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Governance Mechanisms in Business-to-Business Electronic Markets

Rather than relying on traditional relational exchanges, recent technological advances have made it feasible for firms to undertake market-based transactions through information technology–mediated electronic markets. The success of such business-to-business electronic markets depends on the governance practices of the market maker—that is, the firm that manages and administers the electronic market. Market makers use three governance mechanisms to manage electronic markets: (1) monitoring the market participants (i.e., buyers and sellers that participate in the market), (2) building a sense of community among market participants to instill mutual respect and trust, and (3) self-participating in the electronic market to build know-how about how the market functions. Building on transaction cost analysis theory, the authors suggest that the influence of these governance mechanisms on electronic market performance (i.e., meeting strategic and financial objectives) depends on behavioral and external uncertainty in the market. Survey data from market makers show that (1) monitoring is effective for reputed market makers and when demand uncertainty is high, (2) community building is beneficial when pricing is static rather than dynamic, and (3) self-participation is useful when the market maker is well reputed and when the market relies on dynamic pricing.

Keywords: business-to-business marketing, electronic markets, governance mechanisms, performance, uncertainty

R ecent advances in communication and information technologies have produced markets based on these technologies for a diverse set of goods and services, such as Virtual Chip Exchange for electronic components and Steel Spider for steel. Transactions that have historically been conducted using relational interfirm exchanges can now be completed through business-to-business (B2B) electronic markets (e.g., Garicano and Kaplan 2001; Grewal, Comer, and Mehta 2001). These electronic markets consist of a market maker that manages the market and the participant firms—namely, buyers and sellers—that transact in it (hereinafter, when we mention electronic markets, we mean B2B electronic markets). The economic significance of B2B electronic commerce, of which electronic markets form a substantial portion, has grown far beyond that of business-to-consumer electronic commerce; U.S. Census Bureau (2009) figures on e-commerce shipments in 2006 attribute 92.5% of them to the B2B side.

The significance of electronic markets has prompted research (e.g., Bakos 1997; Garicano and Kaplan 2001) predominantly focused on developing typologies of electronic markets (e.g., Bakos 1998; Kaplan and Sawhney 2000) and understanding the behaviors of market participants in single markets (e.g., Choudhury, Hartzel, and Konsynski 1998; Grewal, Comer, and Mehta 2001). This concentration on a single market overlooks the role of market makers, which manage electronic markets by laying out and implementing the rules for interactions between buyers and sellers (e.g., Bakos 1998); we detail the functions of the market maker in Table 1.

The market maker's role in facilitating interactions between buyers and sellers requires it to emphasize governance mechanisms that can ensure that market participants are able to participate in a fair manner. The better governed an electronic market is, the higher is the likelihood that it will attract participants and thus improve market performance (conceptualized as meeting strategic and financial objectives). Therefore, we consider two interrelated research questions: (1) What governance mechanisms can the market maker use to improve the electronic market's performance? and (2) How might behavioral uncertainty within the electronic market and external uncertainty mitigate the effectiveness of governance mechanisms?

Research into the effectiveness of governance mechanisms mostly addresses interfirm governance (e.g., Leiblein, Reuer, and Dalsace 2002; Zaheer and Venkatraman 1995; Zollo and Singh 2002) in diverse contexts, including dyadic marketing channels (Brown, Dev, and Lee

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TABLE 1
Functions of Market Makers

Function	Explanation and Examples

Create and manage content	•Create original content
	  ◦Agriplace, an electronic market for the agriculture community, provides the services of an agronomic expert to participant firms, along with a custom crop planner that enables participant firms to develop fertilizer schedules.
	•Provide and summarize relevant third-party content
	  ◦MRO.com, an electronic market for streamline supply chain management related to maintenance, repair, and operating materials provides daily news updates and its own analysis of the news.
	•Provide links to third-party content.
	  ◦Spot Metals Online Inc., an electronic market for real-time trading of metals, provides links to the Web sites of its member companies, such as the National Steel Corporation.

Aggregate demand and match buyers and sellers	•Engage in marketing strategies to attract potential exchange partners to the market. •Provide incentives to participating firms to make the market their regular and primary sales channel. •Design standard forms for requests for information and quotes. •Provide security from hackers and viruses. •Facilitate buyers' search for sellers and sellers' search for buyers. •Develop and maintain a payment settlement system.
Manage participant opportunism	•Provide history of the transactions of participant firms. •Rate and evaluate participant firms. •Enforce rules. •Punish rogue participant firms. •Ensure that participant firms comply with legal aspects of contract law.
Price-making process	•Establish the rules for the price-making process. •Maintain and regularly upgrade the systems for real-time auctions and price discovery processes.
Provide secondary services	•Logistics. •Training to participant firms. •Provide credit. •Provide insurance against malpractice for participant firms.

2000), buyer–seller relationships (Wuyts and Geyskens 2005), strategic alliances (Ghosh and John 2005), and interfirm networks (Lorenzoni and Lipparini 1999). We build on this literature, but the focus is on a market-making firm that governs multiple market participant firms, not on a single relationship, such as a buyer trying to manage its seller's opportunism.

Electronic market making can employ three predominant governance mechanisms. First and foremost, a market maker can monitor the behavior of market participants (e.g., Bergen, Dutta, and Walker 1992). Some market makers devise mechanisms to authenticate product representations (e.g., AUCNET; Warbelow and Korkuryo 1989) or track unethical bidding practices (e.g., eBay; Kambil and Van Heck 2002). Second, market makers can build a sense of community among the market participants and use socialization to build interfirm trust as a governance mechanism (e.g., Wathne and Heide 2000). For example, ChemConnect, an electronic market maker for chemicals and plastics, emphasizes collaboration hubs among market participants (www.chemconnect.com).[1] Third, early literature on electronic

markets (e.g., Kambil and Van Heck 2002; Malone, Yates, and Benjamin 1994) has noted that a market maker might self-participate in the market as a buyer and/or seller. This self-participation provides a signal that the market maker believes in the electronic market and gives the market maker experiential knowledge about the inner workings of the market, including how direct interactions with participants proceed and how to exert hands-on governance. However, self-participation might offer an unfair advantage to the market maker, which makes and implements the rules that govern the electronic market and therefore must police itself, thus creating a conflict of interest between the market-making and market participant roles.

To study the effectiveness of the three governance mechanisms (monitoring, community building, and self-participation) in B2B electronic markets, we rely on transaction cost analysis (e.g., Krishnan, Martin, and Noorderhaven 2006; Rindfleisch and Heide 1997; Williamson 1985) and suggest that the boundary conditions for the effectiveness of these governance mechanisms depend on uncertainty, whether related to the behaviors of the market mak-

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[1]Although Wathne and Heide (2000) describe four governance mechanisms, including monitoring and socialization (which we call community building), in general, scholars study only the governance mechanisms that are appropriate for the research context at hand. For example, for their supply chain network context, Wathne and Heide (2004) consider adaptation to uncertainty. Similarly, in the context of restaurants, Srinivasan (2006) views vertical

integration and market governance as competing mechanisms. Because we examine a market setting with multiple buyers and sellers, the market maker's use of incentive-alignment systems, such as profit sharing, would not be practical, and selection seems contrary to the spirit of an open marketplace; although *ex post* violators can be asked to leave the marketplace, *ex ante* selection is likely to be impractical.

ers and participants or external to the electronic market. We use the market maker's reputation to gauge uncertainty related to the market maker; a better reputation should reduce behavioral uncertainty (e.g., Weigelt and Camerer 1988). To identify uncertainty related to participant behavior, we use the price-making mechanism of the electronic market (i.e., static or dynamic pricing); dynamic pricing represents greater participant behavioral uncertainty. Finally, external uncertainty reflects the inability of firms to predict future events (e.g., Milliken 1987), which we theorize may manifest as variability in demand conditions or demand uncertainty (e.g., Dwyer and Welsh 1985). Following research that suggests that knowledge-based firm competencies complement transaction cost considerations (e.g., Poppo and Zenger 1998; Tippins and Sohi 2003), we also use organization learning theory to complement the transaction cost analysis when appropriate.

This research makes several important substantive and theoretical contributions. From a substantive standpoint, we provide the first investigation of a population of electronic markets and offer a generalized understanding of the governance of electronic markets. Because of the economic significance of B2B electronic commerce and the criticality of electronic markets in facilitating this electronic commerce, we cannot overstate the importance of this understanding. Theoretically, we extend the use of transaction cost analysis from a dyadic setting to a market setting, in which a market maker governs transactions among multiple buyers and sellers. We also build on governance literature. Monitoring has been studied extensively in interfirm contexts (e.g., Dahlstrom and Nygaard 1999), and socializing has been discussed in the literature (e.g., Wathne and Heide 2000), though it has not received empirical scrutiny, but self-participation seems to be unique to the electronic market context. We also identify conditions for the effectiveness of the governance mechanisms, in the form of behavioral uncertainty within the electronic market and external uncertainty.

Theoretical Background

Electronic markets comprise several characteristics that make their governance unique and challenging. For example, without face-to-face interactions, electronic markets lack the tangibility and visibility of a physical infrastructure, and the ability for anonymous participation creates questions about the accurate representation of products and trades. Consequently, governance challenges might include establishing rules, laws, and social principles for transactions; ensuring the enforcement of trading commitments; and resolving disputes expeditiously (Kambil and Van Heck 2002). A review of emerging academic literature on electronic markets (e.g., Choudhury, Hartzel, and Konsynski 1998; Kaplan and Sawhney 2000; Varadarajan, Yadav, and Shankar 2008) and marketing literature on governance in interfirm relationships (e.g., Brown, Dev, and Lee 2000; Ghosh and John 2005; Wathne and Heide 2000) suggests three primary governance mechanisms that market makers use to administer electronic markets: monitoring, community building, and self-participation. Building on transaction costs analysis (e.g., Williamson 1985), we also reason that

their effectiveness may depend on manifestations of uncertainty about the behaviors of the market maker and market participants (e.g., Rindfleisch and Heide 1997) and uncertainty that is external to the electronic market (e.g., Milliken 1987).

Uncertainty

Behavioral uncertainty: market maker. The market maker's primary responsibility is to bring buyers and sellers together to facilitate their transactions. Because not all of its actions can be transparent to every participant, considerable uncertainty may arise among market participants about the market maker's behaviors. We argue that the extent of this behavioral uncertainty depends on the market maker's reputation.

Reputation refers to the extent to which a market maker is held in high esteem, which we can gauge according to the respect and credibility it garners in the industry (e.g., Weigelt and Camerer 1988; Weiss, Anderson, and MacInnis 1999). Reputation signals the market maker's integrity (Davies and Miles 1998; Dollinger, Golden, and Saxton 1997) and ability (Doney and Cannon 1997; Yoon, Guffey, and Kijewski 1993), as well as its reliability, which should enable it to reduce behavioral uncertainty (Klein and Leffler 1981). Thus, reputation should help a market maker retain the trust of market participants and sustain the electronic market's performance (e.g., Doney and Cannon 1997; Ganesan 1994).

Behavioral uncertainty: market participants. The price-making mechanism of an electronic market determines the nature of its interaction and, thus, the uncertainty market participants feel about the behavior of other participants. Electronic markets usually contain one of two generic price-making mechanisms: static or dynamic (e.g., Kambil and Van Heck 2002). Static pricing occurs when the market maker aggregates the product offerings of multiple vendors and sells them to buyers at a relatively static (fixed) price (e.g., www.testandmeasurement.com); in lead generator markets, in which the market makers derive revenue from advertisements, commissions on sales, or fees for generating qualified sales leads for suppliers (e.g., www.servicemagic.com); and in workflow marketplaces that provide project tracking or collaboration services for complex, iterative, multiparty projects, for which the provider earns a fee (e.g., www.isqft.com). In contrast, dynamic pricing is more common in auctions, in which multiple buyers bid competitively for products from a single supplier (e.g., www.stockshifters.com); in reverse auctions, in which buyers post their needs for products or services and suppliers bid competitively to serve those needs (e.g., www.hedgehog.com); and in two-sided exchanges, in which buyers and sellers interact to exchange information and engage in trade, facilitated by some negotiated dynamic pricing system, such as a bid-and-ask system (e.g., www.xsag.com).

Behavioral uncertainty about market participants should be higher in a dynamic pricing than a static pricing market because, in the latter, the price does not change in real time (though there can be some periodic change), so market participants can be reasonably sure of the price. With dynamic

pricing, there is no such pricing guarantee, and the price changes in real time, which offers more scope for opportunistic bidding practices. For example, Jap (2007) shows that buyers use dynamic pricing mechanisms, such as open bidding, to obtain price concessions. Electronic markets, which often allow for anonymity among market participants, enhance this effect; the behavior of other participants is relatively less transparent and more suspicious in dynamic versus static pricing situations.

Demand uncertainty. Demand uncertainty results from unpredictability and volatility in the environment that surrounds the electronic market (e.g., Dwyer and Welsh 1985). This unpredictability and volatility arises as a result of frequent changes in market participants' composition, needs, and behaviors. High turnover of market participants and trouble understanding or anticipating customer needs create uncertainty for the market maker regarding whether its strategies are appropriate for the electronic market.

We summarize our conceptual model in Figure 1. The hypotheses relate the three governance mechanisms (monitoring, community building, and self-participation) to electronic market performance, with the recognition that the effect of a governance mechanism should depend on the extent of uncertainty due to behaviors of the market maker (reputation), behaviors of market participants (price-making mechanism), and demand uncertainty.
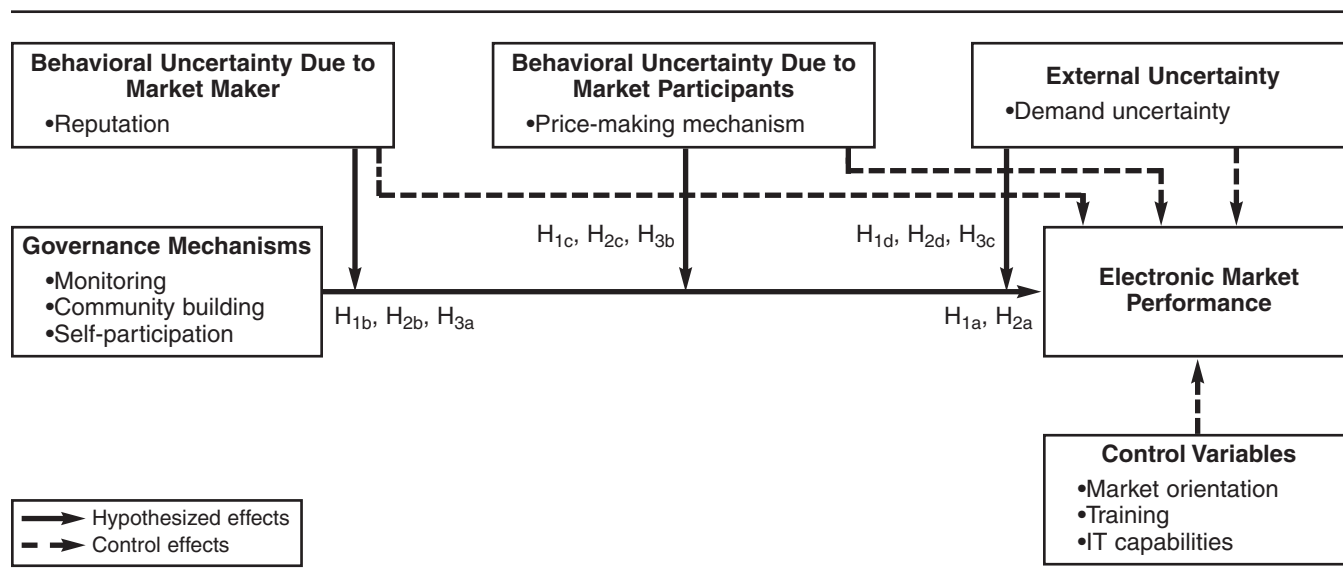
Monitoring

Monitoring refers to the composite activities a market maker undertakes to "police" the electronic market, maintain order and discipline, and ensure that participants abide by its code of conduct rather than act opportunistically. In this setting, opportunistic behaviors include "lying, stealing, cheating, and calculated efforts to mislead, distort, disguise, obfuscate, or otherwise confuse" (Williamson 1985, p. 47). Many electronic markets use monitoring to improve market governance. For example, AUCNET, the Japanese electronic market for the wholesale trade of used automobiles, employs both full-time and contracted agents to conduct vehicle inspections all over Japan to weed out opportunistic traders (Warbelow and Korkuryo 1989). Virtual Chip Exchange, a leading B2B electronic trading hub for semiconductor chips, monitors all transactions and logistics to ensure quality for market participants. Virtual Chip Exchange restricts membership to qualified original equipment manufacturers, franchised distributors, and chip manufacturers to ensure the reliability of the product source and thereby eliminate some uncertainty (www.virtualchip.com).

Two theoretical reasons support the use of monitoring to reduce malpractices (Wathne and Heide 2000). First, the monitoring process likely creates uncomfortable social pressures to comply with social norms (Murry and Heide 1998). Second, monitoring increases the ability of the market maker to detect opportunism (Wathne and Heide 2000). For market participants to trade effectively, they should feel as if they are part of a market that is routinely monitored for opportunistic behavior. Thus, monitoring should positively influence electronic market performance.

Market maker reputation. Behavioral uncertainty about the market maker should increase as its reputation decreases. We might posit that monitoring effectiveness increases as behavioral uncertainty increases, that is, as the reputation of the market maker decreases. However, because reputation signals a firm's integrity (e.g., Dollinger, Golden, and Saxton 1997) and ability (e.g., Yoon, Guffey, and Kijewski 1993), we contend that this relationship need not hold. Both the source of uncertainty and the remedy for that uncertainty come from the market maker, so one with a poor or unknown reputation (high behavioral uncertainty) may not be considered trustworthy or able to monitor other market participants, which would severely discredit its monitoring efforts (Ganesan 1994; Gatignon, Anderson, and Helsen 1989). Furthermore, effective monitoring practices tend to be inconspicuous, but if the market maker's

FIGURE 1
Hypothesized Model

reputation is low, its monitoring efforts may be perceived as impertinent and meddlesome. In summary, we expect the effectiveness of monitoring for electronic market performance to increase as the reputation of the market maker increases.

Price-making mechanism. The effectiveness of monitoring efforts also may be greater when the price-making mechanism is dynamic (high market participant behavioral uncertainty) rather than static (low market participant behavioral uncertainty). Dynamic pricing induces more participant opportunism than static pricing because market participants can resort to problematic practices, such as collusion and shilling in dynamic pricing settings (Kambil and Van Heck 2002). For example, in auction markets, buyer-side collusion occurs when two bidders illegally team up to enter a low and a high bid and then later withdraw the high bid so that the sale goes to the low-bid collaborator. Sellers use shells that enter fake bids to drive the price higher. With the static pricing mechanism, participant pricing instead is fixed and transparent, leaving little room for irregularities, so investments in monitoring routines may not add value. The greater probability of unfair and surreptitious bidding activities in dynamic pricing markets creates higher payoffs from monitoring efforts designed to curb such activities. Therefore, monitoring mechanisms should be more effective under dynamic pricing than static pricing because they discover, prevent, and correct opportunistic behavior as it occurs.

Demand uncertainty. The effectiveness of monitoring efforts for electronic market performance should increase as demand uncertainty increases (e.g., Bergen, Dutta, and Walker 1992). The effects of demand uncertainty are ubiquitous, such that firms are rewarded (penalized) for (in)effective and (in)efficient managerial practices in dynamic environments (e.g., Aldrich 1979). When demand uncertainty is high, monitoring efforts to accumulate, assimilate, interpret, and use participant information to anticipate changing environmental conditions should yield higher rewards (e.g., Jaworski and Kohli 1993). However, when demand uncertainty is low, participant composition and behavior is predictable, and monitoring does not yield much new information about participants or their behaviors. Therefore, with low demand uncertainty, monitoring efforts may not add any value to electronic market performance.

> H_1: Monitoring as a governance mechanism is (a) positively associated with electronic market performance, and its effectiveness increases (b) as the reputation of the market maker increases, (c) in dynamic rather than static price-making mechanisms, and (d) as demand uncertainty increases.

Community Building

Community building refers to the totality of effort exerted by the market maker to create a congenial market environment for participants, which consists of high levels of mutual trust, integrity, and honesty exhibited by participants. Because electronic markets primarily comprise corporate participants that trade big-ticket items, such as capital goods and industrial services (Malone, Yates, and Benjamin

1994), cultivating trust and integrity may take priority over other community values, such as conviviality (which is critical in interpersonal online communities; see Miller, Fabian, and Lin 2009). For example, VertMarkets operates 58 industry-specific electronic markets (e.g., PlasticsNet, SemiconductorOnline) and encourages membership in its community of buyers and sellers by offering benefits such as a downloadable library of white papers, access to trade associations, and industry event calendars (www.plasticsnet.com; www.semiconductoronline.com). PrintCities, a world-wide electronic market for printing equipment, emphasizes building a community for participants by offering an independently moderated technology forum that users can access at any time (www.printcities.com).

From a theoretical standpoint, community-building efforts represent the market maker's attempt to create embedded social relationships that help mitigate the risks associated with opportunistic behaviors by market participants (e.g., Granovetter 1985; Kaufman, Jayachandran, and Rose 2006). By emphasizing trust among market participants, community building ultimately enables bilateral relationships in an electronic market. Because these effects can have positive ramifications with regard to greater market acceptance and usage, we expect community building to influence electronic market performance positively.

Market maker reputation. The effectiveness of the market maker's community-building efforts should increase with its reputation. Community-building efforts attempt to foster trust through informal relationships among market participants, and research among small groups suggests that for entities to benefit from informal relationships, they must be willing to engage with one another (Caniels and Romijin 2003). In addition, social identity research suggests that a group member's readiness to participate in new relationships depends on whether the group can form a salient social identity (Brewer and Gardner 1996). We contend that community building should be more effective when the market maker's reputation is stronger because this strong reputation, unlike a poor reputation, provides a salient social identity for market participants: They are a community managed by a credible, legitimate, and valued entity. Similarly, the characteristics of a prominent entity in small organizations create the context for participants to find common grounds for their interactions (Tjosvold and Weicker 1993). However, a market maker's poor reputation should induce concern about its behaviors, which attenuates any of its efforts to maintain the community.

Price-making mechanism. Community building should be more effective in dynamic pricing settings than in static pricing ones. Dynamic pricing creates uncertainty about the final price, and some buyers may even be uncertain about the identity of the seller. These inherent uncertainties provide incentives for unfair bidding practices, such as collusion and shilling (Kambil and Van Heck 2002). Community building instead emphasizes fair practices and should lessen market participants' incentives to engage in opportunistic bidding behaviors. In contrast, community building offers no value for static pricing markets, because the supplier information, including pricing, is available all the time,

such as in a catalog. The what-you-see-is-what-you-get nature of the market enables participants to assess suppliers in advance and reduces participant apprehension about potential trading partners. Furthermore, the inherent transparency of static pricing makes community-building efforts redundant; all relevant market participant behaviors appear in the public domain.

Demand uncertainty. We argue that the effectiveness of community-building efforts for electronic market performance should increase as demand uncertainty increases. High demand uncertainty, in contrast with low demand uncertainty, implies that participants join and leave the electronic market frequently and exhibit widely varying needs and behaviors. Podolny (1993) shows that in turbulent environments, markets develop a social character, in the sense that organizations search for trading partners with whom they have interacted or transacted before. In an uncertain market context, optimal exchange partners cannot be determined easily, so firms engage in "satisficing"; that is, they search for partners who are good enough because their preferences are similar (Levitt and March 1988). In this case, the community-building efforts by the market maker provide ideal opportunities for informal interactions, which facilitate the search for appropriate transaction partners. By providing trade association memberships, invitations to industry events, or informal networks (Bakos 1997), market makers also give participants the tools to search for partners they might prefer, facilitate their transactions, and calm the market. In contrast, the value of community building may be redundant when demand uncertainty declines, considering the high predictability and stability of the participant composition and behavior in such markets.

H₂: Community building as a governance mechanism is (a) positively associated with electronic market performance, and its effectiveness increases (b) as the reputation of the market maker increases, (c) in dynamic rather than static price-making mechanisms, and (d) as demand uncertainty increases.

Self-Participation

When the market maker participates in the electronic market, it experiences the impact of its rules on its own transaction productivity. It also can interact directly with other market participants. In essence, self-participation provides the market maker a unique opportunity to evaluate the market from both its own perspective and that of a market participant. Such an opportunity may be valuable to all parties, which is the primary goal of governance in an electronic market (Ghosh and John 1999). Therefore, various market makers choose to govern through self-participation, including Converge in electronic component distribution (www.converge.com), Exostar in aerospace (www.exostar.com), and Quadrem in procurement services (www.quadrem.com).

However, the direct impact of self-participation on market performance is debatable. On the one hand, self-participation can be an effective governance tool because it encourages tacit learning about the inner workings of the market and signals the market maker's confidence in the orderly state of its own market. By participating, the market

maker makes transaction-specific investments of its time and information (e.g., Ganesan 1994), so it has a high stake in ensuring that all other participants play by the rules. On the other hand, self-participation may be less effective as a governance mechanism if market participants perceive it solely as an opportunity for the market maker to take advantage of its dual role as market maker and market participant (e.g., Malone, Yates, and Benjamin 1994). The market maker might seem to manipulate the market rules to benefit its own transactions; such concerns among market participants may undermine the purpose of self-participation. Therefore, we suggest that the effectiveness of self-participation as a governance mechanism depends on the prevailing behavioral and external uncertainties in the market.

Market maker reputation. The effectiveness of self-participation for electronic market performance should increase as the market maker's reputation increases. If the general perception of the market maker is of a reputable and honest entity, its experiential knowledge, ability to understand signals of wrongdoing, and style of hands-on governance should induce more credence than the possibility of the market maker acting out of self-interest. In contrast, a market maker with a poor reputation cannot govern effectively through self-participation, because participants are likely to question its intent continually.

Price-making mechanism. Self-participation effectiveness should increase for dynamic versus static pricing. When the price-making mechanism is dynamic, market participants can take advantage of the flexibility of the pricing process to undercut one another and deceive counterparties (Jap 2007). Detecting opportunistic practices in price negotiations and bids is difficult because of the anonymity participants generally retain at the time of trading, as well as the information asymmetry between the trading entities (Kambil and Van Heck 2002). In the presence of high behavioral uncertainty about other market participants, each participant necessarily relies on the market maker to maintain order. As a participant, the market maker signals its competence to detect patterns of improper pricing behavior and to take punitive actions. It also may be harmed itself by opportunistic price-making behavior, so its self-participation may be construed as a personal incentive to ensure order. In addition, in its administrative role, the market maker should realize the general marketplace behavior exhibited by the participants. Such information, as a complement of the market maker's experience and interactions as a participant, can make self-participation a powerful tool when behavioral uncertainty about market participants is high because of a dynamic price-making mechanism.

Demand uncertainty. The effectiveness of the market maker's self-participation increases as demand uncertainty decreases. In a context of high versus low demand uncertainty, market makers must cope with volatile participant needs and rapid turnover. Self-participation endows the market maker with knowledge gained from actual interactions with the participants in the electronic market. We believe that demand uncertainty determines the extent to which this acquired knowledge generalizes to all participants, and generalizability should be higher in low-demand-

uncertainty environments than in high-demand-uncertainty environments because the variability in needs across participants is lower. Thus, the market maker's limited comprehension and learning about the changing demand characteristics of market participants in a high-demand-uncertainty environment should allow for more opportunities for market participants to engage in unethical transaction behaviors than in low-demand-uncertainty environments.[2]

> H[3]: The effectiveness of self-participation as a governance mechanism for electronic market performance is greater (a) as the reputation of the market maker increases, (b) in dynamic rather than static price-making mechanisms, and (c) as demand uncertainty decreases.

Method

Sampling Frame

Perhaps because of their relative newness, a comprehensive list of B2B electronic markets is unavailable, so we created a sampling frame that includes the maximum number of B2B electronic markets available at the time of data collection. An initial Internet search provided one publicly available mailing list, the knowledge base of the online magazine *Net Market Makers*, which consists of various B2B e-commerce players, including market makers, infrastructure providers, and industry-sponsored markets (listed by Jupiter Media Matrix). For this research, the market makers and industry-sponsored markets (e.g., Covisint in the automobile industry) form the initial sampling frame. In addition, we supplement the list of 364 potential respondents with 168 market makers identified by SG Cowen (1999) in one of the first industry reports, as well as with market maker lists obtained through Web searches (primarily b2b.yahoo.com) and markets noted by popular infrastructure providers (e.g., Ariba, Commerce One, i2). Consequently, the list grew to 572 B2B electronic markets.[3]

Next, we visited the Web sites of each market to qualify the market makers and obtain and update contact information. This qualification exercise led to the deletion of firms that were not market makers but for some reason appeared on the list (e.g., www.grainger.com). We also attempted to

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[2]The learning process we postulated for self-participation under dynamic pricing is unlikely to resolve demand uncertainty. In the context of dynamic pricing, a self-participating marker maker learns about the subtleties of price setting and negotiating, which helps improve its knowledge of not only the price-making mechanism but also the opportunistic behaviors of market participants. However, demand uncertainty is manifest because of the wide range (beyond pricing behaviors) of expectations across existing and potential participants (who may be involved with a competing electronic market or not be participating in any electronic market). Thus, learning from self-participation is likely to be of limited utility for managing demand uncertainty.

[3]An electronic market serves as the unit of analysis. In some cases, one firm maintained multiple marketplaces (e.g., VerticalNet with 58, Ventro with 4), so we asked the market maker to complete a questionnaire for each market; however, these market makers agreed to complete only one. Consistent with prior research (e.g., Murry and Heide 1998), we asked the multiple market makers to complete the questionnaire with respect to a typical market.

snowball; that is, during the process of identifying key respondents, we asked each potential respondent to name two to three electronic markets in his or her industry. Usually, the markets they named already appeared in the sampling frame, so this exercise also served as a validation check of comprehensiveness. Constructing the sampling frame elucidated the dynamic nature of B2B electronic markets; some markets had gone out of business (e.g., www.chemdex.com), and others were being revised (e.g., www.covisint.com). Some electronic markets even shut down during the period of data collection (e.g., www.esteel. com). In the end, the sampling frame consisted of 428 B2B electronic markets.

Data Collection Procedure and Key Respondent Identification

Initially, we contacted market makers by telephone to obtain the name and designation of a key respondent, a top manager involved in strategic decision making regarding the electronic market. In most cases, the key respondents were chief executive officers, founders, or vice presidents. During the telephone call, we attempted to talk with the key respondent and, if possible, explain the purpose of the study, as well as remind him or her that the questionnaire would arrive in a week's time. We also queried these respondents about their ability to answer the questionnaire and stressed the criticality of their responses, with the promise of an executive summary of the findings as an added incentive. To snowball and test the extensiveness of the sampling frame, we asked about other possible electronic markets. If the key respondent was unavailable during the first telephone call, we made two more attempts to talk to him or her, usually in the next seven to ten days. In most cases, we were able to talk to or obtain the name and title of the key respondent.

The survey packet consisted of a cover letter on university letterhead, the questionnaire, a self-addressed and prepaid return envelope, and an incentive of $1. The cover letter stated that the data were being collected to investigate the management and efficacy of electronic markets and promised a copy of the findings as an incentive to participate. Three weeks after mailing the surveys, we mailed reminder letters with another copy of the questionnaire and self-addressed and prepaid return envelopes to nonrespondents. In the follow-up letter, we reiterated the criticality of responding and again promised a copy of the findings. This data collection exercise resulted in 114 responses (26.6% response rate), 107 of which were complete and usable.

Measures

Consistent with contemporary measurement theory, we used multiple items to measure each latent construct. Whenever possible, we used established scales (i.e., electronic market performance and demand uncertainty), but some constructs (i.e., monitoring, community building, self-participation, reputation, and price-making mechanism) are new measures (see the Appendix). For the new constructs, we generated a pool of items through field interviews and then refined them in two steps. First, two doctoral students trained in psycho-

metric theory filled out the preliminary research instrument to identify ambiguous items. Second, two e-commerce consultants from a leading consulting firm critically evaluated the research instrument with regard to the scale items and flow.

To measure monitoring, we assessed the market maker's efforts to ensure that participants do not take advantage of other participants, methods for handling complaints about opportunistic behavior by market participants, emphasis on policing, stress on maintaining order, and emphasis on discipline in the market. The community-building measure assessed the market maker's efforts to create a sense of community among participant firms, to build trust, and to create a congenial atmosphere. The measure of the market maker's self-participation relied on a dummy variable that took a value of 1 if the market maker transacted in the electronic market, whether as a buyer or a seller, and 0 if otherwise.

The measure for reputation assessed the image of the market maker in the industry. In addition to a direct measure, the items determined whether the market maker was perceived as respectful and as possessing integrity, as well as the extent to which the market maker's opinions were sought and valued. The price-making mechanism dummy variable equaled 1 if the electronic market was an auction, reverse auction, or an exchange, which implies a dynamic market; otherwise, the pricing mechanism was static and took a value of 0.

We controlled for the market maker's market orientation, or the extent to which the firm understands its customers and competitors (Kirca, Jayachandran, and Bearden 2005), which positively influences firm performance (e.g., Jaworski and Kohli 1993; Narver and Slater 1990). We also controlled for the training capabilities of the market maker. The newness and idiosyncrasies of electronic markets suggest that the training the market maker provides about how to participate in the market should influence market performance. Because the very genesis of electronic markets relies on advances in information technology (IT) (e.g., Grewal, Comer, and Mehta 2001), the extent of IT capabilities of the market maker should be important for market performance. Thus, we controlled for the IT capabilities of the market maker, measured as a second-order construct

consisting of IT infrastructure and IT skills (e.g., Bharadwaj 2000).

Measure Validation

To validate and purify the measures, we used composite reliability to assess the internal consistency and confirmatory factor analysis (CFA) models to assess the unidimensionality and discriminant validity (e.g., Anderson and Gerbing 1988). To maintain a healthy ratio of the sample size to the number of parameters estimated, similar to previous studies, we estimated three CFA models, in which the constructs of each are maximally similar to provide a stringent test of discriminant validity. In general, each model shows statistically significant factor loadings ($p < .01$) and fit indexes close to or above recommended levels (see Table 2). For the discriminant validity, we assessed whether the estimated measurement error-corrected correlation parameters for each set of constructs are significantly different from 1.0 (Anderson and Gerbing 1988); because none are, we establish discriminant validity. A comparison of early and late respondents on all variables indicates that both are similar ($p > .10$), which signals that nonresponse bias is not likely an issue. We also took two steps to alleviate common method concerns, namely, questionnaire design and statistical testing (Podsakoff et al. 2003). First, in terms of questionnaire design, we employed several subsections, so respondents needed to pause and read the instructions for each section of questions. Within and across the sections, we also used different response formats.[4] For example, in addition to seven-point Likert rating scales ("agree/disagree"), we used "unsatisfactory/satisfactory" scales and multiple-choice options (e.g., price-making mechanism). Second, we used Harmon's single-factor test to assess common method bias. Using exploratory factor analysis, we estimated a model with all items for the seven latent constructs (i.e., monitoring, community building, reputation, demand uncertainty, market orientation, training, and IT capabili-

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[4]We changed the response formats for independent constructs only. However, changing the response formats between dependent and independent constructs might have better alleviated concerns about common method variance.

TABLE 2
Results from CFA Models

Measurement Model	Range of Standardized Factor Loadings	CFA Index	Tucker–Lewis Index	RMSEA	χ^2 (d.f., *p*-Value)
Monitoring, community building, reputation, training, IT skills, and IT infrastructure	.59–.87	.96	.95	.06	543.86 (335, $p < .01$)
Electronic market performance, demand uncertainty, market orientation, IT skills, and IT infrastructure	.57–.85	.96	.95	.06	828.16 (499, $p < .01$)
IT capability (second order)[a]	.68–.85	.97	.94	.08[b]	155.79 (76, $p < .01$)

[a]Both IT skills and IT infrastructure load positively on IT capability (IT infrastructure $\gamma_1 = 1.21$, t = 13.25, $p < .001$; IT skills $\gamma_2 = 1.19$, t = 13.68, $p < .001$).
[b]The root mean square error of approximation (RMSEA) values in all three CFAs are less than or equal to .08, which is well within the prescribed range for a reasonable fit for continuous data items (Schreiber et al. 2006). A more stringent RMSEA cutoff at .05 tends to reject properly specified models when sample sizes are close to 100 (Yu 2002).

ties). The rotated factor-loading matrix for the seven-factor solution indicates that the items for the different constructs load on different latent factors (though IT infrastructure and IT skills load on the same factor), which minimizes common method concerns. We averaged the items to create single indicators for the latent constructs; we provide the descriptive statistics in Table 3.

Model Estimation

Because we consider moderating hypotheses, we created interaction terms by multiplying the mean-centered explanatory variables (i.e., governance mechanisms) with the mean-centered moderating variables (i.e., uncertainty variables). The mean-centering increases the interpretability of the main effects of the explanatory variables; the main effects are the effects of the explanatory variables on the dependent variables when the moderator is at its mean value of 0.

The continuous dependent variable (electronic market performance) prompts us to use an ordinary least squares regression to test the hypotheses. However, endogenous self-selection could influence the reputation variable. That is, market makers with poor reputations could have self-selected themselves out of responding to the survey, in which case the close relationship between reputation and electronic market performance might be an artifact of the exclusion of poorly reputed market makers from the sample (e.g., Ferguson, Deephouse, and Ferguson 2000; Roberts and Dowling 2002).[5] To correct for this self-selection bias, we followed the specific steps that Garen (1984) prescribes. First, we regressed reputation on several constructs and obtained the predicted error:

$$(1) \qquad z = \Delta x + \vartheta,$$

where z is reputation, which is a continuous construct; X is the matrix of predictors; Δ is the matrix of coefficients; and ϑ is the standard error term. Second, we used IT capabilities, market orientation, training, and dynamic uncertainty

as predictors of reputation.[6] Third, we estimated the main regression model by introducing additional terms to the hypothesized regression models (Garen 1984):

$$(2) \qquad y = R\beta + \alpha_\vartheta \hat{\vartheta} + \alpha_{\vartheta z} \hat{\vartheta} z + \varepsilon,$$

where y is electronic market performance; R is the matrix of independent variables used in the regression models in Table 3; β, α_ϑ, and $\alpha_{\vartheta z}$ are coefficients to be estimated, with α_ϑ equal to the coefficient of the estimated error term from Equation 1 and $\alpha_{\vartheta z}$ equal to the coefficient for the product of the estimated error from Equation 1 and the reputation variable; $\hat{\vartheta}$ is the estimated error term from Equation 1; and ε is the standard error term. The coefficients estimated in Equation 2 using ordinary least squares are statistically inefficient because of heteroskedasticity in the error term, for which we use White's (1980) correction.

Results

Model Selection and Robustness Assessment

For the explanatory variables, including the interaction terms, the variance inflation factors (highest value is 6.28, below the recommended cutoff of 10.00) and the condition indexes (highest value is 8.23, well below the recommended cutoff of 30.00) indicate that multicollinearity is not an issue (e.g., Mason and Perreault 1991). As we show in Table 4, the independent variables together explain a statistically significant amount of variance in market performance (R^2 = .54, p < .01). Despite the high R-square value, we attempt to assess the robustness of the results by comparing the hypothesized model (M_{HYP}) with three submodels in which

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[5]We thank an anonymous reviewer for pointing out this issue and the potential solution to us.

[6]We use several combinations of predictors, as available in the survey. The final regression results in Equation 2 remain consistent. The correction terms include both the predicted error from Equation 1 and the product of the predicted error and the reputation variable. Garen (1984) prescribes such an approach because the self-selection bias correction is conditional on the value of the reputation variable, so the correction will differ for every value of the reputation variable.

TABLE 3
Descriptive Statistics

	PER	MON	CB	SP	REP	PM	DU	MO	TRN	ITC
Electronic market performance (PER)										
Monitoring (MON)	.17[a]									
Community building (CB)	.25**	.46**								
Self-participation (SP)	.21*	−.06	.00							
Reputation (REP)	.39**	.13	.19*	.12						
Price-making mechanism (PM)	.14	−.06	.12	.15	.09					
Demand uncertainty (DU)	−.17	.11	.17	−.02	−.01	−.11				
Market orientation (MO)	.35**	.31**	.39**	−.01	.44**	.06	.04			
Training (TRN)	.36**	.11	.08	.18	.17*	.04	−.09	.32**		
IT capability (ITC)	.23*	.16*	.10	−.07	.32*	.00	.09	.21*	.16	
M	4.25	4.12	4.16	.26	5.68	.62	4.42	4.92	4.72	5.44
SD	1.36	1.33	1.95	.44	.94	.48	.94	1.12	1.18	.99

*p < .05.
**p < .01.
[a]Two-tailed tests for bivariate correlations.

only monitoring (M_{MON}), only community building (M_{CB}), or only self-participation (M_{SP}) appears as a single governance construct. The likelihood ratio tests reveal that M_{HYP} outperforms all three submodels (M_{MON} $\chi^2_6 = 3.68$, $p < .01$; M_{CB} $\chi^2_6 = 4.51$, $p < .01$; M_{SP} $\chi^2_6 = 4.37$, $p < .01$). In terms of statistical significance, the results do not change across the four models.[7]

Hypotheses Testing

The main effect of monitoring is not statistically significant ($b_{MON} = -.07$, $p > .19$). Although we do not find support for H_{1a}, the results indicate support for H_{1b}, which posits that the effectiveness of monitoring for electronic market performance increases with the reputation of the market maker ($b_{MON \times REP} = .24$, $p < .01$; see Table 4). We conduct a slope analysis to investigate this result (see Table 5) and find that when the market maker's reputation is strong, the effect of monitoring on market performance is positive ($b_{MON \times REPhigh} = .36$, $p < .05$), but when that reputation is poor, the effect of monitoring is negative ($b_{MON \times REPlow} = -.44$, $p < .05$). We must reject H_{1c} because the interaction of monitoring with the price-making mechanism is not statistically significant ($b_{MON \times PM} = .05$, $p > .92$). However, the results support H_{1d} for the interaction between monitoring and demand uncertainty ($b_{MON \times DU} = .10$, $p < .05$). A slope analysis shows that at low levels of demand uncertainty, monitoring leads to a deterioration of market performance ($b_{MON \times DUlow} = -.27$, $p < .01$), but monitoring has a positive effect when demand uncertainty is high ($b_{MON \times DUhigh} = .13$, $p < .05$; Table 5).

The results for H_2 are similarly mixed. We find support for H_{2a}; that is, community building has a positive main effect on electronic market performance ($b_{CB} = .34$, $p < .01$). However, the effect of community building on market performance does not increase with the reputation of the market maker ($b_{CB \times REP} = .02$, $p > .29$), and the interaction between community building and the price-making mechanism is opposite the effect we hypothesized. That is, the effectiveness of community building is greater for static pricing than for dynamic pricing ($b_{COM \times PM} = -.32$, $p < .05$), and the slope analysis confirms that community building has a positive and statistically significant effect only in static pricing conditions ($b_{COM \times PMstatic} = .34$, $p < .01$; $b_{COM \times PMdyn} = .02$, $p > .51$). We also do not find support for H_{2d}, because community building is not more effective in conditions of high rather than low demand uncertainty ($b_{CB \times DU} = .04$, $p > .57$).

Consistent with H_{3a}, the results suggest that the effect of self-participation on market performance increases with the reputation of the market maker ($b_{SP \times REP} = .41$, $p < .05$). The slope analysis reveals that highly reputed market makers can effectively use their self-participation as a governance mechanism ($b_{SP \times REPhigh} = .42$, $p < .05$), whereas market makers with poor reputations cannot ($b_{SP \times REPlow} = -.89$, $p < .01$). We also find support for H_{3b}; the interaction

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[7]For hypothesized effects, we use one-tailed tests of statistical significance. Considering the small sample size (107 electronic markets), in addition to tests of significance at $p < .01$ and .05, we report tests of statistical significance at $p < .10$.

between self-participation and the price-making mechanism is statistically significant ($b_{SP \times PM} = .68$, $p < .05$). From the slope analysis for this interaction effect, we determine that when the price-making mechanism is dynamic, the effect of self-participation is positive and statistically significant ($b_{SP \times PMdyn} = .61$, $p < .05$), but when the pricing mechanism is static, the effect of self-participation is not statistically significant ($b_{SP \times PMstat} = -.07$, $p > .67$). In support of H_{3c}, the impact of the market maker's self-participation decreases as demand uncertainty increases ($b_{SP \times DU} = -.33$, $p < .05$), and the slope analysis suggests that with high demand uncertainty, self-participation is ineffective as a governance mechanism ($b_{SP \times DUhigh} = -.69$, $p < .01$), whereas at low levels of demand uncertainty, its effect is not statistically significant ($b_{SP \times DUlow} = .55$, $p > .19$).

Discussion

Recognizing the growing importance of electronic markets for consummating B2B transactions, we attempt to advance extant research on electronic markets by focusing on the role of the market maker as a facilitator of trade. Our specific focus centers on the effectiveness of the governance mechanisms that the market maker might use to govern the market. We rely on transaction cost analysis and organizational learning theory to suggest that the effectiveness of three governance mechanisms should depend on behavioral and external demand uncertainties in the market (e.g., Williamson 1985).

The results from the survey data demonstrate the boundary conditions for the effectiveness of the three governance mechanisms we consider. Monitoring market participants seems to be effective when the market maker is reputable and demand uncertainty in the external environment is high. However, we find no difference in the effectiveness of monitoring in alternative price-making scenarios. Perhaps with dynamic pricing, the range of possible bidding behaviors makes monitoring too difficult, whereas in a static pricing setting, the monitoring efforts are rendered redundant with the open and transparent fixed pricing system.

In contrast, community building, which is a cultural governance mechanism (rather than a bureaucratic governance mechanism such as monitoring; Jaeger and Baliga 1985), is effective in most conditions, as the statistically significant main effect suggests. Contrary to the hypothesis, however, the effectiveness of community building is most pronounced in electronic markets with static pricing. It seems that the inherent transparency of static pricing makes community-building efforts effective because all relevant market participant information appears in the public domain and the buyers can select the sellers they prefer, whereas dynamic pricing relies on the price-making process to match buyers and sellers. Some static pricing electronic market formats, such as workflow marketplaces, bring multiple parties together for collaborative projects and thus, by their very nature, may be more amenable to community building.

Furthermore, the effectiveness of community building is not bound by the market maker's reputation. We had reasoned that reputation would boost community-building efforts; however, the results seem to suggest that regardless

TABLE 4
Regression Results

Class of Variable	Covariate	Hypothesized Effect	Estimation with Correction for Self-Selection Bias			
			Model M_{MON}	Model M_{CB}	Model M_{SP}	Model M_{HYP}
	Constant		3.59*** (.16)	3.74*** (.17)	3.87*** (.20)	3.76*** (.17)
Behavioral uncertainty due to market maker	Reputation (REP)[a]		.38*** (.15)	.30*** (.16)	.26 (.18)	.32*** (.15)
Behavioral uncertainty due to market participants	Price-making mechanism (PM)		.43*** (.18)	.27 (.19)	.11 (.24)	.19 (.22)
Demand uncertainty	Demand uncertainty (DU)		−.39*** (.10)	−.34*** (.10)	−.25*** (.12)	−.23*** (.11)
Monitoring (MON) as a governance mechanism	MON	Positive	.01 (.11)	−.04 (.09)	−.05 (.09)	−.07 (.09)
	MON × REP	Positive	.25*** (.09)			.24*** (.12)
	MON × PM	Positive	−.06 (.13)			.05 (.14)
	MON × DU	Positive	.14*** (.07)			.10** (.06)
Community building (CB) as a governance mechanism	CB	Positive	.16** (.09)	.36*** (.12)	.23*** (.09)	.34*** (.11)
	CB × REP	Positive		.07 (.12)		.02 (.14)
	CB × PM	Positive		−.33** (.19)		−.32** (.19)
	CB × DU	Positive		.02 (.08)		.04 (.08)
Self-participation (SP) as a governance mechanism	SP	No direct effect	.18 (.19)	.13 (.19)	−.09 (.29)	−.07 (.27)
	SP × REP	Positive			.41** (.21)	.41** (.23)
	SP × PM	Positive			.53* (.38)	.68** (.39)
	SP × DU	Negative			−.36** (.21)	−.33** (.17)
Control variables	Market orientation		.01 (.11)	.03 (.11)	.04 (.11)	.02 (.11)
	IT capabilities		.07 (.10)	.11 (.11)	.09 (.11)	.10 (.10)
	Training		.37*** (.07)	.37*** (.07)	.33*** (.07)	.42*** (.08)
Self-selection variables	$\hat{\vartheta}$		.19** (.10)	.21** (.11)	.21** (.11)	.20** (.11)
	$\hat{\vartheta} \times z$		.13 (.10)	.07 (.08)	.05 (.08)	.16** (.09)
Model fit statistics	R^2		.50	.46	.47	.54
	Adjusted R^2		.42	.38	.39	.44
	F-statistic		6.64***	5.75***	5.98***	5.15***

*$p < .10$.
**$p < .05$.
***$p < .01$.

[a]We report the regression coefficient with standard errors in parentheses. Consistent with extant paradigms, for the hypothesized effects, we report one-tailed tests for statistical significance. We estimate M_{MON}, M_{CB}, M_{SP}, and M_{HYP} using ordinary least squares and find that all results remain unchanged except for the interactions between monitoring and demand uncertainty in models M_{MON} and M_{HYP} and the self-participation and demand uncertainty interaction in model M_{HYP}. For the self-selection variables, z denotes reputation, which we consider a potential source of self-selection bias.

Notes: A positive coefficient of $\hat{\vartheta}$ indicates that we have controlled for an upward bias of electronic market performance due to the preponderance of high reputed market makers in the sample. A positive coefficient of $\hat{\vartheta}z$ indicates that we have controlled for an upward bias of electronic market performance due to the range of high reputation levels.

TABLE 5
Slope Analysis of Hypothesized Moderating Effects

	Dependent Variable: Electronic Market Performance					
	Low Reputation	High Reputation	Static Price-Making Mechanism	Dynamic Price-Making Mechanism	Low Demand Uncertainty	High Demand Uncertainty
Slope for monitoring	−.44* (.25)	.36* (.21)	−.07 (.19)	−.02 (.03)	−.27** (.13)	.13* (.07)
Slope for community building	.34a (.22)	.35 (.63)	.34** (.17)	.02 (.02)	.29 (.73)	.32 (.29)
Slope for self-participation	−.89** (.42)	.42* (.23)	−.07 (.51)	.61* (.32)	.55 (.59)	−.69** (.32)

*p < .05.
**p < .01.
aConsistent with extant paradigms, for the hypothesized effects, we report one-tailed tests for statistical significance.

of the market maker's reputation, a community that has reached a particular level continues to provide returns to participants. Nor does demand uncertainty make a difference for the influence of community building on market performance. Demand uncertainty may increase the emphasis on organizational information-processing capabilities and, thus, economic-oriented governance mechanisms rather than social mechanisms (i.e., similar to the motivation dichotomy of the differential emphasis on efficiency versus legitimacy motives; Grewal, Comer, and Mehta 2001).

Finally, self-participation is a unique governance mechanism for electronic markets that arises from the potential dual role of the market maker. The findings suggest that self-participation as a governance mechanism should be emphasized when the market maker enjoys a high reputation and when dynamic pricing mechanisms appear in the market (Table 5). In contrast, self-participation is not effective when the market maker's reputation is poor and demand uncertainty is high (Table 5).

These findings highlight two important recommendations for the governance of electronic markets. First, the three governance mechanisms are differentially effective under different sources of uncertainty, which implies that the conditions a market maker faces should determine the governance mechanisms it uses. Second, community building has received a great deal of press, but its role in B2B electronic markets may be limited. Community building is effective for electronic markets with static pricing mechanisms, so it could be employed effectively by catalog aggregators, lead generators, and workflow markets. Furthermore, the main effect of community building is positive and statistically significant, which means that it is equally beneficial regardless of whether the market maker is reputable or whether demand uncertainty is high or low. Perhaps community building plays a greater role for business-to-consumer and consumer-to-consumer electronic markets and for social interaction Web sites; this issue demands further research.[8]

Theoretical Implications

Before discussing the crucial theoretical implications of this research, we acknowledge some limitations. First, we use a

cross-sectional survey design, and all the limitations of this research approach are pertinent here. Because of the evolving nature of electronic markets (i.e., technology, market participants, and competing markets), a cross-sectional snapshot might mask some important variables and insights. Longitudinal studies could add significantly to the findings. Second, because market makers typically are small entrepreneurial firms, historical data on them remain rather limited. We conceptualize demand uncertainty only from the market maker's point of view, but it also may stem from variability in demand in the buyer's or seller's industry. The effects of demand uncertainty from such alternative sources could differ. Third, because of the lack of measurement options for the performance of electronic markets (most are privately held), we use only self-reported measures for the dependent variable. Nonetheless, because we rely on important practitioner and academic literature from strategic marketing and transaction cost analysis research to develop the hypotheses, this study provides significant theoretical and practical insights and represents an important initial step toward building a theory of electronic market making.

The primary theoretical contribution lies in the explanation of electronic market performance across a population of electronic markets; we take some initial steps toward determining how successful market making works. Previous empirical research on electronic markets has concentrated on one market at a time (e.g., Grewal, Comer, and Mehta 2001), but it has overlooked the roles and challenges of market makers. We believe that the current research paves the way for further research into electronic market making that can uncover boundary conditions other than uncertainty, such as structural factors (e.g., concentrated versus dispersed markets), participant switching costs, or the proportion of revenue derived from the electronic market. These variables capture variance in market participants' dependence on the electronic market for their operations, which may be effective indicators of their asset specificity. Additional research should also address market participant and market maker opportunism as constructs that could mediate the relationship between governance mechanisms and electronic market performance.[9]

We contribute to governance literature in marketing (e.g., Wathne and Heide 2000) by theorizing about the rele-

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[8]For example, eBay has successfully created the world's largest Web-based community of consumer-to-consumer auctions, which establishes high switching costs and enhances user loyalty. The Web-based music retailer lala.com has created a community of music listeners that complements its pay-per-download business model.

[9]We thank an anonymous reviewer for suggesting opportunism testing as a direction for further research.

vant governance mechanisms for B2B electronic markets. The online electronic market space allows for the use of multiple governance mechanisms, whether bureaucratic (monitoring), cultural (community building), or participatory (self-participation). In this realm, we identify the ambient conditions that become manifest in response to behavioral uncertainty on the part of the market maker and market participants and to external demand uncertainty to identify potential boundary conditions on the effectiveness of the governance mechanisms. To the best of our knowledge, this is the only marketing study that empirically examines the effectiveness of community building while also considering self-participation as a governance mechanism that seems unique to electronic markets.

We also conceptualize new constructs for community building and self-participation, develop a valid and reliable measure for community building, and identify a way to capture self-participation and price-making mechanisms through nominal measurement. The community-building construct is applicable across different contexts and therefore could serve to assess efforts to build esprit de corps among a dealer network of an industrial organization, for example.

Managerial Implications

Depending on the source of perceived uncertainty in their markets, market makers can choose to emphasize (or deemphasize) the governance mechanisms of monitoring, community building, and self-participation, as we illustrate in

Figure 2. When demand uncertainty is high, market makers should emphasize monitoring because it helps fill information gaps about participant composition, expectations, and behaviors. In contrast, when demand uncertainty is low, few information gaps exist, so monitoring is ineffective. Self-participation offers few benefits in high-demand-uncertainty conditions; rather, it harms the electronic market's performance. Because of frequent changes in the participants and their behavior in dynamic environments, opportunistic behaviors may slip through the cracks, considering the bounded rationality of self-participating market makers. However, participant opportunism can be addressed by emphasizing monitoring.

In dynamic pricing electronic markets, it pays to emphasize self-participation because the market maker has a stake in reducing uncertainty for both itself and others. Self-participation also enables the market maker to experience uncertainty by partaking in dynamic pricing activities (e.g., auctions) while allowing for corrective action through its market maker role. However, with static pricing, an emphasis on community building better improves electronic market performance because its inherent transparency reveals all participant attributes and actions.

When market makers have a strong reputation, they can use both monitoring and self-participation to enhance electronic market performance. Well-reputed market makers also can appear unobtrusive in their monitoring because they enjoy credibility and trust among participants. Well-reputed self-participating firms probably do not provoke

FIGURE 2
Governance Mechanisms and Behavioral and External Uncertainty
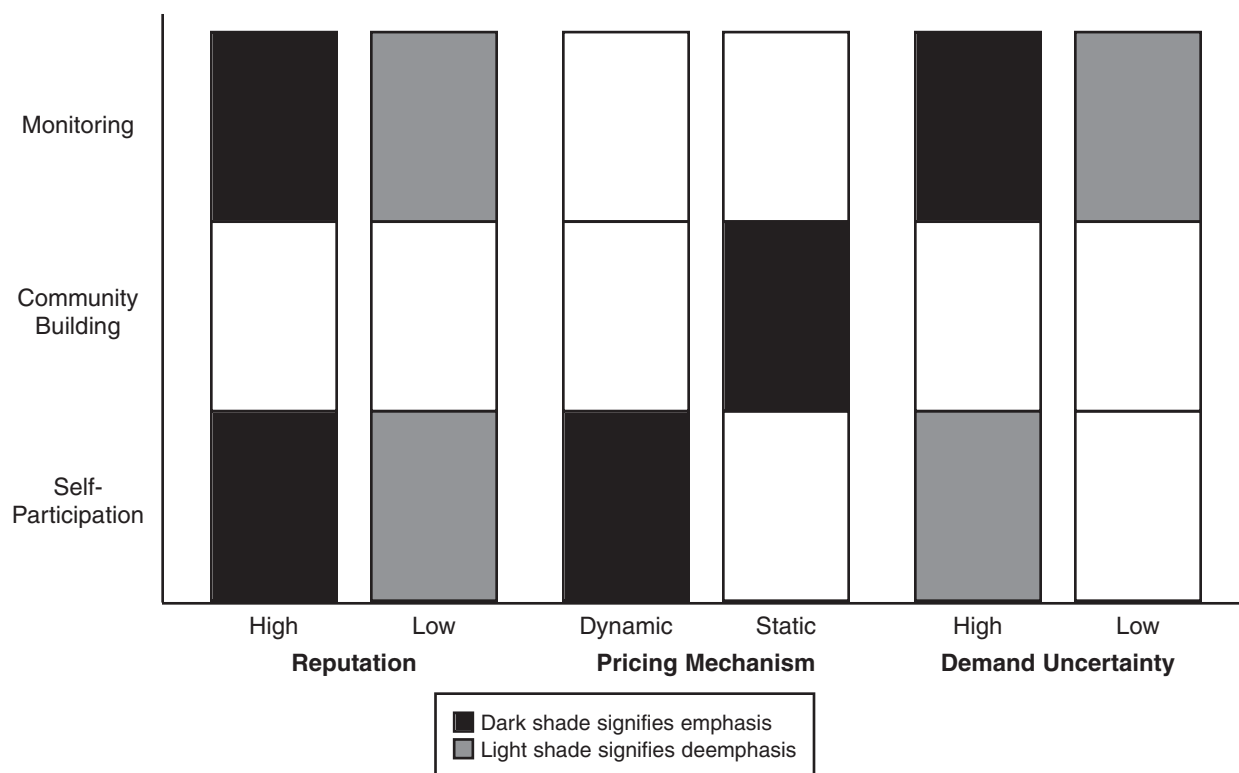
concerns about self-interest-seeking behaviors; monitoring and self-participation are likely to be viewed as legitimate policing actions. In contrast, if nonreputable market makers adopt monitoring and self-participation, it hurts the bottom line. Monitoring comes across as overbearing, and self-participation appears ethically questionable. Community building also may work for reputable market makers; the coefficients of the slopes of community building across reputation conditions are all reasonable (see Table 5).

Because the three governance mechanisms are differentially effective under different aspects of behavioral and external uncertainty, market makers should recognize how each can be developed, implemented, and maintained in the context of electronic markets. For example, monitoring efforts require investments to develop supervisory routines, as well as technology that can accumulate and analyze participant behavior data, provide instant reporting of trading anomalies, and establish a responsive complaint management system. To build communities, market makers need at least two channels of communication and feedback: a bilateral channel between the market maker and individual participants and a network channel among participants. Community building also involves the effective communication of market norms through newsletters, e-mail messages, chat rooms, and message boards. Finally, self-participation requires the market maker to be able to balance trading skills and market-making skills and to manage risk. To avoid surprises, self-participation requires the full disclosure of the market maker's role in the electronic market.

Conclusion

Market making requires an effective infrastructure for exchange, the regulation of participant behavior, and steady governance that takes into account the uncertainty in the market. Electronic markets, the new frontier in market making, create both governance challenges and opportunities for market makers. The key challenge is to govern under uncertainty in the virtual environment. The opportunity lies in the freedom to create a market for any product or service, global or local, as long as market makers make the right decisions about when to monitor, when to build a community, and when to self-participate.

APPENDIX
Measures

Item	Item Description
Electronic Market Performance Please use the scale below to rate aspects of the performance of your electronic market[a] (ρ_c = .96):[b]	•Return on investment relative to objective. •Sales relative to objective. •Profits relative to objective. •Growth relative to objectives. •Market share relative to objective. •Market acceptance. •General success.
Monitoring How much do you agree or disagree with the following statements in describing the management of your Electronic Market? (new scale) (ρ_c = .87):	•We monitor the electronic market closely to make sure that the participating firms do not take advantage of other participating firms. •We take the complaints of opportunistic behavior on the part of user firms seriously. •We believe that one of the primary roles of market makers of an electronic market is to police the market. •It is important for market makers to maintain order in their electronic markets. •We lay heavy emphasis on our disciplining role as a market maker.
Community Building How much do you agree or disagree with the following statements in describing the management of your Electronic Market? (new scale) (ρ_c = .72):	•We expend a lot of effort to build trust among firms participating in our electronic market. •Creating a congenial atmosphere in the electronic market is one of our primary goals. •Building a sense of community among the firms participating in our electronic market is an important goal for us.
Self-Participation The market maker (or firm that owns the electronic market) transacts in the market as either a buyer or a seller. For example, Covisint is a self-participating electronic market, as a co-owner Ford participates in the market, whereas ESTEEL is an unbiased electronic market. Please check the statement that most accurately describes the OPERATING status of the ELECTRONIC MARKET you manage:	_____ The market maker (or one of the firms that owns the electronic market) transacts in the market as a buyer or seller. _____ The market maker maintains neutrality and does not transact in the electronic market.

Item	Item Description
Reputation	
How much do you agree or disagree with the following statements about the image of your Electronic Market Maker in the industry? (new scale) (ρ_c = .86):	•We have a good reputation in the industry. •Our opinion is valued in the industry. •We are perceived as a firm with high level of integrity in the industry. •Firms in the industry respect us. •Our current customers seek our opinion out.
Price-Making Mechanism	
Please check the statement that most accurately categorizes the nature of your electronic market:[c]	•*Catalog Aggregator*: The market maker aggregates catalogs (product offerings) of multiple vendors and sells to buyers at a relatively static (fixed) price. •*Auction*: Multiple buyers bid competitively for products from a single supplier. •*Reverse Auction*: Buyers post their needs for products or services and suppliers bid competitively to fulfill the needs. •*Exchange*: A two-sided electronic market where buyers and sellers interact to exchange information and engage in trade, facilitated through some negotiated dynamic pricing system (such as a bid and ask system). •*Lead Generator*: A seller driven electronic market, where the market maker derives revenue from advertisements, commission on sales, or fees for generating qualified sales leads for suppliers (sellers). •*Workflow Marketplace*: Provides project tracking or collaboration services for complex, iterative, multiparty projects (such as in construction) and charges fees for its services. •*Other*: Describe.
Demand Uncertainty	
Please indicate your agreement with the following statements concerning the environment of your electronic market (adapted from Grewal, Comer, and Mehta 2001) (ρ_c = .77):	•Our customer demands vary a lot. •A lot of user firms join and/or leave our electronic market. •We are often surprised by our customers' behavior. •The environment can be characterized as dynamic.
Market Orientation	
The statements below describe norms that operate in business. Please indicate the extent of your agreement about how well the statements describe the actual norms in your market-making operations (business). Note: "Customers" refers to buyers and/or sellers in the electronic market, whichever is (are) relevant (adapted from Deshpandé and Farley 1998) (ρ_c = .90):	•Our business objectives are driven primarily for customer satisfaction.[d] •We constantly monitor our level of commitment and orientation to serving customer needs. •We freely communicate information about our successful and unsuccessful customer experiences across all business functions. •Our strategy for competitive advantage is based on understanding our customers' needs.[d] •We measure customer satisfaction systematically and frequently. •We have routine and regular measures of customer satisfaction. •We are more customer-focused than our competitors. •We believe that this business exists primarily to serve customers.[d] •We poll end users at least once a year to assess the quality of our products and services. •Data on customer satisfaction is disseminated at all levels, to the concerned constituents for our electronic market's operations, on a regular basis.
Training	
How much do you agree or disagree with the following statements about your role in the Electronic Market? (new scale) (ρ_c = .88):	•The training we offer satisfies the user firms. •We offer an adequate level of technical support to firms participating in our electronic market. •User firms have many opportunities for participating in training sessions. •The level of technical support we offer satisfies the user firms. •We are perceived as being technologically competent.[d]
IT Infrastructure	
Please circle the number that most accurately describes the information technology resources of your organization (new scale) (ρ_c = .91):	•We have strong IT planning capabilities. •We have extensively invested in building our IT infrastructure. •We have a good understanding of possible benefits of IT applications. •We have compatible IT platforms across business functions. •Our strategy heavily emphasizes the strategic importance of IT. •We have a state-of-the-art IT infrastructure. •We regularly update our IT assets.

APPENDIX
Continued

Item	Item Description
IT Skills	
Please circle the number that most accurately describes human information technology resources of your organization (new scale) (ρ_c = .92):	•Is experienced with IT. •We have strong technical IT skills. •We have adequate knowledge about IT. •Our IT skills are comparable with the best in the industry. •We invest heavily in our IT human resources. •We have adequate managerial IT skills.

[a]Similar measures are common in marketing literature (see Grewal and Tansuhaj 2001).
[b]All items are measured on seven-point semantic differential scales (1 = "unsatisfactory," and 7 = "satisfactory").
[c]The price-making mechanism is a dummy variable coded as 1 if the electronic market is dynamic (i.e., an auction, reverse auction, or an exchange) and 0 if the electronic market is static (i.e., catalog aggregator, lead generator, and workflow marketplace).
[d]Item was deleted after CFA.
Notes: We report composite scale reliabilities according to the formula $\rho_c = [(\Sigma\lambda_i)^2 var(\xi)]/[(\Sigma\lambda_i)^2 var(\xi) + \Sigma\theta_{ii}]$ (Bagozzi and Yi 1988), and the covariance matrix is the input matrix. We measured all items on seven-point semantic differential scales (1 = "disagree," and 7 = "agree") unless otherwise indicated.

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