for this is that self-identification verification—which represents others' approval of a person's unique identity—is essentially a value-neutral, ontological problem. As such, it does not affect satisfaction, which is based on the costs and benefits of using an online community. However, self-identification verification does influence engagement, which represents the source of voluntary participation. These findings underscore the importance of self-identity verification in information systems and also highlight potential nuances in its role that previous studies have largely overlooked.

This study also reexamines and reevaluates the powerful role of knowledge self-efficacy. Past empirical studies of information systems examined how knowledge self-efficacy correlates with contributions of electronic knowledge, although a direct relationship was not consistently found (Kankanhalli et al. 2005, Wasko and Faraj 2005). We proposed and found that engagement mediates the effect of knowledge self-efficacy on contributory intentions. Actually, knowledge self-efficacy was the most influential antecedent of engagement in our study, exerting a stronger effect than the social factors researchers often focus on (0.34, $p < 0.001$) (Chiu et al. 2006, Ma and Agarwal 2007). Knowledge self-efficacy plays an even more complex role in prosocial behavior; specifically, as knowledge self-efficacy increases, the relationship between engagement and knowledge contribution decreases. Figure 3 illustrates this interaction. It shows that members with high knowledge self-efficacy are already willing to share knowledge regardless of their level of engagement, so engagement has little additional effect on them. In contrast, the level of knowledge contribution by members with low knowledge self-efficacy tends to be highly sensitive to the level of engagement. In summary, our findings shed new light on the relatively understudied factor of knowledge self-efficacy in online community behavior—knowledge self-efficacy is not only the most influential determinant of engagement, but also moderates the effect of engagement on knowledge contribution.

As a research context, online communities present a uniquely open socio-technical platform for social exchange of information where few mandates are associated with members' contributions and where no formal compensation incentivizes contributions. Our study demonstrates that fostering a heightened sense of engagement is essential to meaningful participation in such unregulated technological environments.

Figure 3 Interaction of Engagement and Knowledge Self-Efficacy



Note. The effect of engagement motivation on knowledge contribution intentions at two levels of knowledge self-efficacy (EFF): very low ($\mu_{\text{EFF}} - 2\sigma_{\text{EFF}}$) and very high ($\mu_{\text{EFF}} + 2\sigma_{\text{EFF}}$).

4.2. Managerial Implications

The results of our proposed model reveal several guidelines for community managers, administrators, and moderators to follow to promote engaged behavior in their online communities. Enhancing online community engagement, satisfaction, and prosocial behaviors essentially requires managing the perceptions of self-identity verification, community identification, self-efficacy, and also increasing the frequency of visits. In closely examining a large number of online communities, including those reported to us in this study, we found many best practices and potential actions that could help implement these guidelines.

First, when community members perceive that others in the community recognize their unique self-identity, it enhances their engagement and eventual contribution. Members who shy away from participating cannot directly communicate their self-identity to others. We can help such users signal their self-identity by letting them choose "flairs" and badges that identify unique skills and interests (e.g., "Netsec Hacker" or "Audiophile"). In large general-purpose communities, where one's participation can be scattered over many areas of interest, the underlying system could automatically generate signals for members from their prior activities and achievements (e.g., "315 posts in Software Development," "Respected status in Guitar Tech"). Apart from enhancing self-identify verification, moderators must also protect against its erosion. Receiving harsh, personal attacks on posted content can harm a member's perception of self-identity by disconfirming his or her role in a very public way.

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Moderators should exercise their ability to give warnings or lock conversations that drift toward hostile, personal ground.

Second, managers must consistently clarify and reinforce the communal identity of an online community because doing so both engages and satisfies users. For example, community managers can post statistics or news that celebrates milestones for the community or that distinguishes it from rival communities (e.g., "Over 1 million members," "We have overtaken Digg in website traffic," or "We were just mentioned by Dr. Gupta on CNN!"). But the major threat to an online community's identity often comes from within. If left unmoderated, off-topic conversations, such as political arguments in a sports related forum, can gradually dilute the identity of a group by introducing elements and arguments unrelated to the interests that first attracted members. Here, managers could suggest that such discussions may not be relevant to the forum or inform members that the discussion is being moved to a more relevant area of the forum.

Next, members with high knowledge self-efficacy are valuable because they are both more engaged and inherently more inclined to contribute. Such experts should be recognized, rewarded, and given a platform that encourages them to participate in helpful ways. Many online communities already allow members to rate comments for helpfulness (e.g., thumbs up/down voting buttons), which allows knowledgeable comments to be recognized even prior to expert reputations being established. As a community matures, it becomes possible to effectively use such ratings to appreciably enhance the overall quality of discourse. For example, forums can elevate comments of previously recognized community experts to a higher position on webpages so that others are drawn to those comments and compelled to respond to them first. In this vein, we even found examples of online communities that require users to obtain a certain level of recognized expertise before allowing them to post new topics. The StackOverflow community, which serves as an online question and answer forum for a range of technical issues, requires users to submit at least 50 points worth of useful answers before being allowed to casually comment on other people's answers. We also suggest that those who design and develop online communities can give moderator privileges to recognized community experts so they can help managers and administrators guide topics according to their specialized knowledge.

Finally, in controlling for the visitation patterns of online community members, we found that frequent visitors are inherently more likely to contribute regardless of their sense of engagement. Here, too, we suggest that to retain their patronage, such users should be recognized and rewarded. Again, we observed that many communities already give visible flairs and badges for tenure (e.g., "Three-year Club" or "Veteran"). But here we might suggest that online communities could do more to bring back previously frequent visitors who have lost the habit of participation. For example, taking a page out of the playbook of many social networking sites and mailing lists, online communities could notify erstwhile frequenters of new content that might be relevant to them based on their previous viewing behavior or by sending digests of recent topics. To inculcate habitual participation in new users, online communities could offer loyalty incentives akin to those in many online games. For example, certain features like flairs and badges, customization of one's profile, or even moderator privileges could be awarded only after a certain level of visitation frequency is achieved.

4.3. Limitations and Future Research

Our choice of study setting and design limits how we can interpret our results. We chose to survey respondents across a multitude of online communities because we know of no definitive, empirically validated typology of online communities. This diversity helped maximize variations in community design, community characteristics, and personal characteristics. However, a voluntary survey of this nature cannot discount participation bias. For example, we cannot be sure whether those who participated in our study did so out of a keen interest in online communities and a desire to help them. Furthermore, our study requested respondents to volunteer what topics are discussed in each community, but we received too few details to conduct a strong quantitative analysis. Thus, our results should be carefully interpreted across different types of online communities, especially those in which users engage in highly sensitive topics. We hope future research more definitively uncovers the unique types of communities and the major differences they exhibit.

We must also reflect on the definition of online communities. In this study, we assumed that most members primarily know each other through an Internet-based setting. We cannot generalize our findings to settings in which members primarily have offline relationships, such as social networks. Although the communities examined in this study are supposed to be mostly online in nature, it is possible that members of some smaller communities have strong offline affiliations. Our word-of-mouth concept incorporates online as well as offline referrals. Results could be different if word of mouth is effectively limited to online referrals.

In conducting our research, we encountered several difficulties that must be addressed to properly develop a research stream on online communities. First, researchers need to synthesize more context-specific measures of beliefs, intentions, and behavior in online communities. For example, our measurement items for satisfaction ask about the overall impressions of

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"using" the online community, which aligns with earlier studies that have examined satisfaction with information systems (McKinney et al. 2002). However, we cannot be sure if respondents interpreted using as meaning all experiences, such as information seeking and interpersonal interactions, or just a subset of experiences. Similarly, we measured behavioral intentions by using measurement items seen in the literature, but we were wary that some items (such as the one referring to contribution as "active participation") could have an ambiguous meaning. Second, our cross-sectional study does not allow us to adequately address actual behavior or bidirectional relationships. We measured intentions of future actions because it was not feasible to measure behavior across the large number of online communities we examined. Also, the literature suggests that it is satisfaction that influences engagement, but we cannot dismiss the possibility that engagement could further enhance future satisfaction.

Because this study is focused on the relatively new concept of engagement, future investigators need to better develop its associations with related concepts. For example, in a recent study of online discussion communities, Bateman et al. (2011) showed that community commitment plays a central role in regulating members' behaviors such as reading threads, posting replies, and moderating discussions. According to Bateman et al. (2011), commitment refers to "a psychological bond that characterizes an individual's relationship with an organization" (p. 842). Commitment and engagement are similar in that both explain why individuals undertake heightened activity for their group. Nevertheless, they are not the same. Whereas commitment is related to one's concern about a group in general, engagement is focused on his or her outlook on the actual work at hand (e.g., community participation).[3] Some researchers also suggest that intrinsic motivation closely resembles engagement (Algesheimer et al. 2005). Davis et al. (1992) introduced the notion of intrinsic motivation into the information systems literature and defined it as an internal drive to perform an activity for itself and the enjoyment derived from it. Although both intrinsic motivation and engagement arise from one's psychological drive, they are not necessarily the same. In particular, unlike intrinsic motivation, engagement is not limited to pure pleasure because it could include a consideration of rewards distinct from the activity itself (e.g., reaching personal goals).[4] To check whether engagement is empirically distinguishable from commitment and intrinsic motivation commitment, we performed an *ad hoc* study. We found that engagement is not a conceptual artifact, but is meaningful in its own right (see online Appendix 3 for details). Despite evidence of the discriminant validity of engagement, little is known regarding the direction of causality with related constructs. Thus, a fertile avenue for future research will be examining how engagement is causally related to commitment and intrinsic motivation. We expect that our research here will serve as a solid basis for expanded frameworks that incorporate constructs related to engagement.

[3] We thank an anonymous reviewer for this valuable suggestion.

[4] We thank the associate editor for this valuable suggestion.

4.4. Conclusions

Although the role of engagement in communities is increasingly recognized across different areas of business, it deserves extra attention in the information systems setting of online communities. These modern forums of knowledge exchange are uniquely complex creations of information technology in which users are under constant, yet anonymous, scrutiny. The key to promoting prosocial behavior here is to create the right balance of engagement and satisfaction. In this hyper-connected realm, engaged users need more than just communal pride. They constantly need verification of their self-identity from other participants, and they need a sense of self-efficacy about their own knowledge. By creating and engaging in online communities, Internet users are charting an unknown path in the technological evolution of social discourse. We believe that heeding the emerging dynamics of Internet-mediated communications will allow researchers and managers to fully realize the potential of these new social structures of the Internet age.

Supplemental Material

Supplemental material to this paper is available at http://dx.doi.org/10.1287/isre.2014.0525.

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