

**FIRM VALUE EFFECTS OF
WEB SITE REDESIGN**

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ABSTRACT

The redesign of a web presence can be classified as both an IT investment and an e-commerce initiative. The empirical literature provides some evidence that the market is sensitive to e-commerce announcements via press releases, but it is not known what types of announcements affect the value of the firm. Our research examines the issue of web site redesign in commercial organizations by studying what kinds of organizations announce changes to their web presence, and by analyzing the value of such redesign initiatives for publicly traded firms. Using the event-study methodology, we investigate the effects of web site redesign announcements for a sample of press releases from 1995 to 1999. Our findings suggest that refining a web presence does not produce significant firm valuation adjustments. However, cross-sectional analyses reveal that web site redesign increases the value of service firms.

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1. INTRODUCTION

Anecdotal evidence suggests that web site redesign can have a significant impact on the firm. For example, in September 2000, shares of NBCi (NBC Internet) increased more than 20% after the company unveiled its redesigned site (USA Today, 9/26/00). However, refining a web presence has not always been a success. For instance, the online magazine Salon.com was forced to pull back a site redesign that generated numerous complaints from its users (New York Times, 6/5/00). Despite these and other examples, we are unaware of any systematic study of the impact of web site changes in commercial organizations. Ideally, an updated web presence should improve the firm's ability to attract customers and to increase its online revenues, and hence augment firm value. However, a redesigned site may also hinder the firm's online performance. These news may be met with unfavorable investors' reactions and thus decrease the value of the firm.

As an organizational activity, the redesign of a web presence can be classified as an IT investment and an e-commerce project. The empirical literature provides some evidence that the market may be sensitive to the announcement of these initiatives via press releases, but it is not known what type of announcements affect the value of the firms. This paper contributes to this body of literature by examining a particular type of announcement (i.e.

changes to a web presence). We investigate what kinds of organizations issue press releases regarding the redesign of their web presence and quantify the value of such redesign initiatives.

This paper proceeds as follows. Section 2 reviews the relevant literature in e-commerce and IT investments. Section 3 puts forth the hypotheses. Section 4 describes the event study methodology and section 5 explains the research design. Section 6 presents the results in the sample at large and cross-sectional analyses of the sample based on different criteria. Section 7 discusses the results and highlights the implications of this research. Finally, section 8 concludes the paper.

2. LITERATURE REVIEW

The emergence of the Internet as a commercial channel opened new business possibilities for organizations. Traditional brick-and-mortar firms took advantage of the new medium and extended their operations to cyberspace. And, at the same time, a new breed of pure-play Internet firms or “dot-coms” were created. These organizations conduct most or all of their business activities through the Internet. For both types of organizations, the maintenance of a web presence is a crucial activity for the viability of their online operations. However, maintaining a web presence is especially critical for pure-Internet firms, for which the site is their *only* interface with their customers.

In the early days of the Internet as a commercial medium, little was known about how to design web sites to maximize profits (Hoffman et al. 1996). Since then, a number of studies have explored the link between web site design and commercial success. Design

features may affect consumers' reactions to the site (Jarvenpaa and Todd, 1997), web site traffic (Goodwin and Marquis, 2000; Lohse and Spiller, 1998), purchase behavior (Liang and Lai, 2002), customer loyalty (Koufaris et al. 2001) and sales (Lohse and Spiller, 1998). However, the frequency, motivation and nature of the changes to commercial web sites are still unexplored issues in the empirical literature.

E-commerce strategies in general, and web-based activities in particular, are driven by the degree of information intensity of the core market offer of the organization. Porter and Millar (1985) suggest that the amount of information that goes into the development, delivery and/or utilization of the product or service affect the overall operations of the firm and the role of information systems. Therefore, the degree of information intensity of the core market offer is one of the key drivers of web site design. In addition to information intensity, web site design is also determined by both marketing decisions and technical choices (Palmer and Griffith, 1998). Clearly, any change in the technological environment or any shift in the web-marketing strategy of the firm would result in the redesign of the web presence in order to take advantage of the new technology or to implement a new web-marketing strategy.

Other studies justify redesign efforts in terms of expanding content to accommodate an increasing user base, including new features to facilitate navigation or access to information, or just changing the overall appearance of the site in favor of a more pleasant layout (Guenther, 2000). Aside from these usability changes, the most important reason for site redesign is the incorporation of new e-commerce functionality, as the organization transforms the site from an electronic billboard to an interactive tool for doing business (Guenther, 2000).

Based on these studies (Guenther, 2000; Palmer and Griffith, 1998), there are three main determinants of web site design, namely: technological capabilities, marketing/electronic commerce strategy and audience/user needs. Thus, a shift in any of these three fronts would result in a web site *redesign*, to insure a better fit between the site and its visitors. This adaptation may be triggered by a technological change (e.g. evolution of Internet technologies), a modification in the organization's e-commerce strategy or an adjustment to the needs or preferences of the users.

According to signaling theory (Eliashberg and Robertson, 1988; Heil and Robertson, 1991; Moore, 1992), firms send messages to their constituents (buyers, competitors, employees, investors, industry analysts, etc.) regarding various projects and initiatives. The objective of such announcements is to influence the attitudes and actions of the different targeted audiences (Calantone and Schatzel, 2000). In the context of web site redesign, the business value of redesigning a web presence can be measured by the investors' reaction to the announcement of such initiative.

Web site redesign may increase firm value if investors perceive that the changes made to a web presence improve the firm's ability to attract customers or generate online sales. Conversely, if investors believe that those changes impair the online performance of the organization, firm value is likely to decrease. Overall, the news about the refinement of a web presence are expected to have an impact on the value of the firm. The success or failure of such redesign efforts can be measured by the increase or decrease in firm value.

The emerging empirical literature provides some evidence that the market is sensitive to the announcement of e-commerce initiatives via press releases. For example, Benbunan-Fich and Fich (2001) found positive stock price changes on the announcement

of web traffic milestones during 1998-1999. Cooper et al. (2000) document a positive stock price reaction to the announcement of corporate name changes to Internet related ("dotcom" or "dotnet") names. Subramani and Walden (2001) report significant stock price increases for 251 e-commerce announcements about new business-to-consumer initiatives during the last quarter of 1998. Since a classification of announcements is not offered in their study, the magnitude of the reaction for each type of initiative is not known. According to these studies, it can be concluded that the market has reacted positively to e-commerce announcements.

Announcing the refinement of a web presence is not only an e-commerce signal but also an IT investment communication. The literature presents interesting findings regarding the effects of such disclosures on the market valuation of the firms. For example, Dos Santos et al. (1993) examine the impact of 97 announcements of IT investments between 1981 and 1988. The study reports no excess returns for the firms announcing IT investments, however, cross-sectional analysis reveals that innovative IT investments increase the value of firms while non-innovative investments do not. An IT investment was considered innovative if it represented the first use of a technology in an industry, if it would produce a new product or service based on information technology or if it would result in the development of new information technology for an industry.

In a follow up study, Im et al. (2001) extend this sample by adding 141 IT investment announcements from 1989 to 1996. They find that on average IT investments do not increase the value of the firms, however, they report positive excess returns for smaller firms and an increase in both price and volume reaction for the more recent portion of the sample.

The review of the empirical literature reveals an interesting paradox. It appears that the market reacts to e-commerce announcements but does not react to the disclosure of IT investments. In this context, what would be the market's reaction to a web site redesign announcement? The completion of a web site redesign project may be perceived as an indication that the company has learned something “new” about technological capabilities or about their online customers and is using this information to improve its site. Thus, the refinement of an online presence may signal that the company is moving ahead in the “learning curve” on how to use the Internet effectively. On the other hand, investors may interpret such changes as a move in the wrong direction that is likely to impair the online operations of the firm. In this case, the value of the firm will decrease as investors react negatively to the refinement of a web presence.

From the practitioners' viewpoint, web site redesign is based on the premise that a refined web presence may lead to better corporate performance (i.e. more traffic, increased sales, greater customer satisfaction, etc.). Therefore, web site redesign decisions are expected to have a favorable effect in traffic, sales and consumer perceptions. However, the success of a redesign effort is not immediate, and will depend upon the users' reaction to the new site. Hence, the market may not be able to assign value to a redesign effort in the absence of other indicators of performance such as traffic, sales, and satisfaction.

This study contributes to this body of literature by examining a particular type of e-commerce announcement (i.e. web presence redesign). The main research question deals with the effect of such press releases on the market value of the firms. We will also investigate whether the market response is different depending upon the type of firm making the announcement and whether the nature (content) of the announcement affects

the direction and magnitude of the reaction. In the next section, we formally posit the hypotheses for these research questions.

3. HYPOTHESES

According to the signaling literature (Heil and Robertson, 1991), any firm would be likely to announce the completion of a site redesign via a press release to encourage customers' visits and inform different audiences about changes in its web presence. In particular, publicly traded firms may use this strategy to alert investors and signal progress in their online operations. Disclosures of web site redesign initiatives belong to the general category of e-commerce announcements for which the emerging empirical literature has found positive market reactions (Benbunan-Fich and Fich, 2001; Subramani and Walden, 2001). Investors can perceive the refinement of a web presence as an indication of evolution and positive change via the incorporation of more advanced technological features, or new e-commerce strategies or better understanding of users needs and preferences. This signal of change should trigger a favorable market reaction. In light of this interpretation, we hypothesize that

H1: The announcement of a web site redesign will increase firm valuation.

We expect that the impact of a web site redesign announcement generate a stronger reaction for Net firms than for traditional firms, because for pure-play Internet firms the web site is the only interface with the customer (Palmer and Griffith, 1998). Moreover,

most of these firms generally have a relatively shorter trading life and more uncertain prospects of success and survival than other more established firms do. Thus, any signal that provides investors with additional information about the likelihood of success (or failure) of publicly traded companies should produce comparatively larger valuation adjustments for net firms than for more established organizations. This conjecture leads us to:

H2: Pure Internet firms will have larger valuation increases due to web site redesign announcements than traditional firms would.

Due to the high degree of information intensity in the product and the process, financial and service firms may experience comparatively more advantages in web-based commerce than manufacturing firms for which there is lower information intensity in their core market offer (Palmer and Griffith, 1998; Porter and Millar, 1985). Thus, we expect that refining a web presence would have a greater impact in service firms that can completely develop and/or deliver their product or services electronically. Therefore, H3: Service firms will have larger valuation increases due to the redesign of their web presence than manufacturing organizations.

The claims made in a press release (content of the announcement) may also affect the dimension and sign of the market reaction. In this context, Dos Santos et al. (1993) report that innovative IT investments increase firm value, while non-innovative announcements do not. In the case of web site redesign, it is plausible that the nature of the

change - new functionality vs. improved usability (Guenther, 2000) - may also influence the direction and magnitude of reaction. For example, the addition of online ordering capabilities (new functionality) should produce a stronger positive reaction than just layout or navigation improvements (usability). Thus,

H4: The addition of new functionality to a web presence will produce larger valuation increases than usability improvements.

4. METHODOLOGY: EVENT STUDY

An event study measures the economic significance of an announcement or project. This method is useful to calculate the event's value for it enables the researcher to establish whether the return of a security is significantly different due to the event from the return that would have been forecasted for the same security had the event not happened.

The event study methodology is based on the notion that financial markets process publicly available information not only to assess current firm performance but also to adjust the expectations of future achievements. Hence, once additional information regarding activities that could affect the firm's potential for future earnings becomes available, the stock price rapidly changes to adjust to new assessments of the value of the firm.

The methodology is based on the efficient market hypothesis (Fama et al. 1969), according to which at any given time, the price of a security reflects all the available information about the firm's current and future profit potential. Thus, any news resulting

from an unexpected event that may affect the firm's current and future earnings will produce changes in the valuation of the firm. The amount of change in the price of a security after an event, compared with its forecasted without-the-event price, would reflect the market's unbiased estimation of the economic value of the new information (Brown and Warner, 1985).

This approach has been widely used in several business disciplines to study the impact of managerial decision-making, and other economic factors on the creation (or destruction) of firm value. In the IS field, the methodology has been used to study value creation through IT investments (Dos Santos et al. 1993; Im et al. 2001), E-commerce announcements (Subramani and Walden, 2001), and mergers and acquisitions in the telecommunication industry (Wilcox et al. 2001) among others.

Event studies examine the excess stock return around the date of the event (a redesign announcement in our case). The impact of the redesign is determined by estimating the price of the stock if the event had not occurred and then calculating the return actually earned by the firm. Abnormal stock returns are then computed by subtracting raw returns around the event date from the market model expected returns, and they are accumulated over a pre-determined period surrounding the announcement (event window), to produce cumulative abnormal returns (CARs). If the difference between the expected stock price and the actual price is significant then it can be concluded that the redesign announcement had an effect on the market valuation of the firm. Furthermore, the magnitude of this difference provides a quantifiable indicator of the business value of a web site redesign project. See Brown and Warner (1985) for a more technical explanation of the event study methodology.

A possible shortcoming of the event study method refers to the fact that stock prices are naturally noisy and therefore an event of interest must generate a reaction significant enough to be detected above the normal background noise of the stock market. A second limitation deals with the issue of the true event date. For some events, it is very difficult to pinpoint exactly when the actual information became publicly available. In some instances, information may leak out of its source before it officially becomes public knowledge. The third limitation is that events may cluster as managers have a tendency to counter bad information with potentially good information. Another possible drawback is that some events may not have a clear effect on the firm. Since the market reaction is an aggregation of expectations, when these expectations are not consistent (some investors think it is good news, while others think it is not so good) the overall effect of the event on the value of the firm may be not significant (Chaney et al. 1991). Notwithstanding these limitations, event studies offer an unbiased estimation of the economic value and significance of an announcement or project.

5. RESEARCH DESIGN

To address the research questions underlying this study, the research consists of two phases. In the first stage, relevant redesign press releases are collected for the 1995-1999 period. In the second stage, only the announcements referring to publicly traded firms are examined using the event study methodology.

5.1 DATA COLLECTION AND SAMPLE SELECTION

Announcements of web site redesign are obtained through full-text database searches of Lexis/Nexis, from January 1995 to December 1999. Redesign articles are defined as those containing the following keywords: redesign AND (website OR web site), and issued as PR Newswires or Business Wires. The initial search yields a total of 630 articles, which includes the redesign of products, magazines, and production facilities. These non-relevant announcements are eliminated. Duplicate articles (those referring to the same redesign), and press releases announcing *intentions* or *plans* of redesign and/or the hiring of consultants for an upcoming redesign project are also excluded. Only articles announcing the completion of a web site redesign effort for which there was no preceding announcement of redesign intentions are kept.

A total of 213 articles meet these criteria (2 in 1995, 21 in 1996, 39 in 1997, 51 in 1998 and 100 in 1999). Since first generation web sites are launched in 1994-1995, when the Internet "opened for business," the number of redesign announcements in 1995 is extremely small. Shortly thereafter, we find evidence through press releases of increasing web site redesign efforts. These initiatives steadily grow over the years and in 1999 the number of press releases doubles the levels of 1998. Figure 1 shows the increase of web site redesign articles during the period.

INSERT FIGURE 1 ABOUT HERE

5.2 SAMPLE CHARACTERISTICS AND CODING OF VARIABLES

For each announcement, we code the ownership (public or private) of the companies that redesigned their web sites. We follow Subramani and Walden's distinction

between *net* and *non-net* (conventional) firms. A net firm is one that derives more than 50% of its revenue from Internet related activities. We determine the type of firm based on this classification. Table 1 shows the total number of announcements in each year along with the ownership (public or private) and type of firm (net or non-net) making the announcements.

Table 1. Description of Announcements

	1995	1996	1997	1998	1999	Total
Articles Retained	2	21	39	51	100	213
Firm Ownership						
Public	1	10	17	23	51	102
Private	1	11	22	28	49	111
Type of firm						
Net	0	5	9	20	53	87
Non-net	2	16	30	31	47	126

In order to investigate what type of firms make redesign announcements, we count the number of press releases in each cell of a bi-dimensional contingency table crossing ownership (public vs. private) and firm type (Net vs. non-net). Table 2 presents the number and frequency of announcements in each category. The highest number of announcements is found in the public/non-net cell, followed by traditional private firms and private Internet organizations. The lowest proportion of announcements corresponds to publicly traded Internet firms.

Table 2. Number of announcements and firm classification

Firm Classification	Number of Announcements*	Frequency
Public /Net	35	16%
Public / Non-net	67	32%
Private / Net	52	24%
Private / Non-net	59	28%
Sample Size	213	100%

* If the same firm made more than one redesign announcement in the period, each announcement was counted separately and classified in the appropriate category.

From the 102 publicly traded companies making redesign announcements during the period 1995-1999, we extract the releases referring to firms trading in the major stock exchanges (NYSE, AMEX or NASDAQ) for which trading data is available from the University of Chicago's Center for Research in Security Prices (CRSP) database. We screen these observations and eliminate those that experience a simultaneous news event (such as earnings, dividends, management or board changes announcements) on the date of the announcement that could contaminate the reaction to the web site redesign initiative. When different news are communicated at the same time, the reaction captured by the methodology may be due to events other than the one under study and it would be very difficult to establish which of these events caused the market reaction. Furthermore, since managers tend to counteract the effect of bad news with potentially good information, some events may offset the impact of others in the overall value of the firm.

Our final sample contains a total of 77 events that pass our screening criteria. This sample is divided in two subgroups (manufacturing and service organizations) based on the Standard Industrial Classification (SIC) of the firms whose web sites are redesigned. Manufacturing organizations are those located in division D (manufacturing – codes 2000

to 3600), while service firms are those that belong to divisions E (transportation and communications), F (wholesale trade), G (retail trade), H (financial firms) or I (services). Appendix 1 shows the distribution of announcements in each category. About 35% of the announcements in our sample refer to manufacturing firms, while 65% refer to service organizations.

In addition, the press releases are classified according to the claims made in the announcement in two categories: functionality or usability. Functionality announcements are those referring to the rollout of new functions or features while usability announcements are those in which the site was redesigned to augment information content, to improve navigation, or to facilitate access to information. According to these definitions, a functionality-based redesign consists of adding a major function that was not present in the earlier version of the site. Examples include new electronic order forms, new online services, new community features (chat rooms, bulletin boards, community of users, etc.), and new interactive options for the users. A usability-based refinement of a web presence consists of general changes to the information content of the site and/or changes to the access to that information. These enhancements include streamlining of the look and feel, faster and easier navigation, enhanced information content and improved search capabilities. Appendix 2 provides examples of announcements in each of these categories.

5.3 EVENT STUDY PARAMETERS

The event study methodology requires a set of parameters over which the reaction of the market would be captured. The first parameter is known as the *estimation period*. It

refers to the length of time preceding the event over which the expected returns will be calculated. The duration of the estimation period is 255 days (about one year of trading data). The *event window* refers to the period over which the abnormal returns will be accumulated. Although a one-day event window is usually recommended, several empirical studies use longer periods to capture pre-announcement information leakage and post-announcement delays. However, McWilliams and Siegel (1997) recommend short event windows because in longer ones many different news items may affect the value of the firm. The windows are determined around the date of announcement, which is designated as 0. Thus, a (-1, +1) window produces cumulative abnormal returns from one day before the announcement until one day after the announcement.

6. RESULTS

To test first hypothesis, we use the sample of 77 events from firms trading in the major stock exchanges (NYSE, AMEX and NASDAQ), and apply the event study technique to compute abnormal returns. We use the (-1, +1) event window, and for consistency with other studies, we also compute abnormal returns for longer windows (-3, +3) and (-5, +5). Table 3 reports the cumulative abnormal returns for the full sample over these event windows, along with the t-statistic. Also reported is the number of securities with positive and negative returns and the generalized sign test.

Table 3. Event Study Results

Event Windows*	Average (%)	CAR t	Positive:Negative	Gen Sign Z
(-1, +1)	1.03	1.014	43:34	1.591+
(-3, +3)	1.47	0.946	37:40	0.221
(-5, +5)	1.58	0.812	36:41	-0.008

Significance level: + = 10%

* Estimation periods for each window are 255 days in length. Model used market adjusted returns, equally weighted index.

Cumulative abnormal returns for the three event windows are about 1.03%, 1.47% and 1.58% for the (-1, +1), (-3, +3) and (-5, +5) windows, respectively. Neither of these CARs is significantly different from zero. The t-statistic is not significant in every window. About 55% of the securities experience positive CARs in the (-1, +1) window, and according to the generalized sign test, this is marginally higher than the fraction of announcements experiencing positive returns in the estimation period. The null hypothesis for the generalized sign test is that the fraction of positive returns is the same as in the estimation period. Thus, the event study results for the full sample do not support *H1*, which states that web site redesign announcements are expected to have an impact on the market value of the mentioned firms.

For the sub sample hypotheses (*H2*, *H3* and *H4*), we use the net/non-net firm categorization, the manufacturing/service classification and the content coding, respectively. Table 4 summarizes the results of the event study for the sub samples in the (-1, +1) event window. For each sub sample, the table presents the cumulative abnormal returns, the t-statistic, the number of positive and negative returns, and the generalized sign test. The last column shows the t-test comparison of the CARs in each of the three sub-samples.

Table 4. Event Study Results for Sub Samples

Sample Category	Sample Size	Average CAR (%)	t	Positive: Negative	Gen Sign Z	Sub-sample comparison t
Breakdown by firm type						-0.096
Net	21	0.83	0.285	12:9	0.915	
Non-net	56	1.10	1.130	31:25	1.306 +	
Breakdown by industry						2.228*
Manufacturing	30	-1.15	-0.934	14:16	0.014	
Service	47	2.42	1.721*	29:18	2.026*	
Breakdown by content						-0.178
Functionality	25	0.71	0.465	14:11	0.828	
Usability	52	1.18	0.892	29:23	1.362+	

Significance levels: + = 10%, * = 5%.

To test the firm type hypothesis (*H2*), we use the net vs. non-net classification. A total of 21 announcements are placed in the net category and the remaining 56 in the non-net category. Cumulative abnormal returns for the net group are about 0.8%, while those in the non-net group are about 1.10%. Neither of them is significantly different from zero. In the "net" sub-sample the proportion of positive returns is the same as in the estimation period, but in the "non-net" group, the frequency of positive returns is marginally higher than in the estimation period. A t-test shows that the average CARs in the net group is not significantly different from those in the non-net group. Thus, *H3* is not supported by the data.

The manufacturing/service classification is used for hypothesis *H3*. About 40% of the announcements are placed in the manufacturing group. Consistent with *H3*, the reactions to web site redesign announcements from service firms are of the order of 2.4%, which is significantly different from zero at 5% level, and the number of announcements

with positive CARs is significantly higher (also at 5%) than those in the estimation period. The CARs for low information intensive firms are negative (-1.12%) but not significantly different from the market's estimation. A t-test of the CARs in the two sub samples shows that the average CAR for the service sub-sample is significantly different (at 5%) from the average CAR for the manufacturing sub-sample. This finding supports *H4*.

To examine whether the content of the press release produced different effects, the authors independently classified the announcements in two categories (functionality and usability) as described above. Initial inter-rater reliability was (.77). A total of 12 announcements were placed in different categories. After the disagreements were solved through discussion and consensus, a total of 25 announcements were placed in the functionality category and 52 were classified as usability. Event study results show that neither of the content sub samples experience significant cumulative abnormal returns (average CARs were 0.71% and 1.28% for the functionality and usability sub sample respectively). However, the frequency of positive returns for usability redesign is marginally higher than the frequency computed in the estimation period. A t-test shows that the average CARs in the two sub samples are not significantly different from each other. Thus, *H4* is not supported by the data.

We examine the simultaneous effects of these three variables (firm type, industry classification and content) on the market's reaction to redesign announcements, by estimating the following regression models:

$$CAR_i = \beta_0 + \beta_1 net + \beta_2 ind + \varepsilon_1 \quad (1)$$

$$CAR_i = \beta_0 + \beta_1 net + \beta_2 ind + \beta_3 cont + \varepsilon_2 \quad (2)$$

The dependent variable is the cumulative abnormal return (CAR) over the three day window (-1, +1) for each firm *i*. In the first model, the independent variables are the net classification (1 if the firm is a pure play Internet company; 0 otherwise), and the industry (1 if it is service; 0 if manufacturing). The model in equation (2) adds the third categorical variable content (1 if the announcement describes a functionality type of redesign; 0 otherwise). Both regressions are estimated with the full sample of 77 announcements.

Estimation results are reported in Table 5. Overall, model 1 is borderline significant at 10% and has a low R^2 . Coefficient estimates for this model confirm that web site redesign announcements for service organizations are received by the market with a statistically larger effect (significant at 5%) than for other firms. The firm type indicator (net) does not have significant additional explanatory power. In the second model, the inclusion of the content indicator (functionality vs. usability) does not increment the explanatory power of the model and the F-statistic is no longer significant.

Table 5. Regression Results

Independent Variables¹	Model 1²	Model 2³
Intercept	-0.92 (1.20)	-0.74 (1.26)
Net	-1.66 (1.80)	-1.65 (1.81)
Industry	3.69 (1.64)*	3.80 (1.67)*
Content		-0.74 (1.62)
R^2	0.06	0.07
F-Statistic	2.53+	1.74

Significance levels: + = 10%; * = 5%.

- (1) The dependent variable is the Cumulative Abnormal Return for the *i*th firm in the sample computed over the (-1, +1) window.
- (2) The explanatory variables in Model 1 are: net (indicator set to 1 if the firm is a pure-Internet firm and 0 otherwise), and industry (indicator set to 1 for service firms and 0 otherwise).
- (3) Model 2 also includes another indicator variable content (set to 0 if the announcement describes a functionality-based web site redesign, and 0 otherwise).

In summary, after analyzing the complete sample of 213 public and private firms making redesign announcements during 1995-1999 we find that non-net publicly traded firms tend to make more redesign announcements than their Internet and privately owned counterparts.

The event study methodology applied to the sample of 77 announcement from public firms, trading in the major stock exchanges, finds no cumulative abnormal returns (CARs) for the (-1+1), (-3, +3) or the (-5, +5) windows. To control for the effect of potentially confounding variables, the sample is divided according to three different criteria, namely: firm type (net vs. non-net), industry classification (manufacturing vs. service) and nature of the announcement (functionality vs. usability). We find that only the industry classification yields significant results. Service organizations experience CARs significantly different from zero at 5%, and these CARs are in turn significantly different from those experienced by manufacturing organizations. Interestingly, the CARs of the manufacturing firms are negative but not significantly different from zero.

7. DISCUSSION, LIMITATIONS AND IMPLICATIONS

Overall, the fact that web site redesign announcements do not generate significant adjustments for the full sample of publicly traded firms, at a time when general e-commerce news (Subramani and Walden, 2001) and web traffic announcements (Benbunan-Fich and Fich, 2001) do prompt market reactions, is noteworthy in itself. Several alternative explanations can justify this finding.

First, from the efficient market hypothesis' perspective we can argue that the market may not receive redesign announcements as *new* information regarding the firm's ability to conduct business. The market anticipates changes to the web presence. Due to their constantly evolving nature, web sites are considered "work in progress," and thus the announcement of a redesign has little wealth adjustment value. Investors expect web sites to evolve and take advantage of new technologies, implement new strategies or accommodate a changing user base.

A second explanation is that the market may be unable to discern between successful and unsuccessful redesigns without other performance indicators such as increased traffic or sales. And it is only in the presence of such indicators that the value of a redesign initiative can be calculated. This could explain why Benbunan-Fich and Fich (2001) find excess returns due to the announcement of traffic milestones but we do not find any in the context of site redesign. A related explanation is the possibility of time lags factors. On average, investors may have difficulties interpreting the implications of a redesign initiative immediately after it is announced. Mainly because its success will depend upon how customers react to the new version of the web site, and on how this refined presence would affect other indicators such as traffic or sales. This could be an argument for expanding the event windows. However, with longer windows it is very difficult to unequivocally attribute the excess returns to the redesign announcement.

Another possibility is that the market may indeed appreciate the value of web site redesign, but the reaction is not strong enough to rise above the general noise of the market. The refinement of a web presence may be a small event relative to the total value of the firm. In particular, for large publicly traded firms changing the web presence in one

of the subsidiaries may not be strong enough to generate excess returns at a corporate level. Interestingly, to avoid this problem, Im et al. (2001) select only IT investment announcements that are significant at the corporate level rather than at the division or sub unit level. Given the size of our sample, we are unable to follow their approach.

Some limitations of this study warrant mention. The use of press releases as the source to identify the companies that change their sites during the period under study may introduce some selection bias. Only companies that announce their redesign activities through PR Newswires or Business Wires are selected, when in fact many more companies may have changed their sites but did not issue a press release to that effect or used a different medium to communicate the redesign of their web site. Second, the event study technique considers all events alike regardless of particular firm characteristics. Although an attempt was made to control for confounding variables such as type of firm, industry and content of the announcement, there could be other variables (such as firm size or trading age) that we did not control for. A third limitation is the size of the sample. We start with a sample of 213 redesign announcements, but only a fraction is usable for the event study (publicly traded firms for which trading data is available and that did not experience a simultaneous news announcement).

Despite these caveats, our results have practical and academic implications. For practitioners, announcing the redesign of a web presence is part of legitimate promotional efforts aimed at communicating the availability of an enhanced web presence. Our findings suggest that investors do not assign significant value to such initiatives upon their announcement. However, other constituents may react positively to this kind of communication (e.g. customers may want to visit the new version of the site). From the

research standpoint, our results calibrate the findings of other empirical studies, and set the stage for developing a taxonomy of e-commerce initiatives and IT investments that contribute to increase the value of firms.

There are several possible extensions to this work. One would be to extend the sample and include more recent observations. Given the exponential increase in redesign announcements over the years since 1995, the inclusion of the years 2000-2002 will increase sample size considerably. In a larger sample, it may be possible to select only those redesign events that are relevant at the corporate level and investigate whether they produce excess returns. An expanded sample may also enable the separation of service firms into financial and non-financial in order to examine whether redesign efforts add more value to financial organizations than to business service organizations. Another extension of our research would be to study the impact of the redesign announcements on the web-consulting firms that were hired for the project and are mentioned in the press release. For these types of organizations, the completion of a redesign initiative for another firm may be perceived as an endorsement of their qualifications and expertise.

8. CONCLUSIONS

This research presents one of the first efforts to study which types of e-commerce initiatives add value to the firm. From an initial sample of 213 press releases announcing the completion of web site redesign efforts in the 1995-1999 period, we observe that traditional (non-net) publicly traded firms tend to make more announcements than other types of firm. We use the event study methodology to examine the value of web site

changes in 77 announcements from firms trading in the major stock exchanges for which trading data was available, in order to quantify the market's reaction to such announcements. Our results indicate that redesign events do not prompt significant firm valuation adjustments by themselves. As for our main research question, web site redesign announcements do not appear to affect the market value of the firms when first disclosed. It is possible that over time, successful redesign affect other variables such as sales or traffic and these, in turn, will increase the value of the firm.

In order to control for the type of industry, the sample was divided into manufacturing and service organizations. Significant cumulative abnormal returns were observed for firms in the service sector, suggesting that these firms could benefit more from web site redesign initiatives than those that manufacture products. Interestingly, however, no differences were observed when the sample was divided into net and non-net firms.

In terms of content, it appears that the nature of the changes communicated in the announcement as operationalized here (functionality vs. usability) does not affect the direction and magnitude of the reaction. The value of a redesign initiative seems to be more dependent upon the industrial classification of the firm making the announcement, than upon the claims made in the press releases.

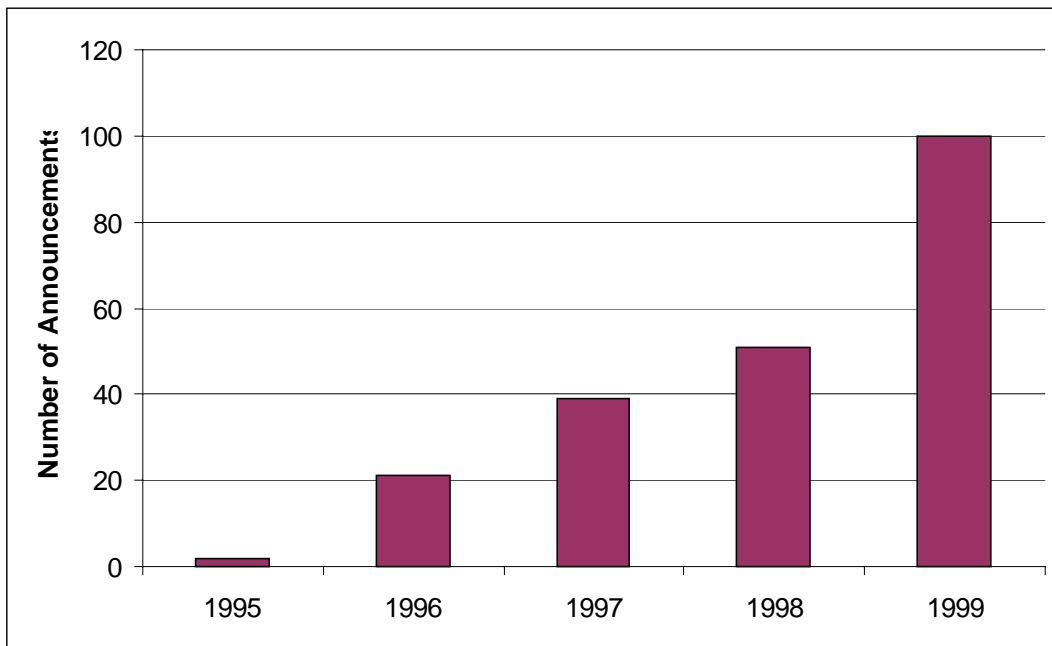
The empirical literature in IT investments and e-commerce announcements offers a fertile ground to explore the nature of the different signals communicated via press releases and their effects. Given the mixed evidence presented by studies in this area, there now appears to be sufficient reason to pursue an aggressive research agenda to discover which type of projects truly contribute to increase the value of the firm.

REFERENCES

- Benbunan-Fich, R. and Fich, E. (2001) Effects of Web traffic announcements on stock prices during the Internet Bubble. *Working paper. Kenan-Flagler Business School. University of North Carolina at Chapel Hill.*
- Brown, S.J. and Warner, J.B. (1985) Using daily stock returns: The case of event studies. *Journal of Financial Economics*, 14, March, 3-31.
- Calantone, R. J. and Schatzel, K. E. (2000) Strategic foretelling: Communication-based antecedents of a firm's propensity to pre-announce. *Journal of Marketing*, 64, January, 17-30.
- Chaney, P.; Devinney, T. and Winer, R. (1991) *The Impact of New Product Introductions on the market value of firms.* *Journal of Business*, 64(4), 573-610.
- Cooper, M. Dimitrov, O. and Rau, P. R. (2000) A rose.com by any other name. *Journal of Finance*, 56(6) December, 2371 - 2388.
- Dos Santos, B.; Peffer, K. and Mauer, D. (1993) The impact of Information Technology investment announcements on the market value of the firm. *Information Systems Research*, 4(1), 1-23.
- Eliashberg, J. and Robertson, T. (1988) New product pre-announcing behavior: A market signaling study. *Journal of Marketing Research*, 25 (3), 282-292.
- Fama, E.; Fisher, L.; and Jensen, M.C. (1969) The adjustment of stock prices to new information. *International Economic Review*, 10(1), 1-21.
- Goodwin, U. and Marquis, G. (2000). Effective web site design: an empirical study. *IEEE International Engineering Management Conference*, Albuquerque, NM.
- Guenther, K. (2000) Evidence based web redesigns. *Online*, September-October, 67-72.
- Heil, O. and Robertson, T. (1991) Towards a theory of competitive market signaling: A research agenda. *Strategic Management Journal*, 12(6), 403-418.
- Hoffman, D.; Novak, T. and Chatterjee, P. (1996) Commercial scenarios for the web. *Journal of Computer-Mediated Communication*. 1(3). Available online.
- Im, K., Dow, K. and Grover, V. (2001) A Reexamination of IT investment and the market value of the firm- An event study methodology. *Information Systems Research* 12 (1), 103-117.

- Jarvenpaa, S. L. and Todd, P. A. (1997) Consumer reactions to electronic shopping on the World Wide Web. *International Journal of Ecommerce*, 1 (2) 59-88.
- Koufaris, M.; Kambil, A. and LaBarbera, P. (2001) Consumer behavior in Web-based commerce: An empirical study. *International Journal of Electronic Commerce*, 6(2), Winter, pp. 115-138.
- Liang, T. P. and Lai, H. J 2002. Effect of store design on consumer purchases: an empirical study of on-line bookstores, *Information & Management* 39 (6), 431-444.
- Lohse, G. and Spiller, P. (1998) Electronic Shopping: The effects of customer interfaces on traffic and sales. *Communications of the ACM*. 41 (7) 81-87.
- McWilliams, A. and Siegel, D. (1997) Event studies in management research: Theoretical and empirical issues. *Academy of Management Journal*, 40(3), 626-657.
- Moore, M. (1992) Signal and choices in a competitive interaction: The role of moves and messages. *Management Science*, 38(4), 483-500.
- New York Times*. Salon Relents and Redesigns Site to Soothe Indignant Readers. Business Section. June 5, 2000.
- Palmer, J. W and Griffith, D. A. (1998) An emerging model of web site design for marketing. *Communications of the ACM*, 44 (3) 1998, 44-51
- Porter, M. E. and Millar, V. (1985) How information gives you competitive advantage. *Harvard Business Review*, July-August, pp. 149-160.
- Subramani, M. and Walden, E. (2001) The impact of E-commerce announcements on the market value of firms. *Information Systems Research*. 12 (2), June, 135-154.
- USA Today*. "NBC Internet Redesigns its Web site" Section B. Moneyline, p. B-1. September, 26, 2000.
- Wilcox, D.; Chang, K. and Grover, V. (2001) Valuation of mergers and acquisitions in the telecommunication industry: A study of diversification and firm size, *Information & Management* 38 (7), August, 459-471.

Figure 1. Annual Count of Web Site Redesign Announcements



Appendix 1. Industrial Classification of Publicly Traded Firms

Category	Division	Industry (two digit SIC)	Count	Percent (%)	
Manufacturing	D- Manufacturing	Food (20)	1	1.3	
		Textiles (23)	2	2.6	
		Paper Products (26)	2	2.6	
		Printing (27)	9	11.7	
		Rubber and Plastic Products (30)	1	1.3	
		Metal (34)	2	2.6	
		Computers (35)	6	7.8	
		Electronic and Electric Equipment (36)	3	3.9	
		Photo Equipment (38)	1	1.3	
		Manufacturing Total	27	35.2	
		Service	E- Transportation, Communication and Utilities	Water Transportation (44)	1
	Air Transportation (45)			2	2.6
Communications (48)	4			5.2	
Electric, Gas and Sanitary Services (49)	1			1.3	
F- Wholesale Trade	Durable Goods (50)			3	3.9
	Non-durable goods (51)		1	1.3	
	E- Retail Trade		General Merchandise Stores (53)	1	1.3
Food Stores (54)			1	1.3	
Apparel and Accessory Stores (56)			1	1.3	
Miscellaneous Retail (59)			3	3.9	
H - Finance, Insurance and Real Estate	Depository Institutions (60)		1	1.3	
	Security and Commodity brokers (62)		6	7.8	
	Holding companies (67)		3	3.9	
	I - Services		Hotel and Lodging (70)	2	2.6
Personal Services (72)			1	1.3	
Business Services (73)			16	20.8	
Motion Pictures (78)			3	3.9	
Service Total			50	65.6	

Appendix 2. Content classification in a sample of announcements

Source and Date	Content (abbreviated)	Classification
Business Wire, 6/17/96	Psygnosis, Inc., one of the fastest-growing multi-platform gaming developers and publishers worldwide, has reaffirmed its commitment to on-line marketing and customer service with a comprehensive redesign of its Web site. The newly improved website will offer web browsers a first-hand look at Psygnosis' broad product lineup for 1996/1997, complete with comprehensive screen shots, press releases, game demos, preview videos and exciting new sweepstakes and contests. The new site features high speed connections to the Internet and more than 100 pages of unique content encompassing product information, technical support, more than 100 MB of digital video, sound and screen capture files, special interest sections and extensive use of Netscape's features.	Usability
PR Newswire, 6/17/97	JCPenney today launched a newly redesigned Internet Store featuring over 2,000 products, an electronic order form, 19 print catalogs and many special online offers. With Modem Media's assistance, JCPenney developed this new dynamic online shopping destination to make it easier for customers to navigate the site and to provide users with a reason to buy JCPenney merchandise online. One of the most noteworthy features of the new site is the electronic order form which provides JCPenney catalog customers with the ability to order any of the more than 90,000 products found in current JCPenney catalogs.	Functionality
PR Newswire, 6/24/97	360 Communications Company, the second largest publicly held cellular company in the United States, today launched a redesign of its World Wide Web site. The new site has an interactive, user friendly format designed to meet the information needs of visitors -- from customers and potential customers to shareowners, potential investors and 360 associates.	Usability
PR Newswire, 6/26/97	3Com today launched a new, visually compelling design for its corporate Web site that offers optimal organization of the vast technical and product information provided at the site...Through in-depth research, Studio Archetype helped 3Com determine that the site should be reoriented from a product-focus to a user-focus so that it can better address its audience's diverse needs for information. Studio Archetype's creative team styled a more intuitive graphical user interface with clearly visible and logically defined navigational features. They created news story zones with obvious captions and descriptive images and introduced a concise labeling system that enables users to instantly locate information to meet their specific needs.	Usability
PR Newswire, 11/2/97	Citibank today announced the release of Direct Access 6.1, the next generation of its acclaimed online banking service, and unveiled a new look for its Web site, with features that will dramatically change the way the bank interacts with its customers. The new version of Direct Access allows, for the first time, Citibank customers to conduct their banking over the Internet and features a familiar point-and-click interface. Direct Access also establishes Citibank as the only bank to provide a complete Internet banking service that carries no additional charges for customers, including for bill payments.	Functionality
PR Newswire, 12/22/97	VF Corporation is the largest publicly traded apparel manufacturer in the world. The redesign of VFC's Corporate Web site, active since December 8th, 1997, is structured as an aggregate site with sections devoted to VFC's brands, its global reach, its corporate history, and its financial outlook. Each section brings to the forefront information that is critical to the investment community but also provides information for general corporate communications and consumers. In addition, the site design is intuitive for users, enabling them to quickly and efficiently get the VFC information they need.	Usability