THOMAS DOTZEL, VENKATESH SHANKAR, and LEONARD L. BERRY*

Service innovativeness, or the propensity to introduce service innovations to satisfy customers and improve firm value at acceptable risk, has become a critical organizational capability. Service innovations are enabled primarily by the Internet or people, corresponding to two types of innovativeness: e- and p-innovativeness. The authors examine the determinants of service innovativeness and its interrelationships with firm-level customer satisfaction, firm value, and firm risk and investigate the differences between e- and p-innovativeness in these relationships. They develop a conceptual model and estimate a system of equations on a unique panel data set of 1049 innovations over five years, using zero-inflated negative binomial regression and seemingly unrelated regression approaches. The results reveal important asymmetries between e- and p-innovativeness. Whereas e-innovativeness has a positive and significant *direct* effect on firm value, p-innovativeness has an overall significantly positive effect on firm value through its positive effect on customer satisfaction but only in human-dominated industries. Both e- and p-innovativeness are positively associated with idiosyncratic risk, but customer satisfaction partially mediates this relationship for p-innovativeness to lower this risk in human-dominated industries. The findings suggest that firms should nurture e-innovativeness in most industries and p-innovativeness in human-dominated industries.

Keywords: services marketing, strategy, innovation, Internet, customer satisfaction

Service Innovativeness and Firm Value

Services have become increasingly important to economic development worldwide. Service industries accounted for approximately 70% of the U.S. gross domestic product in 2011 (Kim, Gilmore, and Jolliff 2012). Furthermore, since 1970, services' share of gross domestic product in developed countries has risen by approximately 20% to more than 70% (World Bank 2009). As services continue to dominate the global economy, firms aim to introduce service innovations and gain competitive advantage (Bitner, Ostrom, and Morgan 2008; Michel, Brown, and Gallan 2008). For example, Apple launched its iTunes Music Store service innovation in 2003 and is now the largest music retailer in the world (Apple 2010).

Adapting Berry et al.'s (2006) definition, we define service innovation as a new or enhanced intangible offering that involves the firm's performance of a task/activity intended to benefit customers. Because service innovations are important and organizational capabilities influence performance (Chandy and Tellis 2000), firms are keen to enhance their service innovativeness, or the organizational capability or propensity to introduce service innovations. This definition is consistent with Garcia and Calantone's (2002) definition of innovativeness as the tendency to develop new products as well as with Hult, Hurley, and Knight's (2004) understanding of innovativeness as the capacity to introduce new products.

*Thomas Dotzel is Assistant Professor of Marketing, Desautels Faculty of Management, McGill University (e-mail: thomas.dotzel@mcgill.ca). Venkatesh Shankar is Professor of Marketing and Coleman Chair in Marketing (e-mail: vshankar@mays.tamu.edu), and Leonard L. Berry is Distinguished Professor of Marketing and M.B. Zale Chair in Retailing and Marketing Leadership (e-mail: berryle@tamu.edu), Mays Business School, Department of Marketing, Texas A&M University. The authors thank the two anonymous *JMR* reviewers for their constructive feedback and participants at the Mays Business School seminar series, the University of Houston Doctoral Symposium, and the INFORMS Marketing Science Conference for many helpful comments and suggestions. They thank Michael Hitt, Sanjay Jain, Ram Janakiraman, Tarun Kushwaha, Shun Yin Lam, Jeff Meyer, Alina Sorescu, Gautham Vadakkepat, Reo Song, and Rajan Varadarajan for their valuable inputs and Maria Fernanda Moreno, Nicole Hanson, and Wonjoo Yun for their research assistance. They gratefully acknowledge financial support from the Mays Business School Center of Retailing Studies' Mini Research Grant Program. This article is an essay in Thomas Dotzel's dissertation. Gerard Tellis served as associate editor for this article.

ISSN: 0022-2437 (print), 1547-7193 (electronic)

To enhance service innovativeness, firms need to understand its consequences (Gatignon and Xuereb 1997). At the innovation level, customer satisfaction is the most frequently used outcome measure (Boston Consulting Group 2009). However, at the firm level, managers should also consider other important consequent variables, such as firm value and firm risk (Fang, Palmatier, and Grewal 2011; McAlister, Srinivasan, and Kim 2007; Sood and Tellis 2009; Srinivasan and Hanssens 2009; Tirunillai and Tellis 2012). Because customer satisfaction and firm value are also related (e.g., Grewal, Chandrashekaran, and Citrin 2010), a clearer understanding of the links among service innovativeness, firm-level customer satisfaction, firm value, and risk is required. Thus, we estimate the effects of service innovativeness on firm-level customer satisfaction, firm value, and firm risk.

Given the growing role of technology (Lee and Grewal 2004), we can categorize service innovativeness into two broad types: Internet-enabled service innovativeness (e-innovativeness) and people-enabled service innovativeness (p-innovativeness) along with their corresponding capabilities, e-innovations and p-innovations, respectively. E-innovations are new services that provide customer benefits primarily through the Internet. Apple's iTunes is an example of an e-innovation. P-innovations are new services delivered primarily through human interactions. Although p-innovations occur in all types of industries (e.g., goods, services, human-dominated), they are particularly important in human-dominated industries—that is, industries that rely heavily on several employees to produce and deliver services (e.g., hospitality, courier services). FedEx Office is an example of a p-innovation in a human-dominated industry. The differences between p- and e-innovations suggest potential differences in the consequences and determinants of e- and p-innovativeness that are important to both researchers and managers.

We address the following two research questions: (1) What are the effects of service innovativeness (e- or p-) on customer satisfaction, firm value, and firm risk, and how are these constructs related? (2) How do e- and p-innovativeness differ (especially in human-dominated industries)? In addition, we examine the determinants of service innovativeness.

Drawing from the marketing, strategic management, industrial organization, finance, and operations literature streams, we formulate a conceptual model of the determinants of service innovativeness and the interrelationships among service innovativeness, customer satisfaction, firm value, and risk. We develop and estimate a system of equations, comprising zero-inflated negative binomial and regression models on a uniquely assembled panel data set of 1049 e- and p-innovations introduced from 2000 through 2004 by 90 firms across nine industries.

Our findings reveal asymmetries between e- and p-innovativeness. Whereas e-innovativeness has a significantly positive *direct* effect on firm value, p-innovativeness has a significantly positive net effect on firm value through its positive effect on customer satisfaction but only in human-dominated industries. Both e- and p-innovativeness are also positively associated with idiosyncratic risk, but customer satisfaction partially mediates this relationship for p-innovativeness to lower this risk in human-dominated industries. Our results suggest that firms should nurture e- (p-) innovativeness in most (human-dominated) industries. Firms in nonhuman-dominated industries should focus only on e-innovativeness.

Our research contributes primarily from theoretical and substantive viewpoints. From a theoretical viewpoint, it is the first to offer a broad understanding of service innovativeness and of the interrelationships among service innovativeness, customer satisfaction, firm value, and firm risk and is the first to determine the differences between e- and p-innovativeness. From a substantive perspective, it is the first to offer managerial insights into the direct and indirect effects of service innovativeness (e- and p-) on firm value and firm risk and to provide guidelines on how firms should approach e- and p-innovativeness.

CONCEPTUAL DEVELOPMENT

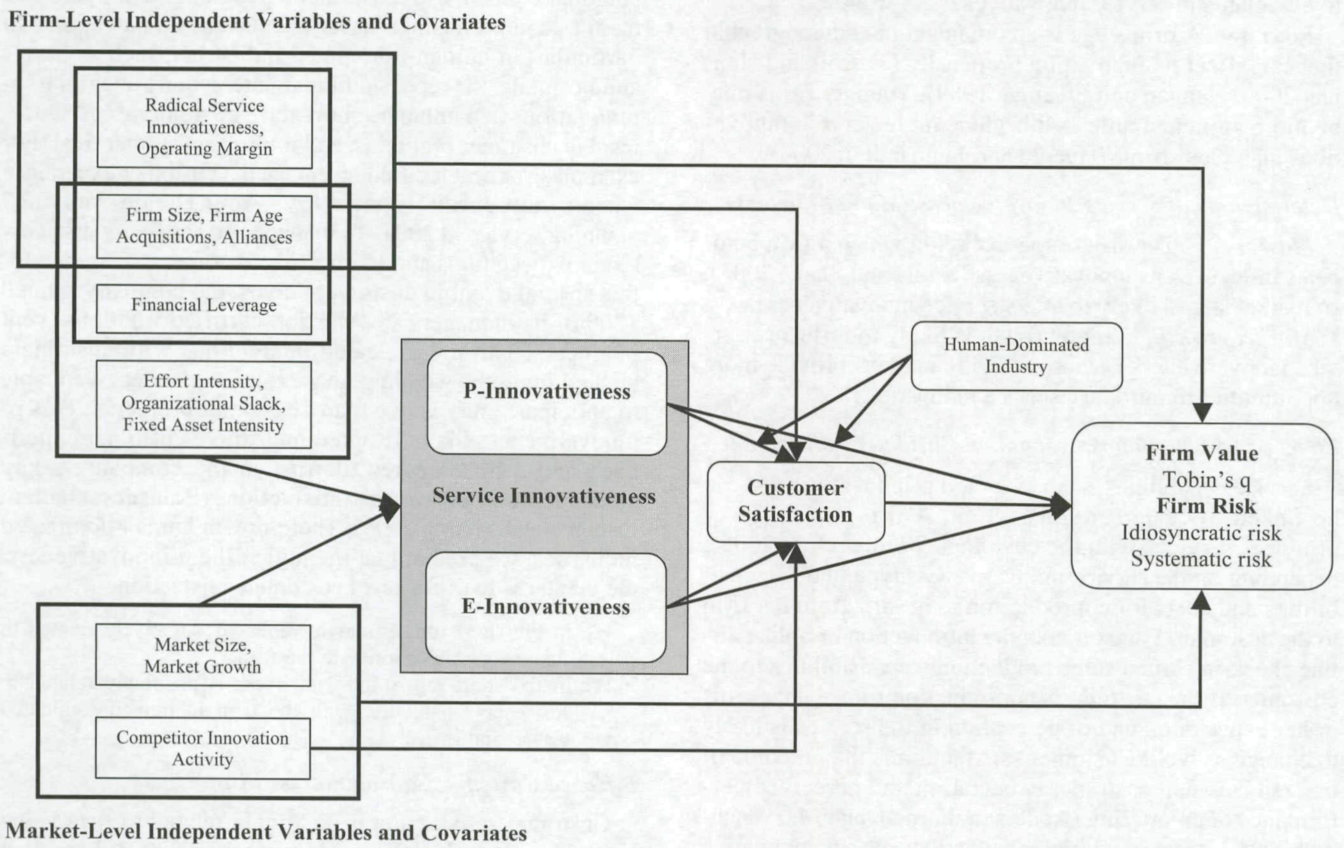
Prior research has focused primarily on goods innovations (Menor, Tatikonda, and Sampson 2002), but service innovations differ from goods innovations in important ways. Service innovations are less tangible and testable (i.e., no "tires to kick"), exhibit greater variance in performance and perceived risk (Murray and Schlacter 1990), are more difficult to protect with patents, and are more difficult for firms to scale and store and for customers to return. In addition, goods and services are likely to differ in customer satisfaction outcomes, financial returns, and risks. For example, because goods are more easily scalable than services, it may take fewer goods innovations to match the financial returns of service innovations.

Furthermore, p- and e-innovations do not share the same characteristics. P-innovations exhibit features such as inseparability due to simultaneous production and consumption of the service (Bendapudi and Leone 2003) and heterogeneity due to inconsistency in human performance. In contrast, e-innovations are often centrally produced, separable, homogeneous or consistent due to standardized processes (Lovelock and Gummesson 2004), highly scalable (Sawhney, Balasubramanian, and Krishnan 2004), and functionally uncertain due to potential failures associated with self-service technologies (Meuter et al. 2000).

The differences in characteristics between e- and p-innovations suggest differences in the consequences and determinants of e- and p-innovativeness. For example, compared with e-innovations, p-innovations may have a greater effect on customer satisfaction in human-dominated industries. Conversely, e-innovations may have a stronger direct effect on firm value because of cost and scalability advantages. Similarly, firms are more likely to introduce e-innovations in smaller markets to leverage their marginal cost advantage over p-innovations.

We discuss the determinants of service innovativeness; the effects of service innovativeness on customer satisfaction, firm value, and firm risk; and the effects of customer satisfaction on firm value and firm risk, consistent with the conceptual model in Figure 1. This model is based on an integration of the resource-based view (RBV) of the firm (Barney 1991), the organizational ecology–based demographic perspective (Carroll and Hannan 2000; Hannan and Freeman 1989), and the role of external resource bases (industry factors) in creating competitive advantage (Dess and Beard 1984; Rumelt 1991). Firms strive to build assets and develop sustainable competitive advantage through

Figure 1
CONCEPTUAL MODEL LINKING SERVICE INNOVATIVENESS, CUSTOMER SATISFACTION, FIRM VALUE, AND RISK



capabilities or bundles of internal resources (Barney 1991; Rumelt 1984). We posit that capabilities, such as e- and p-innovativeness, and assets, such as customer satisfaction (Grewal, Chandrashekaran, and Citrin 2010), influence firm value and firm risk. We also expect that customer satisfaction partially mediates the relationship between innovativeness and firm value and risk because capabilities such as service innovativeness improve customer satisfaction, which in turn enhances value by reducing imitation potential (Rumelt 1984). Furthermore, we expect that industry type (human-dominated vs. other) moderates the effects of p-innovativeness on satisfaction, firm value, and firm risk.

Consistent with the RBV and previous research linking it with goods innovation, organizational capability, and the Internet context (e.g., Dutta, Narasimhan, and Rajiv 2005; Lee and Grewal 2004; Sorescu and Spanjol 2008; Srinivasan, Haunschild, and Grewal 2007; Wade and Hulland 2004), we posit that resource-possession variables (e.g., effort intensity, organizational slack, fixed asset intensity, financial leverage) affect service innovativeness and that operating margin determines customer satisfaction, firm value, and firm risk. We also expect that resource-development variables, such as acquisitions and alliances, influence services innovativeness, customer satisfaction, firm value, and risk because of their relevance to the service innovation context (Morgan and Rego 2006, 2009). Consistent with Chandy and Tellis (1998, 2000) in the goods context, we anticipate that radical innovativeness, a key capability, is related to satisfaction, firm value, and risk in the service context as well.

Building on the organizational ecology perspective, we expect that firm demographic factors, such as age and size, affect service innovativeness, customer satisfaction, firm value, and firm risk (Carroll and Hannan 2000; Hannan and Freeman 1989). Finally, the external resource base or industry factors such as market size, market growth, and competitor innovation activity also influence service innovativeness, customer satisfaction, firm value, and risk (Rumelt 1991).

Determinants of Service Innovativeness: Firm Factors

Effort intensity. The more intense a firm's efforts or the greater the variable resources that a firm expends on its goods and services relative to its sales revenues, the fewer resources it has for innovations and the less likely it will introduce service innovations.

Organizational slack. Firms with greater organizational slack (proportion of total assets covered by net cash flows from operating activities) have surplus resources for ongoing operations (Sorescu and Spanjol 2008), so they are more likely to introduce service innovations.

Financial leverage. Highly financially leveraged firms are less able to make additional investments to introduce service innovations.

Firm size. Larger firms with more resources introduce more goods innovations than smaller firms (e.g., Sorescu, Chandy, and Prabhu 2003), so firm size is likely to be positively related to service innovativeness as well.

Firm age. A firm's age is an organizational demographic that can affect its innovation propensity (Carroll and Hannan 2000; Hannan and Freeman 1989). Younger firms may be more agile and able to introduce more service innovations than older firms (Huergo and Jaumandreu 2004).

Determinants of Service Innovativeness: Market Factors

Market size. The size of the market in which a firm competes influences its innovativeness (Katila and Shane 2005), so market size is likely to affect service innovativeness.

Market growth. Market growth is likely to influence service innovativeness because growing markets provide more opportunities to introduce service innovations.

Effect of Service Innovativeness on Customer Satisfaction

Service capabilities, such as e- and p-innovativeness, can be linked to customer satisfaction. A firm typically coproduces services with the customer (Meuter et al. 2005); depending on the service innovativeness type, the responsibilities and costs for coproduction may shift from the firm to the customer. For example, the introduction of online airline check-in shifted some production responsibilities to the customer. If the customer's coproduction role changes, his or her expectation and/or perception of the service is likely to change as well. Customer satisfaction is the outcome of the gap between customer expectation and perceived performance of an offering (Anderson, Fornell, and Mazvancheryl 2004). Because multiple innovations have a cumulative effect on customer satisfaction with the firm, we anticipate service innovativeness to be related to firm-level customer satisfaction.

We predict that the short-term (typically year-long) effect of service innovativeness on customer satisfaction differs between e- and p-innovativeness. Coproduction changes are particularly significant for e-innovations because they often increase burden and decrease control for the customer (Bendapudi and Leone 2003). Customers often perceive such a shift as reduced customer service in the near term, so satisfaction is likely negatively related to e-innovativeness.[1] Indeed, e-innovations can be viewed as self-service technologies that substitute customer-side capabilities for firm-side capabilities. If so, they may be perceived as firm cost reduction mechanisms in the short run (Bitner, Ostrom, and Meuter 2002). Moreover, e-innovations may have technological limitations or bugs that lower satisfaction in the short run. For example, when the pizza chain Papa John's introduced online ordering, some web-based orders took longer than telephone orders because of the limited penetration of broadband, which caused customer dissatisfaction (*QSR Magazine* 2010). Furthermore, potential technological failures may make customers feel uncomfortable and inadequate in relation to their technology savvy, lowering their satisfaction with the firm (Meuter et al. 2000).

In contrast, because p-innovations typically involve interpersonal contact with customers, people may not perceive them as compromising service as much as e-innovations. In particular, in human-dominated industries, such as hotels and hospitals, the repeated human interactions integral to p-innovations can enhance short-term customer experience, resolve customer problems, and improve customer trust. For example, Marriott focused on enhancing customer experience when it introduced its new "Joy—Your Dream Wedding" planning service in 2004. To manage and satisfy diverse customer expectations and to improve customer experience for this special event in customers' lives, the company trained 1200 of its managers as "Marriott certified wedding event planners." Through repeated interactions with customers leading up to the wedding, these trained planners were able to anticipate and resolve many customer problems. This p-innovativeness likely resulted in positive customer experience and a high degree of trust in the company, a key antecedent to customer satisfaction (Balasubramanian, Konana, and Menon 2003). Therefore, in human-dominated industries, we predict that the higher the p-innovativeness, the greater is the firm-level customer satisfaction.

H_1: In the short run, e-innovativeness is negatively related to customer satisfaction with the firm.

H_2: In the short run, p-innovativeness is positively related to customer satisfaction with the firm in human-dominated service industries.

Effect of Customer Satisfaction on Firm Value

Customer satisfaction is positively related to firm value (e.g., Anderson, Fornell, and Mazvancheryl 2004; Fornell et al. 2006; Gruca and Rego 2005; Mittal et al. 2005; Morgan and Rego 2006) because it increases future cash flow (Gruca and Rego 2005). In the goods industry, firms with high levels of customer satisfaction produce excess financial returns (Fornell et al. 2006; Grewal, Chandrashekaran, and Citrin 2010; Kamakura et al. 2002). We expect the positive link between satisfaction and performance to hold in the services context as well (Mittal et al. 2005).

Effect of Service Innovativeness on Firm Value

Innovativeness may have both direct and indirect effects on firm value (Bayus, Erickson, and Jacobson 2003; Dutta, Narasimhan, and Rajiv 1999; Fang, Palmatier, and Grewal 2011; Moorman and Slotegraaf 1999). The direct effects stem from investors' direct assessment of the value of firm innovativeness. The indirect effects accrue through the combined effects of innovativeness on customer satisfaction and of satisfaction on firm value. We discuss the direct effects in developing the next few hypotheses. Findings on the direct link between innovation and firm value are mixed: Eddy and Saunders (1980) find no significant relationship between new product announcements and stock prices, whereas other researchers (e.g., Fang, Palmatier, and Grewal 2011; Sood and Tellis 2009; Sorescu, Chandy, and Prabhu 2003; Sorescu and Spanjol 2008; Srinivasan et al. 2009) find that the effects are significantly positive. However, studies on the link between innovation and firm value have focused on goods innovation, leaving the effect of service innovativeness on firm value largely unknown.

[1]In the long run, however, customers may get used to the service, perceive greater control of the service (Hui and Bateson 1991), and experience greater satisfaction. Indeed, innovations based on new technologies may be unpopular in the short run but perceived as more beneficial in the long run (Chandy and Tellis 1998, 2000).

We argue that both e- and p-innovativeness have positive direct effects on firm value, which is associated with investors' confidence in the firm's future potential. Past experience, word of mouth, advertising, and public relations efforts can directly influence investors with regard to service innovativeness. For example, when Apple launched its iTunes service, investors might have anticipated an increase in firm value on the basis of word of mouth from iPod users or the market performance of Apple's past service innovations rather than from personal experience using the service. As a result, Apple's service innovativeness had a positive direct effect on its firm value that did not accrue from the satisfaction of these investors as customers. Thus:

H_3: E-innovativeness has a positive direct effect on firm value.
H_4: P-innovativeness has a positive direct effect on firm value.

We expect differences in the direct effects of e- and p-innovativeness on firm value, as Table 1 illustrates. These differences stem from distinctions between e-innovations and p-innovations related to separability, customer and employee heterogeneity/inconsistency, scalability, centralization, and functional uncertainty. These distinctions influence the bases of the RBV such as value-creating ability, rarity, inimitability, and substitutability to different degrees for e- and p-innovations. In turn, these differences lead to dissimilarities in the effects of e-innovations and p-innovations on firm value (e.g., Crook et al. 2008).

E-innovations offer potentially high revenues at low costs. For e-innovations, the production and consumption of service are separable, offering a large scope for producing high value services. Firms can centralize the core benefits of e-innovations, and the greater this centralization, the less they can be substituted. Furthermore, because such innovations are highly scalable, they provide high returns at lower costs, making them more nonsubstitutable than p-innovations. Thus, investors may reward the firm behind e-innovations because of long-term revenue prospects as well as the incremental profit that might accrue from cost savings. Indeed, e-innovation through alliance increases overall firm value (Lee and Grewal 2004).

In contrast, although p-innovations have high revenue potential, their cost benefits may not be as high as those for e-innovations. P-innovations can resolve customer problems and help the firm recover from service failure. Moreover, p-innovations can help a firm create a service delivery system that is difficult for its competitors to replicate. These resource-based advantages can help firms realize a high level of demand and sales revenues. However, investors may expect the low scalability and low separability of production and consumption in p-innovations to yield inadequate cost savings or disadvantages compared with e-innovations. Thus:

H_5: The direct effect of e-innovativeness on firm value is greater than that of p-innovativeness on firm value.

Table 1

DIFFERENCES BETWEEN E-INNOVATIONS AND P-INNOVATIONS

Item	*EINNOVs*	*PINNOVs*
Characteristics		
Separability	High	Low
Heterogeneity/inconsistency	Low	High
Scalability	High	Low
Centralization	High	Low
Functional uncertainty	High	Moderate
Resource-Based Advantages		
Value-creating ability	High	Moderate
Rarity	Moderate	High
Inimitability	Low	High
Substitutability	Low	Moderate
Firm Value		
Effect	High	Moderate
Idiosyncratic Risk		
Effect	High	Moderate

Effect of Service Innovativeness on Firm Risk

Innovation is related to firm risk (Fang, Palmatier, and Grewal 2011; Sorescu and Spanjol 2008). Firm risk that reflects variability in stock prices has two components: systematic risk and idiosyncratic risk. Systematic risk is the extent to which the firm's stock return responds to a change in the average return of all the stocks in the market (Sharpe 1964). Idiosyncratic risk is the residual risk associated with the firm's returns after accounting for systematic risk and is important to debt holders, employees, suppliers, and customers (Gaspar and Massa 2006).

We expect that e-innovativeness is directly related to idiosyncratic risk. As Table 1 shows, e-innovations carry high functional uncertainty about whether the technology will work and whether it will produce expected market outcomes. Many web-based initiatives have suffered from functional glitches. For example, during 2006–2009, the annual percentage of companies with failed customer relationship management software implementations ranged from 31% to 56% (Weinberger 2010). Therefore, investors may view e-innovativeness with a high level of uncertainty related to customer acceptance of technology-enabled innovations.

Furthermore, e-innovations have low inimitability, so competitors can potentially copy them, making the innovating firm's ability to extract returns in excess of the market highly uncertain. Such high uncertainty is associated with high firm-specific or idiosyncratic risk. For example, Papa John's pioneered web-ordering service for pizza, but competitors such as Domino's and Pizza Hut followed suit quickly, increasing investor unease about the stability of incremental rents to Papa John's (*QSR Magazine* 2010). As a result, the stock returns from the introduction of this service innovation were volatile. Indeed, information technology (IT) capital has a direct effect on firm risk (Dewan and Ren 2011), and e-commerce initiatives increase unsystematic risk (Dewan and Ren 2007).

In the case of p-innovations, shareholders expect high uncertainty as well but primarily because of potential inconsistencies in service quality arising from heterogeneity in the performance of employees delivering the service. Therefore, p-innovativeness is also likely to be positively related to idiosyncratic risk.

We expect that the size of the direct effects differs. Because people who can solve customer problems are present, investors may not regard p-innovativeness with as much uncertainty as they attach to the technological performance behind an e-innovation. Investors may view the presence of appropriately trained people as assuaging customers about potential problems and complaints. Employees can adjust their performance and the delivery of benefits to suit customer needs (Berry et al. 2006). As a result, returns from p-innovations are likely to be steadier and more stable than those from e-innovations over time. Indeed, Dewan, Shi, and Gurbaxani (2007) find that IT investments influence firm risk more strongly than non-IT investments because of the functional uncertainty involved with IT. Thus:

- H_6: E-innovativeness has a positive direct effect on idiosyncratic risk.
- H_7: P-innovativeness has a positive direct effect on idiosyncratic risk.
- H_8: The direct effect of e-innovativeness on idiosyncratic risk is greater than that of p-innovativeness on idiosyncratic risk.

In addition to the direct effect of p-innovativeness on idiosyncratic risk, customer satisfaction may partially mediate the relationship between p-innovativeness and idiosyncratic risk. Investors view firms with a high level of customer satisfaction as having a steady revenue stream and profitability and assess them as low-risk prospects. By the same token, shareholders view firms with low levels of customer satisfaction as high-risk players. Improvements in customer satisfaction reduce the variability in a firm's cash flow (Gruca and Rego 2005). Furthermore, firms with high customer satisfaction carry lower risk (Fornell et al. 2006; Grewal, Chandrashekaran, and Citrin 2010); indeed, improvements in customer satisfaction can reduce idiosyncratic risk (Tuli and Bharadwaj 2009). Although high customer satisfaction is associated with low volatility of cash flows for all firms, the partial mediation of customer satisfaction is particularly beneficial for firms in human-dominated industries, in which p-innovativeness is positively related to customer satisfaction. Thus:

- H_9: Customer satisfaction with the firm is negatively related to idiosyncratic risk in human-dominated industries and thus partially mediates the relationship between p-innovativeness and idiosyncratic risk.

Evidence on the link between goods innovativeness and systematic risk is mixed. Firms with more innovations have higher systematic risk (e.g., David, Hitt, and Gimeno 2001), but research-and-development spending is negatively linked to systematic risk (McAlister, Srinivasan, and Kim 2007). We expect that service innovativeness is correlated with systematic risk but have no expectations on the sign or the differences between e- and p-innovativeness.

Additional Variables Affecting Consequences and Determinants: Firm Factors

Radical innovations. Radical innovations, or innovations involving significantly new technologies that offer substantial customer benefits (Chandy and Tellis 1998, 2000), potentially enhance firm value. Rubera and Kirca (2012) conclude that firm value can be higher when innovations are radical. However, radical innovations can also induce uncertainty. Therefore, we expect radical innovations to be positively related to firm value and firm risk.

Acquisitions. Acquisitions can increase (decrease) goods innovations by expanding the product portfolio (reducing available resources) (Sorescu and Spanjol 2008). They can also change customer satisfaction and decrease (increase) firm value if the total asset value after the acquisition is lower (higher) than the book value (Sorescu and Spanjol 2008) with potential changes to risk as well. We also expect similar effects for service innovativeness.

Alliances. The number of strategic alliances in which a firm is involved determines the number of new goods it introduces (Srinivasan, Haunschild, and Grewal 2007). Furthermore, because alliances have effects on customer satisfaction and firm value (e.g., Kalaignanam, Shankar, and Varadarajan 2007), we include this variable in our models in the services context.

Fixed asset intensity. Firms with high fixed asset intensity have reduced liquid assets to finance goods innovations (Sorescu and Spanjol 2008). We expect this relationship to hold for service innovativeness.

Operating margin. Operating margin significantly affects firm value (Rao, Agarwal, and Dahlhoff 2004). Furthermore, we expect operating margin to affect customer satisfaction and firm risk because it represents a firm's ability to charge a premium for delivering greater value to its customers and to manage the variance in the premium. We include this variable in the customer satisfaction, firm value, and firm risk models.

Additional Variables Affecting Consequences and Determinants: Market Factor

When a firm's competitors actively boost their sales through innovations, the firm may compete by introducing new services. We also expect competitor innovation activity to influence customer satisfaction, firm value, and firm risk.

DATA AND VARIABLE OPERATIONALIZATION

To test our hypotheses empirically, we need panel data on customer satisfaction, firm value, firm risk, firm- and market-specific factors, and the number and type of service innovations a firm introduces. Because these data are not readily available from a single data source, we manually assembled a unique panel data set using different sources. An advantage of this approach is that we avoid common method bias by using separate sources for key independent and dependent variables (Mithas, Krishnan, and Fornell 2005).

Because our research involves customer satisfaction, we use the American Customer Satisfaction Index (ACSI) database, which has been widely used as a sampling frame (e.g., Anderson, Fornell, and Mazvancheryl 2004; Gruca and Rego 2005). The ACSI data, collected annually by the University of Michigan, are reasonably representative of U.S. firms.

We first identified all firms that have ACSI scores for 2001–2005. We eliminated firms for which the necessary financial data were unavailable. The sample of 90 firms compares favorably with those in similar studies (e.g., Bayus, Erickson, and Jacobson 2003). Table 2 provides a list of variables, operationalizations, and data sources. We collected these variables from LexisNexis, the ACSI website, and databases from the Center for Research in Security Prices (CRSP), Compustat, and Securities Data Company (SDC) Platinum.

Service Innovativeness

We collected data on service innovations introduced between 2000 and 2004 by the 90 firms in the ACSI data-

Table 2

VARIABLES, MEASURES, AND DATA SOURCES

Variable	*Notation*	*Operational Measure*	*Data Source*
Focal Variables			
E-innovativeness	EINNOV	Annual firm-level count of e-innovations (new-to-market e-innovations weighted twice relative to new-to-firm e-innovations)	LexisNexis
P-innovativeness	PINNOV	Annual firm-level count of p-innovations (new-to-market p-innovations weighted twice relative to new-to-firm p-innovations)	LexisNexis
Customer satisfaction	ACSI	American Customer Satisfaction Index as reported by the National Quality Research Center (1–100)	www.theacsi.org
Firm value	TOBINQ	Tobin's q	CRSP, Compustat
Idiosyncratic risk	IRISK	Standard deviation of residuals of the Carhart four-factor model	CRSP
Systematic risk	SRISK	Value of beta from the Carhart four-factor model	CRSP
Determinants of Service Innovativeness and Control Variables			
Radical service innovations	RSI	Annual firm-level count of new-to-market service innovations that provide significantly greater customer benefits	LexisNexis
Effort intensity	EFFINT	Ratio of cost of goods sold to sales revenues	Compustat
Financial leverage	FINLEV	Ratio of long-term debt to total assets	Compustat
Firm size	LFSIZE	Natural logarithm of firm's sales revenues	Compustat
Firm age	LAGE	Natural logarithm of firm's age in years	Hoover's Company Profiles
Market size	LMSIZE	Natural logarithm of industry sales revenues	Compustat
Market growth	MGROWTH	Annual percentage growth in industry sales revenues	Compustat
Acquisition	ACQUIS	Annual firm-level count of acquisitions	SDC Platinum
Alliance	ALLIANCE	Annual firm-level count of strategic alliances	SDC Platinum
Fixed asset intensity	FAINT	Ratio of fixed assets to total assets	Compustat
Organizational slack	ORGSLACK	Ratio of net cash flow from operating activities to total assets	Compustat
Operating margin	OPMARGIN	Ratio of net income before depreciation to sales revenues	Compustat
Competitor innovation activity	COMPINA	Ratio of annual incremental cumulative competitors' sales revenues to market size	Compustat

base using LexisNexis.[2] This procedure is consistent with prior research (e.g., Tirunillai and Tellis 2012). We searched more than 165,000 different news releases and obtained a usable sample of 1049 service innovations. Consistent with our definition, we searched for three characteristics of a service innovation for inclusion in the sample: a firm's performance of a function/activity/task, an intangible new or improved offering, and an intended benefit to the firm's customers. We used the broad search terms "service," "new," and "innovat" to capture all terms beginning with "innovat." We performed a content analysis and categorized the innovations into e- and p-innovations. We assessed the reliability of our content analysis through two independent judges not involved with the research. The average correlation between the judges' coding and our initial coding was high (.90, $p < .01$). We resolved coding discrepancies by reevaluating the news source. Our final sample includes 282 p-innovations and 767 e-innovations; examples of e- and p-innovations appear in Table 3.

Customer Satisfaction

We use the ACSI scores as our measure of firm-level customer satisfaction, consistent with prior research (e.g., Anderson, Fornell, and Mazvancheryl 2004; Gruca and Rego 2005; Luo and Homburg 2008; Morgan and Rego 2006). The scores are based on telephone interviews with 250 customers of each firm and are reported on a 0–100 scale (Fornell et al. 1996).

Firm Value and Firm Risk

Consistent with prior research (e.g., Grewal, Chandrashekaran, and Citrin 2010; Lee and Grewal 2004), we use Tobin's q to measure firm value for three reasons. First, it is a forward-looking measure because it is based on stock market prices. Second, it captures long-term performance by comparing replacement and market values. Third, it can be used across industries because accounting conventions do not affect it.[3] Following Lee and Grewal (2004), we calculate Tobin's q using the average stock price and common shares outstanding at the end of quarters.[4]

We measure idiosyncratic risk as the standard deviation of residuals from the four-factor model, consistent with the literature (Tuli and Bharadwaj 2009). In line with prior studies, we measure systematic risk as the beta obtained from the four-factor model (Carhart 1997).

[2]Some firms did not introduce any service innovation in some of the years, making the sample well representative of the universe of all firms.

[3]We compute Tobin's q as (market value of common stock shares + book value of preferred stocks + book value of long-term debt + book value of inventories + book value of current liabilities – book value of current assets)/(book value of total assets), which is consistent with previous research (Lee and Grewal 2004).

[4]This approach is more conservative because it avoids volatility associated with a stock price's year-end measure. Nevertheless, the correlation between the averaged and year-end measures of Tobin's q is high (.93) in our data.

Table 3
EXAMPLES OF SERVICE INNOVATIONS

Firm	*Year Introduced*	*Type*	*Service Innovation*
Home Depot	2000	PINNOV	"Home Depot Home Improvement Loan Account ... Whether remodeling a kitchen or bath, or building an addition to a home, customers who are approved for a loan can begin shopping immediately. Customers complete a brief application and receive a decision within minutes." (6/5/2000)
Gateway	2001	PINNOV	"Gateway, Inc. (NYSE: GTW) today begins offering technology installation services into homes across the U.S. with the Gateway House Call program ... With 296 stores acting as service hubs in virtually all major U.S. metropolitan areas, Gateway dispatches highly skilled technicians into customers' homes to set up their PCs." (11/15/2001)
FedEx	2004	PINNOV (human-dominated industry)	"FedEx Custom Critical, a provider of time-critical delivery services, is offering a validating option, TEMP-ASSURE Validated, for temperature-sensitive shipments. The company said the new service was developed to address increasing concerns about the proper handling of temperature-sensitive materials." (2/4/2004)
Nike	2000	EINNOV	"Nike is among the first to use the Web to deliver this service.... Nike's new site provides consumers the opportunity to build their own Nike product (primarily shoes, but also a few other items in the baseball/softball and team categories)." (1/1/2001)
Papa John's	2002	EINNOV	"Online pizza from Papa John's ... said it will let customers order pizza from more than 2,500 domestic restaurants through its Web site. Papa John's is the first U.S. pizza chain to offer online ordering nationwide, the company said." (1/10/2002)
Apple	2003	EINNOV	"Apple Computer will on Monday start its bid to become the leading online music retailer with a fee-based service allowing songs to be downloaded for 99 cents apiece." (4/27/2003)

Figure 2 shows the frequency distributions of e- and p-innovations. The distributions are skewed with a high proportion of zeros. Accordingly, we use zero-inflated count data models of service innovativeness in our subsequent empirical analysis.

Figure 3, Panel A, presents the smoothed distribution of ACSI scores in our sample. The distribution resembles a normal distribution, enabling us to use linear regression to model its determinants. Figure 3, Panel B, presents the smoothed distribution of Tobin's q. Although not shaped like a typical normal distribution, it is unimodal and exhibits some symmetry around the mode, enabling us to use a normal approximation for modeling. Smoothed distributions of idiosyncratic and systematic risk appear in Figure 3, Panels C and D, respectively. They are also unimodal, similar to Tobin's q distribution; only their peaks are sharper than those of Tobin's q.

Determinants of Service Innovativeness

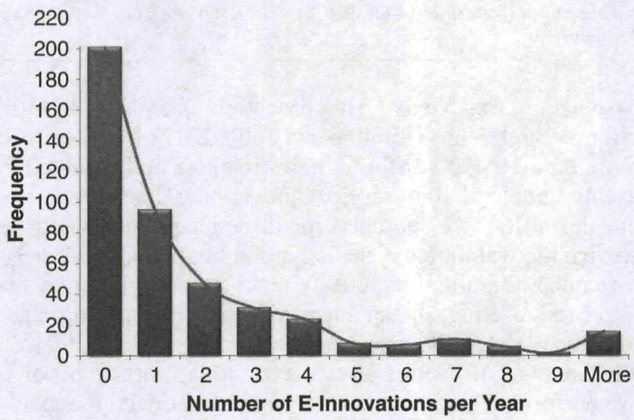
We operationalize "effort intensity" as the ratio of cost of goods sold to sales revenues, "financial leverage" as the ratio of long-term debt to total assets, and "firm size" as the natural logarithm of sales revenues (e.g., David, Hitt, and Gimeno 2001; Mithas, Krishnan, and Fornell 2005). We calculate "market growth" as the average 12-month growth in industry sales at the four-digit North American Industry Classification System code (e.g., Morgan and Rego 2006) and "market size" as the natural log of the sum of revenues of all firms in the industry.

Additional Variables

We collected data on acquisitions and alliances from SDC Platinum and on fixed asset intensity, organizational slack, operating margin, and competitor innovation activity from Compustat. We operationalize "competitor innovation activity" as the ratio of the dollar sales increase of all competi-

Figure 2
DISTRIBUTION OF NUMBER OF INNOVATIONS

A: Distribution of Number of E-Innovations (EINNOVS)



B: Distribution of Number of P-Innovations (PINNOVs)

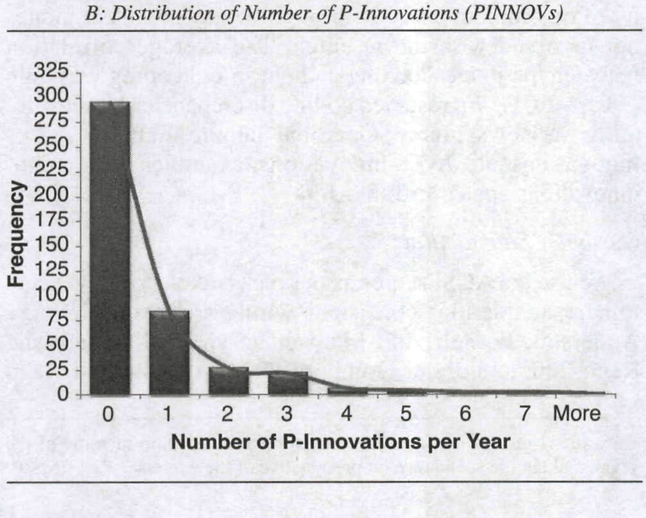
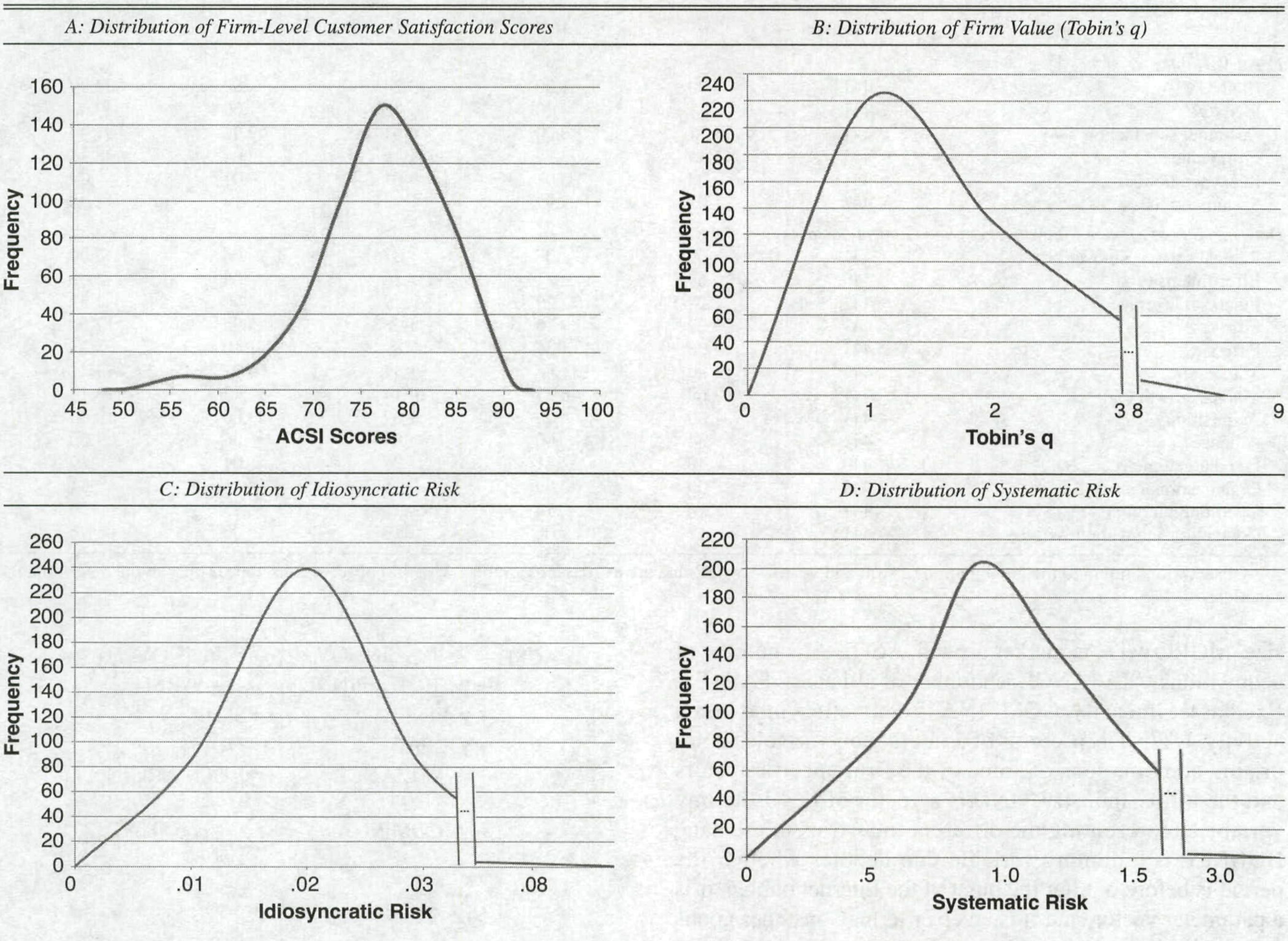


Figure 3

DISTRIBUTION OF INNOVATIVENESS OUTCOME VARIABLES



tors due to new offerings (in the same classification code) to market size.[5]

Consistent with Chandy and Tellis (2000), we identified radical service innovations from the ratings of five innovation experts on two dimensions. These include whether the new service incorporates a substantially different core technology or method and provides substantially higher customer benefits than the previous product generation in the category.

The summary statistics and correlation matrix appear in Tables 4 and 5, respectively. The Tobin's q and customer satisfaction scores are within reasonable range, consistent with prior studies (e.g., Lee and Grewal 2004). The annual number of service innovations by a firm varies from 0 to 22, with e-innovations displaying a wider range than p-innovations. The correlation matrix shows that the correlations among the independent variables are not unreasonably high. Furthermore, consistent with prior research (e.g., Kalaignanam, Shankar, and Varadarajan 2007), the variance inflation factors are below ten, so multicollinearity is not an issue.

[5]We do not include market concentration as an additional variable, because it is highly correlated with market size.

MODEL DEVELOPMENT AND ESTIMATION

Model Development

The model comprises a system of six equations, with e-innovativeness, p-innovativeness, customer satisfaction, firm value, and idiosyncratic and systematic risks as the dependent variables. In each equation, subscript i represents the firm and subscript t represents the year.

$$
\begin{aligned}
(1)\quad \text{EINNOV}_{it} = {} & \alpha_0 + \alpha_1\text{EFFINT}_{i(t-1)} + \alpha_2\text{ORGSLACK}_{i(t-1)} \\
& + \alpha_3\text{FINLEV}_{i(t-1)} + \alpha_4\text{LFSIZE}_{i(t-1)} \\
& + \alpha_5\text{LFAGE}_{i(t-1)} + \alpha_6\text{LMSIZE}_{i(t-1)} \\
& + \alpha_7\text{MGROWTH}_{i(t-1)} + \alpha_8\text{ACQUIS}_{i(t-1)} \\
& + \alpha_9\text{ALLIANCE}_{i(t-1)} + \alpha_{10}\text{FAINT}_{i(t-1)} \\
& + \alpha_{11}\text{COMPINA}_{i(t-1)} + \sum_{j=1}^{J}\alpha_{12j}\text{UTINT}_{ji(t-1)} \\
& + \sum_{k=1}^{K-1}\alpha_{13k}\text{IND}_{ki} + \alpha_{14}\text{BUBBLE}_t + \eta_{it},
\end{aligned}
$$

where EINNOV is e-innovativeness, EFFINT is effort intensity, ORGSLACK is organizational slack, FINLEV is financial leverage, LFSIZE is natural log of firm revenues, LFAGE is natural log of firm age, LMSIZE is natural log of market

Table 4
DESCRIPTIVE STATISTICS

	Observation[a]	*M*	*Mdn*	*SD*	*Min*	*Max*
Focal Variables						
EINNOV	441	1.90	1.00	3.24	.00	22.00
PINNOV	441	.71	.00	1.35	.00	9.00
Customer satisfaction	441	75.71	76.00	6.61	49.00	91.00
Firm value	441	1.45	.99	1.16	.08	8.44
Idiosyncratic risk	441	.02	.01	.01	.01	.09
Systematic risk	441	1.01	.92	.45	.14	3.08
Determinants of Service Innovativeness and Control Variables						
Radical service innovations	441	.09	.00	.31	.00	2.00
Effort intensity	440	.69	.71	.16	.08	1.06
Financial leverage	441	.28	.27	.19	.00	1.32
Firm size	441	9.22	9.15	1.08	5.95	12.56
Firm age	441	4.08	4.36	.89	1.10	5.34
Market size	441	11.90	11.88	1.47	6.21	14.11
Market growth (%)	441	7.69	6.87	20.14	−33.13	115.13
Acquisitions	441	1.00	.00	1.69	.00	10.00
Alliances	441	.34	.00	.94	.00	7.00
Fixed asset intensity	440	.40	.41	.20	.01	.89
Organizational slack	440	.09	.09	.06	−.15	.34
Operating margin (%)	441	.16	.14	.11	−.15	.56
Competitor innovation Activity	441	.12	.06	.19	.00	.96

[a]"Observation" refers to the combination of firm and year for which data are available. Variables with 440 observations appear only in the determinants equations.

size, MGROWTH is market growth, ACQUIS is number of acquisitions, ALLIANCE is number of alliances, FAINT is fixed asset intensity, COMPINA is competitor innovation activity, UTINT is a vector of J interaction variables comprising combinations of some of the firm-specific factors and the utility industry,[6] IND is a vector of K – 1 dummy variables representing the different industries in the data, BUBBLE is a dummy variable that denotes whether the period is before or after the burst of the Internet bubble, α is a parameter vector, and η is an error term. Consumer goods firms constitute the base industry. The dummy variables, IND and BUBBLE, control for heterogeneity through the fixed-effects approach, consistent with prior research (e.g., Shane, Shankar, and Aravindakshan 2006).

$$\begin{aligned}(2)\quad \text{PINNOV}_{it} = {} & \beta_0 + \beta_1\text{EFFINT}_{i(t-1)} + \beta_2\text{ORGSLACK}_{i(t-1)} \\ & + \beta_3\text{FINLEV}_{i(t-1)} + \beta_4\text{LFSIZE}_{i(t-1)} \\ & + \beta_5\text{LFAGE}_{i(t-1)} + \beta_6\text{LMSIZE}_{i(t-1)} \\ & + \beta_7\text{MGROWTH}_{i(t-1)} + \beta_8\text{ACQUIS}_{i(t-1)} \\ & + \beta_9\text{ALLIANCE}_{i(t-1)} + \beta_{10}\text{FAINT}_{i(t-1)} \\ & + \beta_{11}\text{COMPINA}_{i(t-1)} + \sum_{j=1}^{J}\beta_{12j}\text{UTINT}_{ji(t-1)} \\ & + \sum_{k=1}^{K-1}\beta_{13k}\text{IND}_{ki} + \beta_{14}\text{BUBBLE}_t + \xi_{it},\end{aligned}$$

where PINNOV is p-innovativeness, β is a parameter vector, and ξ is an error term.

$$\begin{aligned}(3)\quad \text{ACSI}_{it} = {} & \gamma_0 + \gamma_1\text{EINNOV}_{i(t-1)} + \gamma_2\text{PINNOV}_{i(t-1)} \\ & + \gamma_3(\text{HDI}_i \times \text{PINNOV}_{i(t-1)}) + \gamma_4\text{RSI}_{i(t-1)} \\ & + \gamma_5\text{FINLEV}_{i(t-1)} + \gamma_6\text{LFSIZE}_{i(t-1)} \\ & + \gamma_7\text{LFAGE}_{i(t-1)} + \gamma_8\text{ACQUIS}_{i(t-1)} \\ & + \gamma_9\text{ALLIANCE}_{i(t-1)} + \gamma_{10}\text{OPMARGIN}_{i(t-1)} \\ & + \gamma_{11}\text{COMPINA}_{i(t-1)} + \sum_{m=1}^{M}\gamma_{12m}\text{UTINT}_{mi(t-1)} \\ & + \sum_{k=1}^{K-1}\gamma_{13k}\text{IND}_{ki} + \mu_{it},\end{aligned}$$

where ACSI is customer satisfaction, HDI is a dummy variable denoting whether the focal p-innovation is in a human-dominated industry (e.g., hospitality, courier), RSI is the number of radical service innovations, OPMARGIN is operating margin, M is the total number of interaction variables involving utility industry, γ is a parameter vector, and μ is an error term.

$$\begin{aligned}(4)\quad \text{TOBINQ}_{it} = {} & \delta_0 + \delta_1\text{ACSI}_{it} + \delta_2\text{EINNOV}_{i(t-1)} \\ & + \delta_3\text{PINNOV}_{i(t-1)} + \delta_4\left(\text{HDI}_i \times \text{PINNOV}_{i(t-1)}\right) \\ & + \delta_5\text{RSI}_{i(t-1)} + \delta_6\text{LFSIZE}_{i(t-1)} \\ & + \delta_7\text{LFAGE}_{i(t-1)} + \delta_8\text{LMSIZE}_{i(t-1)} \\ & + \delta_9\text{MGROWTH}_{i(t-1)} + \delta_{10}\text{ACQUIS}_{i(t-1)} \\ & + \delta_{11}\text{ALLIANCE}_{i(t-1)} + \delta_{12}\text{OPMARGIN}_{i(t-1)} \\ & + \delta_{13}\text{COMPINA}_{i(t-1)} + \sum_{m=1}^{M}\delta_{14m}\text{UTINT}_{mi(t-1)} \\ & + \sum_{k=1}^{K-1}\delta_{15k}\text{IND}_{ki} + \nu_{it},\end{aligned}$$

where TOBINQ is Tobin's q, δ is a parameter vector, and ν is an error term.

[6]We performed a Chow test of slope homogeneity (Chow 1960) across industries in our data and determined that the utility industry had differential slope coefficients in this and the subsequent models. To account for these effects, we introduce interaction variables involving the utility industry with the relevant variables in all the models.

Table 5

CORRELATION MATRIX MODEL VARIABLES (n = 441)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
1. EINNOV	1.00																			
2. PINNOV	.12**	1.00																		
3. HDI × PINNOV	.04	.51**	1.00																	
4. Customer satisfaction	–.20**	–.22	.11**	1.00																
5. Firm value	.19**	–.09**	.03	.33**	1.00															
6. Idiosyncratic risk	.36**	.16**	–.08*	–.41**	.02	1.00														
7. Systematic risk	.23**	.22**	.00	–.37**	–.02	.55**	1.00													
8. Radical service innovation	.52**	.19**	.06	–.15**	.06	.21**	.20**	1.00												
9. Effort intensity	–.20**	.22**	.16**	–.25**	–.45**	.08*	.21**	–.02	1.00											
10. Financial leverage	.04	–.02	–.08	–.18**	–.02	.12**	.06	.05	.02	1.00										
11. Firm size	–.08*	.23**	.08*	–.01	–.18**	–.23**	–.06	.01	.25**	–.11**	1.00									
12. Firm age	–.35**	–.05	–.02	.16**	–.39**	–.38**	–.23**	–.16**	.22**	.07	.31**	1.00								
13. Market size	–.13**	.12**	–.10**	–.32**	–.45**	–.16**	–.09*	–.07	.36**	.00	.54**	.29**	1.00							
14. Market growth	.11**	–.05	–.03	–.06	.11**	.11**	–.01	.02	–.07	–.09*	–.05	–.13**	.04	1.00						
15. Acquisitions	.22**	.00	.03	.09*	.15**	.10**	–.03	.03	–.15**	–.08*	.12**	–.11**	.01	.15**	1.00					
16. Alliances	.40**	.19**	.03	–.11**	.10**	.29**	.32**	.25**	–.05	.05	–.05	–.20**	–.11**	–.01	.13**	1.00				
17. Fixed asset intensity	–.10**	.20**	.08*	–.30**	–.28**	–.08	.05	.01	.33**	.27**	.15**	.32**	.41**	–.06	–.15**	.02	1.00			
18. Organizational slack	–.11**	.00	.11**	.31**	.42**	–.29**	–.16**	–.05	–.29**	–.21**	.14**	.04	–.18**	–.02	.01	–.03	–.06	1.00		
19. Operating margin	.07	–.07	–.01	–.03	–.01	–.31**	–.31**	–.04	–.46**	.20**	–.08	.18**	.19**	.08*	.06	–.11**	.23**	.13**	1.00	
20. Competitor innovation activity	–.03	–.04	–.09*	–.02	–.02	.07	–.11**	.02	–.06	.05	.01	.05	.06	.43**	.04	–.09*	–.02	–.02	–.01	1.00

*$p < .10$.
**$p < .05$.
Notes: HDI = human-dominated industry.

$$(5)\quad \text{IRISK}_{it} = \phi_0 + \phi_1\text{ACSI}_{it} + \phi_2\text{EINNOV}_{i(t-1)} + \phi_3\text{PINNOV}_{i(t-1)} + \phi_4\left(\text{HDI}_i \times \text{PINNOV}_{i(t-1)}\right) + \phi_5\text{RSI}_{i(t-1)} + \phi_6\text{LFSIZE}_{i(t-1)} + \phi_7\text{LFAGE}_{i(t-1)} + \phi_8\text{LMSIZE}_{i(t-1)} + \phi_9\text{MGROWTH}_{i(t-1)} + \phi_{10}\text{ACQUIS}_{i(t-1)} + \phi_{11}\text{ALLIANCE}_{i(t-1)} + \phi_{12}\text{OPMARGIN}_{i(t-1)} + \phi_{13}\text{COMPINA}_{i(t-1)} + \sum_{m=1}^{M}\phi_{14m}\text{UTINT}_{mi(t-1)} + \sum_{k=1}^{K-1}\phi_{15k}\text{IND}_{ki} + \zeta_{it},$$

where IRISK is idiosynractic risk, ϕ is a parameter vector, and ζ is an error term.

$$(6)\quad \text{SRISK}_{it} = \rho_0 + \rho_1\text{ACSI}_{it} + \rho_2\text{EINNOV}_{i(t-1)} + \rho_3\text{PINNOV}_{i(t-1)} + \rho_4\left(\text{HDI}_i \times \text{PINNOV}_{i(t-1)}\right) + \rho_5\text{RSI}_{i(t-1)} + \rho_6\text{LFSIZE}_{i(t-1)} + \rho_7\text{LFAGE}_{i(t-1)} + \rho_8\text{LMSIZE}_{i(t-1)} + \rho_9\text{MGROWTH}_{i(t-1)} + \rho_{10}\text{AQUIS}_{i(t-1)} + \rho_{11}\text{ALLIANCE}_{i(t-1)} + \rho_{12}\text{OPMARGIN}_{i(t-1)} + \rho_{13}\text{COMPINA}_{i(t-1)} + \sum_{m=1}^{M}\rho_{14m}\text{UTINT}_{mi(t-1)} + \sum_{k=1}^{K-1}\rho_{15k}\text{IND}_{ki} + \sigma_{it},$$

where SRISK is systematic risk, ρ is a parameter vector, and σ is an error term.

Following Tuli and Bharadwaj (2009), we compute IRISK as follows:

$$(7)\quad \text{IRISK}_{it} = \left[\frac{1}{252}\sum_{\tau=1}^{252}(\varepsilon_{i\tau} - \bar{\varepsilon}_{i\tau})^2\right]^{1/2},$$

where τ is trading day in year t and ε_{it} is the residual from the four-factor model (Carhart 1997).

$$(8)\quad R_{i\tau} - R_{f\tau} = \alpha_{FFM} + \beta_{FFMmi}(R_{m\tau} - R_{f\tau}) + \beta_{Si}SMB_\tau + \beta_{Hi}HML_\tau + \beta_{Ui}UMD_\tau + \varepsilon_{i\tau},$$

where $R_{i\tau}$ is the return of firm i's stock, $R_{f\tau}$ is the return of a risk-free treasury bond f, $R_{m\tau}$ is the return of market index m, SMB_τ is the difference in returns between small and big stocks, HML_τ is the difference in returns between high and low book-to-market stocks, and UMD_τ is the momentum factor, all on trading day τ. The term β_{FFM} is the systematic risk parameter (Carhart 1997), and α_{FFM}, β_S, β_H, and β_U are the other parameters. The error term is as defined previously.

Following prior research (e.g., Anderson, Fornell, and Mazvancheryl 2004; Morgan and Rego 2006; Sorescu and Spanjol 2008), we lag some independent variables in the equations by a year to overcome potential endogeneity and to eliminate potential reverse causality. Furthermore, we use lagged innovativeness in Equations 3, 4, 5, and 6 to ensure that we include only service innovations introduced before customer satisfaction, firm value, and firm risk values are realized.

Model Estimation

The six equations form a recursive system. The sets of determinants and consequences equations each have a different set of observations because the corresponding dependent variable observations differ by one year. Furthermore, an analysis of the cross-correlations of error terms indicates that the errors across the e- and p-innovativeness equations are significantly correlated with one another ($p < .10$), whereas those across the consequences equations are correlated with one another ($p < .10$). Therefore, we estimated these two sets of equations using a seemingly unrelated regression (SUR) estimation approach (Zellner 1962).

Determinants of service innovativeness. Because the outcome variables in Equations 1 and 2 are count variables and a large number of firms in the data did not introduce a service innovation during a given year, we observe a high proportion of zeros in the dependent variable. We account for these excess zeros by using a zero-inflated negative binomial regression (Long and Freese 2003), which is more appropriate than a zero-inflated Poisson model if the data are overdispersed after accounting for the excess zeros, as is the case in our data.

Consequences of service innovativeness. We estimate Equations 3, 4, 5, and 6 using linear regression. As in Equations 1 and 2, we capture unobserved heterogeneity through fixed industry effects. A Hausman test comparing random- and fixed-effects models suggested we use the fixed-effects approach ($p < .01$) for these equations (Hausman 1978). Furthermore, a modified Durbin–Watson test of serial correlation (Bhargava, Franzini, and Narendranathan 1982) in the fixed-effects panel data model suggested that serial correlation is not significant ($p > .10$), consistent with the work of Morgan and Rego (2009). Because systematic risk is an estimated parameter from the four-factor model in Equation 8 and we compute idiosyncratic risk from the same model, they may be heteroskedastic. White's tests reveal that heteroskedasticity is not significant ($p > .15$) in any equation except the systematic risk equation ($p < .05$), which is mixed heteroskedastic. Thus, we estimate the consequences equation system by weighted least squares SUR, in which the systematic risk observations are weighted by the inverse of the square root of the sum of one and the estimated systematic risk variance from Equation 8.

RESULTS AND DISCUSSION

Determinants of Service Innovativeness

The results of Equations 1 and 2 appear in Table 6. Asymmetry is present between e-innovativeness and p-innovativeness in the significant determinants. Effort intensity ($p < .01$), firm size ($p < .01$), and market size ($p < .01$) are significant determinants of e-innovativeness in the expected directions, whereas firm size ($p < .01$) and firm age ($p < .05$) are significant determinants of p-innovativeness in the predicted directions. Tests of differences between the coefficients in the e-innovativeness and p-innovativeness models reveal mixed results. Effort intensity and market size have more negative effects on e- than on p-innovativeness ($p < .10$), whereas firm age does not have a more negative effect on p- than on e-innovativeness ($p > .10$).

Table 6
ZERO-INFLATED NEGATIVE BINOMIAL ESTIMATION RESULTS OF EINNOV AND PINNOV EQUATIONS

Parameter/Independent Variables	*$EINNOV_{it}$ Coefficient (SE)*	*$PINNOV_{it}$ Coefficient (SE)*
Focal Variables		
Intercept	.24 (.67)	−6.35 (1.22)***
Effort intensity$_{i(t-1)}$	−1.13 (.35)***	.17 (.84)
Organizational slack$_{i(t-1)}$	−.44 (.90)	−.85 (1.79)
Financial leverage$_{i(t-1)}$	.16 (.36)	−.32 (.56)
Firm size$_{i(t-1)}$	.30 (.09)***	.45 (.11)***
Firm age$_{i(t-1)}$	−.04 (.11)	−.20 (.10)**
Market size$_{i(t-1)}$	−.29 (.08)***	.02 (.11)
Market growth$_{i(t-1)}$	.00 (.00)	.00 (.01)
Additional Variables and Interactions		
Acquisitions$_{i(t-1)}$	.04 (.03)	−.03 (.05)
Alliances$_{i(t-1)}$	.05 (.03)	.01 (.06)
Fixed asset intensity$_{i(t-1)}$	−.14 (.46)	.74 (.63)
Competitor innovation activity$_{i(t-1)}$	.04 (.36)	.76 (.52)
Market growth × utility$_{i(t-1)}$	.01 (.01)*	.01 (.01)*
Acquisitions × utility$_{i(t-1)}$	−.11 (.07)	.11 (.09)
Alliances × utility$_{i(t-1)}$	1.30 (.35)***	−.31 (.54)
Fixed Effects/Dummy Variables[a]		
Retailing	2.02 (.34)***	2.01 (.50)***
Insurance/telecommunication	3.34 (.36)***	2.57 (.66)***
Hospitality/courier service	2.69 (.31)***	3.74 (.54)***
Airline	3.54 (.39)***	3.72 (.71)***
Internet portal/online travel service	3.77 (.36)***	−22.24 (.68)***
Computer manufacturer	2.75 (.47)***	2.15 (.58)***
Car manufacturer	2.97 (.40)***	1.82 (.63)***
Utility	2.35 (.42)***	1.86 (.62)***
Internet bubble period	−.62 (.15)***	−.17 (.19)
Model fit statistics[b]	LL = −658.11, χ^2 = 215.28, $p < .01$	LL = −408.53, χ^2 = 154.15, $p < .01$

*$p < .10$.
**$p < .05$.
***$p < .01$.
[a]Base industry is consumer goods; base year is 2000.
[b]Model fit statistics are based on independent estimation.
Notes: Sample size = 440. LL = log-likelihood.

Effect of Service Innovativeness on Customer Satisfaction

We present the estimation results for Equations 3–6 in Table 7. Whereas p-innovativeness in human-dominated industries has a significant, positive effect on customer satisfaction ($p < .01$), e-innovativeness does not have a significant effect ($p > .10$). Thus, H_2 is supported, but H_1 is not. The unexpected result for H_1 has two plausible explanations. First, many e-innovations may simply extend existing services rather than replacing them altogether. In such situations, customers can continue to benefit without changing their behavior to use the new service; thus, new services do not improve firm-level customer satisfaction. Second, customers may be satisfied or dissatisfied with a specific e-innovation, but this satisfaction does not significantly alter firm-level satisfaction. The effects of the other variables are in the expected directions.

Effects of Service Innovativeness and Customer Satisfaction on Firm Value and Firm Risk

As Table 7 shows, consistent with our expectation, e-innovativeness has a positive direct effect on firm value ($p < .10$), in support of H_3. However, p-innovativeness does not have a significant direct effect ($p > .10$). Thus, H_4 is not supported. The difference in these effects is significant ($p < .10$), with e-innovativeness having a higher effect, in support of H_5.

The results of the idiosyncratic risk model show that e- and p-innovativeness have significant, positive effects on idiosyncratic risk ($p < .01$), in support of H_6 and H_7, respectively. However, the difference in their effects is not significant ($p > .10$), contrary to H_8. Investors expect uncertainty in the performance of technology behind e-innovations. However, for p-innovations, investors anticipate high variability in service quality because of the heterogeneity in people delivering these services (Murray and Schlacter 1990). Yet, the difference in performance uncertainty for e-innovativeness and quality consistency for p-innovativeness is minimal, suggesting that both e- and p-innovativeness carry similar idiosyncratic risks.

Furthermore, customer satisfaction has a strong positive effect on firm value ($p < .01$), consistent with prior studies (e.g., Anderson, Fornell, and Mazvancheryl 2004; Fornell et al. 2006) and a significant, negative effect on idiosyncratic risk ($p < .01$). P-innovativeness has a positive direct effect on idiosyncratic risk and on customer satisfaction in human-dominated industries. Therefore, customer satisfaction partially mediates service innovativeness' effect, such that idiosyncratic risk is lower with greater satisfaction, in support of H_9. A Sobel test (Sobel 1982) of the difference between the direct effects of service innovativeness on idiosyncratic risk in models with and without customer satisfaction is significant for p-innovativeness ($p < .05$), in support of partial mediation.

The results of the systematic risk model show that e-innovativeness does not have a significant effect on systematic risk ($p > .10$). However, p-innovativeness ($p < .10$) and human-dominated p-innovativeness ($p < .10$) have significant effects on systematic risk.

Among the additional variables, firm age, market growth, acquisitions ($p < .10$), and operating margin are significantly related to firm value ($p < .01$), whereas firm size, firm age, and operating margin are significantly associated with idiosyncratic risk ($p < .01$). The effects of competitor innovation activity on firm value and idiosyncratic risk are significant ($p < .10$). Furthermore, market size and competitor innovation activity are significantly related to systematic risk ($p < .10$). Radical service innovativeness is not significantly related to customer satisfaction, firm value, or firm risk, possibly because of the low proportion of radical innovations in our data.

Robustness Checks

We performed several additional analyses to ensure that our results are robust. First, we estimated our models using the number of employees instead of sales revenues as a measure of firm size.[7] Second, we estimated our models with firm fixed effects in lieu of industry fixed effects. Third, to test for potential endogeneity of customer satisfac-

[7]Because p-innovations need employees to perform the service, the number of employees could positively influence p-innovativeness compared with e-innovativeness. However, the robustness of the result on firm size suggests that firms deploy people in various functions (e.g., research and development and technology support for e-innovations, customer support for p-innovations).

Table 7

WEIGHTED LEAST SQUARES SUR ESTIMATION RESULTS OF SATISFACTION, FIRM VALUE, AND FIRM RISK EQUATIONS

Parameter/Independent Variables	*Customer Satisfaction (ACSI) Coefficient (SE)*	*Firm Value Coefficient (SE)*	*Idiosyncratic Risk Coefficient (SE)*	*Systematic Risk Coefficient (SE)*
Focal Variables				
Intercept	82.33 (2.39)***	–.48 (.91)	.1007 (.0087)***	1.0895 (.0790)***
$ACSI_{it}$		.05 (.01)***	–.0007 (.0001)***	–.0002 (.0050)
$EINNOV_{i(t-1)}$	–.10 (.11)	.04 (.02)**	.0008 (.0002)***	–.0246 (.0214)
$PINNOV_{i(t-1)}$	–.67 (.24)***	–.01 (.04)	.0010 (.0004)**	.0973 (.0516)*
$HDI \times PINNOV_{i(t-1)}$	1.57 (.51)***	–.05 (.10)	.0006 (.0009)	–.1423 (.0782)*
Additional Variables and Interactions				
Radical service innovation $_{i(t-1)}$	.07 (.83)	–.11 (.16)	–.0005 (.0015)	.1061 (.1587)
Financial leverage $_{i(t-1)}$	–.88 (1.23)			
Firm $size_{i(t-1)}$	–.73 (.27)***	.06 (.06)	–.0032 (.0006)***	.0403 (.0521)
Firm $age_{i(t-1)}$	1.20 (.32)***	–.45 (.06)***	–.0017 (.0006)***	.0352 (.0512)
Market $size_{i(t-1)}$		–.08 (.05)	.0001 (.0005)	–.0972 (.0403)**
Market $growth_{i(t-1)}$		.01 (.00)***	–.0000 (.0000)	.0021 (.0032)
$Acquisitions_{i(t-1)}$	.24 (.17)	.05 (.03)*	.0001 (.0003)	–.0211 (.0258)
$Alliances_{i(t-1)}$	.20 (.24)	–.01 (.06)	.0000 (.0005)	.0428 (.0550)
Operating $margin_{i(t-1)}$	4.21 (2.60)	2.49 (.50)***	–.0219 (.0048)***	–.5452 (.4897)
Competitor innovation $activity_{i(t-1)}$	–1.57 (1.12)	–.44 (.25)*	.0041 (.0023)*	–.3014 (.1928)*
EINNOV × $utility_{i(t-1)}$	.54 (.32)*	–.05 (.06)	.0000 (.0006)	–.0263 (.0481)
PINNOV × utility $_{i(t-1)}$	.11 (.54)	.02 (.10)	–.0003 (.0010)	–.1297 (.0789)*
Radical service innovation × $utility_{i(t-1)}$	–5.15 (5.01)	.17 (.95)	–.0065 (.0092)	–.3583 (.7540)
Acquisitions × $utility_{i(t-1)}$	–.23 (.31)	.00 (.06)	.0026 (.0006)***	.0060 (.0510)
Alliances × utility $_{i(t-1)}$	1.65 (2.22)	–.13 (.42)	.0013 (.0041)	–.2068 (.2994)
Market growth × $utility_{i(t-1)}$		–.01 (.00)*	.0001 (.0000)	–.0026 (.0037)
Fixed Effects/Dummy Variables[a]				
Retailing	–2.76 (.77)***	.55 (.15)***	.0014 (.0014)	.2861 (.0588)***
Insurance/telecommunication	–10.59 (1.02)***	–.63 (.23)***	–.0021 (.0022)	.3192 (.0846)***
Hospitality/courier service	–5.07 (1.68)***	–.05 (.33)	–.0080 (.0031)**	.3332 (.1183)***
Airline	–13.51 (1.24)***	.01 (.28)	.0068 (.0027)**	1.0325 (.0952)***
Internet portal/online travel service	–5.27 (2.02)***	.01 (.40)	–.0017 (.0038)	.6194 (.1295)***
Computer manufacturer	–1.81 (1.09)*	–.11 (.22)	.0024 (.0021)	.3228 (.0794)***
Car manufacturer	3.04 (1.45)**	–1.19 (.30)***	.0058 (.0028)**	.2328 (.1035)**
Utility	–8.80 (.77)***	–.50 (.21)**	–.0064 (.0020)***	.2874 (.0808)***
R-square	.56	.48	.54	.53

*$p < .10$.
**$p < .05$.
***$p < .01$.
[a]Base industry is consumer goods.
Notes: Sample size = 441. HDI = human-dominated industry.

tion in Equations 4, 5, and 6, we reestimated them by replacing customer satisfaction with the residual from Equation 3 (Gourieroux et al. 1987). Fourth, we estimated our system of equations using a random-effects panel model in addition to including industry dummies. Fifth, we included lagged customer satisfaction as a proxy for pricing and management quality in Equation 3.[8] Sixth, to ensure that we captured the intensity of innovativeness appropriately, we estimated our model using different weights for new-to-the-market service innovations, ranging from two to five times the count of regular service innovations. Seventh, we estimated an alternative model in which we classified service innovations as radical and incremental (instead of e- and p-) and another with radical e-, incremental e-, radical p-, and incremental p-innovativeness. Eighth, to control for possible effects of advertising and other marketing-mix variables, we added advertising spending and selling, general, and administration expenses to our model and estimated alternative models for subsamples of firms that reported these expenditures. Finally, following Morgan and Rego (2009), we also estimated separate cross-sectional models annually. In all these cases, the results were substantively similar and did not show any significant effect of radical innovativeness.

Table 8 provides a summary of the key findings. Whereas e-innovativeness does not have a significant effect, p-innovativeness in human-dominated industries has a significant, positive effect on satisfaction. E-innovativeness has a positive direct effect on firm value, whereas p-innovativeness does not. Both e- and p-innovativeness have positive direct effects on idiosyncratic risk. However, after we account for the partial mediation of satisfaction, the overall effect of p-innovativeness in human-dominated industries on idiosyncratic risk is less positive.

THEORETICAL IMPLICATIONS

This study expands the sparse research on service innovations. In particular, it extends Green, Langeard, and Favell's (1974) and Shostack's (1977) mentions of service innovations; Berry et al.'s (2006) service innovation typology; Nijssen et al.'s (2006) view of differences in product and service innovation development; Bitner, Ostrom, and

[8]We did not include lagged customer satisfaction as an additional variable in Equations 4, 5, or 6 because of its high correlation (.88) with customer satisfaction.

Table 8
SUMMARY OF KEY FINDINGS AND HYPOTHESIZED SIGNS

	Dependent Variable				
Independent Variable	*EINNOV*	*PINNOV*	*Customer Satisfaction*	*Firm Value*	*Idiosyncratic Risk*
Customer satisfaction				+	– (– [H_9])[a]
EINNOV			n.s. (– [H_1])	+ (+ [H_3])	+ (+ [H_6])
PINNOV			+ (+ [H_2])[a]	n.s. (+ [H_4])	+ (+ [H_7])
Effort intensity	–				
Firm size	+	+	–		–
Firm age		–	+	–	–
Competitor innovation activity				–	+
Operating margin				+	–
Market size	–				

[a]Specific to human-dominated industries.
Notes: n.s. = not significant. The hypothesized signs are shown in parentheses and the hypothesis numbers are provided in square brackets within parentheses. H_5 (supported) and H_8 (not supported) are not shown.

Morgan's (2008) service innovation blueprint; and Michel, Brown, and Gallan's (2008) view of discontinuous service innovations.

Our research makes a theoretical contribution through a new framework that links service innovativeness, customer satisfaction, firm value, and firm risk. First, the results extend prior research on goods innovation (Hauser, Tellis, and Griffin 2006) by identifying the determinants of service innovativeness. They propose mechanisms by which e- and p-innovativeness are enhanced. E-innovativeness can be improved by focusing on less variable cost-based activities and smaller markets, whereas p-innovativeness can be enhanced when the firm is young.

Second, the positive effect of e-innovativeness on firm value and the lack of significant, positive effects of e-innovativeness on customer satisfaction suggest possible theoretical mechanisms for the alignment of customer and shareholder values. Our results extend related literature (e.g., Chandy and Tellis 1998, 2000; Grewal, Chandrashekaran, and Citrin 2010; Lee and Grewal 2004; Sorescu and Spanjol 2008) and shed light on a salient question: Is service innovativeness perceived as valuable by shareholders also perceived as satisfying by customers? Firms can improve customer perception of value through customer benefit enhancement, cost reduction, or both. Although conventional wisdom suggests that service innovativeness associated with high shareholder returns should satisfy customers, our results suggest otherwise. The theoretical reasoning is that e-innovations have two sides through which shareholder returns can be realized: cost reduction (supply side) and satisfaction enhancement (demand side). The RBV (e.g., Barney 1991) suggests that firms can improve their capabilities, including service innovativeness, to attain competitive advantage. In doing so, they may need to trade off cost reduction with satisfaction enhancement. Firms could realize greater shareholder value through cost-controlling or customer-satisfying service innovations. Therefore, shareholders can achieve high returns through different theoretical mechanisms; further research is necessary.

Finally, our results present nuanced risk-return theory implications for service innovativeness as related to firm value and risk. Returns and risks are theoretically positively correlated (Sharpe 1964). Our results are consistent with this theory, but only for e-innovativeness, which has a positive direct effect on both firm value and idiosyncratic risk. Investors likely anticipate higher returns with an increase in e-innovativeness. However, as a result of the functional uncertainty of e-innovations, investors also expect them to carry high risks. In contrast, although investors associate high risks with p-innovativeness because of expected variability in human performance, they are also less enthusiastic about return prospects, even in human-dominated industries. However, overall, p-innovativeness in human-dominated industries may enjoy higher returns as well as lower risk than in other industries. These outcomes may result indirectly from customer satisfaction improvements that come from employees' ability to resolve customers' problems, improving revenues and reducing demand uncertainty.

MANAGERIAL IMPLICATIONS

Our research provides fresh guidelines to managers on building service innovativeness and on managing service innovations. First, to enhance shareholder value, managers, including those in primarily goods companies, should improve service innovativeness. The traditional practice has been to focus on building goods innovativeness.

Second, regardless of whether a firm is goods- or service-dominant or in a human-dominated industry, it should leverage the Internet to develop new services. Unlike p-innovativeness, e-innovativeness has a direct positive effect on firm value. Because the Internet is not proprietary and the development of p-innovations requires people, e-innovations represent lucrative opportunities. For example, FedEx's firm value rose by 10.5% in 2003 after it introduced an e-innovation: an online duty and tax estimator service for international shippers.

Third, firms in human-dominated industries, such as hospitality and consulting, also need to nurture p-innovativeness. Employee task variety is critical to firm effectiveness (Narayanan, Balasubramanian, and Swaminathan 2009) and p-innovativeness is indirectly positively associated with firm value through customer satisfaction. Therefore, managers in these industries should enhance it by identifying, recruiting, and training qualified people. However, p-innovations resulting from more employees are not as scalable or as widely introduced as e-innovations because the ubiquity and the public nature of the Internet allow managers to develop more e-innovations than p-innovations. For example, when United Parcel Service launched its retail store service (a p-innovation), it opened one store in Georgia and took several years to scale and expand the service nationwide (Krause 2000). In contrast, Papa John's scaled its online ordering service nationally almost immediately after launch (Papa John's International 2002).

By the same token, managers in nonhuman-dominated industries, such as computers and cars, should be cautious about investing in p-innovativeness. In our study, firms in such industries experienced no positive direct or indirect effects on firm value from p-innovativeness and only adverse effects on firm risk. For example, the computer firm Gateway did not improve its firm value by introducing an in-home installation p-innovation. Instead, it steadily lost value, ultimately selling out to Acer computers at half its initial public offering value (Huang 2007).

Table 9, which reports a summary of the average number of e- and p-innovations and their incremental effects on firm value for the nine industries studied, supports this idea. Although the net (direct plus indirect) effect on firm value is more positive for human-dominated p-innovativeness than for e-innovativeness based on the coefficients alone, the net effect on firm value for an average firm in all other industries is higher for e-innovativeness than for p-innovativeness. Therefore, firms should have a stronger focus on e-innovativeness in most industries and on p-innovativeness in human-dominated industries.

Fourth, in small markets, when margins are high (low effort intensity), managers should focus on enhancing e-innovativeness. Managers need to determine whether they have wide enough margins to invest in e-innovations to leverage their low variable costs.

Fifth, the finding that service innovativeness has a nonsignificant or even negative short-term effect on customer satisfaction suggests that managers need to rethink customer satisfaction as the main outcome variable of innovation success (Boston Consulting Group 2009). Furthermore, rather than rewarding employees solely on the basis of customer satisfaction for service innovations, firms should consider incentives linked to raising firm value and lowering firm risk. Sixth, although e-innovativeness does not have a significant effect on customer satisfaction, managers should not lose sight of improving firm-level customer satisfaction through other means because it has a direct positive and significant effect on firm value.

Table 9

SUMMARY OF AVERAGE NUMBER OF EINNOVs AND PINNOVs AND THEIR EFFECTS ON FIRM VALUE (TOBIN'S Q) BY INDUSTRY

Industry	*Average Annual Number of EINNOVs per Firm*[a]	*Average Annual Number of PINNOVs per Firm*[a]	*Net Effect of EINNOVs on Firm Value*[b]	*Net Effect of PINNOVs on Firm Value*[b]
Consumer goods	.25	.05	.01	–.00
Retailing	1.70	.72	.06	–.02
Insurance/telecommunication	4.50	1.08	.16	–.04
Human-dominated industries	2.40	2.72	.08	.12
Airline	3.92	1.96	.14	–.07
Internet portal/ online travel service	12.10	.00	.42	.00
Computer manufacturer	1.92	.52	.07	–.02
Car manufacturer	3.40	.87	.12	–.03
Utility	.95	.52	.03	–.02

[a]The average is across all the firms, many of which do not introduce any service innovation in a given year.

[b]Net effect is net of the direct and indirect effects of EINNOV/PINNOV.

LIMITATIONS AND FURTHER RESEARCH

The limitations of this study suggest opportunities for further research. First, although our analysis was at the firm level, further research could focus on the innovation level. Second, exploring differences between market-creating and nonmarket-creating service innovativeness (Berry et al. 2006) would be a useful research avenue. Third, examining more potential moderators would be worthwhile. Fourth, although radical innovativeness was not significant in our model, probably due to the small number of such innovations in our data, future studies could generate additional insights by extending the study to other contexts with higher occurrences of radical innovations.

This study is the first to examine the interrelationships among service innovativeness, customer satisfaction, firm value, and firm risk. Our results reveal important new relationships and asymmetries between e- and p-innovativeness. Whereas e-innovativeness has a positively significant *direct* effect on firm value, p-innovativeness has a significantly positive net effect on firm value through its positive effect on customer satisfaction but only in human-dominated industries. Finally, both e- and p-innovativeness are positively associated with idiosyncratic risk, but customer satisfaction partially mediates this relationship for p-innovativeness in human-dominated industries to lower idiosyncratic risk. Our findings suggest that firms should nurture e- (p-) innovativeness in most (human-dominated) industries and that firms in nonhuman-dominated industries should focus only on e-innovativeness.

REFERENCES

Anderson, Eugene W., Claes Fornell, and Sanal K. Mazvancheryl (2004), "Customer Satisfaction and Shareholder Value," *Journal of Marketing*, 68 (October), 172–85.

Apple (2010), "iTunes Store Tops 10 Billion Songs Sold," press release, (February 25).

Balasubramanian, Sridhar, Prabhudev Konana, and Nirup M. Menon (2003), "Customer Satisfaction in Virtual Environments: A Study of Online Investing," *Management Science*, 49 (7), 871–89.

Barney, Jay (1991), "Firm Resources and Sustained Competitive Advantage," *Journal of Management*, 17 (1), 99–120.

Bayus, Barry, Gary Erickson, and Robert Jacobson (2003), "The Financial Rewards of New Product Introductions in the Personal Computer Industry," *Management Science*, 49 (2), 197–210.

Bendapudi, Neeli and Robert P. Leone (2003), "Psychological Implications of Customer Participation in Co-Production," *Journal of Marketing*, 67 (January), 14–28.

Berry, Leonard L., Venkatesh Shankar, Janet T. Parish, Susan Cadwallader, and Thomas Dotzel (2006), "Creating New Markets Through Service Innovation," *MIT Sloan Management Review*, 47 (Winter), 56–63.

Bhargava, Alok, L. Franzini, and W. Narendranathan (1982), "Serial Correlation and the Fixed Effects Models," *Review of Economic Studies*, 49 (158), 533–49.

Bitner, Mary Jo, Amy L. Ostrom, and Matthew L. Meuter (2002), "Implementing Successful Self-Service Technologies," *Academy of Management Executive*, 16 (4), 96–109.

——, ——, and Felicia N. Morgan (2008), "Service Blueprinting: A Practical Technique for Service Innovation," *California Management Review*, 50 (Spring), 66–94.

Boston Consulting Group (2009), *Innovation 2009: A BCG Senior Management Survey*. Boston: Boston Consulting Group.

Carhart, Mark (1997), "On Persistence in Mutual Fund Performance," *Journal of Finance*, 52 (1), 57–82.

Carroll, Glenn R. and Michael T. Hannan (2000), *The Demography of Corporations and Industries*. Princeton, NJ: Princeton University Press.

Chandy, Rajesh K. and Gerard J. Tellis (1998), "Organizing for Radical Innovation: The Overlooked Role of Willingness to Cannibalize," *Journal of Marketing Research*, 35 (November), 474–87.

—— and —— (2000), "The Incumbent's Curse: Incumbency, Size, and Radical Innovation," *Journal of Marketing*, 64 (July), 1–17.

Chow, Gregory C. (1960). "Tests of Equality Between Sets of Coefficients in Two Linear Regressions," *Econometrica*, 28 (3), 591–605.

Crook, T. Russell, David J. Ketchen Jr., James G. Combs, and Samuel Y. Todd (2008), "Strategic Resources and Performance: A Meta-Analysis," *Strategic Management Journal*, 29 (11), 1141–54.

David, Parthiban, Michael A. Hitt, and Javier Gimeno (2001), "The Influence of Activism by Institutional Investors on R&D," *Academy of Management Journal*, 44 (1), 144–57.

Dess, Gregory G. and Donald W. Beard (1984), "Dimensions of Organizational Task Environments," *Administrative Science Quarterly*, 29 (1), 52–73.

Dewan, Sanjeev and Fei Ren (2007), "Risk and Return of Information Technology Initiatives: Evidence from Electronic Commerce Announcements," *Information Systems Research*, 18 (4), 370–94.

—— and —— (2011), "Information Technologies and Firm Boundaries: Impact on Firm Risk and Return Performance," *Information Systems Research*, 22 (2), 369–88.

——, Charles Shi, and Vijay Gurbaxani (2007), "Investigating the Risk-Return Relationship of Information Technology Investment: Firm-Level Empirical Analysis," *Management Science*, 53 (12), 1829–42.

Dutta, Shantanu, Om Narasimhan, and Surendra Rajiv (1999), "Success in High-Technology Markets: Is Marketing Capability Critical?" *Marketing Science*, 18 (4), 547–68.

——, ——, and —— (2005), "Conceptualizing and Measuring Capabilities: Methodologies and Empirical Application," *Strategic Management Journal*, 26 (3), 277–85.

Eddy, Albert R. and George B. Saunders (1980), "New Product Announcements and Stock Prices," *Decision Sciences*, 11 (1), 90–97.

Fang, Eric, Robert Palmatier, and Rajdeep Grewal (2011), "Effects of Customer and Innovation Asset Configuration Strategies on Firm Performance," *Journal of Marketing Research*, 48 (June), 587–602.

Fornell, Claes, Michael D. Johnson, Eugene W. Anderson, Jaesung Cha, and Barbara Everitt Bryant (1996), "The American Customer Satisfaction Index: Nature, Purpose, and Findings," *Journal of Marketing*, 60 (October), 7–18.

——, Sunil Mithas, Forrest Morgeson III, and M.S. Krishnan (2006), "Customer Satisfaction and Stock Prices: High Returns, Low Risk," *Journal of Marketing*, 70 (January), 3–14

Garcia, Rosanna and Roger Calantone (2002), "A Critical Look at Technological Innovation Typology and Innovativeness Terminology: A Literature Review," *Journal of Product Innovation Management*, 19 (2), 110–32.

Gaspar, Joes-Miguel and Massimo Massa (2006), "Idiosyncratic Volatility and Product Market Competition," *Journal of Business*, 79 (6), 3125–52.

Gatignon, Hubert and Jean-Marc Xuereb (1997), "Strategic Orientation of the Firm and New Product Performance," *Journal of Marketing Research*, 34 (February), 77–90.

Gourieroux, Christian, Alain Monfort, Eric Renault, and Alain Trognon (1987), "Generalised Residuals," *Journal of Econometrics*, 34 (1/2), 5–32.

Green, Robert T., Eric Langeard, and Alice C. Favell (1974), "Innovation in the Service Sector: Some Empirical Findings," *Journal of Marketing Research*, 11 (August), 323–26.

Grewal, Rajdeep, Murali Chandrashekaran, and Alka V. Citrin (2010), "Customer Satisfaction Heterogeneity and Shareholder Value," *Journal of Marketing Research*, 47 (August), 612–26.

Gruca, Thomas S. and Lopo L. Rego (2005), "Customer Satisfaction, Cash Flow, and Shareholder Value," *Journal of Marketing*, 69 (July), 115–30.

Hannan, Michael T. and John Freeman (1989), *Organizational Ecology*. Cambridge, MA: Harvard University Press.

Hauser, John, Gerard J. Tellis, and Abbie Griffin (2006), "Research on Innovation: A Review and Agenda for Marketing Science," *Marketing Science*, 25 (6), 687–717.

Hausman, Jerry A. (1978), "Specification Tests in Econometrics," *Econometrica*, 46 (6), 1251–71.

Huang, Annie (2007), "Taiwan's Acer to Acquire Gateway," *USA Today* (accessed November 27, 2012), [available at http://usatoday30.usatoday.com/tech/products/2007-08-27-3752315976_x.htm].

Huergo, Elena and Jordi Jaumandreu (2004), "How Does Probability of Innovation Change with Firm Age?" *Small Business Economics*, 22 (3/4), 193–207.

Hui, Michael K. and John E.G. Bateson (1991), "Perceived Control and the Effects of Crowding and Consumer Control," *Journal of Consumer Research*, 18 (2), 174–85.

Hult, G. Tomas M., Robert Hurley, and Gary A. Knight (2004), "Innovativeness: Its Antecedents and Impact on Business Performance," *Industrial Marketing Management*, 33 (5), 429–38.

Kalaignanam, Kartik, Venkatesh Shankar, and Rajan Varadarajan (2007), "Asymmetric New Product Development Alliances: Win–Win or Win–Lose Partnerships?" *Management Science*, 53 (3), 357–74.

Kamakura, Wagner A., Vikas Mittal, Fernando de Rosa, and Jose Afonso Mazzon (2002), "Assessing the Service–Profit Chain," *Marketing Science*, 21 (3), 294–317.

Katila, Riitta and Scott Shane (2005), "When Does Lack of Resources Make New Firms Innovative?" *Academy of Management Journal*, 48 (5), 814–29.

Kim, Donald D., Teresa L. Gilmore, and William A. Jolliff (2012), "Annual Industry Accounts: Advance Statistics on GDP by Industry for 2011," *U.S. Bureau of Economic Analysis Survey of Current Business*, (May), 6–22.

Krause, Kristin S. (2000), "First UPS 'Retail' Store," *Traffic World*, (March 13), 261 (11), 38–39.

Lee, Ruby P. and Rajdeep Grewal (2004), "Strategic Responses to New Technologies and Their Impact on Firm Performance," *Journal of Marketing*, 68 (October), 157–71.

Long, Scott J. and Jeremy Freese (2003), *Regression Models for Categorical Dependent Variables Using Stata*. College Station, TX: Stata Press.

Lovelock, Christopher and Evert Gummesson (2004), "Whither Services Marketing? In Search of a New Paradigm and Fresh Perspectives," *Journal of Service Research*, 7 (1), 20–41.

Luo, Xueming and Christian Homburg (2008), "Satisfaction, Complaint, and the Stock Value Gap," *Journal of Marketing*, 72 (July), 29–43.

McAlister, Leigh, Raji Srinivasan, and MinChung Kim (2007), "Advertising, Research and Development, and Systematic Risk of the Firm," *Journal of Marketing*, 71 (January), 35–48.

Menor, L.J., Mohan V. Tatikonda, and Scott E. Sampson (2002), "New Service Development: Areas for Exploitation and Exploration," *Journal of Operations Management*, 20 (2), 135–57.

Meuter, Matthew L., Mary Jo Bitner, Amy L. Ostrom, and Stephen W. Brown (2005), "Choosing Among Alternative Service Delivery Modes: An Investigation of Customer Trial of Self-Service Technologies," *Journal of Marketing*, 69 (April), 61–83.

——, Amy L. Ostrom, Robert I. Roundtree, and Mary Jo Bitner (2000), "Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Encounters," *Journal of Marketing*, 64 (July), 50–64.

Michel, Stefan, Stephen W. Brown, and Andrew Gallan (2008), "Service–Logic Innovations: How to Innovate Customers, Not Products," *California Management Review*, 50 (Spring), 49–65.

Mithas, Sunil, M.S. Krishnan, and Claes Fornell (2005), "Why Do Customer Relationship Management Applications Affect Customer Satisfaction?" *Journal of Marketing*, 69 (October), 201–209.

Mittal, Vikas, Eugene W. Anderson, Akin Sayrak, and Pandu Tadikamalla (2005), "Dual Emphasis and the Long-Term Financial Impact on Customer Satisfaction," *Marketing Science*, 24 (4), 544–55.

Moorman, Christine and Rebecca J. Slotegraaf (1999), "Contingency Value of Complementary Capabilities in Product Development," *Journal of Marketing Research*, 36 (May), 239–57.

Morgan, Neil A. and Lopo L. Rego (2006), "The Value of Different Customer Satisfaction and Loyalty Metrics in Predicting Business Performance," *Marketing Science*, 25 (5), 426–39.

—— and —— (2009), "Brand Portfolio Strategy and Firm Performance," *Journal of Marketing*, 73 (January), 59–74.

Murray, Keith B. and John L. Schlacter (1990), "The Impact of Services Versus Goods on Consumers' Assessment of Perceived Risk and Variability," *Journal of the Academy of Marketing Science*, 18 (1), 51–65.

Narayanan, Sriram, Sridhar Balasubramanian, and Jayashankar Swaminathan (2009), "A Matter of Balance: Specialization, Task Variety, and Individual Learning in a Software Maintenance Environment," *Management Science*, 55 (11), 1861–76.

Nijssen, Edwin J., Bas Hillebrand, Patrick A.M. Vermeulen, and Ron G.M. Kemp (2006), "Exploring Product and Service Innovation Similarities and Differences," *International Journal of Research in Marketing*, 23 (3), 241–51.

Papa John's International (2002), "2002 Annual Report," (accessed November 27, 2012), [available at http://ir.papajohns.com/annuals.cfm].

QSR Magazine (2010), "Papa John Himself Finally Orders Online," (October 18), (accessed November 27, 2012), [available at http://www.qsrmagazine.com/news/papa-john-himself-finally-orders-online].

Rao, Vithala, Manoj Agarwal, and Denise Dahlhoff (2004), "How Is Manifest Branding Strategy Related to Intangible Value of a Corporation?" *Journal of Marketing*, 68 (October), 126–41.

Rubera, Gaia and Ahmet H. Kirca (2012), "Firm Innovativeness and Its Performance Outcomes: A Meta-Analytic Review and Theoretical Integration," *Journal of Marketing*, 76 (May), 130–47.

Rumelt, Richard P. (1984), "Toward a Strategic Theory of the Firm," in *Competitive Strategic Management*, Robert B. Lamb, ed. Englewood Cliffs, NJ: Prentice Hall, 556–70.

—— (1991), "How Much Does Industry Matter?" *Strategic Management Journal*, 12 (3), 167–85.

Sawhney, Mohanbir, Sridhar Balasubramanian, and Vish V. Krishnan (2004), "Creating Growth With Services," *MIT Sloan Management Review*, 45 (Winter), 34–43.

Shane, Scott, Venkatesh Shankar, and A. Aravindakshan (2006), "The Effects of New Franchisor Partnering Strategies on Franchise System Size," *Management Science*, 52 (5), 773–87.

Sharpe, William F. (1964), "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," *Journal of Finance*, 19 (3), 425–42.

Shostack, Lynn G. (1977), "Breaking Free from Product Marketing," *Journal of Marketing*, 41 (April), 73–80.

Sobel, Michael E. (1982), "Asymptotic Intervals for Indirect Effects in Structural Equations Models," in *Sociological Methodology*, S. Leinhart, ed. San Francisco: Jossey-Bass, 290–312.

Sood, Ashish and Gerard J. Tellis (2009), "Do Innovations Really Pay Off? Total Stock Market Returns to Innovation," *Marketing Science*, 28 (3), 442–56.

Sorescu, Alina B., Rajesh K. Chandy, and Jaideep C. Prabhu (2003), "Sources and Financial Consequences of Radical Innovation: Insights from Pharmaceuticals," *Journal of Marketing*, 67 (October), 82–102.

—— and Jelena Spanjol (2008), "Innovation's Effect on Firm Value and Risk: Insights from Consumer Packaged Goods," *Journal of Marketing*, 72 (March), 114–32.

Srinivasan, Rajashree, Pamela Haunschild, and Rajdeep Grewal (2007), "Vicarious Learning in New Product Introductions in Early Years of a Converging Market," *Management Science*, 53 (1), 16–28.

Srinivasan, Shuba and Dominique M. Hanssens (2009), "Marketing and Firm Value: Metrics, Methods, Findings, and Future Directions," *Journal of Marketing Research*, 45 (June), 293–312.

——, Koen Pauwels, Jorge Silva-Risso, and Dominique M. Hanssens (2009), "Product Innovations, Advertising, and Stock Returns," *Journal of Marketing*, 73 (January), 24–43.

Tirunillai, Seshadri and Gerard Tellis (2012), "Does Chatter Really Matter? Dynamics of User-Generated Content and Stock Performance," *Marketing Science*, 31 (2), 198–215.

Tuli, Kapil and Sundar G. Bharadwaj (2009), "Customer Satisfaction and Stock Returns Risk," *Journal of Marketing*, 73 (November), 184–97.

Wade, Michael and John Hulland (2004), "Resource-Based View and Information Systems Research: Review, Extension and Suggestions for Future Research," *MIS Quarterly*, 28 (1), 107–142.

Weinberger, Joshua (2010), "CRM: Then and Now," DestinationCRM.com, (accessed July 6, 2012), [available at http://www.destinationcrm.com/Articles/Editorial/Magazine-Features/CRM-Then-and-Now-68083.aspx].

World Bank (2009), *World Development Indicators 2009*. Washington, DC: World Bank Publications.

Zellner, Arnold (1962), "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests of Aggregation Bias," *Journal of the American Statistical Association*, 57 (298), 348–68.