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How Customer Participation in B2B Peer-to-Peer Problem-Solving Communities Influences the Need for Traditional Customer Service

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Abstract

Customer support is critical for the success of business-to-business (B2B) service firms. A key issue such firms face is how to reduce customers' reliance on traditional support service. B2B companies are increasingly turning to firm hosted virtual peer-to-peer problem-solving (P3) communities to fulfill some of their customer support service needs. This raises the question: Does customer problem-solving participation in such communities reduce the demands associated with traditional customer support service? This research investigates the effects of problem-solving customer participation in a P3 community among global B2B customers. Results reveal that community problem-solving customer participation, in terms of helping oneself (posting questions) and helping others (responding to peer questions), reduces the participant's use of traditional customer support service. Results show that the frequency of logging in to the community and breadth of community memberships both serve to increase the use of traditional customer support service. This is the first empirical study to investigate the longitudinal effects of problem-solving customer participation in a peer-to-peer problem-solving community of B2B customers. Promoting peer-to-peer customer interactions provides managers with strategic levers to increase the efficiencies and the effectiveness of their support service.

Keywords

customer support, peer-to-peer problem-solving communities, knowledge management, cocreation, participation, business-to-business, big data, customer analytics

Providing fast, helpful customer support service is critical for the success of many business-to-business (B2B) firms. This support includes services such as product maintenance, expert advice, technical support, upgrades, patches, and repairs. However, traditional customer support is expensive for both the firm and the customer. Traditional customer support service is defined as the one-to-one, customer-firm interaction that is designed to assist the customer in learning about service and product-related decisions, service and product uses, and finally in problem solving or troubleshooting (Das 2003). With technology changes, support services are now delivered in a variety of methods, including traditional call centers, e-mail, or online support (Markeset and Kumar 2005). In an effort to connect, engage, and extend relationships with customers, many companies are increasingly turning to firm-hosted collaborative technologies like virtual peer-to-peer problem-solving (P3) communities to fulfill some of their customer service needs (Mathwick, Wiertz, and De Ruyter 2008). These P3 communities are created explicitly to enable the transfer and integration of knowledge. Uniquely different from brand communities, which are based on a structured set of social relations among admirers of a brand (Muniz and O'Guinn 2001), P3 communities are a collection of people who want to share their knowledge, perspective, and solutions with others in the community (Petouhoff 2009). As these communities have both startup and maintenance costs, an important question for B2B firms is how effective these P3 communities are at addressing customers' support needs and thus reducing customer reliance on traditional support service.

Many firms are starting to realize valuable benefits from facilitating customer-to-customer (C2C) support service through these P3 communities, including product or solution awareness, self-service problem resolution, support cost

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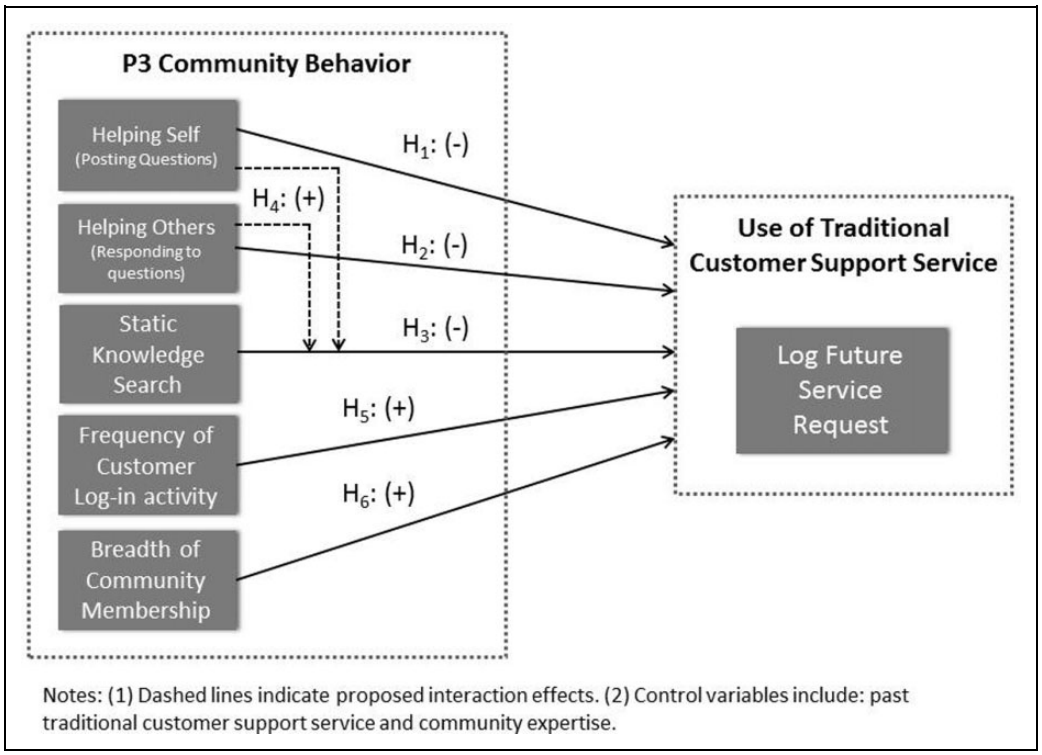

Figure 1. Theoretical model.

reduction, and enhanced customer loyalty. Apple, Intel, Dell, HP, Sprint, and Oracle have created large and thriving P3 communities to supplement or replace traditional customer support service models (Chiu, Hsu, and Wang 2006; Nambisan 2002). Cisco goes even further, giving customers open online access to Cisco's knowledge base and user community. In these settings, both parties actively help one another (Prahalad and Ramaswamy 2000). By being actively involved in the cocreation of customer support service, customers are taking over a role once occupied by the firm. The firm is able to conserve the time and resources associated with traditional support services, while customers are able to solve problems faster and more efficiently.

In line with prior research (Carson et al. 1999), we believe it is critical to develop a theoretical framework that shows how customer participation in P3 communities helps maximize value (see Figure 1). Our results support the argument that customer participation in these communities reduces customer reliance on costly traditional support service. Building upon prior customer participation research (Chan et al. 2010), we define customer participation in problem resolution as the degree to which the customer is involved in taking actions to both solve their own service support needs and offering support solutions to peer customers.

Traditional research in this realm has investigated customer interactions in brand communities in a business-to-consumer (B2C) environment (Algesheimer, Dholakia, and Herrmann 2005; Bagozzi and Dholakia 2006; Muniz and O'Guinn 2001). We extend this research by examining the understudied phenomenon of C2C problem-solving participation (Libai et al. 2010) in firm-hosted global B2B P3 communities. In contrast to traditional B2C communities, B2B customers are not seeking a forum to socialize or develop personal relationships but rather to engage in problem-solving activities (Wasko and Faraj 2000). P3 communities enable individuals to share their knowledge, perspectives, and solutions in an online environment (Petouhoff 2009). These dynamic communities are explicitly created to enable collaborative problem solving through the integration of problem-solving knowledge.

P3 communities are also very effective knowledge management tools. Traditional knowledge management literature views knowledge as either an object or something embedded in individuals. Wasko and Faraj (2000) argue that knowledge can also be embedded in P3 communities. P3 communities are often created explicitly to enable the transferring and integration of knowledge (Alavi and Leidner 2001). Increased knowledge sharing in the P3 community may eliminate the customer's use of traditional customer support service, such as opening a service ticket or service request (SR) through a call center or web support agent (Petouhoff 2009). Although customer participation in the P3 community may not completely negate the need to interact with traditional customer support (i.e., to log an SR), the customer may be able to streamline the problem resolution process, resulting in greater efficiencies and cost savings for the service provider (Petouhoff 2009). Participating in community problem-solving activity may help increase the customer's knowledge, as they interact with peer customers who have resolved similar

problems. Van Doorn et al. (2010) argue that these C2C community activities further expand the impact of cocreation as they are discretionary behaviors that enhance the core offering itself. We propose that customer cocreation in problem resolution P3 communities improves the overall customer support service experience.

We investigate the extent to which communities may reduce customers' reliance on traditional customer support service. Specifically, does customer participation in problem resolution in P3 communities reduce the requirement for traditional customer support service? We contribute to the literature by understanding the influence of community participation on reducing the use of traditional customer support service and the associated costs among B2B customers. We seek to understand which customer behaviors in P3 communities reduce the customer's use of traditional customer support service. Further, in response to Bendapudi and Leone's (2003) call, our longitudinal study adds to the literature pertaining to value cocreation in B2B literature, as much of the past research is either theoretical or reflects anecdotal accounts (e.g., Lusch, Brown, and Brunswick 1992; Prahalad and Ramaswamy 2000).

To examine the value of customer participation in problem resolution in P3 communities, we partnered with a large Fortune 100 enterprise software firm that hosts and moderates over 200 unique global P3 communities, each focusing on a unique product, service, or platform that the firm offers. We conducted a longitudinal study to investigate the impact of P3 community activities on customer behavior. We focus on the actual customer P3 community behavior among B2B customers. Specifically, these data reflect the dynamic C2C interactions of posting questions and responding to peers' questions in the community, as well as customers' use of traditional static knowledge resources (e.g., product news, manuals, and updates). We define static knowledge as information that can only be searched and accessed for support service but cannot be added to, changed, or altered. Overall, we identify specific customer behaviors in P3 communities that influence (increase or decrease) the use of traditional support service.

The results of our study offer managers and academics new insights into customer participation in B2B online support communities. Our findings also provide managers with new avenues to increase the efficiency and effectiveness of delivering pre- and post-sales support service to their B2B customers. From a theoretical perspective, we yield cross-disciplinary implications for service marketing, information systems, computer science, and service operations. This research is in response to the need in service research identified by Huang and Rust (2013, p. 5) for "both data-driven and theory-driven customer analytics that allow us to figure out from big data why customers make the decisions they make and why they behave in a certain way by incorporating our existing theories," as well as Libai et al.'s (2010) call for future research on C2C interactions in B2B environments. From the IS literature, this research also responds to the call for an emphasis on customer support service needs (El Sawy and Bowles 1997). Further, we extend the research on employee help-seeking behavior (Flynn 2005) into customer-to-customer interactions.

Background Perspective

As our research builds upon research on traditional customer support service, knowledge management, and support communities, we first provide some background as the foundation for our conceptual framework.

Customer Support Services

To address customer problems, firms offer a range of support services. Examples include help documentation, installation, user training, upgrades or patches, maintenance and repair, and warranties (Bolton, Lemon and Bramlett 2006; El Sawy and Bowles 1997). In B2B relationships, these services often have clear and agreed upon support approaches for problem resolution. Many customers strategically rely on this relationship to assist with problem resolution and to avoid delays, which can result in downtime causing subsequent loss of earnings for the firm. For example, an independent study revealed that North American businesses collectively suffer US$26.5 billion in lost revenue each year as a result of slow recovery from IT system downtime. Such downtime reduces the average firm's ability to generate revenue by 29% (CA Technologies 2011).

For many years, the traditional outlet for support has been this one-to-one customer support model in which the customer calls a service agent to solve a problem or answer a question (Wiertz and de Ruyter 2007). Repetitive costs and problem solving are inherent in this model, as each occurrence of the problem must be solved individually. Effectiveness is further hindered by the difficulty of sharing knowledge or learning across customers and service representatives, as solutions are only disseminated on a one-to-one level. New technology advances have enabled firms to deliver support via a variety of methods including traditional call centers, e-mail, or online support (Markeset and Kumar 2005). Web-based customer support enables the firm to address customers' issues on a much larger scale; online or e-mail interactions simply replace the traditional call center. For example, Microsoft's web-based customer support receives more than 100,000 contacts per day (Negash, Ryan, and Igbaria 2003) and Dell Computer receives more than 80,000 tech support requests each day (Smith 2007). Recent research has shown that these web-based support services continue to grow in use, with a 12% rise in web self-service knowledge usage, a 24% rise in chat usage, and a 25% increase in community usage for customer service in the past 3 years (Leggett 2013). The rise of online tools has enabled customers to notify the firm more quickly and efficiently about product or service problems or questions. Web-based customer support may become a self-service opportunity, as the customer can directly access product or problem-specific information from the firm's knowledge management system (Negash, Ryan, and Igbaria 2003).

Knowledge Management

Knowledge management is considered a dynamic and continuous set of processes and practices that focus on creating, storing/retrieving, transferring, and applying knowledge. Simply possessing knowledge does not imply value nor does simply creating a knowledge network (Alavi and Leidner 2001). Research in knowledge management has traditionally advanced two main perspectives that have contributed to the advent of P3 communities. The first perspective views knowledge as a private resource that can be shared or exchanged like any other resource. The second perspective is that knowledge is embedded in people and exchanged through one-to-one interaction. The third, and understudied perspective, is that knowledge can be embedded in a community. In this realm, knowledge is socially generated, maintained, and shared in the community (Wasko and Faraj 2000). It is in this third understudied area that our study is set.

As knowledge management systems have evolved from being static repositories of knowledge to being socially constructed P3 communities, firms have shared the benefits of organizational learning with their customers (Alavi and Leidner 2001; Bates and Robert 2002). Viewing knowledge as a socially constructed idea moves our focus from one individual's knowledge as an asset to be potentially transferred on a one-to-one basis, to collectively generated and shared knowledge. From this perspective, knowledge is created as individuals in the community collaborate and share experiences and insights with one another (Ardichvili, Page, and Wentling 2003; Wenger and Snyder 2000). This sharing of knowledge creates a critical linkage for the firm by inviting their customers to participate in organizational learning which enhances firm performance (Wenger and Snyder 2000).

Knowledge acquisition occurs when knowledge about a product or technology is obtained from different sources (Nambisan 2002). In our study, users have two main sources of acquiring knowledge. The first source is the firm's static knowledge database or knowledge that is independent of human action (Wasko and Faraj 2000). This knowledge management system is a straightforward, web-based customer support platform on which customers can log in and search for needed information. Customers can often download helpful information, such as help documentation, user manuals, and instructional videos (Markeset and Kumar 2005). We refer to this source as "static knowledge" because users cannot add, change, or alter this information. Prior research has also referred to this as a data repository model (Alavi and Leidner 2001; Nambisan 2002). In the repository model, explicit knowledge about products and technologies is situated in electronic files and documents, and facilities are provided for customers to search and retrieve information from them (Wasko and Faraj 2000). This static knowledge repository can contain information that, if managed correctly, can be updated often, be accessed globally, and reduce the need for one-to-one resolution. Up to 60% of customers now use these web-based self-service knowledge sources to solve their support needs (Leggett 2013). Although web-based customer self-service is appealing to the organization for its potential to reduce service costs, static knowledge search or navigation difficulties can frustrate and anger customers whose own poor problem definition and unclear descriptions can lead to inadequate search results (Negash, Ryan, and Igbaria 2003). Customers are forced to rely on the accuracy and completeness of knowledge content artifacts without the benefit and assurance of a support agent who understands the nuances of their situation.

A second source of knowledge comes from customer interactions in an online support community (Wasko and Faraj 2000), with a population consisting of the firm's customer users. This network model is based on providing access to knowledge that resides within people by establishing direct links among individuals in the community (Nambisan 2002). Kumar et al. (2010) argue that active customers create value for the firm. Often, these customer participation activities are discretionary and not rewarded in the context of the employer's formal reward structure. Customer discretionary participation behaviors help support the firm's ability to provide quality service. These behaviors include customers providing suggestions for service improvements, customer cooperation and conscientiousness during service encounters, and the customer spreading positive word of mouth (Bettencourt 1997).

Customer Participation in Peer-to-Peer Problem-Solving Communities

Customer participation is defined as "a behavioral construct that measures the extent to which customers provide/share information, make suggestions, and become involved in decision making" (Chan et al. 2010, p. 49). Customer participation has been linked to increased firm productivity (Lovelock and Young 1979), customer satisfaction, employee job satisfaction, and employee job performance (Bendapudi and Leone 2003). As a result, there has been a fundamental shift by many firms to viewing customers as active cocreators rather than as a passive audience (Wind and Rangaswamy 2000).

Traditional customer participation research has often focused on the economic rationale, as customer participation reduces labor costs and enables a firm to market the offering at a lower monetary price, resulting in a win-win situation in the buyer-seller relationship (Fitzsimmons 1985). The firm is not simply encouraging customer participation to save resources; it is mobilizing the customer to improve the service offering (Normann and Ramírez 1993). Collaborating with customers to cocreate value is considered a competitive advantage (Bendapudi and Leone 2003; Chan et. al. 2010).

Much of the existing research on communities has focused on brand communities, in which the common bond or tie is often the love for or attachment to a particular brand or firm. Prior research has examined brand communities based on a shared affect for brands, such as Apple (Muniz and Schau 2005), Jeep (McAlexander, Schouten, and Koenig 2002), Ford, Macintosh, and Saab (Muniz and O'Guinn 2001). Customers often have specific goals when they actively participate with

a firm, such as maximizing consumption benefits, gaining relational benefits, or becoming involved in future product directions (Van Doorn et al. 2010). Although members in a P3 community may forge social relationships with one another, the core value or need is ultimately for problem solving, which makes these customer P3 communities distinct from brand or advocacy communities.

The development of a P3 community requires investments from both parties. Customers invest time and effort both seeking and sharing information, and service providers incur costs through the need to develop new systems for handling information (Ennew and Binks 1999). However, research has shown that customers participate only if they believe they will receive benefits from the relationship (Ennew and Binks 1999). Thus, we argue that simply viewing the customer as a resource is not an effective perspective. In order to succeed, customer participation must deliver value to both customers and firms (Auh et al. 2007; Lovelock and Young 1979). Participation in P3 communities works because community members believe they will receive value in the form of problem resolution, and the firm will reduce costs by decreasing customer reliance on traditional support services. Increasingly, customers are able to choose which aspect and how much of a service they want to produce for themselves (Auh et al. 2007). In a problem resolution setting, the customer has the option to use traditional support services to solve their problem, but many choose to use these communities to address their needs. While the customer is cocreating value, and saving the firm resources by solving their problems in the community, the customer is also having their needs met.

Past research has argued that P3 communities are places where individuals exchange experiences and knowledge in an open dialogue so as to effectively problem solve and improve, help drive strategy, transfer best practices, and develop skills and expertise (Mathwick, Wiertz, and De Ruyter 2008; Wenger and Snyder 2000). Often, a strong motivation for actively participating with a firm in the B2B setting is the desire or need to solve a problem (Schrage 1990). Research has shown that when customers collaborate with the firm they are better able solve to their needs (Bendapudi and Leone 2003; Bitner and Brown 2008), thereby allowing customers to engage in dialogue with other customers about a specific problem (Dholakia et al. 2009). By effectively solving customer problems using P3 communities, a firm can deepen its value proposition and differentiate its services from its competitors (Dholakia et al. 2009). Not only do P3 communities decrease costs and allow for rapid dissemination of information, they create opportunities for customer engagement and collaboration resulting in deeper and longer lasting customer relationships (Dholakia, Bagozzi, and Pearo 2004), create touch points to gather feedback, and strengthen the brand (Moon and Sproull 2001).

Customers traditionally expect the service provider to offer some form of support service, either free of charge or as part of a service contract. In firm-hosted P3 communities, however, customers not only receive support service from other customers, they also spend their own time and effort solving other community member problems (Wiertz and de Ruyter 2007). Members of such communities take over service functions traditionally provided by the host firm, most times without receiving any monetary compensation or other direct rewards.

Online support communities enable a firm to engage a large number of customers without compromising the richness and depth of the support. These virtual support communities can become vast sources of socially generated knowledge (Sawhney, Verona, and Prandelli 2005). Users can post complex questions to the community that can be answered by others. In the community studied in this research, the most valuable users are called "super users"; these expert users make up roughly 1–2% of the community members but contribute between 40 and 60% of the community content. Super users often have more community expertise and context sensitive solutions than the customer support staff. P3 communities can also make firm support agents more productive through their access to the latest problems and resolutions that the community creates. The information generated can then be transformed into a valuable update to the static knowledge library (Petouhoff 2009).

Conceptual Model and Hypotheses

We propose and test a model of P3 community behavior. Our model tests the effect of customer P3 community participation, static knowledge search, community log-in frequency, and membership breadth on the customer's future use of traditional customer support service provided by the firm, while controlling for previous traditional customer support service behaviors and community expertise (see Figure 1).

Customer Problem-Solving Participation in a P3 Community

We first examine customer community problem-solving participation in the form of helping oneself and helping others in the P3 community (Dholakia et al. 2009). Active customers proactively seek out solutions and provide solutions to others. Organizations that build and use these customer support networks can expect a range of benefits, from reductions in the cost to serve customers to more effective use of self-support service. Petouhoff (2009) lists a variety of benefits, including the reduction of agent-assisted interactions by telephone or web, for which a certain percentage of customers will be able to solve their problem with little or no firm interaction. Active P3 community participants should experience a significant decrease in their use of traditional customer support service.

Previous research has argued that these communities can eliminate some of the redundancies, inefficiencies, and frustrations of past customer support tools (Nambisan 2002). Wasko and Faraj (2000) propose that knowledge sharing is enabled through posting and responding to questions. Knowledge transfer is not a simple straightforward process (Bates and Robert 2002) and we argue that both helping oneself and helping other

community members will reduce customers' need for traditional service support.

Past research has investigated the motivations for P3 community usage (Ardichvili, Page, and Wentling 2003; Wasko and Faraj 2000). Among the most dominant motives for P3 community participation is the need to post questions to solve specific problems or to answer specific questions. Anthropologists and sociologists have examined social exchanges and outlined help seekers and helpers as long-standing social roles (Gourash 1978). Help seeking has been viewed as an interpersonal activity in which individuals deliberately approach others whom they consider to possess the skills, capabilities, or resources required to manage or solve a problem (Bamberger 2009). Wasko and Faraj (2000) suggest that a customer posting questions to specific problems is acting out of self-interest as the customer is motivated by a need to solve their own problem using the shared knowledge of the community. Psychologists have found that asking questions in group settings reduces the time and errors in problem solving (Gibson et al. 2011). Research in an education setting found a strong relationship between help-seeking and achievement behavior (Karabenick and Knapp 1991). In an employee context, past research has argued that soliciting help from other employees may enhance their chances of effectively and efficiently solving their problem (Ellis and Tyre 2001). Seeking help has been found to help employees make better and quicker decisions (Eisenhardt 1989), reduce indecision and stress (West 2000), and increase important knowledge and skills (Leonard-Barton 1989). Further, Podsakoff, Whiting, and Blume (2009) found that receiving help had a positive impact on employee performance. Based on this logic, we propose that posting questions in a P3 community will reduce the need for interactive service support.

Hypothesis 1: Helping oneself by posting questions in a P3 community will be negatively related to the customer's future use of traditional customer support service.

Posting questions represents only one side of the customer problem-solving behavior in P3 communities; customers also supply knowledge, as they respond to others in a P3 community. Nambisan (2002) contends that one key characteristic of customers is that they are uniquely qualified to provide support to other users. Customers often acquire significant knowledge of or expertise in various aspects of product usage, which then becomes the basis for providing product support to peers. Customers, actively using the system on a daily basis, can acquire knowledge and experience the support provider may not have. This gives customers a unique perspective that often enables them to quickly solve problems and meet job needs. Once such information is gained, customers are able to pass on the learnings in the P3 community. Past research in customer participation has argued that one of the most well-documented customer roles has been information sharing (Lengnick-Hall 1996). Information sharing is defined as the extent to which two partners exchange information about the product idea, market, and problem solutions, among other issues (Jap 1999). Direct contributions from customers are most common in B2B settings (Garvin 1988).

As a public resource, knowledge in a community can be created and shared only if members contribute to the community (Wasko and Faraj 2000). While both repository and network models are effective at transferring knowledge, the network model is more critical given the focus on community interactions as the primary instrument for knowledge sharing (Nambisan 2002). Wasko and Faraj conclude that individuals do not act solely out of self-interest when participating in P3 communities, but also respond to others' questions altruistically and pro-socially, contributing to the welfare of others without apparent compensation. They forego the tendency to free ride or consume the information in P3 communities without contributing to its creation or development out of a sense of fairness, public duty, and concern for their community (Schwartz 1970).

Wasko and Faraj (2000) also suggest that knowledge and expertise may be gained through helping others in P3 communities. The dynamic and quick feedback that results as customers contribute answers to others' questions allows individuals to gauge their own expertise and validate their own knowledge relative to others in the community. As an individual responds to another's question, they not only test the viability of their solution, but they also benefit as other community users modify the response. The individual comes away with ideas and solutions that no single individual could have come up with on their own. Therefore, we propose:

Hypothesis 2: Helping others by responding to others' questions in a P3 community will be negatively related to the customer's future use of traditional customer support service.

Static Knowledge Search

We further investigate the relationship between customers' search of firm-created online static knowledge content and their future use of traditional customer support service. One major aspect of knowledge management is the ability to store information. Online repositories of static information can store large amounts of solutions, ideas, updates, and other useful information. More importantly, these static repositories must be able to retrieve the needed information in a timely manner. Also, while the user may experience difficulties in properly framing their search, limitations of the search algorithms themselves may impact their success and search effectiveness (Mårtensson, 2000).

Prior IT research has found that static knowledge creations, such as installation guides or help documentation, resulted in increased customer satisfaction and reduced firm support costs (Blackwell 1995). However, Walsham (2001) argues that unless the firm is able to adequately anticipate users' support needs, and thus have the needed information posted in a timely manner, these tools are ineffective. For example, users indicated that data-driven activities, such as presentations and reports, were often irrelevant to their current situations (Walsham 2001). While firms may be good at posting high volumes

of information, it may prove ineffective if the users' needs are not anticipated. While these online repositories of knowledge provide customers with instant access to large amounts of information, the system still relies on customers being able to effectively articulate their problems to achieve effective searches. Thus, although limited by customer ability to define problems and effectively search for answers, we believe that static knowledge search should still be a useful tool for solving problems and reducing customers' future needs to use traditional customer support service.

Hypothesis 3: Static knowledge search will be negatively related to the customer's future use of traditional customer support service.

Combining Support Sources

When an individual has a problem or question, there is the potential that the individual will use multiple different support services to resolve the issue. It is important to understand the impact of using more than one support service. Thus, we further examine two possible interactions when multiple resources are employed: (1) between static knowledge search and helping oneself and (2) between static knowledge search and helping others. Using multiple knowledge sources may be an indication that the individual is having difficulty solving a problem and thus would result in an increase in future need for service. If one resource does not successfully solve the problem, the individual is forced to seek other resources to solve the problem. Geller and Bamberger (2012) argue that help-seeking behavior can be stressful and have significant mental and instrumental costs. Help seeking is not effortless and the need to use multiple resources to solve a problem only amplifies the effort needed. This is consistent with Nadler, Ellis, and Bar (2003), who found a curvilinear relationship between help-seeking frequency and performance, such that a high frequency of help-seeking behavior was found to be negatively related to performance. Thus, we hypothesize that using multiple sources to find an answer will increase the likelihood the individual will need to use traditional support services.

Hypothesis 4: Using multiple resources to solve a problem will be positively related to the customer's future use of traditional support service.

P3 Community Log-In Frequency and Membership Breadth

Not all participation in P3 communities involves active problem-solving behaviors like that of posting questions and responding to peer questions. Simply logging in to the community does not necessitate that the customer will actively participate in any future problem-solving behaviors. Similarly, merely being a member of more than one community does not mean being engaged in more activity. Thus, we also examine the effect of frequency of log-in activity and breadth of community membership.

First, we examine the impact of a change in frequency of customer log-in activity in the P3 community on use of traditional service support. In the high-tech B2B realm, solving problems quickly and efficiently is paramount. The need to log in multiple times to solve a problem slows progress and prevents the employee from effectively doing their job. Human problem-solving research argues that for a problem solver to be efficient they must have the enough knowledge about the task or problem at hand (Newell and Simon 1971). An increase in frequency of community log in may be an indication that the individual is lacking the information to solve their problem efficiently and is trying to find missing information. Online communities are producing data at unprecedented levels; however, the individual's ability to extract the necessary solution is not always efficient (Woods, Patterson, and Roth 2002). Known as the data availability paradox (Woods, Patterson, and Roth 2002), the flood of available data challenges the user's ability to find what is informative or meaningful for their problem or need (Miller 1960). Even if all the pieces to the individual's solution are present in the community, an increase in log-in frequency may indicate that the user required extra time and effort to attempt to solve their problem (Woods, Patterson, and Roth 2002), necessitating a traditional service support request. Such individuals may not develop the expertise or knowledge capital needed to solve their problems. An increase in log-in activity will, therefore, increase their need for service support.

Consistent with this logic, merely logging into the community requires very little noticeable effort in the community on the part of the customer. This simple task does not necessitate that any learning or problem-solving behavior occurred in the community. We argue that without active problem-solving behavior (posting questions and responding to peer questions), greater log-in activity indicates a need for traditional service support.

Hypothesis 5: An increase in the frequency of customer log ins will be positively related to the customer's future use of traditional support service.

We also investigate the impact of the user's breadth of community memberships (the number of product- or service-specific communities in which the customer is registered) on the need to use traditional service support. Being a member in multiple product- or service-specific communities implies that the customer is attempting to provide support for multiple products or services for their firm. The more communities (greater breadth) in which the customer is a registered member, the higher the likelihood that he or she may not have the time or mental bandwidth to focus on a specific problem resolution need for much time. This employee may be experiencing role overload. Role overload is defined as situations in which an individual feels that there are too many responsibilities or activities expected of them, given the time available, their abilities, and other constraints (Bolino and Turnley 2005; Rizzo, House, and Lirtzman 1970).

Employers are expecting employees to work longer hours, to put forth more effort, and to be easy to access (e.g., Bond,

Table 1. Construct Measures and Collection Mechanisms.

Variables		Source of Data	Time Period Collected	Data Description
TSUPPORT	Number of service requests initiated by the customer in Time 3	Service request management system	Month 4	Actual customer requests for traditional customer support service
PASTTSUPPORT	Number of service requests initiated by the customer in Time 1		Months 1, 2, and 3	
KNOWSEARCH	Number of knowledge search clicks executed to seek out and read troubleshooting articles and product updates in Time 2	Clickstream	Month 4	Actual customer behavior in terms of browsing and contributions in the community
COMMQUESTIONS	Number of times a customer posted a question in a P3 community in Time 2	Clickstream	Month 4	
COMMREPLIES	Number of replies to questions from peer customers in Time 2	Clickstream	Month 4	
FREQUENCY	Number of logins to the P3 community in Time 2	Clickstream	Month 4	
BREADTH	Number of communities member of in to in Time 2	Clickstream	Month 4	
COMMEXPERTISE	Number of points a customer earns based on P3 community participation and response accuracy in Time 2	Clickstream	Month 4	

Galinsky, and Swanberg 1998; Hochschild 1997). As multitasking becomes the norm in the workplace, role overload also becomes more prevalent (Kirsh 2000). While P3 communities were created as a tool to help employees effectively solve problems, and thus do their jobs more efficiently, such communities may also function to increase role overload. Given the staggering amounts of new data and information in these communities (Woods, Patterson, and Roth 2002), if an individual is trying to navigate a wide breadth of different P3 communities, the level of information processing needed can be overwhelming (Kirsh 2000).

Computer science literature uses cognitive load theory to explain role overload. This literature argues that optimal learning occurs when an individual's working memory is minimized, so that long-term memory can be facilitated. Past research has shown that an increased utilization of a technology system, such as joining a large breadth of support communities, can actually result in poorer individual performance (Karr-Wisnieski and Lu 2010). Much like feature overload (Hsi and Potts 2000), attempting to search too many communities for problem solutions may lead to an increase in the need to use traditional customer support service. It appears that while on the surface being a member of multiple communities could lead to more effective problem-solving behavior by an individual, it may actually increase role overload and thus decrease the effectiveness of customer problem-solving activity.

Hypothesis 6: An increase in the customer's breadth of community membership will be positively related to the customer's future use of traditional support service.

In summary, we examine the effects of customer participation in a P3 community on customer future use of traditional customer support service. We propose that helping oneself by posting questions (Hypothesis 1) or by responding to others' questions (Hypothesis 2) will reduce customer's future use of such support service. We also propose that higher use of static knowledge search will reduce customer future use of traditional support service (Hypothesis 3). However, using multiple resources, such as posting to the community and using static search (Hypothesis 4) will moderate these reductions. In addition, we propose that more frequent customer log ins (Hypothesis 5), and breadth of community membership (Hypothesis 6) will increase customer future use of support service. Recognizing that there is significant heterogeneity in customers' need for (and use of) traditional customer support service and potentially significant variability in customer expertise in P3 communities, we control for these by including two variables: past use of traditional customer support and community expertise.

Customer Participation and Need for Support Service: A Longitudinal Field Study

To test our research hypotheses, we partnered with a large Fortune 100 technology firm that has a variety of customer support tools, including traditional call centers, online web support, large online libraries, and extensive P3 communities that cover a breadth of product lines and categories. The P3 environment includes more than 200 product- and service-specific online communities. We conducted a longitudinal study to understand the effect customer community problem-solving activities has on actual customer support service behavior.

Methodology and Data Collection

We gathered longitudinal data from 2,542 customers participating in the firm's global P3 community over a 4-month time period (see Table 1 for variable definitions). This time period

was designated based on the time the P3 community had been launched and populated. Using a common identifier, multiple data sources across multiple firm departments were matched and merged and resulted in an aggregated data set of B2B customers across the firm's P3 communities. Adding to the robustness of the data, this population was a diverse international group of B2B customers representing a variety of products and services offered by the organization.

In Time 1 (Months 1, 2, and 3 in our data set), we first gathered prior use of traditional customer support service to use as a control variable by capturing customers' use of traditional support service in the first three months. Using three months of previous behaviors allowed us to truly capture past behavioral preferences and habits. It also enabled us to control for some of the heterogeneity in the data set, as it would account for those individuals who, for reasons we may not be able to capture in our data, utilize traditional customer support much more or much less than others. Such a time-lagged data set allows for a proper examination of potential effects across customers (Bendapudi and Leone 2003).

Following Montgomery et al. (2004), customer community behaviors were captured using clickstream records in Time 2 (Month 4 in our data set). Clickstream data were captured, as the community participant clicked anywhere in the various company online applications and venues. Clickstream captures a very detailed record of the user's actions (Moe and Fader 2004).

We investigated two types of customer community problem-solving activities in the P3 community—(1) helping oneself by posting questions and (2) helping others by posting responses. In line with Dholakia et al. (2009), helping oneself was measured by the number of questions the customer posted in the community in Time 2 and helping others by the number of responses the customer posted to others' questions in Time 2. We retrieved information from clickstream and archival databases to measure the use of static knowledge search, the frequency of community log in, the breadth of community membership, and community expertise in Time 2. Static knowledge search was measured as the number of knowledge search clicks executed to seek out and read troubleshooting articles and product updates in Time 2. Frequency of participation was measured as the number of times the customer logged in to the firm's P3 community during Time 2. Breadth of community membership was measured as the number of product- and/or service-specific communities the customer was a member of during Time 2.

We included two control variables in the analysis: community expertise and past traditional customer support service. Community expertise was measured as the number of points a customer earned from the community moderators and is based on P3 community participation and response accuracy in Time 2. Points are granted by the community moderators for correct and accurate responses a user provides to community peers. These expertise scores are visible to all users in the community. Past traditional customer support service behavior was measured as the number of SRs initiated by the customer in Time 1. Prior research has argued that past behavior predicts future behavior, and a behavior performed repeatedly becomes a habit (Aarts, Verplanken, and Van Knippenberg 1998; Ouellette and Wood 1998). Logging traditional customer SRs may turn into a habit or become the customer's default problem-solving source.

The key dependent variable, the use of traditional customer support service, was also measured in Time 2. It consisted of the objective behavioral measure of the customer's logging of SRs, measured as the number of SRs initiated by the customer in this time period. The data were collected from the SR system used to track such customer requests. The clickstream measures noted above and the use of traditional customer support service were measured in the same time period to reflect the customer behavior and the context. If customers seek problem resolution from static knowledge and the community and are unsuccessful in resolving their problems with those resources, they will immediately log an SR instead of waiting until a later time period. Table 1 highlights the data collection mechanisms, variable names, and definitions sources utilized for this research.

Model Estimation

The dependent variable of interest, use of traditional customer support service (TSUPPORT), is a count variable, and thus we estimate the model as a generalized linear Poisson regression model because of its robustness in accommodating the violation of the heteroscedasticity and normality of distribution assumptions associated with modeling count variables (Coxe, West, and Aiken 2009).[1] All independent predictors were transformed using the natural log transformation to correct issues of normality commonly associated with clickstream data. See Table 2 for full descriptive statistics.

The estimated model is as follows:

$$\begin{aligned}(\text{TSUPPORT}) = f(&\text{KNOWSEARCH}, \text{COMMQUESTIONS},\\ &\text{COMMREPLIES}, \text{FREQUENCY}, \text{BREADTH},\\ &\text{PASTTSUPPORT}, \text{COMMEXPERTISE},\\ &\text{KNOWSEARCH} \times \text{COMMQUESTIONS},\\ &\text{KNOWSEARCH} \times \text{COMMREPLIES})\end{aligned} \quad (1)$$

where

SUPPORT = number of SRs initiated by customer in Time 2,

KNOWSEARCH = static knowledge search (number of knowledge search clicks executed to seek out and read troubleshooting articles and product updates in Time 2),

COMMQUESTIONS = helping oneself (number of times customer posted a question to the community in Time 2),

Table 2. Descriptive Statistics and Correlations.

Variable	Mean	*SD*	1	2	3	4	5	6	7	8
Future traditional customer support service (TSUPPORT)	1.01	2.06	1.00							
Static knowledge search (KNOWSEARCH)	2.68	1.61	.32**	1.00						
Helping oneself (COMMQUESTIONS)	.02	.16	.01	.04*	1.00					
Helping others (COMMREPLIES)	.04	.25	.02	.03	.61**	1.00				
Frequency of community participation (FREQUENCY)	2.38	1.02	.49**	.73**	.07**	.08**	1.00			
Breadth of community membership (BREADTH)	.03	.16	.03	.05*	.74**	.84**	.09**	1.00		
Community expertise (COMMEXPERTISE)	.13	.64	−.01	.00	.41**	.60**	.01	.51**	1.00	
Past traditional customer support service (PASTTSUPPORT)	3.27	5.61	.64**	.31**	.01	.01	.46**	.01	.00	1.00

*$p < .05$. **$p < .01$.

Table 3. Poisson Regression Results.

Variable	*B*	*SE*	Wald	*p* Value
Intercept	−2.22	.07	1,014.78	.000
Static knowledge search (KNOWSEARCH)	−.05	.02	7.07	.008
Helping oneself (COMMQUESTIONS)	−1.74	.66	6.97	.008
Helping others (COMMREPLIES)	−.62	.31	4.01	.045
Frequency of community participation (FREQUENCY)	.77	.03	725.76	.000
Breadth of community membership (BREADTH)	.69	.25	7.46	.006
Community expertise (COMMEXPERTISE)	.03	.04	.58	.45
Past traditional customer support service (PASTTSUPPORT)	.03	.00	362.68	.000
KNOWSEARCH × COMMQUESTIONS	.38	.15	6.32	.012
KNOWSEARCH × COMMREPLIES	.07	.07	.83	.363

Note. Predicting Future Use of Traditional Customer Support Service. ($\chi^2 = 2{,}800.65$, $p < .0001$, $df = 9$, log likelihood = −3,153.35).

COMMREPLIES = helping others (number of replies to questions from a peer customer in Time 2),

FREQUENCY = frequency of community participation (number of log-ins to community site in Time 2),

BREADTH = breadth of community membership (number of communities customer was member of in Time 2),

PASTTSUPPORT = number of SRs initiated by the customer in Time 1, and

COMMEXPERTISE = community expertise (number of points a customer earns based on P3 community participation and response accuracy in Time 2).

Results

The likelihood ratio χ^2 test of the model was significant ($\chi^2 = 2{,}800.65$, $p < .0001$, $df = 9$). Table 3 details the regression results. As predicted, both helping oneself (COMMQUESTIONS; $B = -1.74$, $p < .01$) and helping others (COMMREPLIES; $B = -.62$, $p < .05$) significantly decreased the customer's use of traditional customer support service, providing support for Hyphothesis 1 and Hyphothesis 2. Consistent with our prediction, knowledge search significantly decreased the use of traditional customer support service (KNOWSEARCH; $B = -.05$, $p < .01$), providing support of Hypothesis 3. Hyphothesis 4 was partially supported: The interaction between knowledge search and helping oneself was positive and significant (KNOWSEARCH × COMMQUESTIONS; $B = .38$, $p = .012$), while the interaction between knowledge search and helping others was not significant (KNOWSEARCH × COMMREPLIES; $B = .07$, $p = .36$).[2]

The frequency of log-in activity (FREQUENCY; $B = .77$, $p < .001$) and the breadth of community membership (BREADTH; $B = .69$, $p < .01$) both significantly increased the use of traditional support service, supporting Hyphothesis 5 and Hyphothesis 6. An increase in both of these low-activity behaviors is positively related to an increase in SRs logged.

The past use of traditional support service, included to control for heterogeneity across customers, was positive and significant as expected (PASTTSUPPORT; $B = .03$, $p < .001$). This indicates that there is a relationship between past behaviors of using traditional support and the use of the same method in the future. Finally, community expertise, also included to control for heterogeneity across community members, was not significant (COMMEXPERTISE; $B = .03$, $p = .45$).

Additional Tests to Control for Heterogeneity

Additional models were estimated in an effort to control for heterogeneity and to rule out explanations of individual difference factors influencing the results of our hypotheses testing.

We first estimated a model using a subset of the data where we controlled for the product category for which the customer was seeking support. Poisson regression was used to analyze a model with product type included as a dummy variable and this variable was included as a predictor of TSUPPORT. Data regarding a customer's primary product type were captured from the customer account database. The vast majority of the customers in our sample indicated they primarily used one of two key product types offered by the firm. One of two the product types was significantly more likely to use traditional customer support (PASTTSUPPORT, $B = .11$, $p < .05$) and the other product type was significantly less likely to use traditional customer support (PASTTSUPPORT, $B = -.28$, $p < .001$). The direction and significance of our other independent variables in the model remained consistent.

Second, we controlled for the potential effect of lurker behavior. Previous research has called for an investigation of lurker behavior in P3 community (Mathwick, Wiertz, and De Ruyter 2008). Past research estimates that up to 90% of those who log into online communities are lurkers and never actively post in the community (Nielsen 2006). Using additional clickstream behavioral data, we were able to differentiate lurkers from active participants. To control for lurkers in the community, we estimated a Poisson regression model including a lurker (*never posted* = 0) and active participant (*posted at least once* = 1) binary variable. The effect of lurkers on TSUPPORT was not significant ($B = -.30$, $p = .37$) and the direction and significance of the other parameters in our original model were consistent.

Third, as prior research regarding communities has identified multiple motives for customers to participate in communities, we sought to gain insight into customers' motives for using P3 communities. Using an additional firm data set including measures of customer satisfaction with the P3 community, we estimated a model of customer motivations and satisfaction with the P3 community. We found that when customer motivation to participate in the P3 was "problem resolution," customers were more satisfied with the P3 community than when customers' motivation was "knowledge acquisition" or "social." In sum, the robustness of our results, when accounting for multiple forms of heterogeneity as well as customer motives, increases our confidence in the results of the study.

Theoretical Implications

This work contributes to the literature on customer participation, communities, knowledge management, and support services in several important ways. First, to our knowledge, this is the first empirical study to investigate the longitudinal effects of customer participation in a problem-solving community of B2B customers. After controlling for past traditional customer support service behavior and customer community expertise, we demonstrate that the problem-solving activities of helping oneself (posting questions) and helping others (responding to questions) in a peer-to-peer problem-solving community were significant predictors and primary drivers of reducing the customer's use of traditional customer support service. We extend the model of Dholakia et al. (2009), which highlights the role of learning in these communities, and the functional and social benefits received from participating in a P3 community. While Dholakia et al. (2009) focuses on the antecedents of helping oneself and helping others, the present work empirically investigates the positive outcomes of these behaviors. We find that customer searching of static knowledge repositories also reduced the need to log an SR. However, the interaction between helping oneself and static knowledge search suggest the effect of helping oneself on reducing the need for service is weaker when the customer also searches the firm's static knowledge resources. Taken together, these results provide new insights into how online support tools, separately and in combination, influence customer need for traditional service support.

Consistent with the theory of role overload, our results suggest that the greater the breadth of community membership by customers, the higher their use of traditional customer support service. We also found support for our prediction that an increase in the frequency of logging into the community and in the breadth of community membership was related to an increase in the customers' need for support service. These results identify new distinctions between B2B support communities and other forms of B2C communities. We believe this extends past work on role overload into the online community literature, and provides new insights regarding the influence of differences in levels of participation, as suggested by Brodie et al. (2011). Taken together, our results provide evidence for problem-solving behavior in a community as a cocreative experience with instrumental value for customers (Van Doorn et al. 2010).

Finally, we contribute to the knowledge management literature by examining knowledge embedded in a community. According to Wasko and Faraj (2000), there is considerable research examining knowledge as an object and knowledge embedded in people; however, there is a need for research examining the knowledge embedded in community. In line with their research, this study has shown that knowledge can be created, stored, and shared in communities.

Managerial Implications

This research provides insights and strategic directions for managers aiming to promote increased problem-solving activities among their customers in P3 communities and to increase efficiencies in their customer support services. Customers who actively post questions and respond to others' questions in the community are less likely to log SRs. Customer static knowledge search reduces the need to log an SR; however, despite the significance of static knowledge search, helping oneself and helping others has a larger influence on need for future traditional customer support service.

Our results suggest specific directions for managers charged with reducing the cost of post-sales service and technical support. These results suggest that managers should identify the

appropriate combination of customer community participation and static knowledge creation to leverage the ability of the P3 community to reduce requests for service. By investigating each P3 community, managers can gain insight into the types of interactions that are specifically reducing the need for SRs. Such community-specific knowledge can be utilized as the basis for static knowledge generation to create impactful static knowledge resources that extend the SR reduction effect.

These insights can be used to identify best practices of community members to improve the customer experience within the community and across the firm's support services. Managers who want problem-solving engagement to increase should keep the customers' problem-solving motivations and successes at the forefront of their minds to continually improve the community experience. For B2B customers, we demonstrate that the problem-solving benefits of such communities can reduce the need for traditional customer support service.

In this study, it does not seem that more activity is necessarily better. Managers should seek to create communities that allow users to problem solve in a timely manner and lessen the need to log in too frequently. Similarly, managers should work with their partner firms to provide proper training, so community users can effectively use and navigate the community. Finally, it would also seem prudent for managers to encourage their customers not to have their IT specialists troubleshooting too many different products or services, as a larger breadth of community memberships seemed to indicate role overload led to an increase in future use of traditional customer support service.

Limitations, Further Research, and Conclusions

Several potential limitations exist due to the nature of the data and analyses. First, we recognize the limitation of possible omitted variables. Further research should consider adding measures of product knowledge to understand the optimal level of participation in a P3 community, as our data were limited in this regard. We included customer community expertise in our models and found that it neither had an attenuating nor a reversal effect on frequency of participation or breadth of community membership with the community. Future research may explore other measures of expertise and job role characteristics to investigate how customer knowledge and job role impacts the effect of community participation on their use of traditional customer support service. We were also able to account for some individual differences in this study (customer expertise, product category, lurker tendency, and motivation for using the community). Other individual differences should be examined that may influence an individual's tendency to use traditional service support. For example, some individuals may be more "service hungry" than others, desiring service from peer-to-peer sources as well as traditional sources. Future research could also explore cross-cultural differences in problem-solving engagement in P3 communities.

A second limitation is that we do not include customers' purchase behavior characteristics in our model due to data constraints of the participating firm. A key question is whether satisfied users of a support community translate into increased revenue for the providing firm. B2B networks often have multiple layers within one organization, and the people who use the support community are often distinct from those responsible for purchase decisions. Thus, for support community usage in a B2B setting to affect loyalty, the benefits (e.g., increased knowledge, efficient problem solving) must transfer from the individual user to the decision maker within the customer organization.

Third, we were not able to gather the content of the actual posts in our clickstream data. While we did have the count of replies and questions, we were not able to analyze the qualitative nature of the comments. Future research should examine whether individual posts differ in terms of specific content. While in this setting most comments were related to problem resolution, some comments may be more social in nature or have no relationship to specific questions asked. In addition, due to data limitations, community participation and logged SRs were collected in the same time period. Though unlikely, it is possible that some customers may have logged an SR prior to (or simultaneous with) participating in the community; future research should address this limitation. Also, while our partner company was large with a diverse client base covering a variety of services and products, future research should seek to replicate these findings in other contexts.

Finally, this research clearly identified the value of engaging customers in P3 communities. Further research should investigate the possible positive outcomes of customer community participation for the customer. Customers' increased ability to solve problems more effectively, and thus satisfy their job responsibilities, is likely a strong driver of behavior in these communities. Research should also examine other positive outcomes for the support community user, such as increased job satisfaction and job performance, or reductions in job stressors or burnout.

Overall, this research provides several key insights into the critical nexus of service marketing, information systems, computer science, and service operations. B2B companies are increasingly hosting virtual communities to fulfill some of their customer service needs. This study demonstrates the value of creating and effectively managing such communities in a B2B setting. We demonstrated that customer problem-solving activities, in the form of posting questions and replies in a P3 community, lead to positive outcomes for the firm. Further, we demonstrated that participation in such communities increases the use of traditional customer support when the individual is logging into the community at a high frequency or into many different communities. Promoting peer-to-peer customer interactions provides managers with strategic levers to increase the efficiencies and the effectiveness of their pre- and post-sales support service. While it is still important for companies to offer traditional customer support service, developing effective P3 communities is a clear method for decreasing customer reliance on traditional problem-solving channels.

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All authors contributed equally to this article.

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Notes

1. While we report Poisson procedures in this article, we estimated the model using negative binomial regression and the results were consistent.
2. In follow-up analyses for the participating firm, we included the primary product type the customer used as a control measure. The results are consistent with those presented here.

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