The Relationship of E-Commerce Competence to Customer Value and Firm Performance: An Empirical Investigation

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ABSTRACT: The advent of electronic commerce has induced many organizations to develop a Web presence and exploit the opportunities offered by the Internet. In an environment that commoditizes products and allows for easy imitative behavior through instant access to information on competitor's offerings, it is not clear how to build a sustainable competitive advantage. This study endeavors to facilitate an understanding of this complex issue. Electronic commerce competence is posited as a key driver of organizational performance, and it is argued that this effect is mediated by the generation of "customer value" through Web site functionality. By empirically analyzing primary and secondary data from over 100 companies, the relationship between electronic commerce competence, customer value, and both short- and long-term firm performance is examined. The results show that firms with high electronic commerce competence exhibit superior performance and that customer value generated through Web site functionality partially mediates this relationship. In addition, the results show that companies can enhance short-term performance by providing value to the customer in prepurchase situations. But in order to build customer loyalty and thus long-term performance, companies need to enhance the product ownership experience of customers.

KEY WORDS AND PHRASES: competitive advantage, customer value, electronic commerce, electronic commerce competence, financial measures, organizational performance.

THE EXPONENTIAL GROWTH IN COMMERCE on the Internet has created an environment that purportedly makes it easier for customers to compare alternatives, reduce complexity, information asymmetry, and switching costs, and therefore commoditize products. In such environments, it is not clear how companies can build and sustain competitive advantage. This issue deserves further research.

According to the resource-based view of the firm, firm-level competencies are an importance source of competitive advantage. However, for a competence to be a source of enduring success, it should be inert, differentiated across firms, and extremely expensive to replicate [5]. Firm resources that are accumulated over time with path dependencies represent such competencies [19]. Although many different competencies may fit this profile, experiential-based know-how in managing an Internet-enabled business has been highlighted as an important resource [27]. Evidence suggests that it takes a firm at least three years, on the average, to develop and design Web sites focused on the needs of the customers [60]. Thus, effective management of Net-enabled businesses benefits from considerable learning effects. While experiential based know-how constitutes a firm's knowledge base in managing an online business, its effective application requires slack resources to support innovation. Collectively, exposure to managing an online business when combined with allocation of resources could reflect pivotal competencies that affect performance [75]. Electronic commerce competence that is heterogeneously distributed across firms thus provides a viable approach in examining variation in financial success of Net-enabled firms.
In electronic commerce, the Web site of the company assumes a pivotal role, as it is the critical interface between a buyer and a seller. Well-developed Web sites can be the vehicle for delivery of value-adding services [11]. Prior work suggests that electronic commerce competence may enable firms to leverage Web site technologies in enhancing customer value by providing augmented customer service [26, 44, 75]. Services can add unique and sustainable value, as they may be more difficult to copy effectively than product quality and price [20, 45, 57]. Thus, facilitating customer's buying experience is an important consideration for companies operating and entering into electronic commerce. For instance, Cisco Systems provides its customers access to the same internal database that is used by its employees. It also provides an expert system that customers can use for troubleshooting. Amazon.com offers access to customer reviews and sends product recommendations based on past purchase history.

The issue of performance also deserves in-depth analysis. The resource-based view of the firm proposes a direct link between competence and firm performance [30]. However, this linkage within an electronic commerce context has received limited empirical attention. In examining the linkage between Web site functionalities and firm performance, Saeed et al. [63] found that value-added services focused on presale activities are related to economic value added (EVA), which is a measure of short-term performance. However, the recent shift in strategy of many electronic commerce companies from customer acquisition to customer retention and customer loyalty requires a more holistic approach toward performance measurement. Interesting insights could emerge from investigating how electronic commerce competence and the value proposition offered through the Web interface of a firm may affect short-term and long-term firm performance.

While previous research examines competence, creation of value through the Web interface, and performance, it fails to provide an overall framework systematically linking these concepts. Based on the resource-based view of the firm, we argue that electronic commerce competence directly affects firm performance. Why, though, does this relationship exist? Our thesis is that electronic commerce competence may enable firms to employ business models that strategize customer value as the core objective. Electronic commerce competence may play a pivotal role in how well a firm is able to employ electronic commerce technologies to deliver higher customer value. Such a value-based strategy may allow organizations to enhance both short-term and long-term performance. An empirical validation of these relationships could take us a long way toward understanding the relationships among electronic commerce competence, customer value, and both short- and long term performance of electronic commerce companies.

Electronic Commerce Competence

WHY ARE SOME FIRMS BETTER ABLE TO LEVERAGE the Internet to enhance performance? The answer to this question may reside in understanding the ambiguity in deploying electronic commerce technologies in such a fashion that it enhances performance. The resource-based view of the firm argues that variance in performance across
firms may be attributable to idiosyncratic firm-level resources. Building on this thesis, Wheeler [75] argues that dynamic capabilities that enable firms to recognize innovative ways to create customer value and structure organizational routines to deliver that value, distinguish leaders from the laggards. Eisenhardt and Martin [21], elaborating on dynamic capabilities, point toward product development routines by which managers combine their varied skills and functional backgrounds to create revenue-producing products and services.

Henderson and Cockburn [30] distinguish between competencies and capabilities. They argue that competencies are resources similar to what Eisenhardt and Martin [21] term as skills and backgrounds, whereas capabilities involve how these resources are combined or integrated to create value. Competencies may be reflected in skills, information systems infrastructure, experience, and slack resources [3]. Experiential-based learning enhances competence. Experience with a particular production process over an extended period of time reflects a firm competence that has performance implications [30]. Similarly, a history of managing an online business will broaden a firm’s repertoire of experiences [61]. The accumulated experience is a function of actions taken in response to diverse situations and assimilation of the consequences of such actions. Such experience adds to the knowledge base of the firm and facilitates calculated risk taking. However, experience alone cannot be of much value unless sufficient resource allocations are made in utilizing the accumulated know-how. Enough slack resources need to be available to apply the accumulated knowledge in identifying, experimenting, and leveraging innovative projects. Therefore, we define electronic commerce competence as both experience and slack resources that are peculiar to developing and managing Internet-based businesses.

Resource-based theory highlights the importance of historic events that may provide unique opportunities for firms [5]. The late 1990s represented a time for business that was epitomized by almost unlimited resources for experimentation. Firms that entered into the electronic commerce arena early accumulated valuable know-how and knowledge on what may work and what may not work. Thus, electronic commerce competence is representative of pivotal resources differentiated across firms that can contribute toward firm performance. Moreover, such competencies may enable a firm to generate valuable capabilities that are in line with the needs of customers [75]. Therefore, it is our thesis that electronic commerce competence reflected in longer exposure to running an electronic commerce business along with allocation of resources toward maintaining and improving the Web site interface may enable firms to enhance customer value.

Customer Value

CUSTOMER VALUE REPRESENTS THE NET WORTH to customers from buying and using a seller’s product [76]. Recent work in this domain incorporates the idea of services offered by sellers as a distinct component in value determination. Although the actual products offered by a company constitute the real source of customer value, services provided by companies can augment this value. Superior presale and postsale service
rendered by the seller can substantially add to the benefits received and also reduce
the buyer's nonmonetary cost such as time, effort, and mental stress [57]. For ex-
ample, if a customer wants to purchase a book that is available at both Amazon.com
and Borders.com for a similar price, customer reviews available at Amazon.com may
influential the purchase decision. In addition, if a customer wants to sell a book after
reading it, the auction at Amazon.com may likewise enhance value of the purchase.
Similarly, a customer interested in purchasing a computer might prefer Dell.com over
Compaq.com because Dell offers support services and trade-in options through its
Web site. Recent work suggests that sustainable competitive advantage is difficult to
achieve based on superior products and lower prices alone [57]. Superior service
levels are essential for enhancing performance on a sustained basis, thus increasing
the importance of value components related to services [9].

The notion of customer value has been presented as a dynamic concept. Slater and
Narver [67] note that creating superior value for buyers continuously, requires that a
seller understands a buyer's entire value chain, not only as it is today but also as it
evolves over time. So, the determinants of customer value change with the phases of
customer's relationship with a firm [76]. The drivers of value that facilitate a purchase
can differ from the levers of value at the initial usage stage, which can be different
from what determines value during long-term use. Firms can achieve superior perfor-
ance through augmenting customer value if they can recognize the fine distinction
between phases of a customer's relationship with an organization and develop their
service offerings around the drivers of customer value within each phase [63, 76].

In moving from the conceptual to the operational domain, two specific issues need
to be addressed. First, a clear distinction needs to be developed for the phases of a
customer's relationship with the organization. Second, tactical levers need to be iden-
tified within each phase that could potentially create or enhance value for the cus-
tomer. For understanding the phases that a customer goes through in acquiring a
product, the consumer decision-making process literature presents various models
[22, 35, 56]. The most widely used model is the one presented by Engel et al. [22].
This model presents the consumer decision-making process as a set of five steps:
(1) problem recognition, (2) information search, (3) evaluations of alternatives, (4) pur-
chase, and (5) postpurchase evaluations and disposal. The retail patronage literature
focuses on the consumer decision-making process and factors related to a retail store
that are influential in developing a long-term relationship with the customer. Taher et
al. [71] isolate (1) shopping, (2) buying, (3) delivery and installation, (4) using/oper-
ating, (5) service/repair/maintenance, and (6) disposal/renewal as six dimensions on
which customers evaluate their retail experience. Product perceptions, shopping ex-
perience, customer service, and consumer risk perceptions are proposed as important
factors [46]. Retail patronage literature has found increasing use in the study of Web-
based commerce [41, 50]. Keeney [44] provides a comprehensive list of value drivers
that are pivotal in creating and enhancing customer value in Internet-related com-
merce. These studies examine salient features in a virtual store (Web site of a com-
pany) that facilitate the buying experience of a customer and thus enhance value to
the customer.
A framework that integrates these two perspectives into a unified model within the context of electronic commerce is customer service life cycle (CSLC). This framework segments a customer's relationship with a company into different stages similar to the Engel et al. [22] model. It also proposes specific information technology (IT)-enabled services such as search and recommendation tools, ordering systems, and communication tools associated with each stage that may be instrumental in developing a long-term relationship with the customer [39]. According to CSLCs, when a consumer purchases a product, he or she goes through a four-stage life cycle. In the initial stage of the life cycle, "Requirements," a decision has to be made on "What is needed?" and "What attributes of the product are appropriate?" In the second stage, "Acquisition," the customer actually acquires the product. In the third stage, "Ownership," the consumer integrates the product within his or her total system. In the final stage, "Retirement," the consumer disposes of the product by transfer of ownership or actual discard. Ives and Learmonth [38] and, later, Ives and Mason [39] argue that organizations through the effective use of IT can personalize, augment, or even transform the services they provide to the customers. For example, in the requirements stage, one of the tasks the consumer needs to perform is to search for information about the product. Companies through their Web site can provide search capabilities to facilitate this task and thus create value for the customer. Another similar service can be advanced search mechanisms with drop-down boxes, which are preferred by some customers. Companies could go a step further and incorporate error-correction mechanisms within the search capability where spelling errors are automatically corrected. Similarly, other stages also present equivalent opportunities for creating and enhancing value. Organizations that take a leadership role in leveraging IT and assisting their customers in each of the four stages of the CSLC stand a better chance of creating and enhancing customer value, thus differentiating them from competitors. We believe that these three streams of literature can be used to provide a richer conceptualization of each of the four stages of CSLC (Table 1 provides a synthesis of the three approaches).

Long- and Short-Term Firm Performance

The extensive research on IT value points toward the importance of recognizing both the intangible value of IT investments and the role of IT investments in generating wealth [10, 12, 16, 33]. Tobin's $q$ and EVA are two measures that capture these aspects. We argue that collectively these reflect long-term and short-term performance assessments and that both should be used for richer and holistic measurement of performance.

Intangible value reflects recognition of assets that can create long-term value for the firm. Tobin's $q$ is one such measure for capturing the long-term performance of IT investments [10]. The measure reflects the difference between book value and market value of the firm at a particular time. This difference, in theory, captures the value of intangible assets and the market expectation of the future potential of organizational assets [15, 17]. Tobin's $q$ is appropriate in cases where performance of a company is
Table 1. Mapping of CSLC, Consumer Decision-Making Process, and Retail Patronage

<table>
<thead>
<tr>
<th>CSLC</th>
<th>Consumer decision-making process</th>
<th>Retail patronage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Need recognition</td>
<td>Shopping</td>
</tr>
<tr>
<td></td>
<td>Information search</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evaluation of alternatives</td>
<td></td>
</tr>
<tr>
<td>Acquisition</td>
<td>Purchase</td>
<td>Buying, delivery, and installation</td>
</tr>
<tr>
<td>Ownership</td>
<td>Outcome (postpurchase)</td>
<td>Using/operating, service/repair/maintenance</td>
</tr>
<tr>
<td>Retirement</td>
<td>Outcome (disposal)</td>
<td>Disposal/renewal</td>
</tr>
</tbody>
</table>

driven by factors that create intangible value, such as technological assets and brand equity [18, 32, 52].

The second aspect of an appropriate performance metric is its ability to capture wealth creation [63, 73]. IT-intensive companies bank extensively on IT-related projects for enhancing performance. For assessment of the actual contribution of such projects to the overall wealth of the company, an appropriate approach is to adjust rate of return by the total cost of capital (debt and equity) that is tied into materializing these projects. This approach is similar to the one suggested by Feltham and Ohlson [24] in calculating the abnormal earnings of a firm. A measure that operationalizes this concept is EVA. EVA primarily reflects short-term performance and captures the true economic wealth created by companies [70].

The conceptual differences between the two measures are described in Table 2. It should be noted that both Tobin’s $q$ and EVA are risk-adjusted performance measures. Tobin’s $q$ is the present value of future returns of a company, which takes into account the company’s unique risk and industry-level risk. EVA uses beta, which is a company’s unique risk over the market risk, in calculating weighted average cost of capital [36]. We believe that these two measures together can provide a more comprehensive framework for evaluating the performance of electronic commerce companies.

Research Model

The overall research model is presented in Figure 1. Electronic commerce competence represents a firm’s intellectual capital embedded in skills and experience accumulated over time through exposure to a variety of situations and active experimentation with novel approaches. Electronic commerce competence thus represents a unique organizational resource that directly affects performance. However, Huselid [37] proposes that the effect of resources (such as technology, expertise, etc.) on financial outcomes involves two or three intermediate stages. Building on this idea, Heskett [31] proposes the service management profit chain (SMPC). According to the SPMC approach, expertise and investments in electronic commerce systems may
Table 2. Differences Between EVA and Tobin’s q

<table>
<thead>
<tr>
<th>Item/measure</th>
<th>EVA</th>
<th>Tobin’s q</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Payoff timing</td>
<td>Current value (short-term performance)</td>
<td>Future value (long-term performance)</td>
</tr>
<tr>
<td>2. Focus</td>
<td>Wealth creation driver</td>
<td>Intangible value</td>
</tr>
<tr>
<td>3. Perspective</td>
<td>Manager (control and reward)</td>
<td>Analyst (market’s evaluation)</td>
</tr>
</tbody>
</table>

Figure 1. Research Model

lead to improvements in processes that deliver customer value. Augmented customer value then drives financial performance. This approach is similar to the “strategy map” proposed by the balanced scorecard (BSC) approach. The strategy map specifies the critical elements and their linkages for an organization's strategy [43]. Learning/growth, internal processes, customer satisfaction, and financial performance constitute the elements of BSC. Learning/growth reconfigures internal processes to be more responsive to customer needs, thus enhancing customer satisfaction, which then contributes to financial performance.

The proposed research model captures all elements and linkages as proposed by BSC. Learning represented in electronic commerce competence plays a pivotal role in leveraging electronic commerce systems to make internal processes more responsive to cus-
Customer needs. Electronic commerce competence thus guides the application of such systems as Web-enabled services that cater to customer needs at each stage of the customer–supplier relationship, resulting in enhanced customer value. These Web-enabled services constitute value propositions. According to Woodruff [76], if value propositions enhance customer value, the customer rewards the firm through repeat purchases. Customer satisfaction then eventually enhances firm performance. The research framework explicitly captures learning/growth, internal processes, and firm performance. However, the customer satisfaction aspect is captured in the linkage between internal process and firm performance. Based on the previous discussion, we argue for a direct relationship between electronic commerce competence and firm performance. However, this relationship will also be mediated by value propositions offered by the firm to support the various stages of the consumer’s decision-making process.

Hypotheses

Electronic Commerce Competence

Electronic commerce competence presents a resource that is developed through the path-dependent history of the firm. It encapsulates know-how accumulated through experience with operating in an online environment and is inert to the extent that it is embedded in an organizational context. A new context brings with it its own rigidities and set of principles that may not align with experiential-based know-how developed in another context. The application of electronic commerce competence outside the organizational context will require learning and adaptation. Thus, it is a resource that is unique across firms and represents an organizational competence that can lead to superior performance.

Tacit knowledge developed by managers in administering online businesses over an extended period of time may enable them to structure organizational processes and routines that enhance customer value [1, 30]. In particular, companies with a longer history of exposure to electronic commerce and an inclination toward investing in innovative ideas not only develop expertise in managing day-to-day operations but also may have a better understanding of online consumer behavior [44]. For example, Amazon.com, one of the initial entrants in the electronic commerce arena, is regarded as the leader in providing an enhanced shopping experience. It is an innovator in offering novel functionalities through its Web site. Some examples are the one-click mechanism, the shopping-cart mechanism, rating systems, and customer reviews. The company’s long history and continuous commitment toward allocating resources to fuel innovation has enabled it to offer functionalities that contribute to customer value in each stage of the purchase process. Thus, we argue that the effect of electronic commerce competence on firm performance will also be mediated by the customer-value approach [30, 44, 75].

H1a: Electronic commerce competence is positively related to firm performance as measured by EVA.
H1b: Electronic commerce competence is positively related to firm performance as measured by Tobin's q.

H1c: The relationship between electronic commerce competence and firm performance as measured by EVA is mediated by customer requirements, acquisition, ownership, and retirement facilitation.

H1d: The relationship between electronic commerce competence and firm performance as measured by Tobin's q is mediated by customer requirements, acquisition, ownership, and retirement facilitation.

Requirements

At the requirements stage, the customer formulates his or her product requirements and specifies the product features that are most appropriate [39]. The customer's need recognition triggers information gathering for evaluating alternatives and making a choice. It has been noted that the consumers will collect as much information as possible, as long as the process of gathering it is not too onerous or time consuming [29]. Net-enabled companies can create value for the customer by offering information search capability, in-depth product descriptions, customer testimonials, and pictorial representations of the product [23, 41, 69]. Periodic newsletters, e-mails, and announcement sections within Web sites can provide quick access to information on special offers [69]. Customers can also be offered product comparison and recommendation tools. Research indicates that such functionalities do affect the buying preferences of the consumers [2, 41]. Net-enabled firms can offer functionalities that tap value determinants related to the tasks the customer performs in the requirements phase. So, comprehensively covering the requirements phase and providing greater flexibility to the customer is instrumental in creating customer value and enhancing performance.

H2a: The extent of customer requirements facilitation is positively related to firm performance as measured by EVA.

H3a: The extent of customer requirements facilitation is positively related to firm performance as measured by Tobin's q.

Acquisition

In the acquisition stage, the product must be ordered, paid for, and acquired [39]. Companies can create value by providing comprehensive information about the online buying process [41, 69] and order cancellation procedures [4]. The ordering process can be made more convenient through shopping-cart and one-click mechanisms [50, 64]. Payment process facilitation is another source of value. Here, companies can provide information about various payment options [64]; can offer multiple payment modes such as credit cards, electronic funds transfer, or Web site–specific credit cards; and can assist the customers in applying for credit [41, 50, 53]. Logistical services
can also be leveraged as a source of customer value. Companies can provide multiple delivery options and offer order-tracking options [41, 53]. Net-enabled firms, by enhancing the scope and range of functionality, can enhance customer value in the acquisition stage, thus improving performance.

**H2b**: The extent of customer acquisition facilitation is positively related to firm performance as measured by EVA.

**H3b**: The extent of customer acquisition facilitation is positively related to firm performance as measured by Tobin’s q.

Ownership

In the ownership stage, the customer is seeking support for changes in status, the need for upgrades, monitoring operations, required maintenance, training, or ongoing management [39]. Superior postsales service and support has been found to be one of the important drivers of customer retention in online markets [62]. Consumers are engaged in a constant process of evaluating the things they buy, as these products are integrated into their daily consumption activities. Information on product returns, product return options, and feedback mechanisms can augment the postpurchase experience [4, 41, 48, 72]. Information on maintenance, new uses of the product, and how the product can interface with related products [68] can enhance the ownership experience. So, actively getting involved in the ownership phase by providing functionalities that support postpurchase information and service requirements can create customer value and increase customer retention rates, thus enabling the company to attain high levels of sustained performance.

**H2c**: The extent of customer ownership facilitation is positively related to firm performance as measured by EVA.

**H3c**: The extent of customer ownership facilitation is positively related to firm performance as measured by EVA.

Retirement

In the retirement stage, the customer thinks that the product has served its purpose, and it is either thrown away, traded, returned, cancelled, or sold [39]. Jacoby et al. [40] provide a comprehensive model illustrating the various options a consumer has regarding product disposal. The increasing importance of recycling products [65], the growing size and importance of used-merchandise establishments, and auctions markets for secondary products [51] also highlight the importance of this stage. In addition, companies allow customers to maintain purchase and maintenance cost information related to the product on their systems that has been formally termed as the total-cost-of-ownership program [62]. The value drivers within the retirement stage are an emerging opportunity for companies, as they may be influential in increasing customer retention rates. By offering functionalities that leverage value determinants
in the retirement stage, companies may be able to enhance value for existing customers, laying the ground for sustained performance.

\[ H2d: \text{The extent of customer retirement facilitation is positively related to firm performance as measured by EVA}. \]

\[ H3d: \text{The extent of customer retirement facilitation is positively related to firm performance as measured by Tobin's q}. \]

**Methodology**

In order to test the research model, primary and secondary data were collected on a number of companies involved in electronic commerce. Major challenges in the operational domain were to measure electronic commerce competence, facilitation of the various CSLC phases, and short-term and long-term performance of the firms involved in electronic commerce. We provide a detailed review of the measurement approach for each variable in the following section.

**Operationalization**

Electronic commerce competence was measured by combining two measures of firm resources. For the first resource, experience was captured by the number of months a company has been operating through the Internet. The second resource is the amount of investment a firm allocated to developing and managing the Web site of the company as a percentage of sales. The real value of experience lies in its application. We believe that combining experience and resource allocations that are aimed at leveraging this experience captures a more appropriate picture. The combined measure was standardized and based on the generated values, and the total sample was divided into two groups by using zero as the cutoff value. The value below zero represented firms with low electronic commerce competence, and values greater than zero indicate those with high electronic commerce competence. For details on operationalization of this variable, see Table 3.

The list of functionalities categorized under each stage was adapted from Saeed et al. [63] (Table 4). The list was modified to include four more functionalities, which are highlighted in Table 4 with an asterisk. We used the presence of functionalities as a surrogate for the services offered by the company. An ideal approach would have been to incorporate the quality dimension of such services into the measurement. But doing so could have made the measurement subjective. Thus, a trade-off was made between objectivity of the measures and a more inclusive measurement model.

To test the content validity of the items, a Q-sort was conducted. All items in the instrument were randomly mixed. A panel of nine members (doctoral students and faculty) was provided with the list of functionalities and a definition for each stage of the CSLC, and was asked to categorize the items within each stage. Eighty-six percent of the items were correctly categorized. Certain modifications were made based on the recommendations provided by the panel. An index value for each stage in the
Table 3. Operationalization of Electronic Commerce Competence

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic commerce experience (number of months the Web site has been in operation)</td>
<td>Normalize the variable to remove scale effect</td>
<td>Add the two variables and standardized the resulting variable</td>
<td>Segregate the companies into two groups based on the mean (which is 0)</td>
</tr>
<tr>
<td>Investment in Web site development and maintenance (investment divided by sales)</td>
<td>Normalize the variable to remove scale effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements</td>
<td>Acquisition</td>
<td>Ownership</td>
<td>Retirement</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1. Simple search function [23, 29, 69]</td>
<td>1. Mechanism for helping the customer understand the buying process of the product [41, 64, 69]</td>
<td>1. FAQ mechanism [69]</td>
<td>1. Mechanism that allows customers to view information on disposal options [40]</td>
</tr>
<tr>
<td>2. Advanced search function with drop-down list boxes [23, 29]</td>
<td>2. Mechanism through which a customer can order products online and pick them up from the nearest physical store* [8]</td>
<td>2. Mechanism that allows the customer to return and exchange defective products [48]</td>
<td>2. Mechanism for locating special deals for transfer, replacement, and disposal of the product [51, 65]</td>
</tr>
<tr>
<td>3. Advanced search features that turn incorrect queries into correct results [50]</td>
<td>3. Mechanism for locating physical store* [8]</td>
<td>3. Mechanism that allows customer to return or exchange to the physical store a product bought from the online store* [28, 48]</td>
<td>3. Mechanism for calculating total cost of ownership of the product [62]</td>
</tr>
<tr>
<td>6. Mechanism for reviewing recommendations from other customers [7, 41, 50]</td>
<td>6. Mechanism that helps the customer integrate the new purchases he or she intends to make with the purchases that he or she has already made from the online store [42]</td>
<td>6. Mechanism for contacting company representatives for after-sales service [68]</td>
<td>6. Mechanism for real-time interaction with the Web site [34, 54]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10. E-mail mechanism [41, 69]</td>
</tr>
</tbody>
</table>
10. Mechanism for saving a list of products for future purchase [42]
11. Mechanism for displaying various announcements for customers [69]
12. Mechanism for comparing products [41, 50]
13. Mechanism for viewing products [41, 69]
14. Mechanism that supports real-time interaction with the Web sites [34, 54]
15. FAQ mechanism [69]
16. Chat mechanism that enables communication with other customers [58, 74]
17. Telephone response mechanism [34, 50]
18. Mechanism for developing customized Web pages [42]
19. Mechanism that helps the customer integrate the new purchases he or she intends to make with the purchases that he or she has already made from the online store [42]
20. E-mail mechanism [34, 41, 69]

9. Mechanism that helps the customer apply for credit [53]
10. One-click mechanism [50, 64]
11. Shipment tracking mechanism [41, 53]
12. FAQ mechanism [69]
13. E-mail mechanism [34, 41, 69]
14. Telephone response mechanism [34, 54]
9. Chat mechanism that enables communication with other customers [58]
10. Telephone response mechanism [34, 54]
11. Registration mechanism [42]
12. Mechanism for developing customized Web pages [42]
13. E-mail mechanism [41, 69]

* These functionalities are included in the total number of functionalities only if a company has presence in a physical as well as a virtual marketplace (hybrid company). So, for hybrid companies total functionalities for Requirements = 20, Acquisition = 15, Ownership = 13, and Retirement = 10. For virtual companies, total functionalities for Requirements = 19, Acquisition = 13, Ownership = 12, and Retirement = 10.
CSLC was developed based on the presence or absence of the functionalities in a particular stage (see Appendix A for more details).

EVA is used as a measure of short-term performance. In technical terms, EVA is the net operating profit after tax (NOPAT) minus a capital charge. The main power of EVA as a short-term measure of wealth creation of the company emerges from the adjustments that need to be made for calculating the measure. The source of information for adjustments is the notes to the financial statements. For detailed operationalization, see Saeed et al. [63].

Different methods have been proposed for calculating Tobin's \( q \) ratio. This study uses Chung and Pruitt's [17] method to calculate the value for \( q \). Bharadwaj et al. [10] also use this method in their study. Bharadwaj et al. suggest that the main advantage of this method is that it uses a simple formula that requires financial and accounting information available from the financial statements and is highly correlated with \( q \) calculated by using the more traditional Lindenberg and Ross's [49] method (see Appendix B for calculation details).

Sample

Three criteria were used for sample selection. First, we focused on companies selling physical products on the Internet. Such companies tend to support the entire CSLC rather than one specific phase. This criterion rules out companies that are providing only services (such as information search, logistics, financial services), information-based products for which the Internet also acts as a delivery platform, and storefronts that either aggregate various suppliers or provide links to other Web sites. Second, we only targeted listed companies, so public disclosure of financial information was mandatory. Third, with the ephemeral nature of some e-commerce companies, we only considered those that had been in operation as public companies for a minimum of one year. Most companies in the sample had multiyear operations.

Three main sources were used for sample selection. These sources include Interactive Week (www.zdnet.com/intweek/Internet500.html), the Media Matrix listing of the top 500 Internet companies, and the Nasdaq listing. Interactive Week 500 lists the top 500 companies in terms of the amount of online revenues. Interactive Week, Ernst & Young, and the Massachusetts Institute of Technology (MIT) compiled this data set. A thorough search of these sources yielded a sample of 104 companies that met the overall criteria for the sample. The financial data for the year 2000 were used for calculating the performance measures. The main sources of financial data were FreeEdgar.com and Nasdaq.com. The data on electronic commerce experience were collected through a rigorous search of secondary sources that included the Web sites of the companies, commercial databases, and Internet-based magazines. The data related to the investment on developing and maintaining the Web site were collected through an in-depth review of the notes to the accounts of the financial statements of the firms. These data were only available for 73 companies.
Rating Criteria

Three researchers independently visited each company’s Web site and filled out the instrument. After the data were collected, disagreements were resolved through a voting scheme, where the item was included if two researchers agreed on its presence. The inter-rater reliability was 90 percent [59]. The main objective in getting three observations per data item is to enhance the reliability of the observation.

Control Variables

Six control variables that can potentially influence the performance of a Net-enabled firm are included in Models 1 and 2. The selection is based on previous empirical studies that have focused on firm performance. The variables are industry growth, firm size, advertising expenditure, product type, ratio of online sales to total sales, and segment affiliation (business-to-consumer [B2C]/business-to-business [B2B]) [14, 25, 47].

Product type, ratio of online sales to total sales, and segment affiliation variables are included because of their relevance to the special nature of the electronic commerce industry. Anecdotal evidence suggests that salability of a product over the Internet is an important aspect that needs to be considered when assessing performance. Many companies track this information and publish ratings based on overall online sales of a particular category of product (Appendix C). The main motivation for including ratio of online sales to total sales is to segregate the performance of companies that is accounted for by physical presence and by virtual presence. Finally, categorical variables are added into the model to control for the performance arising from a company’s affiliation to specific segments, such as B2C, B2B, or both. Table 5 provides more details on the control measures.

Statistical Models

Model 1(A) tests the direct relationship between electronic commerce competence and firm performance. Model 1(B) examines the mediating role of value propositions offered in the four stages of CSLC. Model 2 tests the direct relationship between the four stages of CSLC and firm performance. All the models include six control variables that are likely to affect firm performance.

Model 1

\[ Y = \beta_0 + \beta_1 C_1 + \beta_2 X_2 + \beta_3 X_6 + \beta_4 X_7 + \beta_5 X_8 + \beta_6 X_9 + \beta_7 X_{10} + \varepsilon \] (A)

\[ Y = \beta_0 + \beta_1 C_1 + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_4 + \beta_6 X_5 + \beta_7 X_6 + \beta_8 X_7 + \beta_9 X_8 + \beta_{10} X_9 + \beta_{11} X_{10} + \varepsilon. \] (B)
### Table 5. Control Variables

<table>
<thead>
<tr>
<th>Control measure</th>
<th>Operationalization</th>
<th>Rationale</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry growth</td>
<td>Industry growth rate (S&amp;P categorization)</td>
<td>Companies operating in different industries have varying growth potential that is linked to the overall growth in the industry. Literature shows that industry growth is positively related to performance.</td>
<td>[14]</td>
</tr>
<tr>
<td>Firm size</td>
<td>Natural log of number of employees</td>
<td>Organizational resources affect performance.</td>
<td>[10, 14]</td>
</tr>
<tr>
<td>Advertising expenditure</td>
<td>Advertising expenditure as a percentage of sales of the company</td>
<td>Advertising has been consistently shown to relate positively with performance of a company.</td>
<td>[14]</td>
</tr>
<tr>
<td>Product fit</td>
<td>Appendix C</td>
<td>Anecdotal evidence suggests that product type is an important aspect that needs to be considered when assessing performance.</td>
<td>[25, 47]</td>
</tr>
<tr>
<td>Online revenue ratio</td>
<td>Ratio of online sales to total sales of the company</td>
<td>The main motivation for including this variable is to segregate the performance of companies that is accounted for by physical presence and by virtual presence.</td>
<td></td>
</tr>
<tr>
<td>Categorical variables</td>
<td>B2B and B2C</td>
<td>The aim is to control for the performance arising from a company's affiliation to specific segments, such as business to consumer, business to business, or both.</td>
<td></td>
</tr>
</tbody>
</table>
Model 2

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 \\
+ \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon. \]

Dependent variables

\[ Y_1: \text{Economic valued added} \]
\[ Y_2: \text{Tobin's } q \]

Independent variables

\[ C_i: \text{Electronic commerce competence} \]
\[ X_i: \text{Index for "Requirements" stage} \]
\[ X_2: \text{Index for "Acquisition" stage} \]
\[ X_3: \text{Index for "Ownership" stage} \]
\[ X_4: \text{Index for "Retirement" stage} \]

Control variables

\[ X_5: \text{Firm size (log of total number employees)} \]
\[ X_6: \text{Product type (see Appendix C for details)} \]
\[ X_7: \text{Industry growth} \]
\[ X_8: \text{Ratio of online revenue to total revenue} \]
\[ X_9: \text{Advertising expenditure} \]
\[ X_{10} : \text{B2B, B2C, or both (Categorical variable)} \]

Statistical Analysis and Results

Tests of assumptions for running ordinary least squares (OLS) were conducted for Model 1 and Model 2. OLS assumes constant variance of error terms (homoskedasticity). Heteroskedasticity problems do not make the estimates biased but make them less efficient and cast a doubt on subsequent tests. In our case, we found heteroskedasticity in the data. To correct this problem, the data were transformed using Box–Cox transformations (details in Appendix D). The variance inflation factor (VIF) and the condition number index [55] indicated that multicollinearity was not a problem. Cook’s D criterion was used for detecting influential outliers [55]. This test was conducted separately for Model 1 and Model 2 because of the different variables included in each model. For Model 1, the test revealed the existence of 16 influential outliers. Further analysis revealed that the firms identified as outliers had a ratio of Web site development and maintenance investment to sales greater than 1.
Table 6. Univariate Analysis When Electronic Commerce Competence Is the
Independent Variable

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>9.61</td>
<td>0.003</td>
</tr>
<tr>
<td>Acquisition</td>
<td>8.99</td>
<td>0.004</td>
</tr>
<tr>
<td>Ownership</td>
<td>11.44</td>
<td>0.001</td>
</tr>
<tr>
<td>Retirement</td>
<td>5.816</td>
<td>0.019</td>
</tr>
</tbody>
</table>

These observations were eliminated from the sample. For Model 2, based on the
examination of the results, two influential outliers were eliminated.

The results for the univariate analysis examining linkage between electronic commerce
competence and each stage of CSLC are presented in Table 6. Figure 2 presents the
difference between the two groups (high and low electronic commerce competence) in terms of value propositions offered in each stage of CSLC. The re-
sults are present in Tables 7, 8, and 9 for Model 1(A) (direct model), Model 1(B)
(mediating model), and Model 2 (customer value and performance), respectively.

Results and Discussion

Hypothesis Related to Electronic Commerce Competence (H1)

The results provide support for the direct linkage between electronic commerce com-
petence and firm performance as measured by EVA (H1a: p-value ≤ 0.012) and Tobin's q (H1b: p-value ≤ 0.011). Electronic commerce competence thus reflects a
Table 7. Direct Effect Model (Electronic Commerce Competence and Firm Performance)

<table>
<thead>
<tr>
<th>Variables</th>
<th>EVA</th>
<th>Tobin’s q</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardized estimates</td>
<td>t-values</td>
</tr>
<tr>
<td>Size</td>
<td>-0.146</td>
<td>-0.805</td>
</tr>
<tr>
<td>Product fit</td>
<td>-0.068</td>
<td>-0.426</td>
</tr>
<tr>
<td>Industry growth</td>
<td>0.23</td>
<td>1.615</td>
</tr>
<tr>
<td>Online revenue ratio</td>
<td>-0.117</td>
<td>-0.677</td>
</tr>
<tr>
<td>Advertising expenditure ratio</td>
<td>0.259</td>
<td>1.868</td>
</tr>
<tr>
<td>B2B</td>
<td>0.097</td>
<td>0.622</td>
</tr>
<tr>
<td>B2C</td>
<td>-0.05</td>
<td>-0.332</td>
</tr>
<tr>
<td>E-commerce competence</td>
<td>0.457</td>
<td>2.642</td>
</tr>
</tbody>
</table>

$R^2 = 0.32$
Adj. $R^2 = 0.202$
Sample size = 57

$R^2 = 0.245$
Adj. $R^2 = 0.11$
Sample size = 57

*p ≤ 0.05
Table 8. Mediating Model (Electronic Commerce Competence, Customer Value, and Firm Performance)

<table>
<thead>
<tr>
<th>Variables</th>
<th>EVA</th>
<th></th>
<th></th>
<th>Tobin’s q</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardized estimates</td>
<td>t-values</td>
<td>p-values</td>
<td>Standardized estimates</td>
<td>t-values</td>
<td>p-values</td>
</tr>
<tr>
<td>Size</td>
<td>-0.269</td>
<td>-1.456</td>
<td>0.153</td>
<td>-0.123</td>
<td>-0.701</td>
<td>0.487</td>
</tr>
<tr>
<td>Product fit</td>
<td>-0.029</td>
<td>-0.179</td>
<td>0.859</td>
<td>-0.079</td>
<td>-0.519</td>
<td>0.606</td>
</tr>
<tr>
<td>Industry growth</td>
<td>0.233</td>
<td>1.658</td>
<td>0.105</td>
<td>0.111</td>
<td>0.83</td>
<td>0.411</td>
</tr>
<tr>
<td>Online revenue ratio</td>
<td>-0.039</td>
<td>-0.225</td>
<td>0.0823</td>
<td>0.24</td>
<td>1.451</td>
<td>0.154</td>
</tr>
<tr>
<td>Advertising expenditure ratio</td>
<td>0.278</td>
<td>1.935</td>
<td>0.060</td>
<td>-0.06</td>
<td>-0.442</td>
<td>0.661</td>
</tr>
<tr>
<td>B2B</td>
<td>0.057</td>
<td>0.368</td>
<td>0.715</td>
<td>0.009</td>
<td>0.062</td>
<td>0.951</td>
</tr>
<tr>
<td>B2C</td>
<td>-0.122</td>
<td>-0.789</td>
<td>0.435</td>
<td>0.129</td>
<td>0.873</td>
<td>0.387</td>
</tr>
<tr>
<td>E-commerce competence</td>
<td>0.244</td>
<td>1.233</td>
<td>0.224</td>
<td>0.128</td>
<td>0.679</td>
<td>0.501</td>
</tr>
<tr>
<td>Requirements</td>
<td>0.856</td>
<td>2.024</td>
<td>0.049</td>
<td>-0.308</td>
<td>-0.765</td>
<td>0.449</td>
</tr>
<tr>
<td>Acquisition</td>
<td>-0.051</td>
<td>-0.19</td>
<td>0.851</td>
<td>0.149</td>
<td>0.579</td>
<td>0.566</td>
</tr>
<tr>
<td>Ownership</td>
<td>-0.229</td>
<td>-0.572</td>
<td>0.571</td>
<td>0.76</td>
<td>2.046</td>
<td>0.045</td>
</tr>
<tr>
<td>Retirement</td>
<td>-0.166</td>
<td>-0.739</td>
<td>0.464</td>
<td>0.104</td>
<td>0.486</td>
<td>0.629</td>
</tr>
</tbody>
</table>

$R^2 = 0.413$

Adj. $R^2 = 0.245$

Sample size = 57

* $p \leq 0.05$

$R^2 = 0.469$

Adj. $R^2 = 0.317$

Sample size = 57

* $p \leq 0.05$
<table>
<thead>
<tr>
<th>Variables</th>
<th>EVA</th>
<th>Tobin’s q</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardized estimates</td>
<td>t-values</td>
</tr>
<tr>
<td>Size</td>
<td>-0.596</td>
<td>-0.445</td>
</tr>
<tr>
<td>Product fit</td>
<td>-0.022</td>
<td>-0.195</td>
</tr>
<tr>
<td>Industry growth</td>
<td>0.084</td>
<td>0.760</td>
</tr>
<tr>
<td>Online revenue ratio</td>
<td>-0.645</td>
<td>-0.486</td>
</tr>
<tr>
<td>Advertising expenditure ratio</td>
<td>0.208</td>
<td>2.060</td>
</tr>
<tr>
<td>B2B</td>
<td>-0.025</td>
<td>-0.226</td>
</tr>
<tr>
<td>B2C</td>
<td>-0.111</td>
<td>-1.012</td>
</tr>
<tr>
<td>Requirements</td>
<td>0.562</td>
<td>2.062</td>
</tr>
<tr>
<td>Acquisition</td>
<td>-0.817</td>
<td>-0.421</td>
</tr>
<tr>
<td>Ownership</td>
<td>-0.005</td>
<td>-0.019</td>
</tr>
<tr>
<td>Retirement</td>
<td>-0.003</td>
<td>-0.026</td>
</tr>
</tbody>
</table>

$R^2 = 0.2417$
Adj. $R^2 = 0.15$
Sample size = 102

$R^2 = 0.3227$
Adj. $R^2 = 0.240$
Sample size = 102

$p \leq 0.05$
unique resource that directly contributes toward firm performance. The results of the mediating model below provide insights on why the relationship exists.

Baron and Kenny [6] state that for a mediating model to be valid: (1) Electronic commerce competence must be significantly correlated with mediating variables, which, in this case, are the value propositions related to each stage of CSLC. (2) Electronic commerce competence must have a direct relationship with firm performance. (3) The value propositions related to the stages of CSLC must affect firm performance in a regression of both electronic commerce competence and value propositions on firm performance. (4) The effect of electronic commerce competence on firm performance (direct effect) must be diminished in the mediation model. The results show that conditions 1, 2, and 4 are met (Tables 6, 7, and 8). Condition 3 is partially met. Facilitation at the requirements stage shows a significant relationship with EVA, and facilitation at the ownership stage shows a significant relationship with Tobin’s \( q \). Firms with higher electronic commerce competence seem to be favoring requirements and ownership stages for enhancing customer value and, thereby, firm performance. The difference in results for short-term and long-term performance suggests that accumulated know-how enables firms to better comprehend the likely avenues for success. Firms with higher competence seem to be targeting certain stages to enhance customer value. Such an approach may emerge from the understanding that enhancing customer value in requirements and ownership stages affects different aspects of performance. The examination of the direct linkage between value drivers in different CSLC stages and firm performance can provide further insights on this issue.

Hypotheses Related to Requirements Stage (H2a and H3a)

The results support H2a \( (p \leq 0.05) \). As pointed out earlier, EVA is a measure of wealth creation and captures the short-term performance of the company. The results support our contention that functionalities in the requirements stage are instrumental in facilitating growth of the company. These results are further strengthened by the rationale that the requirements stage was the initial target of most electronic commerce companies. The visible benefits of aggregation of information and suppliers enhanced customer value by decreasing the search costs and enabling price comparison. The initial strategic advantage for Amazon.com was in providing the largest selection of books through a single interface that consumers could use to quickly search for what they need. Further assistance included availability of product-related information, such as recommendations and reviews by other customers. As the industry leader, it set the direction for most of the other companies that embraced the e-commerce platform. Schubert and Selz [64], in an ongoing study on Web assessment, state that the information phase (similar to requirements phase) was always the one with the highest assessment scores and the highest functionalities. They state that this is no surprise, because it reflects the development of electronic commerce, where companies typically started transforming their paper-based product catalogs into the new medium and added interactive elements.

The service levels offered by the companies in product search and related information search impressed consumers bounded by the traditional shopping notions. Thus,
the drive toward augmenting service levels associated with the requirements phase provided value to the customer. Customers rewarded those electronic commerce companies that provided a comprehensive set of functionalities to facilitate the requirements phase. This enabled the companies to achieve higher growth levels, as is visible in the significant relationship between the value drivers in the requirements phase and the short-term performance of the company.

The lack of support for H3a seems to suggest that value drivers within the requirements stage do not seem to be influential in building long-term equity. The reason might be the nature of the value drivers in the requirements stage. The popularity of comparison shopping with the emergence of shop bots, which allow customers to get across-store comparisons of products, may reduce the benefits of value drivers offered by a single Web site and may not support building long-term performance.

Hypotheses Related to Acquisition (H2b and H3b)

The results do not provide evidence to support relationship between value drivers in the acquisition phase and performance. The main reason for such a finding may be that the functionalities within this stage are more common in Web sites. This argument is further corroborated by low standard deviation for the acquisition stage. But this does not mean that this stage cannot be a source of customer value. The findings may suggest that current functionality is routine, and the value potential of this stage is underutilized.

Hypotheses Related to Ownership (H2c and H3c)

The value drivers in the ownership stage show a positive relationship with long-term performance of the company as measured by Tobin's $q$ ($H3c: p \leq 0.05$). As discussed earlier, the value drivers in the ownership stage are a source of enhancing customer retention and thus building loyalty among customers. The results are intuitive, in that most of the value drivers in the ownership stage provide value to customers who have already purchased a product from the company. Companies that perform better in after-sales services and support and offer customers services (such as information on upgrade, maintenance, and complimentary products) through their Web site can potentially enhance customer retention and fuel long-term growth, although it seems that value drivers in the ownership phase should also affect short-term performance indirectly, due to good referrals by existing customers. Our results do not support this contention. It is likely that referral systems are a recent phenomenon, and it may take time for them to reach their actual potential.

Hypotheses Related to Retirement (H2d and H3d)

It is interesting to note that value drivers in the retirement phase depict no relationship with performance. Since the retirement stage has the lowest mean among the stages, the lack of significant relationship could be attributable to the emerging nature of such value drivers. Importance of these value drivers could increase over time, as
companies realize that value drivers within this stage have the potential to increase customer value and hence performance.

Further Discussion

CUMULATIVELY, THE RESULTS PROVIDE INTERESTING INSIGHTS into the drivers of performance for Net-enabled organizations. The results support the contention that facilitating the requirements stage can enable the company to enhance short-term performance, but not long-term performance. Brynjolfesson and Smith [13] support this notion in their study, in which they state that the problem with using product heterogeneity to explain the difference in Internet prices is that many of the service characteristics are purely informational in nature and thus separable from the product. They further state that there is no technical or legal reason why a shopper could not go to one site for help in selecting a product and then simply click to another site to buy it.

Value drivers within the requirements phase can be useful in attracting customers but cannot differentiate the company in situations where consumers can use functionalities provided by one company to locate what they need and then move to other sites to buy the product. This highlights the importance of value drivers related to the other stages of CSLC. Once the consumer makes the decision to buy a product from a company, an exclusive relationship is developed, and switching among Web sites becomes meaningless. Thus, functionalities related to postpurchase could be instrumental in building long-term performance. In this regard, customer loyalty programs that currently exist in the physical marketplace can provide guidance. Frequent flyer programs, product trade-in options, and maintenance plans are examples that have been used by companies in the physical marketplace to create customer value. Electronic commerce companies can develop Web functionalities that facilitate the enrollment and management of such customer loyalty programs. In addition, effective referral systems can allow the company to use satisfied customers to attract new customers, thus enabling the company to optimize both short- and long-term performance.

Firms with higher electronic commerce competence seem to be more adept at configuring their Web interface to support both short- and long-term performance. The accumulated know-how seems to be an important factor in directing resources toward building "facilitators of customer value" that support growth by attracting new customers and sustainability by retaining customers. Order fulfillment and postsales services and support have been suggested as two key drivers of performance of online operations [62]. Firms that depict high electronic commerce competence make resource allocation decisions on the presumption that developing and strengthening the relationship with customers should not be restricted to isolated purchases, but should span the extended life cycle of products. The Web interface is configured to provide value to new customers through prepurchase value drivers and to lock in the customers in a cycle in which future purchases flow out of past purchases through value generated by functionalities associated with the postpurchase stages.
Implications for Practice

An appropriate question to ask at this juncture is, “Are there strategies or options available to firms to leverage electronic commerce competence?” Resources can be acquired, but how they are combined and integrated to generate certain capabilities is what provides sustained competitive advantage [30]. The study highlights electronic commerce competence and Web-based functionality as important factors that enable firms to deliver customer value. Our study provides some guidance on the value of combining two undifferentiated resources—namely, experiential-based know-how and investments. Managers need to explicitly focus on the combinative or integrative aspect of combining undifferentiated resources to create organization routines that deliver customer value. This study also provides a structured approach that could be used by companies to create and enhance customer value. Each stage in the customer–supplier relationship has distinct value associated with it. Recognizing these value drivers and their varying effects on performance can guide managers in developing Web functionalities with a clear objective. Managers can use the framework, the metrics on Web functionalities, and the findings to focus their energies on areas that have greater potential effects on performance. For example, the framework can provide managers with a structured way of viewing how Web-enabled services may support different stages of the relationship with customers and enhance customer value. The results demonstrate the importance of customer acquisition and retention. Appropriate Web-based services within the requirements and ownership stages can be instrumental in attracting new customers and retaining existing ones. With finite resources, managers need to create a balance between building customer base and retaining existing customers.

Implications for Research

This stream of literature is ambitious, as it endeavors to structure the knowledge on electronic commerce competence, IT-based interfaces, and the implications for electronic commerce. This study is a preliminary step toward achieving this objective and opens up new avenues for further research. A fruitful avenue for research is to actually examine the Net-enabled organizational routines that have been termed as dynamic capabilities by Wheeler [75]. He proposes choosing, matching, executing, and assessing four specific capabilities. What resources do firms need to put in place for developing these capabilities?

Another interesting research direction could be exploring the relationships between the value drivers and the extent of consumer value in their use. This can provide insights in developing a weighting scheme for value drivers. Such a study could help direct efforts to enhance the personalization of value drivers and focus on areas that have the most effect on performance. Another interesting direction can be to conduct studies that are focused on enhancing understanding of retirement stage and referral systems. How can these concepts allow companies to enhance performance? Such studies can be used along with this study to gain a more in-depth understanding of the
relationship of these concepts to performance. Subsequent research can also replicate this study to gauge the shift in drivers of performance as the Internet-based marketplace moves toward maturity. Replication can also be done over a global sample of electronic commerce companies to enhance generalizability of the results. Finally, this study focused on front-end systems that interface with the customer. However, the effect of these systems on performance would be dependent on the quality of service provided by these value drivers. Integrated processes and back-end integration, including supply chain effectiveness, can be germane to performance and offer rich areas for further research.

Limitations

Some limitations should be noted. First, "experience" is a relatively crude measure of learning and was used as a proxy to measure experiential-based know-how. However, this measure has been used in many studies. In addition, Amazon.com, which has one of the longest experiences in managing an Internet-based business, is now managing online operations of other companies. These, together with the fact that using experience only makes our statistical analysis more conservative, are some considerations for selecting this measure. Second, in the evaluation of customer value, all the functionalities are given equal weight. In practice, it might be that certain functionalities are more important than others. Since the importance of functionalities can change, given the task at hand, and consumers can weight functionalities differently in different situations, any weight assigned could have resulted in inconsistent results. Another issue was the usage of the same Web site features in multiple stages. In the data collection phase, the researchers took care of ascertaining stage specificity of such features. This approach, along with high inter-rater reliability scores, partially alleviates discriminant validity issues.

A third limitation arises from the changing nature of Web sites. Web sites are updated to incorporate new ideas. Since time-related information on updates is almost impossible to obtain, this might have affected our results. But these effects may not be serious, as over three-quarters of the companies in our sample had a steady-state Web presence of two years or more. Fourth, multiple Web sites of one company, or a Web site divided into two segments, posed another challenge. Ideally, we would have liked to weigh the Web sites based on the revenue generation, but these types of data were not available. The approach we followed was to assess all the Web sites and then average the scores on functionalities. This approach was preferred, because in the absence of the required data, any assigned weight would have been arbitrary and could have provided misleading results.

Finally, although found to be pertinent in this case, the measures of performance used in the study suffer from some limitations. Tobin's q, which is a market-based measure, has been mainly criticized for being strongly influenced by the stock markets rather than firm-specific variables and also for lack of adjusting for the noise in the market. EVA has been mainly criticized for lack of standardization in the adjustments that need to be made. We made the adjustments that are pertinent in the case of
companies that are IT intensive in their operations. Another issue regarding the calculation of EVA is determining cost of equity. It has been pointed out that computing cost of equity is a complex undertaking. In this paper, we follow a simple approach suggested by Stern Stewart & Co [70].

Conclusion

IN THIS STUDY, WE HAVE TRIED TO ADDRESS some interesting issues that are currently subject to extensive debate by researchers and practitioners in the area of electronic commerce. First, the study contributes to the burgeoning literature on issues related to competitiveness of electronic commerce companies and presents an electronic commerce competence and customer value approach as the means to enhance organizational performance and shareholder’s value. Second, the study provides interesting insights on the relationship between electronic commerce competence, customer value, and firm performance. Firms can combine different resources to develop and structure processes that are focused on delivering value to the customer. Electronic commerce competence enables firms to recognize the areas that have the best potential to generate customer value and enhance performance. Net-enabled firms can attain high growth through attracting new customers by offering value creating and enhancing services when the customer is in the process of making a purchase decision. They can retain customers through services that enhance product ownership experience and thus stimulate future purchases from the same company. Such an approach may be pivotal in assuring both short-term and long-term performance.

NOTES

1. Stern Stewart, the consultancy that pioneered the EVA measure, has identified a total of 164 equity equivalent reserve adjustments; however, only about 20 to 25 are addressed in detail, and only a portion of these actually may be made in practice. Typically, 5 to 15 adjustments can significantly improve the precision of performance measurement. In our study, we used 11 adjustments.

2. It is important to note that our sample includes companies that are totally virtual and companies that are hybrid (operating in both a physical and a virtual marketplace). In some cases, accurate data on their physical versus virtual markets was not available. These companies were eliminated from the sample.

REFERENCES


48. Lee, L. "Clicks and mortar" at Gap.com; The clothing chain's stores and Web site work together to push up sales at both. *Business Week* (October 18, 1999), 150.


73. Tully, S. The real key to creating wealth. *Fortune* (September 1993), 38–50.
Appendix A. Operationalization of the Stages of CSLC

The calculation of index for each stage: Let $n_i$ represent the number of functionalities (at stage 1—Requirements) provided by one company's Web site. Different Web sites have different $n_i$. Let $N_1$ denote the total number of all possible functionalities at stage 1 (Requirements). $N_1$ is the same for all Web sites within the sample frame.

For example, if Dell.com has 14 functionalities at stage 1, then $n_i = 14$. And if $N_1 = 20$, then the index of the "Requirements" stage for Dell.com is $n_i/N_1 = 0.7$.

We have different scales for different independent variables. We use the standardized coefficients based on the following:

1. The common metric or "scale" notion. The standardized coefficients are on a common metric regardless of the measurement scale utilized for different independent variables. This common metric allows a comparative analysis of the effects of different independent variables. Unstandardized coefficients do not always reveal such comparative insights.

2. The interpretability. The square of the standardized coefficient is the variance explained in the dependent variable.

(For further information, see Singh [66].)

Appendix B. Calculation of Tobin’s $q$

Tobin’s $q = (MVE + PS + DEBT)/TA,$

where $MVE = (Price \ of \ share*) \times (Number \ of \ common \ shares \ outstanding); \ PS = Liquidating \ value \ of \ firm's \ outstanding \ preferred \ stock; \ DEBT = (Current \ liabilities - Current \ assets) + (Book \ value \ of \ inventories) + (Long-term \ debt); \ and \ TA = Book \ value \ of \ total \ assets.$

* Price of share is derived from the average stock price on the last day of each month.
Appendix C. Operationalization of Product Type Variable

<table>
<thead>
<tr>
<th>Product</th>
<th>Rank</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Hardware and electronics</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Books</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Travel</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Music and videos</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Clothing</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Toys and video games</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Health and beauty</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Jewelry</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Shoes</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Gomez.com.

Example: Amazon.com sells books, music, software, hardware (electronics), health and beauty, toys and video games, lawn and patio, tools and hardware, art and collectibles, and videos and DVDs.

Total score = 10 + 9 + 8 + 6 + 4 + 3 + 0 + 0 + 0 + 0 = 40.
Average = 40/10 = 4; so Amazon.com is assigned 4 for the product type category.

Appendix D. Heteroskedasticity

The Box-Cox transformation suggests the following transformation for the dependent variables.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Suggested transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVA</td>
<td>0.2</td>
</tr>
<tr>
<td>Tobin's q</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Multi-collinearity

<table>
<thead>
<tr>
<th>Variables</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>8.826</td>
</tr>
<tr>
<td>Acquisition</td>
<td>4.462</td>
</tr>
<tr>
<td>Ownership</td>
<td>7.837</td>
</tr>
<tr>
<td>Retirement</td>
<td>1.387</td>
</tr>
<tr>
<td>Size</td>
<td>2.130</td>
</tr>
<tr>
<td>Product fit</td>
<td>1.538</td>
</tr>
<tr>
<td>Industry growth</td>
<td>1.451</td>
</tr>
<tr>
<td>Online revenue ratio</td>
<td>2.094</td>
</tr>
<tr>
<td>Advertising expenditure ratio</td>
<td>1.204</td>
</tr>
<tr>
<td>B2B</td>
<td>1.407</td>
</tr>
<tr>
<td>B2C</td>
<td>1.427</td>
</tr>
</tbody>
</table>

Condition index value = 27.567