

# THE ANTECEDENTS AND CONSEQUENCES OF E-PURCHASING TOOLS USAGE IN SUPPLY MANAGEMENT

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This study develops an integrated model of the antecedents and consequences of e-purchasing tools (EPTs) adoption in supply management. Based on the technology adoption model, it explores how Internet skill and Internet convenience, as well as supplier support, are associated with the implementation of EPTs. Leveraging the business-to-business relationship literature, we examine the potential associations between EPTs usage and yet untested, managerially relevant variables of supplier cooperation, internal service performance, and purchasing performance. Results indicate that EPT implementation is associated with the purchasing function's internal service performance and supplier cooperation. Moreover, the results suggest that suppliers' support, in tandem with users' perceptions of convenience, is correlated with successful adoption.

This research defines e-purchasing tools (EPTs) as Internet-based systems that facilitate buyer-seller transactions (e.g., Internet-based buyer-supplier applications, enterprise resource planning systems) and enhance organizational and supply chain performance. EPTs fall within the overall framework of e-business systems. Essentially, e-business systems link organizations electronically to enable the exchange of goods and services and related information that can facilitate interfirm collaboration (Vakharia 2002). EPTs provide organizations with faster, more efficient purchasing processes (Antonette, Giunipero, and Sawchuk 2002; Kim and Pae 2007; Walters 2008). Correspondingly, EPT implementation liberates supply managers from mundane and routine tasks while enabling both intra- and interfirm communication, thus paving the way for enhanced organizational performance (Monczka et al. 2009). Furthermore, EPTs implementation has been shown to enhance the entire purchasing cycle from requisition to price quotation and from order placement to evaluation (Svensson 2003). Thus, EPTs have the potential to positively affect holistic marketing and supply chain management-driven organizations.

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Although previous research has demonstrated the potentially positive outcomes associated with EPT usage, the literature is relatively silent on the effects of EPT implementation on the focal firm's inner workings and has instead focused on EPTs' impact on relationships with suppliers (see Jap 2002, 2003). Since supply managers serve in a boundary-spanning capacity—they interface with multiple internal customers—the implementation of EPTs can have wide-ranging effects on the organization and its employees who are served through the acquisition of needed goods and services (Fredendall, Hopkins, and Bhonsle 2005; Monczka et al. 2009). Regarding buyer-supplier relationships, the literature has suggested that EPT adoption can be beneficial as well as detrimental (see Jap 2003; Percy, Giunipero, and Wilson 2007). For example, Jap (2002) has argued that the adoption of one EPT, reverse auctions, raises the suspicion of opportunism, whereas Percy, Giunipero, and Wilson (2007) have argued that reverse auctions can serve to maintain the relationship between parties to an exchange (also see Archer, Wang, and Kang 2008; Goldsby and Eckert 2003). Thus, additional research is needed to gain a more thorough understanding of EPTs' effect on intra- and interorganizational relationships.

Prior research has also grappled with enumerating the factors that influence the adoption of technology in a broad sense and EPTs in a narrower sense (Davis, Bagozzi, and Warshaw 1989; Lancioni, Smith, and Schau 2003; Premkumar and Bhattacharjee 2008). More concretely, individual difference variables such as perceived ease of use and

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The authors acknowledge and thank the three anonymous *JMTP* reviewers for their assistance in improving this paper.

perceived usefulness have been found to be instrumental in the adoption of technological innovations, suggesting that successful adoption is contingent on perceptions of the time investment required for user proficiency, as well as the technology's ability to make tasks easier to accomplish (see Davis, Bagozzi, and Warshaw 1989). At the same time, firm-level factors, such as cost savings, the prospect of strengthening buyer-supplier relationships, transaction size limitations, and suppliers' commitment levels, affect the organizational decision to adopt and implement EPTs (Archer, Wang, and Kang 2008; Goldsby and Eckert 2003). Since employees play a central role in the adoption of any organizational initiative, and since implementation success can hinge on supplier assistance, additional research on the efficacy of these factors in a supply management context is needed.

For these reasons, we develop and test an integrative model of the adoption of EPTs in supply management. The purpose of this study is to explore the factors that may influence the adoption of EPTs, and to test the association between EPT usage and purchasing performance. Drawing on the logic undergirding the technology adoption model (TAM) and findings from the interorganizational relationships literature, factors both internal and external to the firm that encourage technology use are evaluated (Cagliano, Caniato, and Spina 2003; Davis, Bagozzi, and Warshaw 1989; Deeter-Schemlitz and Kennedy 2002; Dyer and Singh 1998). In particular, this study applies TAM to consider how perceived Internet convenience and perceived Internet skill, as well as supplier support, are related to EPT usage. Both of the antecedent variables, perceived Internet convenience and perceived Internet skill, are adapted from the TAM, whereas supplier support is drawn from previous research that suggests its centrality in the EPT adoption process. Moreover, the association between EPTs and perceptions of internal service performance, in addition to that with supplier cooperation, are investigated (Fredendall, Hopkins, and Bhonsle 2005). Furthermore, the linkage between supplier cooperation and internal service performance is evaluated. Finally, the association of these factors with purchasing performance is studied (see Figure 1).

In the following sections, the theoretical underpinnings of the research model are presented. Next, the literature relating to elements of the research model is reviewed (see Figure 1). Hypotheses to test the modeled relationships are then proposed. This discussion addresses the model in a left-to-right fashion, beginning with an overview of constructs that are hypothesized to correlate with the EPT adoption process, while ending with a summary of the potential impact of implementation on several managerially

relevant outcomes. A discussion of the research method and results follows. Finally, recommendations for supply chain managers are offered.

## CONCEPTUAL BACKGROUND

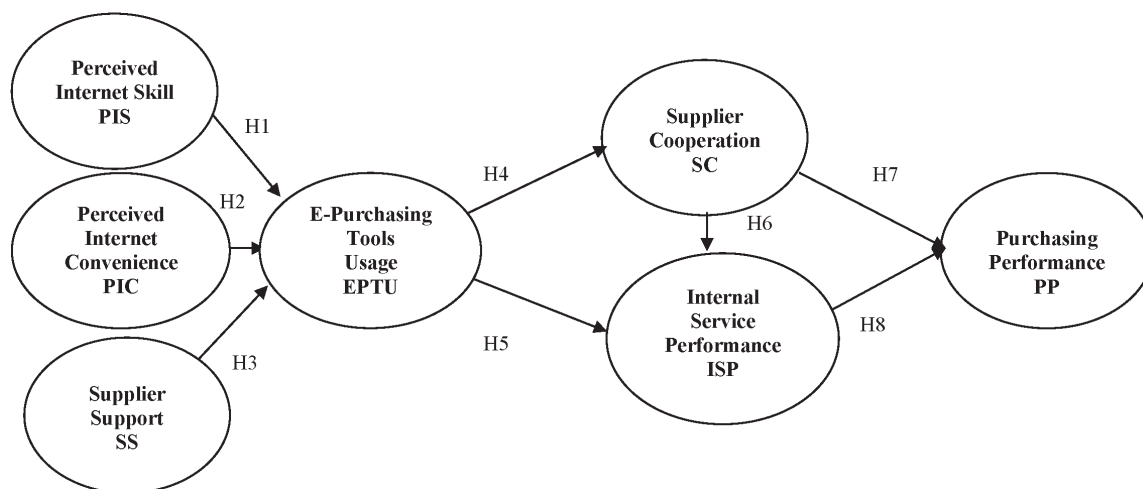
### Theoretical Underpinnings

Despite the fact that EPT usage provides advantages and disadvantages, their adoption in business-to-business (B2B) marketing continues unabated (Monczka et al. 2009). TAM is perhaps the most widely recognized model that has been proposed to explain technology adoption (Davis, Bagozzi, and Warshaw 1989). This theory postulates that a combination of employee-level, individual differences, such as perceived ease of use and perceived usefulness, are instrumental in the adoption of new technologies. TAM's supporting logic suggests that individuals are reticent to adopt a technology unless it solves a particular problem; that is, that the technology in question contains attributes that when applied either fill a need or resolve an issue. This implies that individuals are goal directed; preferring to learn a new technology if doing so provides a payoff. Furthermore, with regard to perceived ease of use, individuals are more willing to adopt a given technology if doing so does not require a substantial investment in time and effort for the adoptee to develop facility with the technology. In a sense, this implies that individuals are cognitive misers and thus are unwilling to sacrifice scarce resources (e.g., cognitive capacity) to accomplish a task unless its mastery can be attained with relative ease.

TAM research primarily investigates intrafirm technology adoption (Davis, Bagozzi, and Warshaw 1989; Jackson, Chow, and Leitch 1997). As mentioned earlier, however, since EPTs usage spans organizational boundaries, the findings from prior research may not be applicable to this particular context. Moreover, EPT implementation requires supplier support and assistance, as well as a commitment from internal users, in order to be effective. This, too, calls for additional research on the effects of related factors. Thus, we have included two variables that closely map on to those found in the TAM and added a third (supplier support) to account for the boundary-spanning nature of the supply management function. These constructs are discussed in greater detail in the following section. We now turn our attention to relationship marketing theory and how it informs our research model.

Supplier-buyer relationships have become an increasingly important part of the exchange process, as they represent a potential source of competitive advantage (Ulaga

**Figure 1**  
The Antecedents and Consequences of E-Purchasing Tool Usage in Purchasing/Supply Management



and Eggert 2006). As such, relationship management skills are highly coveted. They are defined as the ability to act ethically, listen effectively, communicate, and use creative problem-solving techniques. In fact, this employee competency is one of the most highly rated by supply managers (Monczka et al. 2009). In addition, relationship management skills are used by supply managers both within as well as external to the organization. When used internally, they enable the cultivation of strong relationships with internal customers, therefore leading to enhanced internal service performance. When used external to the organization, relationships can result in asset-specific investments. Such cooperative arrangements have been proven mutually beneficial to both the buyer and supplier (Dyer and Singh 1998). Specifically, more effective buyer-seller relationships help to jointly manage uncertainty, lower total costs, and enhance product development. Relationships, furthermore, permit increased sensitivity to partners' needs, deepening these bonds (Cannon and Perreault 1999). Therefore, the resulting supplier cooperation creates value for both parties, reinforcing a virtuous cycle (Ulaga and Eggert 2006). Stated differently, enhanced relationship management skills, in conjunction with internal customer integration, add value to the organization and, hence, improve purchasing performance. In the following section, we develop a series of research hypotheses to test the aforementioned theories.

### Antecedents to E-Purchasing Tool Usage

As stated above, the purpose of the present research is to examine the interrelationship between EPT usage and purchasing performance, as well as to consider the factors that

may influence their adoption. Although research has shown that a variety of factors contribute to EPT implementation, these factors can be generally described as employee and organizationally related (Cho and Chang 2008; Hernandez, Jimenez, and Martin 2009; Lee and Park 2008). The research model considers two individual difference variables and one external organizational variable as they are subject to managerial influence. The following is an overview of these antecedent factors.

Perceived Internet skill and perceived Internet convenience have been found to play an influential role in technology adoption (Hernandez, Jimenez, and Martin 2009). Closely mapping on to factors found in TAM, perceived Internet skill and perceived Internet convenience are related to the individual user's cognitive appraisals of a technology's usefulness, and hence should affect its adoption (Davis, Bagozzi, and Warshaw 1989). As alluded to above, the individual and his or her perceptions have been shown to be valid predictors of adoption behavior. Furthermore, since organizations are composed of individual employees who may choose to create unwarranted barriers to adoption, understanding employee attitudes is managerially relevant (Cho and Chang 2008).

Additional support for individual difference variables in technology acceptance comes from behavioral studies in marketing. For instance, Novak, Hoffman, and Yung (2000) studied the individual's cognitive state during Internet use. Levels of arousal, attention, and Internet skill are found to be vital components that result in adoption behavior. Also, in a study examining the industrial buyer's perceptions of the usefulness of the Internet in B2B transactions, Deeter-Schmelz and Kennedy (2002) found that percep-

tions of Internet skill and convenience played a central role in technology acceptance—where the former refers to the employee’s capabilities, acumen, and level of comfort while using these technologies, and the latter refers to the employees’ perceptions that their jobs will be made easier through usage. Taken collectively, these research studies suggest that individual difference variables affect a firm’s tendency toward implementing EPTs. Therefore, this study hypothesizes:

*Hypothesis 1: The supply manager’s perceived level of Internet skill is positively related to a firm’s EPT usage.*

*Hypothesis 2: The supply manager’s perceptions of Internet convenience are positively related to a firm’s EPT usage.*

Whereas individual differences have proven to be worthwhile explanatory and predictive variables for adoption behavior, the addition of organizational factors provides for a more thorough understanding (Wu and Li 2007). In this regard, research has emphasized the role played by supplier support (supplier assistance, incentives, and encouragement) in technology adoption (Deeter-Schmelz et al. 2001). For instance, in research investigating the efficacy of several supplier-initiated strategies designed to encourage the use of Web-based communication tools, Deeter-Schmelz and Kennedy (2002) found that supplier support was a critical factor. Furthermore, Ellram and Hendrick (1995) discovered that high levels of supplier support were associated with connectivity among supply partners. Corsten and Kumar (2005) suggested a linkage between supplier support and the implementation of efficient consumer response programs. Furthermore, in research on the intersection between the e-marketplace and purchasing/supply management, supplier support services were shown to influence the functioning of the e-marketplace (Eng 2004). Finally, Lee, Lee, and Kwon (2005) suggested that supplier-based incentives drove intentions to use a computer-based reservation system. In sum, research suggests that supplier support affects the organization’s adoption of EPTs. Therefore, this study asserts the following hypothesis:

*Hypothesis 3: The supply manager’s perceptions of supplier support are positively related to a firm’s EPT usage.*

### **E-Purchasing Tool Usage**

EPT usage represents the firm-wide adoption of Internet-based technologies. Initial e-purchasing research efforts focused on how EPTs streamline the transaction process and

reduce the administrative cost associated with the acquisition of low-cost items. In fact, Krajlíc (1983) developed a matrix of purchased items that ranged from noncritical to strategic. Naturally, noncritical items are among the first procured using EPTs, are typically low in dollar value, and yet generate many purchase orders. The sizable number of purchase orders for small dollar value items generated significant transaction costs under a manual system. Thus, their acquisition through EPTs greatly reduces transaction costs at little or no risk to the firm (Antonette, Giunipero, and Sawchuk 2002).

EPT usage has been shown to facilitate buyer-supplier transactions (Lancastre and Lages 2006), despite the fact that the use of certain EPTs, such as online reverse auctions, can have a potentially damaging effect on buyer-supplier relationships (see Jap 2002, 2003). Recent studies investigating this linkage, however, suggest otherwise (Gattiker, Huang, and Schwarz 2007; Percy, Giunipero, and Wilson 2007). Consider that Michelino, Bianco, and Caputo (2008) found that heightened levels of collaboration resulted from the implementation of what is deemed “Internet-based tools.” This study suggests that an increase in collaboration resulted from the free flow of information that EPTs allow (also see Lancastre and Lages 2006). Furthermore, a dyadic study keying in on product customization and information exchange between parties found that relationships improved with the implementation of e-business technologies (Klein 2007). Finally, Percy, Giunipero, and Wilson (2007) found that supplier cooperation remains intact in reverse auctions usage as long as the supplier anticipates future business transactions. Thus, the research presented hypothesizes that EPT usage promotes cooperative buyer-supplier relations. More formally stated:

*Hypothesis 4: EPT usage is positively related to supplier cooperation.*

### **Internal Service Performance**

Internal service performance is defined as the extent to which purchasing performs its required tasks “quickly, accurately, completely and with the intent of satisfying internal customers” (Goebel, Marshall, and Locander 2003, p. 5). This definition implies that all organizational employees are potential or actual customers of the purchasing function’s services and internal service performance is a value-added function of the firm. Since one of the major goals of the purchasing/supply management function is to meet the needs of internal customers, their satisfaction levels must be taken into account (Finn et al. 1996; Monczka et al.

2009). Naturally, internal customers want fast, responsive, and quality service. Therefore, it is incumbent on the purchasing function to ensure that internal customers' needs are met, if not exceeded (Fredendall, Hopkins, and Bhonsle 2005). The implementation of EPTs assists in achieving this goal by streamlining the requisition process, resulting in improved perceptions of service performance (Min and Galle 2003).

Despite the potentially beneficial effects that EPT usage can have on internal service performance, the literature offers scant coverage on this topic. In fact, most of the studies that deal with these effects examine the broader issue of information technology implementation and its effects on internal business processes (Liu and Tsai 2007). These studies suggest, however, that technology adoption has a positive effect on internal service performance. Carr and Pearson (2002) found that involvement by purchasing had a positive effect on performance of the firm as a whole, and Gonzalez-Benito (2007) found that the contribution of purchasing to firm performance was dependent on purchasing performance, in terms of efficacy, strategy, and capabilities. A study of the implementation of a Web-based information sharing system in Taiwan, for example, suggested that using the system resulted in improvements in performance to both internal and external customers (Liu and Tsai 2007). In a related study, the implementation of an electronic human resources management system was predicted to improve perceptions of the human resources department's service level (Rüel, Bondarouk, and Van der Velde 2007). Finally, research on knowledge management systems in small to medium-size firms has suggested that system adoption has positive effects on internal business processes (Lee, Ho, and Chiu 2008). By extension, these studies demonstrate that EPTs usage should positively affect perceptions of internal service performance. Therefore, this study hypothesizes:

*Hypothesis 5: EPT usage is positively related to internal service performance.*

## Supplier Cooperation

Supplier cooperation plays an integral role in the buyer-seller exchange process because it serves to deepen relationships (Dwyer, Schurr, and Oh 1987). Cooperation levels also serve to differentiate suppliers, where some represent key business partners (Ulaga and Eggert 2006). Defined in a broad sense, supplier cooperation involves the firm's willingness to strive for mutually beneficial relationships with its channel partners, which oftentimes means the encouragement of interfirm transparency; that is, complete

honesty, integrity, and fair dealing (Pearcy, Giunipero, and Wilson 2007). Implied in this definition is the notion that cooperative suppliers are market oriented, seek feedback from their customers, and maintain flexibility in order to improve their services, with the hopes of developing long-term relationships and/or attaining strategic supplier status (Lancastre and Lages 2006; Lee 2004). This is contrasted with supplier support, an antecedent to EPT usage in the research model, which was defined earlier as the supplier's enactment of systems to encourage and incentivize the implementation of Internet-based technologies to facilitate buyer-supplier interaction.

Stanley and Wisner (2001) found that collaborative buyer-supplier relations resulted in improved perceptions of internal service performance. Fredendall, Hopkins, and Bhonsle (2005) showed that supplier cooperation was linked to assessments of internal service levels. Building on this research, and the findings on the benefits that can accrue to the firm as a function of EPT adoption, the current study examines the possible impact of supplier cooperation on internal service performance. More formally,

*Hypothesis 6: Supplier cooperation is positively related to internal service performance.*

Supplier cooperation has been shown to provide firms with both strategic and operational advantages (Morgan and Hunt 1994). For example, Ulaga and Eggert (2006) found that supplier cooperation allowed some suppliers to earn strategic supplier status. Furthermore, cooperative relationships encouraged buyer-supplier knowledge sharing and asset-specific investments, allowing for mutual gains (Dyer 1997; Dyer and Singh 1998). For these reasons, this study hypothesizes:

*Hypothesis 7: The level of supplier cooperation is positively related to purchasing performance.*

Although a linkage between a firm's internal service performance and purchasing performance has a strong intuitive appeal, there is a shortage of research on this specific relationship (Stanley and Wisner 2001). However, it could be argued that firms incorporating internal service performance into their organizations are essentially implementing the total quality management (TQM) philosophy (Johnston 2008). Since research that assesses the effects of TQM implementation suggests that doing so affects external performance (e.g., customer perceptions of the firm), it stands to reason that doing so may also affect purchasing performance (Johnston 2008). In addition, a parallel can be drawn from research on the profit-value chain. In this regard, the logic undergirding the profit-value chain sug-

gests that firms that maintain high levels of internal service performance, through treating employees as valued customers, tend to reap improved operational performance and, consequently, sales and profit increases (Heskett, Sasser, and Schlesinger 2003). For these reasons, we propose to explore the following hypothesis:

*Hypothesis 8: A firm's level of internal service performance is positively related with purchasing performance.*

## Purchasing Performance

Although potential cost reductions represent the most obvious benefit accruing to companies that strategically adopt EPTs, a host of benefits can be garnered by technologically enabled firms. Specifically, firms experience improved information transfer efficiency and timeliness, as well as higher levels of information transparency (Cagliano, Caniato, and Spina 2003). For this reason, purchasing performance is defined as the benefits that supply managers gain through using EPTs, serving as the research model's outcome variable.

## METHOD

### Sample and Participant Characteristics

Professional supply managers, who were members of the Institute for Supply Management, composed the study's sampling frame. A heterogeneous sample of firms with respect to geographic location, business type, and firm size was randomly generated from the membership list. A total of 899 members were then mailed surveys. One hundred seventeen usable surveys were received, among which 13 were eliminated from consideration because of the respondent's failure to complete the survey. Consequently, 104 completed surveys were evaluated. The response rate was 13 percent, in line with those found in purchasing/supply management research (e.g., Larson 2005; Percy, Giunipero, and Wilson 2007). The sample, it should be noted, was received in two waves, yielding 74 early and 30 late respondents. The results from an independent samples *t*-test conducted using SPSS 18 indicated that there were no significant differences between respondent groups with regard to their survey answers ( $t = 1.098$ ,  $df$  [degrees of freedom] = 102,  $p = 0.275$ ) (Armstrong and Overton 1977).

A broad range of firms was sampled, including both product and service organizations (e.g., automotive, electronics, machinery, and health care). Respondent titles ranged from buyer to vice president of strategic sourcing, with

the majority employed as purchasing managers. Firm size, reported in terms of annual sales revenue, fell into three broad categories: (1) small (15.4 percent), with less than \$99 million in annual revenues; (2) medium (26.9 percent), with \$100–\$499 million in annual revenues; and (3) large (51.9 percent), with over \$500 million in annual revenues. The sampled firms employed 14 to 250,000 people, with a median of 1,000 employees. All the respondents used EPTs in their purchase cycle, and as part of the sourcing process. For example, 81.6 percent and 91.3 percent of the firms purchased and quoted, respectively, as much as half their annual spending using EPTs (see Table 1). The respondents were asked to indicate their use and application of EPTs.

### Measures

The survey consisted of several multi-item scales that were adapted from prior research. Adapted from the International Manufacturing Strategy Survey (Cagliano, Caniato, and Spina 2003; Lancioni, Smith, and Schau 2003), the EPT usage scale consisted of 16 semantic differential items that served to create an index of Internet procurement practices. Perceived Internet skill, supplier support, and perceived Internet convenience were measured using 12 Likert scale items. These measures tapped into perceptions of Internet usage skills and impressions of the level of supplier support received by their firms (Deeter-Schmelz and Kennedy 2002; Novak, Hoffman, and Yung 2000). The scales for supplier cooperation and internal service performance were adapted from Fredendall, Hopkins, and Bhonsle (2005) to measure these constructs. Finally, an adapted version of the strategic business unit (SBU) performance measure, found in Wu, Mahajan, and Balasubramanian (2003), was used to measure purchasing performance. A complete list of the survey items is in the Appendix.

Efforts were made to minimize the risk, as well as to test for the occurrence, of common methods bias (Lindell and Whitney 2001; Podsakoff et al. 2003). First, to reduce the risk of methods bias, participants were assured of anonymity and only published scales were used. Second, to determine if the use of a single research method had contaminated the data, the Harman one-factor test was conducted prior to estimating the model's parameters (Harman 1976). Here, an exploratory factor analysis (EFA) using principal axis factoring with an unrotated factor solution in SPSS 18 was conducted on all of the scale items identified in the research model. The EFA yielded a 10-factor solution, with each construct containing an eigenvalue greater than 1.0, and 64.25 percent of the variance in the data explained

by the emergent factor structure. Since a 10-factor solution was found, and since the main factor did not account for a majority of the data's variance (23.87 percent), the effects associated with using a common research method did not appear to have biased the study's findings.

### Model Estimation

Given our relatively small sample ( $n = 104$ ), path analysis with Amos 18 was used to test the hypothesized model (see Goldsmith 2002; Medina and Michaels 1994). Similar to covariance-based structural equation modeling techniques, path analysis permits an assessment of the relative impact of a series of exogenous or endogenous constructs. Although path analysis does not model latent constructs and consequently does not partial out measurement error, the technique allows for the simultaneous testing of a series of regression models containing summated variables. Thus, path analysis illuminates construct interrelationships that might have been obscured in an ordinary least squares (OLS) regression analysis (see Pedhazur 1997).

Prior to conducting the path analysis, a scale purification process was undertaken. Specifically, a confirmatory factor analysis using Amos 18 assessed the psychometric properties of six of the seven constructs identified in the research model ( $n = 104$ ,  $\chi^2 = 214.24$ , 174 df; CFI [comparative fit index] = 0.97, TLI [Tucker-Lewis index] = 0.96, and RMSEA [root mean square error of approximation] = 0.047). The EPTs scale was not included in this process, given that it is a formative construct. Each construct proved to be highly reliable, as composite reliabilities exceeded the recommended threshold ( $> 0.70$ ) (Nunnally and Bernstein 1994). In addition, the constructs were tested for convergent and discriminant validity (Anderson and Gerbing 1988; Fornell and Larcker 1981). Here, the model's constructs were found to exhibit convergent validity, as the  $t$ -values for each factor loading ( $\lambda$ ) were statistically significant ( $p < 0.05$ ) and substantial (see Tables 2 and 3). It should be mentioned, however, that the perceived Internet convenience and supplier cooperation scales each had one item deleted because they exhibited low factor loadings and because their deletion improved the scales' composite reliabilities but did not alter construct validity. Furthermore, the model's constructs were tested for discriminant validity by comparing the average variances extracted for each construct with the shared variance between the constructs (Fornell and Larcker 1981). Each construct was found to be distinct, as the average variances extracted were greater than the shared

**Table 1**  
**Demographics of Respondents**

Category	Percentage of Respondents
Respondent Title	
Vice president or director of strategic sourcing	3.8
Supply chain manager	10.6
Purchasing manager	25.0
Materials manager	6.7
Logistics manager	0.9
Senior buyer	15.4
Buyer	18.3
Other	19.3
Annual Revenues	
Small firms (less than \$99 million)	15.4
Medium-size firms (\$100–\$499 million)	26.9
Large firms (over \$500 million)	51.9
Not reported	5.8
Employees	
100–499	38.5
500–2,499	27.9
2,500–24,999	28.6
Over 25,000	5.0
Purchases	
Use of e-purchasing tools for making purchases (percentage of total purchase expenditures) <sup>1</sup>	
10 and less	45.2
11–20	12.5
21–49	23.9
50 and above	18.4
Use of e-purchasing tools for obtaining quotes (percentage of total expenditures) <sup>2</sup>	
10 and less	56.7
11–20	12.5
21–49	22.1
50 and above	8.7

<sup>1</sup> Use of e-purchasing tools for making purchases (percentage of total purchase expenditures) = Total expenditures contracted via e-purchasing tools/Total expenditures for all goods and services.

<sup>2</sup> Use of e-purchasing tools for obtaining quotes (percentage of total purchase expenditures) = Total expenditures quoted via e-purchasing tools/Total expenditures for all goods and services.

variances between constructs (Fornell and Larcker 1981) (see Table 3).

## RESULTS

### Parameter Estimates and Hypothesis Testing

After determining that the model's constructs exhibited adequate psychometric properties, a path analysis was conducted

**Table 2**  
Scale Statistics

Variable	Mean	Standard Deviation	Average Variances Extracted (Percent)	Parameter Estimates	t-Values
Perceived Internet Skill	5.79	0.89	57	0.69–0.82	6.4–6.8
Perceived Internet Convenience	4.86	1.15	53	0.67–0.79	5.9–6.1
Supplier Support	4.00	1.21	57	0.60–0.86	5.7–6.7
External Supplier Cooperation	4.01	1.70	70	0.76–0.94	8.5–9.6
Internal Service Performance	5.89	1.15	74	0.73–0.97	10.0–19.5
Purchasing Performance	5.04	1.22	66	0.72–0.87	7.5–9.4

Notes:  $n = 104$ ,  $\chi^2 = 214.24$ , 174 df, CFI = 0.97, TLI = 0.96, RMSEA = 0.047.

**Table 3**  
Correlation Matrix

Variable	1	2	3	4	5	6	7
Perceived Internet Skill	<b>0.80</b>	0.20	0.06	0.01	0.00	0.00	0.05
Perceived Internet Convenience	0.45	<b>0.77</b>	0.11	0.08	0.00	0.00	0.16
Supplier Support	0.25	0.33	<b>0.79</b>	0.14	0.02	0.00	0.11
E-Purchasing Tools Usage	0.11	0.29	0.38	—	0.17	0.08	0.28
Supplier Cooperation	0.06	–0.01	0.15	0.41	<b>0.88</b>	0.01	0.05
Internal Service Performance	–0.01	0.04	0.04	0.29	0.11	<b>0.92</b>	0.04
Purchasing Performance	0.23	0.40	0.34	0.53	0.22	0.19	<b>0.91</b>

Notes: Intercorrelations are presented in the lower triangle of the matrix. Construct reliabilities for each scale are depicted in boldface on the diagonal. Shared variances in percentages are in the upper triangle of the matrix.

using Amos 18. To accomplish this, summated variables were created by taking the average of each latent construct's items. Table 4 and Figure 2 contain the results from the path analysis, showing the model's estimated beta and gamma coefficients, as well as its *t*-values and *R*<sup>2</sup> values.

The results provided support for several of the research hypotheses. Parameter estimates for the supported paths were 0.21, 0.33, 0.41, 0.29, and 0.21, respectively ( $p < 0.05$ ) (see Table 4). Specifically, the hypotheses that both perceptions of perceived Internet convenience ( $\gamma = 0.21$ ,  $p < 0.05$ ) and supplier support ( $\gamma = 0.33$ ,  $p < 0.05$ ) play an integral role in a firm's adoption of EPTs were supported (H2 and H3). Next, the hypotheses that EPT usage is related to both supplier cooperation ( $\beta = 0.41$ ,  $p < 0.05$ ) and internal service performance ( $\beta = 0.29$ ,  $p < 0.05$ ) were also supported (H4 and H5). Supplier cooperation was shown to be significantly linked to purchasing performance (H7). The relationship between internal service performance and purchasing performance was found to border on statistical significance ( $\beta = 0.17$ ,  $p < 0.10$ ) (see Table 4 and Figure 2). In a final

analysis, a multigroup path analysis was conducted to determine if the effects were robust to firm size, based on sales volume (see Table 4). The results indicated heterogeneity of effects, as the only relationship that held across firm size was that between supplier support and purchasing performance ( $\gamma = 0.46$ ,  $p < 0.05$ ;  $\gamma = 0.55$ ,  $p < 0.005$ ;  $\gamma = 0.33$ ,  $p < 0.05$ , for small, medium, and large firms, respectively).

In terms of variance explained, the endogenous variables in the study featured *R*<sup>2</sup> values of 17 percent for both EPTs usage and supplier cooperation and 8 percent for both internal service performance and purchasing performance (see Table 4). A calculation of effect size ( $f^2 = R^2/1 - R^2$ ) suggests that a medium amount of variance is explained by the former endogenous constructs ( $f^2 = 0.20$ ), while a small amount is explained by the latter endogenous constructs ( $f^2 = 0.09$ ) (Cohen 1992). In sum, the constellation of constructs found in the research model is useful for explaining variance in both proximal and distal outcomes, although it does not provide a complete explanation for the phenomena under investigation.

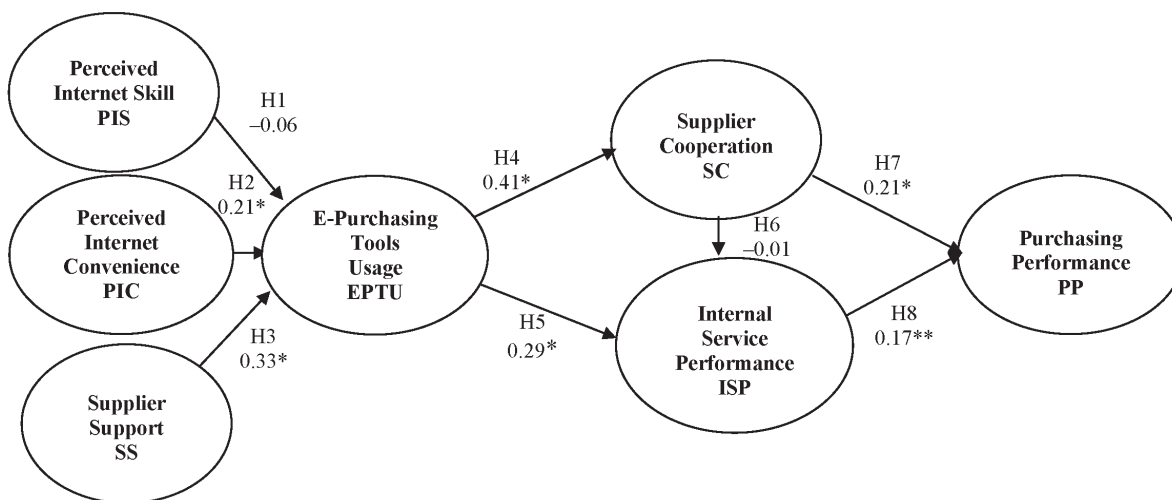


**Table 4**  
**Path Analysis Parameter Estimates**

Hypothesized Paths	Completely Standardized Coefficients	t-Value	R <sup>2</sup> (Percent)
Perceived Internet Skill → E-Purchasing Tools Usage	-0.06	-0.62	17
Perceived Internet Convenience → E-Purchasing Tools Usage	0.21*	1.99	
Supplier Support → E-Purchasing Tools Usage	0.33*	3.40	
E-Purchasing Tools Usage → Supplier Cooperation	0.41*	4.52	17
E-Purchasing Tools Usage → Internal Service Performance	0.29*	2.81	8
Supplier Cooperation → Internal Service Performance	-0.01	-0.08	
Supplier Cooperation → Purchasing Performance	0.21*	2.16	8
Internal Service Performance → Purchasing Performance	0.17**	1.77	

Notes: The table shows the parameter estimates (β and γ coefficients) derived from the path analysis. \*  $p < 0.05$ ; \*\*  $p < 0.10$ .

**Figure 2**  
**Path Analysis Results**



\*  $p < 0.05$ ; \*\*  $p < 0.10$ .

**DISCUSSION AND IMPLICATIONS**

Taken collectively, the findings suggest that EPT usage is associated with improvements in perceptions of purchasing performance. More specifically, supply managers suggested that the use of EPTs was linked to reducing the costs involved with materials and services acquisition. Furthermore, the results indicate that EPT usage may help to improve relationships among suppliers. This finding suggests that EPT usage is linked to cooperation with suppliers and, hence, the strengthening of buyer-supplier bonds. This further implies that this high level of cooperation could facilitate the creation of synergies that provide joint opportunities for relational rent extraction; that is, the capacity to gar-

ner significantly higher than average returns on business activities as a function of collaborative endeavors (Dwyer, Schurr, and Oh 1987). This linkage also implies that relationships may emerge as a result of supplier cooperation. Such cooperation should allow for greater transparency in the dealings between the two parties. By building strong relationships with suppliers, transactions and governance costs can be minimized (Dyer 1997).

Moreover, the results suggest that EPTs usage is related to improved perceptions of internal service performance. These improvements result from the order cycle time reduction that accompanies EPT implementation. Reduced cycle times result in improved responsiveness to internal customer needs and the purchaser spends less time on clerical

tasks, such as order processing (Antonette, Giunipero, and Sawchuk 2002). This improved service to internal customers may elevate the purchasing function's status within the organization.

Furthermore, the results indicate that internal service performance is positively related to perceptions of purchasing performance. This suggests that purchasing and supply managers who treat their internal customers as though they were highly valued may improve organizational performance. In short, by placing a high priority on building and improving internal customer relationships, the organization should be better positioned to satisfy external customers. It also stands to reason that if the purchasing function adopts a *laissez-faire* attitude toward intraorganizational inefficiencies, the firm's response to external customers, and the ever-evolving marketplace, may be hindered (Lee 2004).

With regard to the factors that are related to the adoption of EPTs, the results suggest that supplier support is a crucial element. Suppliers seeking to encourage the mutually beneficial use of technology should incentivize this behavior because doing so can enhance EPT usage. In line with this finding, suppliers could provide their customers with rewards for using electronic systems to place orders. These incentive systems might also act as barriers to supplier switching, since purchasing managers may find it easier to do business with an established and supportive supplier. In addition to providing extrinsic rewards, suppliers should provide resources to train buyer firms' employees and be available to troubleshoot EPT implementation issues. The end result is a recursive relationship where successful cooperation increases commitment and trust, which then leads to more cooperation (Anderson and Narus 1990).

While the overall results did not provide support for the notion that perceived Internet skill is linked to EPT adoption, the results did indicate that perceived Internet convenience played a role in the adoption of EPTs. This suggests that if EPTs make the purchasing manager's job easier to accomplish, result in a reduction in nonproductive time, and permit the free flow of information, these tools will be more readily accepted. In sum, despite the fact that most supply managers have finely tuned Internet skills, care should be taken to develop EPTs with highly intuitive and user-friendly graphic user interfaces, as this may aid in their adoption (Giunipero and Pearcy 2000).

### Managerial Implications

As companies of all sizes embrace Web-based technologies, many purchasing managers now recognize that EPTs

can enhance the purchasing function's efficiency and effectiveness (Cerquides et al. 2007). The research presented empirically supports this statement, as EPT usage was shown to be positively related with internal service performance and supplier cooperation. Furthermore, these two factors may influence purchasing performance. Thus, the present research suggests that purchasing managers adopt EPTs despite the perception that reverse auctions could negatively impact interorganizational relationships (Jap 2002, 2003). These findings may also imply that companies are underutilizing EPTs because of the perceptions associated with one tool. Further, most EPTs are initially directed toward low dollar, high transaction cost items (Antonette, Giunipero, and Sawchuk 2002). This is in accordance with our findings, as almost half of the companies (45.2 percent) in our sample sourced 10 percent or less of their total purchasing expenditures using EPTs. However, this 10 percent of companies' spending may represent a large portion of their transactions. It might also suggest that purchasing managers are capitalizing on the clerical use of EPTs. It remains to be seen if a similar sample would find an increase in the total dollar expenditures made using EPTs. If managers are concerned that EPT usage may jeopardize relationships, now managers should be comforted knowing that interorganizational relationships will remain intact as long as future business opportunities with sellers are still available and if relationships are considered in the bidding process (see Pearcy, Giunipero, and Wilson 2007).

The research presented has shown that several factors are tied to EPT usage. As alluded to above, EPTs must be intuitive and convenient. In addition, a key determinant to successful implementation hinges on the level of supplier support. This suggests that purchasing managers should work closely with their suppliers when developing EPTs and those suppliers should help buyer firms troubleshoot implementation issues.

To summarize, two important lessons for business marketing managers are presented. First, the use of EPTs may improve a firm's internal service, enhance cooperation with supply chain partners, and ultimately, improve purchasing performance. This is useful information in that it suggests that managers can leverage technologies without creating adversarial or strained relations with supplier firms. Second, buyers may benefit from collaborating with suppliers as they develop e-purchasing systems, in an effort to make them both easy to use and valuable for both parties. It should be noted that suppliers have a vested interest in such collaborative efforts, as the implementation of firm-specific tools increases switching costs, enhances the value of the

buyer-supplier relationship, and thus, engenders long-term relationships.

### Theoretical Implications

In addition to contributing to practice, the research presented also contributes to theory in two ways. First, it casts supplier cooperation and internal service performance as potential consequences of technology adoption factors in a nomological network, testing heretofore unexplored theoretically supported relationships. Second, the model combines two theoretically based sets of factors, those related to TAM and those found in the relationship marketing literature, to bear on purchasing performance, thus providing a more holistic view of the interplay among factors that may influence this outcome. By combining two unrelated theoretical perspectives, the research should encourage future researchers to attempt to capitalize on creative opportunities to do so.

### Limitations and Extensions

This study's findings may be limited by its relatively small sample size. While declining response rates represent a daunting challenge for logistics researchers who use mail surveys to gather their data, novel techniques have been put forth to remedy this issue (Larson 2005). In particular, financial incentives, follow-ups, participant prequalification, and association support may help increase or stabilize declining response rates. Future research should use these techniques to secure a larger sample.

Researchers should also consider additional exogenous variables when evaluating this model, as the inclusion of different variables may increase the amount of variance explained. Specifically, forces outside the firm, such as the effects of network externalities on software adoption, should be included (Lange, McDade, and Oliva 2004). Also, since the results did not provide support for the hypothesis that perceived Internet skill affected EPT usage, this relationship should be retested in future work, as similar relationships have proven to be statistically significant in previous research (e.g., Davis, Bagozzi, and Warshaw 1989).

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## APPENDIX

### Survey Items

#### **Perceived Internet Skill (seven-point agree/disagree response format) (adapted from Deeter-Schmelz and Kennedy 2002)**

1. I am extremely skilled at using the Internet.
2. I consider myself knowledgeable about good search techniques on the Internet.
3. I know somewhat less about using the Internet than most users. (This item was deleted in the final analysis.)
4. I know how to find what I am looking for on the Internet.

#### **Perceived Internet Convenience (seven-point agree/disagree response format) (adapted from Novak, Hoffman, and Yung 2000)**

1. With the Internet, I will be able to reduce the time I spend with suppliers' salespeople.
2. Compared to traditional communication sources, I can get my questions answered more effectively using the Internet.
3. With suppliers who have online services, my job as a purchasing professional is easier.

#### **Supplier Support (seven-point agree/disagree response format) (adapted from Deeter-Schmelz and Kennedy 2002)**

1. Most of my suppliers encourage me to use their Internet sites.
2. My suppliers provide effective guidance in the use of their Internet sites.
3. Many of my suppliers offer incentives for using their Internet purchasing options.

**E-Purchasing Tool Usage (seven-point no usage/very high usage response format) (adapted from Cagliano, Caniato, and Spina 2003)**

1. Evaluate supplier performance.
2. Allow suppliers to submit bids online.
3. Conduct reverse auctions.
4. Purchase order processing.
5. Purchase order tracking.
6. Purchase requisition processing.
7. Purchase requisition tracking.
8. Spend analysis.
9. Send supplier updates concerning new product or service requirements (e.g., via e-mail).
10. Provide specific online information about product or service specifications.
11. Permit suppliers to directly link up to our databases (e.g., enterprise resource planning).
12. Share inventory planning information with our suppliers.
13. Transportation planning.
14. Procurement of standard items.
15. Procurement of special items.
16. Use online marketplace to source suppliers.

**Supplier Cooperation (seven-point agree/disagree response format) (adapted from Fredendall, Hopkins, and Bhonsle 2005)**

1. We frequently are in close contact with our suppliers. (This item was deleted in the final analysis.)
2. Our suppliers give us feedback on the quality of our performance.
3. Our suppliers give us feedback on our delivery performance.
4. We have an effective process for resolving external suppliers' complaints.

**Internal Service Performance (seven-point agree/disagree response format) (adapted from Fredendall, Hopkins, and Bhonsle 2005)**

1. I place priority on requests for assistance from internal customers.
2. I attach a high level of importance to requests from internal customers.
3. Solving my internal customers' problems is part of my job.
4. Internal customer requests are handled immediately.

**Purchasing Performance (seven-point agree/disagree response format) (adapted from Wu, Mahajan, and Balasubramanian 2003)**

1. The use of the Internet technologies in purchasing has enabled us to reduce the coordinating costs with our suppliers.
2. The use of the Internet technologies in purchasing has enabled us to reduce the time spent coordinating activities with our internal customers.
3. The use of the Internet technologies in purchasing has enabled us to reduce the transmittal costs associated with conducting business with our suppliers.
4. The use of the Internet technologies in purchasing has enabled us to increase our overall service to internal customers.
5. The use of the Internet technologies in purchasing has enabled us to reduce our overall costs of purchased materials and services.

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