The Impact of E-Commerce Announcements on the Market Value of Firms

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Firms are undertaking growing numbers of e-commerce initiatives and increasingly making significant investments required to participate in the growing online market. However, empirical support for the benefits to firms from e-commerce is weaker than glowing accounts in the popular press, based on anecdotal evidence, would lead us to believe. In this paper, we explore the following questions: What are the returns to shareholders in firms engaging in e-commerce? How do the returns to conventional, *brick and mortar* firms from e-commerce initiatives compare with returns to the new breed of *net* firms? How do returns from *business-to-business* e-commerce compare with returns from *business-to-consumer* e-commerce? How do the returns to e-commerce initiatives involving *digital* goods compare to initiatives involving *tangible* goods? We examine these issues using event study methodology and assess the *cumulative abnormal returns to shareholders (CARs)* for 251 e-commerce initiatives announced by firms between October and December 1998. The results suggest that e-commerce initiatives do indeed lead to significant positive *CARs* for firms' shareholders. While the *CARs* for conventional firms are not significantly different from those for net firms, the *CARs* for *business-to-consumer* (B2C) announcements are higher than those for *business-to-business* (B2B) announcements. Also, the *CARs* with respect to e-commerce initiatives involving tangible goods are higher than for those involving digital goods. Our data were collected in the last quarter of 1998 during a unique bull market period and the magnitudes of *CARs* (between 4.9 and 23.4% for different subsamples) in response to e-commerce announcements are larger than those reported for a variety of other firm actions in prior event studies. This paper presents the first empirical test of the *dot com effect*, validating popular anticipations of significant future benefits to firms entering into e-commerce arrangements.
(*Event Study*; *Electronic Commerce*; *Market Value*; *Resource-Based View*; *Business-to-Business*; *Business-to-Consumer*; *Digital Goods*; *Tangible Goods*)

1. Introduction

Reporting in the general and business press suggests that we are witnessing a burgeoning interest in the use of the Internet. The number of web users is growing rapidly: one estimate is that over one million new users come online every week, and that the current number of adults in U.S. and Canada using the Internet and the web is over 150 million (Nua Internet Surveys 2000). This represents a large base of potential customers for e-commerce activities that are currently estimated at $25 billion in 1999 and expected to grow to over $233 billion by 2004 (Giga Information Group 2000). Drawing the growing base of Internet and web users to participate in online shopping and trading activities is a significant opportunity for e-commerce (Green 1999). The enormous and highly publicized success of

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firms such as Amazon.com and eBay is viewed as portending a rosy future for *business-to-consumer* (B2C) e-commerce, leading to a scramble among both established firms and start-up firms to join the fray. Further, the opportunities in the *business-to-business* (B2B) e-commerce arena to create efficient interfirm interfaces and streamline supply chains are also believed to be considerable. Early movers like Cisco Systems are reportedly transacting almost all of their dealings with distributors over the Internet. By many accounts, the opportunities in the business-to-business e-commerce arena far exceed the opportunities in business-to-consumer e-commerce.

In spite of anecdotal accounts, evidence on the benefits to firms from e-commerce initiatives is mixed, while the costs of entry are real and staggering. Considerable up-front investments in creating e-commerce capabilities are required to be a viable player in the current e-commerce environment. The Gartner Group estimates that firms creating e-commerce sites spend $1 million in the first five months, and $20 million "for a place in cyberspace that sets them apart from the competition" (Diederich 1999). Moreover, these costs are projected to increase at a rate of over 25% per year over the next two years (Satterthwaite 1999).

An examination of the annual reports of e-commerce companies reflects the magnitude of these costs. Amazon.com's annual report for 1999 reveals that the firm spent $152 million on computers, equipment, and software in 1998, amounting to 9% of their annual revenues for the year. This figure for BarnesandNoble.com is $34 million (16% of revenue) and for CDNow is $12 million (12% of revenue). As a percentage of annual revenue, these numbers are significantly higher than the average IT spending of 1% of revenue in the retail and distribution industry (Information Week 1998). In the financial services industry, Charles Schwab reported e-commerce related expenditures in 1998 to be between 15–17% of annual revenue (Tempest 1999), over twice the average of 7% for the sector in the year (Information Week 1998).

Once these investments are in place, the costs of entry into e-commerce also include significant marketing expenses in activities such as the placement of banner ads in one or more portal sites. For instance, Monster.com, a provider of job search services concluded an agreement in 1999 to pay AOL $100 million over four years to be the exclusive provider of position listings on AOL (Business Wire, December 2, 1999). Because a growing number of firms are making or considering making significant investments both in information technologies and in organizational changes related to e-commerce, a logical question that follows is: *What are the returns to shareholders from firms engaging in e-commerce?* Positive returns will provide evidence that investors can foresee future benefits to company performance from these planned activities and associated IT investments.

In an efficient capital market, investors are assumed to collectively recognize future benefit streams accruing from initiatives announced by firms, a judgment subsequently reflected in the stock price of the firm. If e-commerce activities of firms are expected to enhance future cash flows, the capital market would respond favorably to *unanticipated* e-commerce announcements by firms, resulting in an increase in their stock price. The event study methodology is designed specifically to take advantage of this aspect of financial markets, making it a very useful tool for management researchers to examine consensus estimates of the future benefits streams attributable to organizational initiatives (McWilliams and Siegel 1997). This methodology is well accepted and has been used to study the effect on the economic value of firm actions such as IT investments (Dos Santos, Pfeffers 1993), corporate acquisitions (Chatterjee 1986), takeover bids (Jarrel and Poulsen 1989), celebrity endorsements (Agrawal and Kamakura 1995) and new product introductions (Chaney et al. 1991).

In this paper, we employ the event study methodology to assess the impact on the market value of e-commerce initiatives announced by firms. Contingent on a positive finding of an overall effect, we explore the extent to which this effect is particularly strong or is not observed in different subgroups in the sample. As we are in the early stages of the phenomenon with few academic examinations of the issues related to e-commerce, we expect this exploration to advance our understanding of the phenomenon. We examine whether the market value created by the announcement is different for incumbent firms and net

firms and whether it is different between *business-to-business* e-commerce initiatives and *business-to-consumer* e-commerce initiatives. Finally, we examine whether market valuation enhancements are different when e-commerce initiatives involve tangible goods and when they involve digital goods. We examine these hypotheses using data on e-commerce announcements by firms in the last quarter of 1998.

The structure of the paper is as follows: §2 presents the evidence on benefits to firms from engaging in e-commerce activities and the hypotheses linking e-commerce announcements to cumulative abnormal returns; §3 contains a description of the event study methodology and details of data collection and analysis; §4 presents the results of the analysis; and the paper concludes with the discussion of the results in §5.

2. Hypotheses

Link Between E-Commerce Announcements and Market Value

E-commerce initiatives undertaken by firms reflect the active engagement of firms to build resources and capabilities for the new medium (Peteraf 1993). These announcements are expected to position the firms advantageously to exploit opportunities created by the growth in electronic commerce, thus creating benefits to the firm in future periods. Further, e-commerce initiatives suggest that a firm is planning to take advantage of significant efficiencies in streamlining operational processes through the deployment of information technologies (Hamel and Sampler 1998). Consistent with the signaling hypothesis (Fama, Jensen, and Roll 1969), announcements of e-commerce initiatives are a means for firms to convey favorable private information to investors such as the presence of an innovative, forward-looking, profit-oriented management team leveraging new technologies and acquiring organizational capabilities to address growing online markets.

These arguments suggest that firms announcing e-commerce initiatives are likely to realize significant strategic and operational advantages in the future. If so, investors should react positively to e-commerce announcements, creating a positive abnormal stock market return—*a risk-adjusted return in excess of the average stock market return*—around the date of the e-commerce announcement by firms. This leads to the hypothesis that e-commerce initiatives are associated with enhanced benefits streams in the future and consequently enhanced market valuation. We describe our overall hypothesis (H1).

Hypothesis 1 (H1). *The abnormal returns attributable to e-commerce announcements are positive.*

Firm Type and Market Value

We view firms as falling into two categories: conventional "*brick and mortar*" firms engaging in e-commerce and emerging firms for which e-commerce is central to the business model. The first category comprises incumbent firms with a history of competing in their traditional markets. For these firms, e-commerce initiatives offer a strategic opportunity to redefine and extend their current activities using the Internet. We term these *conventional* firms. Examples include Toys "R" Us, and IBM: firms established in their particular industries that have extended their activities to include e-commerce operations as an extension of their conventional operations. The second category comprises newer firms such as Amazon.com, Yahoo!, and E*Trade whose operations are primarily enabled by Internet technologies. We term these *net* firms. This categorization parallels the distinction made by investment analysts between *pure-play* e-commerce firms engaged primarily in e-commerce activities and conventional firms for whom e-commerce is an extension of their traditional activities (Burnham 1998).

The *resource-based view* (Conner and Prahalad 1996) highlights that conventional firms, over years of operating in their chosen product-market space, accumulate valuable experience and understanding of their market and their customers. These firm resources are embedded in the knowledge of their employees as well as in the design of their organizational structures and operational processes and routines. Conventional firms can draw on these valuable resources related to the business context as they extend their operations to the e-commerce domain. In spite of these advantages,

conventional firms face considerable challenges in reconfiguring their existing resources to compete effectively in e-commerce environments. The resources created by firms to compete in conventional markets, in some cases, may be ill-suited or even constraining in changing environments, a phenomenon described as *the incumbents' curse* (Chandy and Tellis 2000) or the *late mover advantage* (Shankar et al. 1998). That certain components of the resource stock of the firm developed in one environment may turn into serious limitations in another parallels the observation that core rigidities often have their roots in core competencies (Leonard-Barton 1992).

In addition, the pacing of action, the *clockspeed* of the firm (Yoffie and Cusumano 1999) may be fundamentally different in conventional and e-commerce environments. The competitive e-commerce environment is considerably shaped by developments in hardware, software, and networking technologies and therefore inextricably linked to the rapid cycles of change in these enabling technologies. The phrase *Internet time* has been used to describe the heightened pace of operations and rapid cycles of decision making required to exploit extremely short windows of opportunity to gain competitive advantages (Yoffie and Cusumano 1999). As organizational processes—the routines established over time within conventional firms are relatively inflexible (Davenport 1992, Nelson and Winter 1982), future benefits from e-commerce benefits are contingent on conventional firms being able to accomplish the difficult task of adapting their processes to these fast-paced contexts. This task is further complicated by the challenge of having to unlearn the lessons learned in conventional environments before effective learning can occur (Starbuck 1996). Overall, these arguments suggest that the future benefits from e-commerce activities to conventional firms are uncertain on account of these obstacles faced by them.

In contrast, *net* firms have significant advantages that make them particularly suited to the current e-commerce environment. These environments are characterized by considerable volatility and are described as a *parallel universe* (Fox 1999) requiring radically different organizational strategies and managerial mindsets. *Net* firms tend to be technology-driven and have significant capabilities related to Internet technologies. Evidence suggests that they are characterized by entrepreneurial cultures and have the ability to make rapid changes to their strategies to leverage and align with changes to the fluid technological and market environments (Yoffie and Cusumano 1999, Warner 1999).

The relative advantages of conventional and net firms are still unclear. Do the benefits from extending intangible assets in the form of supplier relationships, brand recognition and reputations to the e-commerce environment outweigh the constraints arising from these prior resource stocks? Are the initial disadvantages of conventional firms from being on the learning curve with respect to Internet technologies and the novel e-commerce context offset by the advantages derived from the migration of existing firm competencies to e-commerce operations? Are the learning curves for *net* firms with respect to different elements of the complex business environment steeper than those confronted by *net* firms in adopting novel e-commerce technologies?

There are conflicting reports regarding these issues in the business and practitioner press. The relative disadvantage of *net* firms in comparison with conventional firms is highlighted in a study by Boston Consulting Group and Shop.org that reveals that the acquisition and servicing costs incurred by *net* firms are nearly twice as large as those incurred by conventional firms (Paul 1999). However, industries are being transformed in ways that traditional operating processes and strategies that form the basis of conventional firm advantages are rendered less useful or even dysfunctional in e-commerce environments (Evans and Wurster 1999). As a recent commentary examining the question concluded: "*Bottom Line: Nobody Really Knows*" (Neuborne 2000, page 98).

We explore the complex issue by examining the two subgroups in the data.

Hypothesis 2 (H2). *The abnormal returns attributable to e-commerce announcements of conventional firms are different from the abnormal returns attributable to e-commerce announcements of net firms.*

Nature of Initiative and Market Value

In H3, we focus on the broad classification of e-commerce initiatives into two categories—B2B and

B2C. The volume of business-to-consumer e-commerce (B2C) in 1999 was estimated at $25 billion and forecasts indicate this figure as rising to $152 billion in 2003 and then to $233 billion in 2004 (Giga Information Group 2000). The tantalizing promise of B2C e-commerce derives from the possibility of the large and rapidly growing population of web users being a market for goods and services. The concept that customers would order goods online to be delivered directly to their doors, bypassing traditional intermediaries such as retail outlets is epitomized by highly publicized firms such as Amazon.com and e-Toys. The future benefits from such e-commerce initiatives hinge on the value created by the ability to directly address a wide, geographically dispersed audience, the ability to offer a wider assortment than feasible in conventional stores, and the potential to customize customer interactions and derive cost efficiencies from eliminating intermediaries. Offsetting these considerable advantages, B2C commerce is plagued by the difficulties of establishing and managing processes for efficient direct delivery of goods to customers (Ginsburg 2000).

The potential for B2B e-commerce is estimated to grow from $131 billion dollars in 1999 to as high as $7.3 trillion by 2004 (Junnarkar 2000). Benefits from B2B e-commerce are expected to be derived from scale economies from accessing a wider customer base and from greater efficiencies through the streamlining of supply chains using internet technologies. As firms can potentially establish multiple B2B relationships, firms currently initiating B2B initiatives will have the opportunity to transfer the learning from initial B2B initiatives to become more efficient in subsequent relationships through the development of alliance capabilities (Kale and Singh 1999). This suggests that firms that enter into B2B e-commerce in the present period are likely to be positioned advantageously in the future to leverage the learning from early experience (Conner and Prahalad 1996). However, offsetting the considerable advantages of B2B e-commerce are uncertainties arising from the increased ability of large buyers to appropriate benefits from suppliers by procuring through online auctions and the possibility of supplier firms engaging in dynamic pricing, raising the overall costs of items to buyers (Junnarkar 2000).

To inform the debate on the payoffs to firms from B2B and B2C e-commerce, we propose to explore the relative benefits to firms from such initiatives with the following hypothesis:

Hypothesis 3 (H3). *The abnormal returns attributable to business-to-business e-commerce announcements are different from the abnormal returns attributable to business-to-consumer e-commerce announcements.*

Type of Goods and Market Value

A range of e-commerce initiatives involve products such as software code, stock quotes, and magazine articles that are available in digital form for downloading or for use online by customers. For instance, a customer can pay using a credit card and immediately download software programs such as *Corel Draw* and *Word Perfect* from Corel.com, or search the archives of the New York Times and print articles of interest for a small fee. Other e-commerce initiatives involve *tangible goods* such as CDs, books, toys, and computers that can be ordered online but need to be physically shipped to the customer. This distinction between digital and tangible goods is analogous to the view of economic activity as involving either *bits* or *atoms* advocated by Negroponte (1995).

While e-commerce presents an opportunity for firms selling both categories of products, especially significant advantages accrue to firms supplying *digital goods* as they can use the Internet as a medium for immediate product delivery. The use of the Internet to deliver digital goods allows firms to break free of the limitations and physical constraints imposed by tangible containers such as packaged CDs and printed magazines. For instance, an online magazine can potentially deliver individually customized issues to all its subscribers, engage its audience through hyperlinks to related content and provide readers the ability to dialogue with the author and with one another. Similar devices that enhance the value of the content to customers are not feasible in the printed form as a printed magazine is generally limited by physical constraints such as the number of pages and the need for large print runs with similar content. Similarly, a software firm can offer a wider range of versions of their products with different functionalities at multiple price points when selling online than when constrained by the costs of managing

the complexity of delivering a variety of products to customers through traditional channels.

Intangible digital goods deliverable online are a subset of the category of *information goods;* the marginal costs of producing such goods are very small (Shapiro and Varian 1999). This feature of the economics of production of intangible goods, combined with the ability to immediately deliver such products to a large number of consumers over the Internet creates the opportunity for firms to evolve highly scaleable and profitable e-commerce business models. Initiatives involving the use of the Internet as a delivery medium for digital products are likely to create significantly higher future benefit streams than e-commerce initiatives involving tangible products where the Internet is employed largely as a means for more efficient searching and ordering by customers. For instance, firms such as eBay or Corel Corp that use the Internet as a means to instantly deliver their products and services are likely to enjoy significantly higher benefit streams in the future as transaction volumes increase—the marginal costs of hosting additional auctions or delivering an extra copy of Word Perfect are minimal. In contrast, benefits to online firms selling tangible items such as borders.com or gap.com do not scale up in the same proportion as for eBay or Corel in view of the considerable and relatively steady ongoing costs of procuring and shipping copies of books or clothes as order volumes increase.

However, investors are expected to realize these efficiencies in the production and distribution of digital goods and factor them into the stock prices of firms engaged in these activities. The relative increases in the market value of firms producing digital goods and tangible goods therefore are not clear. To begin to address these issues, we hypothesize that:

Hypothesis 4 (H4). *The abnormal returns attributable to e-commerce announcements involving tangible goods are different from the abnormal returns attributable to e-commerce announcements involving digital goods.*

3. Methodology

Linking e-commerce activities and the economic returns to evaluate the payoff to firms from IT investments and complementary investments in human capital and appropriate organizational structures is an extremely complex undertaking. Prior approaches to measure returns from IT and complementary investments have used return on assets (Barua et al. 1995), cost savings (Mukhopadhyay et al. 1995) or return on investment (Hitt and Brynjolfsson 1996) to understand the value of these investments. All of these use accounting-based measures of firm benefits from IT that have been criticized as being insensitive to the strategic nature of IT investments that often create benefits to firms in the form of flexibility and expanded operating choices in future periods (Benaroch and Kauffman 1999). Moreover, as these benefits often accrue over time, evaluating the value of IT and complementary investments related to specific firm initiatives is problematic. The use of forward-looking measures is suggested as one way to overcome these deficiencies (Bharadwaj et al. 1999). Consistent with this view, we examine the impact of individual firms' e-commerce initiatives on the stream of future benefits by focusing on the *abnormal returns* to the firms. Abnormal returns to a firm are created by the consensual estimates of the large number of investors in the capital markets of the *expected future benefit streams* associated with firm initiatives. If the consensus of investors regarding firm announcements for e-commerce initiatives is that they create value for firms in future periods, investors would react favorably to these announcements by firms. This will be reflected in a positive abnormal stock market return for the firm's stock—*a risk-adjusted return in excess of the average stock market return*—around the date of the e-commerce announcement. Abnormal returns thus provide a unique means to associate the impact of a specific action by the firm on the firm's expected profitability in future periods (MacKinlay 1997).

Event study methodology draws on the efficient market hypothesis (Fama et al. 1969) that capital markets are efficient mechanisms to process information available on firms. The logic underlying the hypothesis is the belief that investors in capital markets process publicly available information on firm activities to assess the impact of firm activities, not just on current performance but also the performance of the firm in future periods. When additional information becomes publicly available on firm activities that might affect a firm's present and future earnings, the stock price

changes relatively rapidly to reflect the current assessment of the value of the firm. The strength of the method lies in the fact that it captures the overall assessment by a large number of investors of the discounted value of current and future firm performance attributable to individual events, which is reflected in the stock price and the market value of the firm (see McWilliams and Siegel 1997 for a detailed review).

The event study methodology provides management researchers a powerful technique to explore the strength of the link between managerial actions and the creation of value for the firm (McWilliams and Siegel 1997). This methodology is well accepted and has been used in a variety of management research to study the effect on the economic value of firm actions such as IT investments (Dos Santos et al. 1993), corporate acquisitions (Chatterjee 1986), CEO succession (Davidson et al. 1993), joint venture formations (Koh and Venkatraman 1991), celebrity endorsements (Agrawal and Kamakura 1995) and new product introductions (Chaney et al. 1991).

Data

We define the event as a public announcement of a firm's e-commerce initiative in the media. We collected the data from a full text search of company announcements related to e-commerce in the period between October 1, 1998, and December 31, 1998, using two leading news sources: PR Newswire, and Business Wire. Based on an examination of several candidate announcements, we used the online search features of Lexis/Nexis to search for announcements containing the words *launch* or *announce* within the same sentence as the words *online* or *commerce*,[1] and *.com*. The search yielded 536 announcements.

In the period that we examined—the last quarter of 1998—there was a considerable level of e-commerce activity and investor euphoria, particularly related to B2C e-commerce (Green 1999). This was also a time when firms with commitments to e-commerce operations reported strong sales through the new channel. For instance, e-Toys—one of the new breed of e-tailers—garnered considerable attention and was perceived as having a first-mover advantage as compared to conventional outlets such as Toys "R" Us (Pareira 1999). Charles Schwab was another firm viewed as being conspicuously successful. Schwab's online operations, fueled by the growth in online trading, enabled the firm to draw ahead in market capitalization of erstwhile market leader Merrill Lynch, in spite of Merrill Lynch's client assets (at $1.4 trillion) being about three times that of Schwab's ($491 billion). Reported on December 29, 1998, this landmark event was considered a triumph linked to Schwab's e-commerce strategy (Schwab Tops Merrill In Market Value 1998). In this quarter, the S&P 500 index went up from 986 on October 1 to 1229 on December 31, a rise of 24.64%. In this same period, the NASDAQ Composite Index went from 1612 to 2193, a rise of 36.04% in one quarter.[2]

We believe that the widespread recognition of the potential of e-commerce after the events in 1998 is reflected in the acknowledgement of the Internet as a significant medium by key policy makers. As the Federal Reserve Chairman, Alan Greenspan testified before the U.S. Senate in January 1999: "The issue really gets to the increasing evidence that a significant part of the distribution of goods and services in this country is going to move from conventional channels into some form of Internet system." (Alan Greenspan quoted in Hanson 2000, p. 357).

The criteria we used to identify an announcement as an event was that the news item be an announcement of a new electronic commerce-related initiative or the extension or expansion of an existing initiative. Miscellaneous announcements such as estimates of expected earnings, news about personnel changes, and site traffic volumes, etc. were discarded. In cases where the announcements contained news about multiple companies jointly engaged in e-commerce initiatives as in the case of firms establishing strategic partnerships or marketing partnerships related to e-commerce, consistent with the tradition in the literature, we counted the announcement as multiple events, one relating to each of the firms involved.[3] Overall, from the set of 536

[1]We observed considerable variation in the wording of announcements related to electronic commerce. Using the word "commerce" captured the most common variants: *e-commerce, e commerce,* and *electronic commerce.*

[2]To provide a point of reference, on Dec. 31, 1999, the S&P 500 Index was at 1455 and the NASDAQ Composite Index was at 4069.

[3]In many instances where multiple firms featured in the announcement, only one of the firms was publicly traded, and therefore only one event was registered.

announcements derived from the text search, we identified 375 e-commerce events relating to publicly traded companies. Of this set, 88 events were dropped because these firms were new listings on stock exchanges and did not have a trading history of 120 days prior to the event to be included in the analysis. We also eliminated stocks whose average price in the period was less than $1, as price changes in these stocks tend to be unrepresentative of the broader market. Further, we eliminated stocks where the average daily-traded volume in the period was less than 50,000 shares as the efficiency of the market is likely to be questionable with small trading volumes when information is processed in fits and starts and the market can overreact or underreact to new information with limited predictability. Many institutional investors and pension funds are prohibited from buying or owning penny stocks and investing in inactive or illiquid stocks. Dropping 36 events pertaining to low-priced or inactive stocks left us with a data set comprising events pertaining only to stocks with a sufficient following and broad enough investor interest to have been fairly priced before the announcement. The final sample that we retained for analysis comprised 251 events.

Coding

In classifying firms as *net* or *conventional* firms to test H2, we followed the classification system devised for the Dow Jones Internet Index ("Dow Jones Creates New Index" 1999) that considers *net* firms to be those deriving more than 50% of revenue from Internet activities. Of the 251 events, 115 were coded as pertaining to *net* firms and 136 to *conventional* firms.

The coding of events as *business-to-business* (B2B) or *business-to-consumer* (B2C) to test H3 and involving *digital* or *tangible* goods to test H4 was based on the analysis of the full text of the announcement. We independently coded the events using the coding scheme and the description of the announcement in the text of the press release. Inconsistencies in coding were resolved through discussion of the differing interpretations of the event.

To evolve the coding scheme for B2B and B2C, we used a definition of B2B as involving business agreements between firms, usually involving consolidated settlement of payments over multiple transactions. In contrast, B2C is viewed as involving transactions between a firm and end customers and usually involving payments linked to individual transactions. Essentially, we used the *revenue model*—the source of the revenue for the firm making the announcement—whether it was from an agreement concluded with another business or whether it was from a customer engaging in individual transactions as the basis to classify events into B2C and B2B. This closely parallels the fundamental distinction by the Bureau of Labor Statistics between activities as influencing either the Producer Price Index (PPI) or the Consumer Price Index (CPI). For instance, the announcement by the office supply store *Staples* of a website aimed at small businesses and distributors ordering products was classified as B2B. The announcement by D.G. Jewellery to create a website for customers to order jewelry online was classified as B2C. When there were multiple firms mentioned in announcements, the decision about whether the event was B2B or B2C was made for each firm involved. For example, the announcement "Reel.com opens virtual video store front on america online" was coded as B2B for AOL and as B2C for Reel.com. The logic was that the source of revenue for AOL was the one-time fee paid by Reel.com as well as periodic payments based on traffic channeled to Reel.com. The revenue for Reel.com is from video sales to individuals channeled to the company website. On the other hand the announcement "Digital river adds Kmart corporation to growing network of online software dealers" was coded as B2C for Kmart and as B2B for Digital River as Digital River would receive periodic consolidated payments based on individual purchases by customers at Kmart's online site. Instances where the revenue arrangements were unclear were dropped. Of the 251 announcements, 113 were coded as B2B and 116 coded as B2C. Twenty-two events were eliminated during the coding, as the text did not provide sufficient information to allow a determination of whether they belonged to one or the other of the two types of e-commerce.

The coding of the event as involving digital goods or tangible goods to test H3 was also based on the details in the announcement. We classified initiatives where the goods or services were made available online for use or downloaded for use as involving digital goods. For instance, announcements of firms offering

products or services such as rock concerts on demand, online trading, signup for telecom services, and purchase of insurance services were coded as involving digital goods. Similarly, announcements by firms of online forums for exchange or trade were coded as involving digital goods. Announcements of online availability of products such as sports merchandise or books were classified as involving tangible goods. Of the 251 events, 114 events were coded as involving tangible goods and 137 as involving digital goods.

The breakup of the sample into events for net and conventional firms, relating to B2B and B2C e-commerce and involving digital and tangible goods, is provided in Table 1. Table 2 provides the mean, minimum, the maximum of the daily trading volumes of stocks, and the prices of stocks in the sample for each of the subgroups that we examined: Net/Conventional, B2B/B2C and Tangible/Digital.

Data Analysis

To calculate the effect of an event it is necessary to estimate what the return of the stock would have been, had the event not occurred. To do this, and to control for overall market effects, the return of the stock is regressed against the return of a market index. The estimated coefficients from that regression are used to calculate the predicted value of the stock over the time window in which the stock price is adjusted. This yields the regression:

$$R_{s,t} = \alpha_s + \beta_s R_{m,t} + \epsilon_{s,t}, \quad (1)$$

where $R_{s,t}$ is the return of stock s on day t: $R_{s,t} = (\text{Price}_{s,t} - \text{Price}_{s,t-1})/\text{Price}_{s,t-1}$. Similarly, $R_{m,t}$ indicates the market return on day t, the average of returns for all firms included in a market index. We used the Standard and Poor's 500 as the index of the market. The S&P 500 is a capitalization-weighted index based on a broad cross-section of the market and is commonly employed in prior event studies (Campbell et al. 1997). The $\epsilon_{s,t}$ is a random error term for stock s on day t, and the α_s and β_s are firm-dependent coefficients to be estimated. The return of the stock, rather than the price of the stock is used to control for autocorrelation.

Table 1 Illustrative Sample of E-Commerce Announcements

	Digital (n = 137)	Tangible (n = 114)
Conventional (n = 115)	(n = 49; B2B = 21, B2C = 26, Other = 2) (a) Business Wire, December 30, 1998, Wednesday, 675 words, Tel-Save.com Signs Long Term Agreement With AT&T, New Hope, PA.	(n = 66; B2B = 18, B2C = 40, Other = 8) (c) Business Wire, December 2, 1998, Wednesday, 453 words, Airgas Ushers in Enhanced Customer Focus With On-Line Web Site, Radnor, PA.
	(b) Business Wire, December 22, 1998, Tuesday, 831 words, Digital River Adds Kmart Corporation to Growing Network of Online Software Dealers, MINNEAPOLIS	Business Wire, November 17, 1998, Tuesday, 1174 words, Staples Streamlines Buying Office Supplies Online; Launches Staples.com as E-Commerce Solution for Small Businesses
Net (n = 136)	(n = 88; B2B = 51, B2C = 26, Other = 11) (d) Business Wire, December 22, 1998, Tuesday, 831 words, Digital River Adds Kmart Corporation to Growing Network of Online Software Dealers, MINNEAPOLIS	(n = 48; B2B = 23, B2C = 24, Other = 1) (f) PR Newswire, October 8, 1998, Thursday, Financial News, 515 words, Peapod Introduces New Web Site; New Site Streamlines Shopping Experience, SKOKIE, Ill., Oct. 8
	(e) PR Newswire, October 15, 1998, Thursday, Financial News, 446 words, eBay Launches New "About Me" Feature Allowing Users to Create Personal Homepages; eBay Promotes Strong Sense of Community for Online Trading With 'About Me' Feature, SAN JOSE, Calif., Oct. 15	(g) Business Wire, December 1, 1998, Tuesday, 432 words, YourGrocer.com Launches the First Online Bulk Grocery Store on the Internet, PORT CHESTER, N.Y.

Note. Events (b) and (d) are repeated. Event was coded as B2B for Digital River and B2C for Kmart. Events listed as "Other" were dropped in the coding of *CARs* in the B2B, B2C subgroups.

Table 2 Average Daily Trading Volumes and Average Prices of Stocks in Sample

		Mean	Std Dev	Min	Max
All	*Volume*	5,150,117	9,446,423	51,556	33,678,072
($n = 251$)	*Price*	\$ 27.76	\$ 24.29	\$ 1.09	\$ 138.33
	Beta[a,b]	1.2616223	0.7418352	−1.5048983	2.9123723
Conventional	*Volume*	4,189,388	9,278,934	51,556	30,525,569
($n = 115$)	*Price*	\$ 24.26	\$ 23.19	\$ 1.10	\$ 138.33
Net	*Volume*	5,962,498	9,544,278	51870	33,678,072
($n = 136$)	*Price*	\$ 30.73	\$ 24.89	\$ 1.09	\$ 85.66
B2C	*Volume*	2,216,114	5,169,624	51,556	30,525,569
($n = 116$)[c]	*Price*	\$ 21.56	\$ 21.56	\$ 21.56	\$ 21.56
B2B	*Volume*	7,461,712	11,160,542	53,681	33,678,072
($n = 113$)	*Price*	\$ 34.22	\$ 24.90	\$ 1.09	\$ 85.66
Tangible	*Volume*	5,466,580	10,040,503	51,870	33,678,072
($n = 114$)	*Price*	\$ 24.09	\$ 21.19	\$ 1.09	\$ 85.66
Digital	*Volume*	4,886,783	8,950,883	51,556	33,678,072
($n = 137$)	*Price*	\$ 30.82	\$ 26.28	\$ 1.14	\$ 138.33

Notes.

a. The coefficient was obtained for each stock using Equation (1) and 120 days of stock price data. This was subsequently used for the estimation of the *CARs* in Equation (2).

b. 6 of the 251 betas were negative.

c. 22 events were dropped in the coding of B2B/B2C.

Specifically, we would expect that the price of a stock on any day is related to the price the previous day, but the return of a stock should be tied to the overall growth of the firm. Brown and Warner (1985) discuss a variety of issues related to the use of daily stock returns and the use of alternatives such as monthly stock returns. Our analytical methods are consistent with prior studies using daily stock returns.

For the analysis, we used an estimation period of 120 days and calculated the *CARs* over two event windows: an 11-day interval—five days before and five days after the event and a 21-day interval—10 days before and 10 days after the event. The length of the estimation period and the event windows we use are consistent with prior studies of capital market responses (Dasgupta et al. 1997).

We used the coefficient estimates from regression (1) to predict the expected return over the $t = [-5,5]$ and $t = [-10, +10]$ event windows. We calculated abnormal return in these windows as defined by McWilliams and Siegel (1997):

$$AR_{s,t} = R_{st} - (\alpha_s + \beta_s R_{m,t}). \quad (2)$$

The coefficients α_s and β_s are estimates of the true parameters obtained via ordinary least squares. The abnormal returns are simply the prediction errors of the model over the event window. Notice here, that *AR* are abnormal returns: they are returns over and above those predicted by the general trend of the market on each day. The assumptions of the methodology are that the abnormal returns are the result of the announcement, and not some other random event occurring on the same day. The strength of the method is linked to the improbability of random events across different firms on different days coinciding with the announcement of an e-commerce initiative. The standard errors are calculated by the formula defined by (Judge et. al 1988, pg. 170).

$$\text{var}(AR_{s,\tau}) = \left(S_s^2 \left[1 + \frac{1}{T} + \frac{(R_{m,\tau} - \bar{R}_m)^2}{\sum_{t=1}^{T} (R_{m,t} - \bar{R}_m)^2} \right] \right) \quad (3)$$

Where S_s^2 is the variance of the error from the estimation model, R_m is the mean market return over the prediction interval, and T is the number of days in the estimation interval. The τ indicates observations within the event window, while t indicates the day in the estimation interval. Notice then, that the standard error on any given day in the prediction interval is a function of how far the market return on that day is from the mean market return. So on days where the market return is very different from the expected market return, the standard errors of abnormal returns are greater. The standard error depends on the length of the estimation interval, longer estimation intervals lead to lower standard errors.

The return of the stock, rather than the price of the stock, is used to control for autocorrelation. Specifically, we expect the price of a stock on one day to be related to the price on the prior day and the return of a stock to be tied to the overall growth of the firm. Under the assumption that the returns on each day are independent, the standard error of the cumulative return is the sum of the standard errors. Thus, we have

the following equations to describe *CAR*, and *var(CAR)* in the 5-day window ($\tau = 5$) and the 10-day window ($\tau = 10$):

$$CAR_{s,\tau} = \sum_{i=-\tau}^{\tau} AR_{s,i} \tag{4}$$

and

$$\text{var}(CAR_{s,\tau}) = \sum_{i=-\tau}^{\tau} \text{var}(AR_{s,i}). \tag{5}$$

From these equations, we calculate the average *CAR* across all firms and the variance of *CAR*. The resulting equations are:

$$\overline{CAR}_{\tau} = \frac{1}{N} \sum_{s=1}^{N} CAR_{s,\tau} \tag{6}$$

and

$$\text{var}(\overline{CAR}_{\tau}) = \frac{1}{N^2} \sum_{s=1}^{N} \text{var}(CAR_{s,\tau}). \tag{7}$$

To test the hypothesis that the mean *CAR* is different from zero on any given day, we use a student's *t* test, which is of the form:

$$t = \frac{\overline{CAR}_{\tau}}{\sqrt{\text{var}(\overline{CAR}_{\tau})}} \sim t_{(a,df=N-1)} \tag{8}$$

For a more detailed discussion of analytical techniques employed in event studies, see Campbell et al. (1997).

4. Results

Effect of E-Commerce Announcements

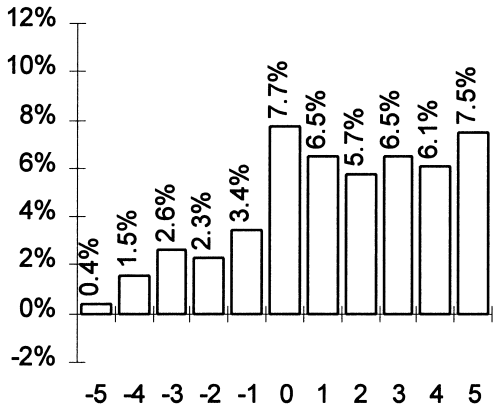
The *CARs* observed for the 251 e-commerce announcements in the sample and the test for significance of the effect are presented in Table 3.[4] The *CARs* on each of the days in the 10-day window[5] are provided in Appendix 1. The bars in the graph on Figure 1 represent the mean *CARs* on each of the days in the 5-day window. The results in Table 3 and Figure 1 indicate that the *CARs* to firms making e-commerce announcements are positive and significant at the end of the 5-day window around the event (*CARs* = 7.5%, $t = 5.45$, $p < 0.001$). The *CARs* at the end of the 10-day event are positive and significant as well (*CARs* = 16.2%, $t = 8.53$, $p < 0.001$). The magnitudes of the *CARs* are uniformly positive and significant in both time windows and thus provide strong support for H1.

Table 3 ***CARs* Related to E-Commerce Announcements** ($n = 251$)

Windows	*CARs* (All firms)	*t* value
−5 + 5	7.5%	5.45***
−10 + 10	16.2%	8.53***

Note. The *t* value reported is for the 2-tailed test; +:$p < 0.1$, *:$p < 0.05$, **:$p < 0.01$, ***$p < 0.001$

Figure 1 **Cumulative Abnormal Returns for All Firms** ($n = 251$)



Effect of Announcement for Conventional, Net Firms

The *CARs* related to e-commerce announcements for the 115 Conventional firms and the 136 Net Firms in the sample are presented in Table 4. The bars in Figures 2 and 3 represent the mean *CARs* on each of the days in the 5-day time windows bracketing the event for Conventional firms and Net firms. The *CARs* on each of the days in the 10-day window are provided in Appendix 1. The results in Table 4 suggest that the *CARs* for *conventional* firms are positive and significant in the 5-day window (*CARs* = 4.9%, $t = 2.41$, $p < 0.05$) as well as in the 10-day time window around the event

[4]The results are robust to the removal of outliers from the dataset.

[5]We refer to the entire time interval: 10 days prior to and 10 days after the event as the 10-day window.

day (*CARs* = 14.0%, t = 5.03, $p < 0.001$). Similarly, the *CARs* for *net* firms are positive and significant in the 5-day window (*CARs* = 9.6%, t = 5.19, $p < 0.001$) as

Table 4 ***CARs* for Conventional and Net Firms**

Time Windows	*CARs:* Conventional Firm ($n = 115$)	t value	*CARs:* Net Firm ($n = 136$)	t value	Difference in *CARs* (Conv. − Net)	t value
−5 + 5	4.9%	2.41*	9.6%	5.19***	−4.7%	−1.72+
−10 + 10	14.0%	5.03**	18.1%	6.96***	−4.1%	−1.07

Note. The t value reported is for the 2-tailed test; +:$p < 0.1$, *:$p < 0.05$, **:$p < 0.01$, ***$p < 0.001$.

Figure 2 **Cumulative Abnormal Returns for Conventional Firms** (n = 115)

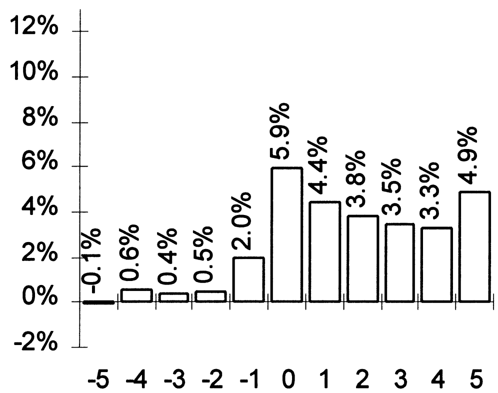
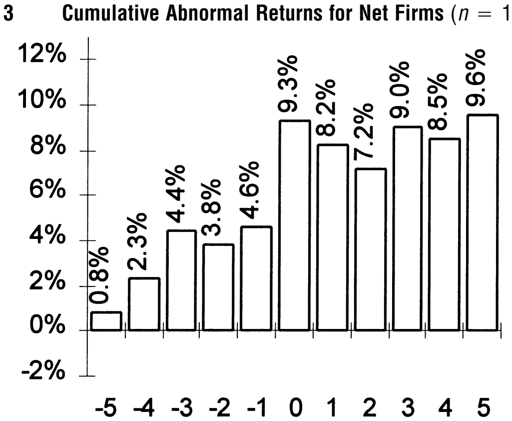


Figure 3 **Cumulative Abnormal Returns for Net Firms** (n = 136)



well as the 10-day window (*CARs* = 18.1%, t = 6.96, $p < 0.001$).

While the *CARs* for *conventional* firms are uniformly lower than that for *net* firms, the difference between the *CARs* are only marginally significant in the 5-day window ($CAR_{diff} = -4.7\%$, $t = -1.72$, $p < 0.10$) and not significant in the 10-day window ($CAR_{diff} = -4.1\%$, $t = -1.07$, *ns*). H2, the hypothesis that the cumulative abnormal return for *conventional* firms would be different from that for *net* firms is thus not supported in the data.

Effect of Announcements for B2B and B2C E-Commerce

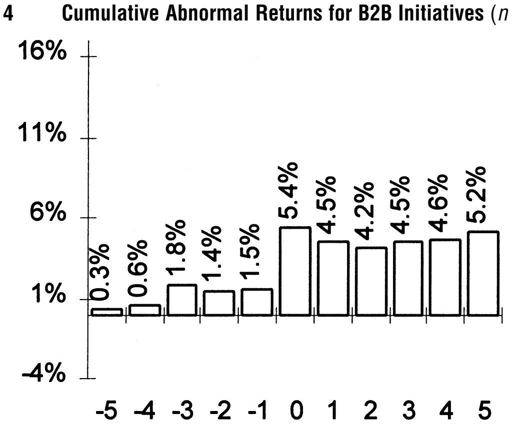
The *CARs* related to the 113 firms making B2B announcements and 116 firms making B2C announcements are provided in Table 5. The bars in Figures 4 and 5 represent the mean *CARs* on each of the days in the 5-day time windows bracketing the event for B2B

Table 5 ***CARs* at the End of 5 and 10 Day Event Windows for B2B and B2C**

Time Windows	*CARs:* B2B ($n = 113$)	t value	*CARs:* B2C ($n = 116$)	t value	Difference in *CARs* (B2B − B2C)	t value
−5 + 5	5.2%	2.93**	9.3%	4.29***	−4.1%	−1.53
−10 + 10	12.8%	6.88***	21.0%	5.38***	−8.2%	−2.21*

Note. The t value reported is for the 2-tailed test; +:$p < 0.1$, *:$p < 0.05$, **:$p < 0.01$, ***$p < 0.001$

Figure 4 **Cumulative Abnormal Returns for B2B Initiatives** (n = 113)



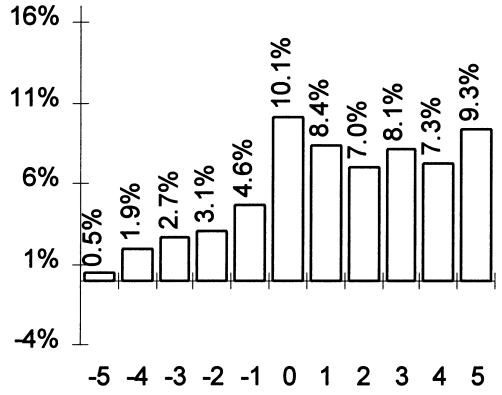
announcements and B2C announcements, respectively. The *CARs* on each of the days in the 10-day window[6] are provided in the Appendix. The *CARs* for firms making B2B announcements are positive and significant in the 5-day window after the event (*CARs* = 5.2%, $t = 2.93$, $p < 0.01$) as well as in the 10-day window after the event (*CARs* = 12.8%, $t = 6.88$, $p < 0.001$). For firms making B2C announcements, the *CARs* are positive as well, both in the 5-day window (*CARs* = 9.3%, $t = 4.29$, $p < 0.001$) as well as in the 10-day window (*CARs* = 21.0%, $t = 5.38$, $p < 0.001$). While the magnitudes of the *CARs* for B2B and B2C announcements are each large and individually significant, the *CARs* for B2B announcements are consistently lower in magnitude than those for B2C announcements.

The difference in the *CARs* is not significant in the 5-day window ($CAR_{diff} = -4.1$, $t = 1.53$, ns) but it is significant in the 10-day window ($CAR_{diff} = -8.2$, $t = 2.21$, $p < 0.05$). Hypothesis 3 that *CARs* for B2B announcements are significantly different from those observed for B2C announcements thus receives weak support.

Effect of Announcement for Tangible, Digital Goods

The *CARs* related to the 114 firms making announcements involving tangible goods and 137 firms making announcements involving digital goods are provided in Table 6. The bars in Figures 6 and 7 represent the mean *CARs* on each of the days in the 5-day event window around the announcements. The *CARs* on each of

Figure 5 **Cumulative Abnormal Returns for B2C Initiatives** ($n = 116$)



[6]We refer to the entire time period: 10 days prior to and 10 days after the event as the 10-day window.

Table 6 ***CARs* at the End of 5 and 10 Day Event Windows for Tangible and Digital Goods**

Time Windows	*CARs:* Tangible Goods ($n = 114$)	t value	*CARs:* Digital Goods ($n = 137$)	t value	Difference in *CARs* (Tangible-Digital)	t value
−5 + 5	9.4%	4.42***	5.8%	3.29**	3.7%	1.33
−10 + 10	23.4%	8.02***	10.2%	4.10***	13.2%	3.44***

Note. The t value reported is for the 2-tailed test; +:$p < 0.1$, *:$p < 0.05$, **:$p < 0.01$, ***:$p < 0.001$

Figure 6 **Cumulative Abnormal Returns for Tangible Goods** ($n = 114$)

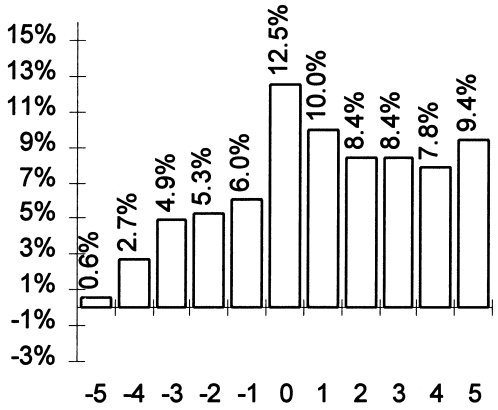
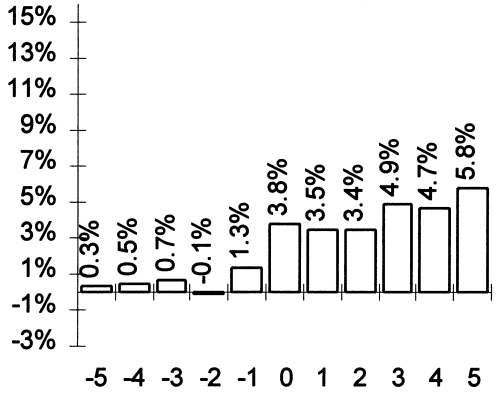


Figure 7 **Cumulative Abnormal Returns for Digital Goods** ($n = 137$)



the days in the 10-day window are provided in the Appendix. The *CARs* for firms making announcements involving tangible goods are positive and significant at the end of the 5-day window around the event ($CARs = 9.4\%$, $t = 4.42$, $p < 0.001$) as well as at the end of the 10-day event window ($CARs = 23.4\%$, $t = 8.02$, $p < 0.001$). Similarly, for firms announcing e-commerce initiatives involving digital goods, the *CARs* are positive and significant at the end of the 5-day window around the event ($CARs = 5.8\%$, $t = 3.29$, $p < 0.01$) as well as the end of the 10-day window ($CARs = 10.2\%$, $t = 4.10$, $p < 0.001$).

While the *CARs* for tangible goods are consistently higher than those for digital goods in both time windows, the results related to the significance of the difference between them are different in the two time windows (Table 6). When compared at the end of the 5-day window, the difference in *CARs* is not significant ($CAR_{diff} = 3.7\%$, $t = 1.33$, *ns*) while the difference is highly significant in the 10-day event window ($CAR_{diff} = 13.2\%$, $t = 3.44$, $p < 0.001$). We thus have weak support for Hypothesis 3 that the *CARs* for tangible goods are different from those for digital goods.

Overall, our results are:

a. Capital markets react positively to firm announcements of e-commerce initiatives, leading to a significant enhancement of the firm's market value. The abnormal returns (*ARs*) for e-commerce announcements are 4.3% on the day of the event; the cumulative abnormal returns (*CARs*) are 7.5% over a 5-day time window and 16.2% over a 10-day time window.

b. This positive and significant effect is observed for both *conventional* firms and *net* firms. The *ARs* from e-commerce announcements for *conventional* firms are 3.9% on the day of the event; the cumulative abnormal returns (*CARs*) are 4.9% over a 5-day time window and 14% over a 10-day time window around the event date. The *ARs* for *net* firms are 4.7% on the day of the event. The *CARs* for *net* firms are 9.6% at the end of the 5-day time window after the event and 18.1% at the end of the 10-day window. The hypothesis that the return for *conventional* firms is different from that for *net* firms is not supported.

c. The *CARs* for both B2B and B2C e-commerce announcements are positive and highly significant. The *ARs* for *business-to-business* e-commerce announcements are 3.9% on the day of the event, the *CARs* are 5.2% over a 5-day time window and 12.8% over a 10-day time window. For *business-to-consumer* initiatives, the *ARs* on the day of the event are 5.5%. At the end of the 5-day window after the event, the *CARs* are 9.3%, while they are 21.0% at the end of the 10-day window. The hypothesis that the cumulative abnormal returns related to announcements of *business-to-business* e-commerce are different from those for *business-to-consumer* e-commerce receives weak support: the *CARs* for B2C announcements are significantly higher than those for B2B announcements over the 10-day window but not over the shorter 5-day window.

d. The *CARs* for e-commerce announcements involving tangible and digital goods are both positive and highly significant. For e-commerce initiatives involving tangible goods, the *ARs* on the event day are 6.5%. The *CARs* at the end of 5-day time window are 9.4% and at the end of the 10-day window are 23.4%. For initiatives involving digital goods, the *ARs* on the event day are 2.5%. At the end of the 5-day window after the event, the *CARs* are 5.8% and at the end of the 10-day window, they are 10.2%. The hypothesis that the cumulative abnormal returns related to *tangible* goods are different from those for *digital* goods receives weak support: the *CARs* for tangible goods are significantly higher than those for digital goods over the 10-day window but not over the 5-day window.

5. Discussions

Overall, the results of this event study suggest that e-commerce announcements are associated with significant increases in market valuation of firms and, at least temporarily, create value for the firms' stockholders. This, therefore, indicates a perception among investors that e-commerce initiatives announced are likely to be associated with significant future benefit streams for firms. This effect was shown to hold over a broad set of firms and product types.

A skeptical rival hypothesis might be that the results reflect firms' attempts to enhance their market value based on insincere e-commerce announcements to the market. However, evidence from prior studies suggests that financial markets incorporate mechanisms

that factor in information on firm credibility in responding to announcements by firms. Researchers argue that *false signaling* through announcements that are not subsequently confirmed adversely affects firm reputation and that announcements by firms *crying wolf*—those engaging in false signaling—are discounted by investors in future periods (Heinkel 1994). Empirical research confirms that the cost of false signaling to firms is a reduced ability to signal in future periods through a loss of credibility in firm announcements and that the loss of credibility is proportional to the severity of the false signal in prior periods (Doran 1995). Thus, judgments about the credibility of firm announcements are inherently factored into the complex calculus underlying market responses. The *CARs* observed in this study therefore reflect the extent to which the large body of investors interprets e-commerce announcements as *signals* that the firms' prospects for profitability and growth are credibly and unexpectedly better than the prospects inferred from information available prior to the announcements.

However, not all of the *CARs* we observe can be attributed to the expected additional earnings from the announced venture. The event study method makes the assumption that share prices reflect expected future earnings, and that deviations from that will be arbitraged away. When expectations change, share prices do adjust, as our data indicate occurs when e-commerce announcements are made. As a related example, there is evidence of positive *abnormal returns* to firms that announce stock splits (2 for 1, 3 for 2, etc.), although these have no direct impact on future earnings (Ikenberry, et al. 1996). Researchers argue that the split is a signal to the market of management's optimism, and that the price impact does not reflect irrationality or speculation. Rather, the split is seen as positive, unexpected information to investors (Doran 1994). In a similar fashion, it is likely that the e-commerce initiatives that are the subject of the 251 announcements we study, may be a market signal of favorable firm attributes such as a *forward-looking, profit-driven,* and *willing-to-innovate* management.[7]

Size of the firm is one factor we did not specifically include in our analysis. To examine the influence of size,[8] we compared the *CAR* related to e-commerce announcements for two subgroups—small firms ($n = 111$) and large firms ($n = 141$). The results suggest that the *CAR* related to e-commerce announcements for small firms is higher than that for large firms and that this difference is significant. While it appears reasonable to expect that the stock prices of smaller firms should be more sensitive to individual announcements than those of large firms, this is an issue that requires further examination.

The findings that *CARs* associated with announcements by both *conventional* firms and *net* firms are positive suggest that, in general, investors expect conventional firms to be able to overcome the constraints that prior commitments may pose and leverage their resources in the context of e-commerce operations to create significant future benefit streams. Similarly, this suggests that net firms are expected to be able to overcome the limitations posed by the lack of experience and leverage their understanding of emerging technologies to create significant benefits streams in the future. These are issues that merit further examination. Future research should also focus on returns to *conventional* and *net* firms in specific industry groups and consider the relative proportion of a firm's business influenced by e-commerce initiatives to derive a more detailed understanding of this phenomenon.

Our results suggest that the magnitudes of *CARs* related to B2B announcements are lower than those for B2C. One explanation for the lower *CARs* for B2B announcements is that they include the benefits from the conversion of existing buyer-supplier arrangements mediated using EDI technologies to web-based interaction. As the benefits from integrated operations are already factored into stock prices, the incremental benefits may be viewed as minimal (reducing the returns observed for B2B e-commerce announcements). It may also be that the high level of integration between partners required for B2B interactions and difficulties in establishing effective management processes in interorganizational relationships observed by prior researchers (Hart and Saunders 1997, Henderson and Subramani 1999) might lead investors to view B2B as being fraught with risk, reducing the returns observed.

[7]We are grateful to an anonymous reviewer for this insight.

[8]We used trading volume x price as a proxy for size.

Market psychology and investor psychology may also be responsible for the higher *CARs* for B2C e-commerce. In late 1998, B2C commerce received far greater attention in the media than B2B e-commerce. Also, as retail investors may have played a dominant role in the trading of technology stocks in this period (Smith 1998), the greater familiarity of individuals with firms announcing B2C e-commerce rather than those announcing B2B initiatives may have contributed to the magnitude of B2C *CARs*.

The finding that *CARs* related to e-commerce initiatives involving tangible goods are higher than those related to digital goods is interesting. The difference in the magnitudes is quite surprising: *CARs* for announcements involving tangible goods are 62% higher than those for digital goods in the 5-day window and 129% higher after the 10-day window.

One plausible explanation for these results is the threat of *commoditization* faced by suppliers of information goods (Shapiro and Varian 1999). Shapiro and Varian argue that as information goods are cheap to reproduce and there are no natural capacity limits for additional copies, "the markets for such goods will not and *cannot*, look like textbook-perfect competitive markets in which there are many suppliers offering similar products, each lacking the ability to influence prices" (Shapiro and Varian 1999, page 23, emphasis in original). They suggest that once multiple firms have sunk investments to create the information product, competitive forces drive down prices of the information goods towards their low marginal costs.[9] Therefore, while consumers benefit enormously, the creation of future benefit streams from supply of information goods is associated with high levels of uncertainty. We see some evidence of this already; information goods such as stock quotes and news are commodities. Services such as online auctions, personal portfolio management, and electronic mail hosting are free and ubiquitous at many sites, and it is unlikely that these information products themselves would generate significant future revenue streams for firms offering them. We believe that this threat to producers of information goods is reflected in the lower *CARs* to digital goods than to tangible goods. This important issue requires further research.

It is remarkable that nearly half of the *CARs* in the 5-day and 10-day windows in all cases occur in the period prior to the day of the announcement: Day 1 (please see Figures 1, 2, 3, 4 and the Appendix). This suggests a pattern of information leakage and the anticipation of firm actions immediately prior to the formal announcements of e-commerce initiatives by firms. This run-up is consistently observed in the sample as a whole as well as in all the subgroups: Conventional/Net, B2B/B2C, and Tangible/Digital. Further, the positive abnormal returns (*ARs*) continue to accrue beyond the event day till day nine in all cases. This provides evidence of a middle ground between semi-strong form and strong-form market efficiency and is an issue that merits further examination.

We wish to draw attention to the magnitudes of the influence of e-commerce announcements on market value: they are at the high end in magnitude of effects found in prior event studies. The majority of event studies in the U.S. stock market observe *CAR* magnitudes ranging from -2% to 2.3% as shown in Table 7. Our results provide the first empirical test of the extremely positive market response to e-commerce announcements and confirm the validity of what is informally termed the *dot com effect*—the transformational effect of Internet technologies on the market values of firms.

This study also highlights an alternative approach to examine the thorny issue of payoffs to firms from IT investments. If announcements of e-commerce initiatives are signals of the considerable investments in information technologies supporting these initiatives, our results suggest that these investments are associated with significant enhancement of future profitability and consequent increases in the market value of firms.

Overall, the results of our study derived by a methodologically sound technique provide but one window into phenomena related to e-commerce. We hope that our efforts spur more detailed investigation of the complex and fascinating phenomena focusing on facets such as the differences in business models employed by *conventional* and *net* firms and the relative

[9]This is true only if the supplier of information goods has no monopoly power.

Table 7 ***CARs*** **Reported in Prior Event Studies**

Prior Study	*CARs*
This Study: Effects of E-commerce announcements involving Tangible goods	23.4%
This Study: Effects of B2C E-commerce announcements	21.0%
Jarrel and Poulsen (1989): Effect of successful takeover bids	20%
This Study: Effects of E-commerce announcements	16.2%
MacKinlay (1997): Effect of Earnings Announcements	2.3%
Menzar, Nigh, and Kwok (1994): Effects of Withdrawal from South Africa*	−2.0%
Wright, Ferris, Hiller, and Kroll (1995): Effects of Affirmative Action Awards*	1.6%
Das, Sen, and Sengupta (1998): Effects of Strategic Alliances	1.6%
Dos Santos, Peffers, and Mauer (1993): Effects of IT Investments	1.0%
Horsky and Swyngedouw (1985): Effects of Change in Firm Name**	0.64%
Lane and Jacobson (1995): Effects of Announcements of Brand Leveraging**	0.32%
Wright, Ferris, Hiller, and Kroll (1995): Effects of Being Found Guilty of Discrimination*	−0.3%
Chaney, DeVinney, and Winer (1991): Effects of New Product Announcements**	0.25%
Agrawal and Kamakura (1995): Effect of Celebrity Endorsement	0.2%

Note. Studies in the table are sorted by absolute magnitude of *CARs* reported.

*As reported in (McWilliams and Siegel 1997)

**As reported in (Agrawal and Kamakura 1995)

role of different components of transaction costs in creating benefits in e-commerce operations.

While the results from our sample of 251 events are robust to changes in statistical parameters such as the estimation period,[10] the length of the event window, and the elimination of outliers, they need to be interpreted in the light of the limitations of the study. The imputation of abnormal returns to events is based on the assumption that markets are efficient and that the events were surprises and therefore unanticipated by investors. It is feasible that for *net* firms, e-commerce announcements were anticipated to a greater degree than for *conventional* firms. Similarly, these announcements may have been relatively more anticipated in the case of digital goods than for tangible goods and future benefits may have been discounted into prices prior to the announcements. If the events were indeed anticipated by investors, this would clearly affect our results. As e-commerce becomes increasingly central to the operations of firms, it is plausible that announcements of e-commerce initiatives may cease to be surprises to investors. Investors may use firm characteristics to forecast the likelihood of the event occurring and factor this into the stock price (Campbell et al. 1997), an issue that can be explored in future research.

Additionally, the results are based on a relatively short interval—the last quarter in 1998—and may be limited in their generalizability to other periods. Stocks in the internet sector in this period were the targets of substantial speculative activity by individual investors, making them particularly sensitive to press announcements (Smith 1998). Further, observers suggest that market valuations, particularly those of firms engaged in e-commerce were significantly influenced by media hype (Lucchetti 1998, Vickers and Weiss 2000). Two parts of a fascinating 5-part special report titled the "Internet Revolution" appearing in the *Financial Times*, "Money for Nothing, Cheques for Free" (*Financial Times*, October 12, 2000) and "Lies, Damned Lies and Web Valuations" (*Financial Times*, October 13, 2000), highlight the complex interplay of factors that contributed to investor enthusiasm for internet commerce and the large valuations placed on internet stocks. These suggest that the stock market was in a unique bullish phase in 1998 and 1999 with respect to internet stocks in general and for firms associating themselves with the internet in particular. The lack of a significant difference in *CARs* for announcements by *conventional* and *net* firms thus may be an artifact of the mania characterizing e-commerce in this period. For instance, if investors were undiscriminating in their perception of future benefits, this may explain why we did not find a significant difference between abnormal returns associated with conventional and net firms. However, market manias are very difficult to verify ex-post without the benefit of considerable hindsight. Initial evidence of the rationality of market responses in this period with respect to Internet stocks is provided by a recent study (Subramani and Walden 2000) that found no evidence of significant, abnormal returns to

[10]The results using an estimation period of 45 days and 270 days to compute *CARs* are very similar and are available from the authors.

firms changing their names to a *.com* name to position themselves in the Internet sector, e.g., changing from Egghead, Inc. to Egghead.com. Studies of capital market myopia with respect to the Internet on the lines of Sahlman and Stevenson (1985) are likely to shed more light on this issue. Including a suitably selected base case in future event studies on the lines of Campbell et al. (1997) would also provide a more detailed understanding of the influence of e-commerce events on market valuation and highlight the bias from context specific and period-specific factors.

Finally, it is plausible that e-commerce announcements were merely symbolic moves by firms rather than genuine attempts to initiate e-commerce activities (Westphal and Zajac 1998), in which case, our explanations for the effects grounded in the rational theories of firm action may be less appropriate than explanations drawing on socio-political theories (Feldman and March 1981). Future studies examining the link between firm announcements to the implementation of plans by firms and subsequent outcomes for firms have the potential to derive some insight on this important issue.

We believe that the event study is a powerful technique well suited to examining a range of issues central to IS research, and we hope this study will spur greater application of this methodology.

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Appendix

Table 7 *CARs* **Related to E-Commerce Announcements in 10-Day Window** ($n = 251$)

Day	All ($n = 251$)	Conv. ($n = 115$)	Net ($n = 136$)	B2B ($n = 113$)	B2C ($n = 116$)	Tangible ($n = 114$)	Digital ($n = 137$)
−10	1.1%	0.2%	1.9%	2.4%	0.2%	0.6%	1.5%
−9	2.3%	1.4%	3.1%	3.3%	2.0%	2.2%	2.4%
−8	3.3%	1.7%	4.6%	3.7%	3.5%	3.6%	3.0%
−7	3.6%	2.0%	4.9%	4.1%	3.6%	4.1%	3.1%
−6	4.5%	3.5%	5.3%	5.1%	4.8%	5.7%	3.5%
−5	4.9%	3.4%	6.2%	5.4%	5.3%	6.3%	3.8%
−4	6.0%	4.1%	7.7%	5.7%	6.7%	8.5%	4.0%
−3	7.2%	4.0%	9.8%	7.0%	7.5%	10.7%	4.2%
−2	6.9%	4.1%	9.3%	6.7%	7.9%	11.1%	3.4%
−1	8.0%	5.6%	10.1%	6.8%	9.4%	11.9%	4.8%
0	12.4%	9.5%	14.8%	10.8%	14.9%	18.5%	7.3%
1	11.1%	8.0%	13.7%	9.9%	13.2%	16.1%	7.0%
2	10.4%	7.5%	12.8%	9.7%	11.8%	14.5%	6.9%
3	11.2%	7.1%	14.6%	10.1%	12.9%	14.5%	8.4%
4	10.8%	6.9%	14.1%	10.1%	12.2%	14.0%	8.2%
5	12.2%	8.6%	15.3%	10.7%	14.1%	15.6%	9.3%
6	12.8%	9.5%	15.6%	11.0%	15.3%	16.5%	9.7%
7	13.6%	11.1%	15.7%	11.4%	16.5%	17.9%	10.0%
8	14.9%	11.6%	17.6%	12.3%	18.6%	19.5%	11.0%
9	16.4%	14.5%	18.0%	13.0%	21.2%	24.0%	10.1%
10	16.2%	14.0%	18.1%	12.8%	21.0%	23.4%	10.2%

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