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The Value Relevance of IT Investments on Firm Value in the Financial Services Sector

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ABSTRACT

Understanding and assessing the payoff from investments in IT is an important exercise for managers. A number of researchers have examined the elusive notion of firm-level information system effectiveness and the results are mixed. This study contributes to this debate by examining the association between market value of equity and IT-related investments for a sample of firms in the financial services sector. It should be noted that companies in the financial services industry are intensive users of IT and often rely upon IT as a source of competitive advantage. We find a positive association between investments in IT and market value. Overall, our findings support the notion that investors perceive investments in IT as value-relevant.

Keywords: IT investment payoff; information systems effectiveness; financial services sector

INTRODUCTION

We examine whether dislosures relating to investments in information technology (IT) are relevant to investors in assessing the market value of equity. During the last two decades, firms have made large investments in strategic information systems. Managers believe that the investments in IT would enable them to introduce new products and services with greater ease and in the long run, the investments would provide their firms with several tangible and intangible benefits such as cost reduction, improved operational efficiency, decision support in the areas of planning and business strategies, and enhancement of brand image, product quality, and customer loyalty (Keen, 1981; Ives & Learmonth, 1984; McFarlan, 1984; Cash & Konsynski, 1985; Porter & Millar, 1985; Cash et al., 1988). Managers consider the IT investments as a strategic necessity and a key to obtaining a competitive position within the industry.

For corporate managers, a greater understanding of the current and future value of IT investments is important. While deciding to invest in IT, managers must evaluate the impact of such spending on the firm's current operational and strategic performances and also the impact on the

bottom line. Concurrently, they must weigh the consequences of falling behind a competitor or losing competitive position and not making investments on a timely manner. IT investment decisions made on a timely manner improve a firm's competitive position and when delayed, make the firm more vulnerable to competitive forces (Cash & Konsynski, 1985; Clemons & Row, 1988; Jarvenpaa & Ives, 1990; Parsons, 1984; Porter & Millar, 1985). For example, in the financial services industry, IT investments are a strategic necessity. IT investments help financial service firms in offering innovative products (e.g., Merrill Lynch Cash Management System), building customer service and customer loyalty and brand image, all of which contribute to competitive success (Guilding & Pike, 1990; Hodgson et al., 1993). Assessing the potential benefits also aid managers in assessing the risks of such investments. IT investments require significant investments and as history has shown, many of these systems have failed to produce benefits to the investing firm. The risk assessment will help managers in determining whether the competitive advantages can be sustained (Sabherwal & King, 1995).

Since the early 1980s, the information technology literature has pointed out the importance of investment in IT. When a firm invests in IT, it helps improvement in performance through greater operational efficiency, cost reduction, increased sales and revenue that contribute to cash flows. Managers are generally aware of these benefits and consider them in their IT investment decisions (Dos Santos et al., 1993). However, managers also must consider the future benefits of IT investments and whether the investment would help the firm's bottom line. This is because the current investments in IT enable the firm to use the technology in future projects and receive sustainable competitive advantage when it uses the IT to leverage differences in strategic resources (Clemons & Row, 1993). If firms are investing in IT to receive competitive benefits, then managers must look at the "totality of the firm" and make IT decisions based from a "totality of the firm" perspective (Clemons & Row, 1993). When managers make investment decisions based on future opportunities available to the firm, the decisions would have an impact on maximizing the future value of the firm (Dos Santos, 1991).

In practice, managers rarely evaluate the future potential or firm value in the long run. This is because future IT benefits and the value enhancement that the benefits produce are difficult to quantify and measure (Barua et al., 1995). As Brynjolfson et al. (1998) identify, estimating the long term economic impact of IT investments is difficult because of measurement problems, lag between IT investments and impacts, and redistribution of outputs within an industry. Earlier studies that provided evidence that IT leads to corporate success or provided long-term value were mostly anecdotal and consisted of ex post investigation of firms that were successful in implementing information technology. These studies lacked rigorous empirical support and did not provide rationality for management's decision to invest in IT (Cash & Konsynski, 1985; McFarlan, 1984; Wiseman, 1985; Kramer & King, 1986; Laudon & Turner, 1989). Therefore, in this study, we take a different approach to studying the future value of IT. Instead of directly measuring the benefits that accrued to a specific firm, we take a macro approach and investigate whether investors and the stock market react to IT investments that are of strategic importance. We analyze the impact of IT investment announcements on the common

stock prices of financial service firms. If the information announcement leads to a positive market association, we interpret the investment decision as value enhancing and as increasing the market value of the firm. If the information announcement leads to a negative market association, we interpret the investment decision as value reducing or decreasing the market value of the firm. We believe such a finding will be useful to managers in making investment decisions based on the "totality of the firm" perspective and in supporting investment decisions that increase firm value and in maximizing shareholder wealth.

We believe that market assessment of IT decisions by firms would help managers determine how their decisions affect the value of the firm. If the market reacts to announcements about IT investments and positively revalues the firm's shares, we will conclude that the market believes that the IT investments are a strategic necessity with long term positive impact on the firm's value. If the market reacts negatively to IT investments, we will conclude that the market does not believe that the investments would maximize the value of the firm in the long run. Either way, observing the market's reaction to their IT decisions would help managers in assessing how their decisions affect the value of their firms and whether their decision, from a "totality of the firm" perspective, was in the right direction.

As earlier studies have pointed out, the market's reaction to IT investment announcements depends on various factors including investment timing and industry characteristics (Cash et al., 1992; Dos Santos et al., 1993). We therefore restrict our analysis to one specific industry—the financial services industry where IT investments are significant and where IT plays a major role in providing many services of strategic importance (Cash et al., 1988). For example, in the financial services industry, electronic fund transfers, ATMs, debit and credit cards, pay-by-phone, and treasury workstations are common applications with a direct and indirect impact on customer perceptions of service and quality. Because of the value of these services to customers, investments in these IT applications become a strategic necessity. By providing these IT-supported services, banks benefit from surcharge on pay-by-phone transactions, lower operating cost through ATMs, interest float, and interest earned on deposits. The IT system becomes a backbone for these firms to improve their competitive power, efficient operations, and long-term survival, and total system failure or even temporary set back in the IT-based systems would have serious economic consequences.

The remainder of the study is organized as follows: the next section summarizes prior research and the business value of investment in information technology. We then discuss the value relevance of IT expenditures and their strategic importance. The next section develops the research design and describes the sample selection procedures. The results are then presented followed by the summary and conclusions.

THE BUSINESS VALUE OF IT

Organizations use IT to better manage their cost of production, operational, and strategic processes, including managing their inventory system, supplier-vendor, and other value chain relationships. Similarly, financial services firms use IT to get easier access to markets, differentiate their products, and to improve customer and vendor relationships (Jarvenpaa & Ives, 1990; Boynton & Zmud, 1994; King & Teo, 1996;

Kettinger et al., 1994) and determine their success (King & Teo, 1996; Sabherwal & King, 1995). Financial services firms recognize the business value of IT, and hence budget and spend significant amounts (on an average, exceeding 10% of their total budgets) on IT-related assets.

While IT could provide various benefits to financial services firms, measuring the operational and strategic benefits that IT investments and expenditures provide is a difficult task. Prior studies that examined the benefits of IT report only mixed results (Mukhopadhyay et al., 1995; Roach, 1991; Banker & Kauffman, 1988; Brynjolfson & Hitt, 1996; Brynjolfson & Yang, 1998; Alpar & Kim, 1990). For example, a few studies examined the relationship between IT and worker productivity and market share and found no significant impact on any of these factors. On the contrary, a few studies did observe IT to improve productivity and to significantly contribute to increases in return on investments (Roach, 1991; Banker & Kauffman, 1988; Brynjolfson & Hitt, 1996; Harris & Katz, 1991). Weill (1992) reports that investments in transactional IT significantly and consistently provide higher return on assets, sales growth, and non-production labor productivity. Weill also reports that the use of strategic IT appeared to have no effect on performance in the long run and in fact, produced a slightly negative effect in the short run.

Dos Santos et al.'s (1993) study was one of the earliest to use an event-study methodology to examine the stock market's reaction to announcements of IT investments. Using a sample of 97 firms in the finance and manufacturing industries from 1981 through 1988, the authors find that, on average, IT investments do not add value, although the market reacts in different ways to announcements of innovative IT investments and to follow-up or non-innovative investments in IT.

Kettinger et al. (1994) examine the linkage between investments in IT and sustainability of a firm's competitive advantage by studying longitudinal changes in performance measures of 30 firms cited as classic strategic users of IT. The results suggest that not all of these firms can be seen as sustained winners. The authors conclude that the introduction of strategic IT has not always resulted in an improved competitive position. Similarly, Loveman (1994), in an investigation of the productivity impact of IT in the manufacturing sector, concludes that the marginal dollar would best have been spent on non-IT inputs into production, such as non-IT capital.

Other studies find evidence of payoffs from investment in information technology. Alpar and Kim (1990) examine a sample of larger banks and find that IT investments are associated with a decrease in total costs. Similarly, Harris and Katz (1991), in an analysis of the insurance industry, find that IT spending is associated with lower growth in operating expenses. This is consistent with Bender's (1986) finding that high IT spending results in improved cost efficiency in the insurance industry.

Barua et al. (1995) study the impact of IT in the manufacturing sector, and find that IT has a significant positive impact on intermediate variables such as capacity utilization, inventory turnover, and product quality, but little impact on return on assets or market share.

Brown et al. (1995) investigate a sample of 35 firms identified in the media for successful use of strategic information systems. The authors employ two approaches to analyze the impact of IT on financial success. First, they examine several performance measures over several

years to see if a positive relationship exists between employment of IT and the financial performance. Second, they conduct an event study to examine the market association to announcements of investment in IT. The results indicate that the stock market reacts favorably to the announcements and that in years subsequent to the investment in IT, the sample firms tend to be more profitable than otherwise comparable firms in their industries. In this case, the stock market regarded investments in IT as value-relevant.

Mukhopadhyay et al. (1995) attempt to isolate the benefits of IT on firm performance by undertaking a longitudinal study of a specific type of IT investment-electronic data interchange (EDI). Using performance data gathered from Chrysler's assembly centers, the authors conclude that EDI has enabled Chrysler to significantly reduce operating costs associated with carrying inventories, obsolescence, and transportation. The authors estimate the annual savings to Chrysler due to EDI to be $220 million.

Mitra and Chaya (1996) studied the IT budget data collected by *Computerworld* for more than 400 firms to examine the cost factors that are influenced by IT investments. They find that higher investments in IT are associated with lower average production costs, lower average total costs, and higher average overhead costs. Their findings, however, do not establish a causal relationship between investments in IT and the various cost factors investigated.

Brynjolfsson et al. (1998) claim that the return on investments for IT capital is over 50% per year and that the return to spending on labor is also very high. Similarly, Dewan and Min (1997) report that the gross marginal product of IT capital (the increase in annual value added due to a one dollar increase in IT capital) is 117% for the median firm.

As the survey of the literature points out, most studies agree that IT represents a critical organizational resource. However, while IT is used in many organizations, the extent to which they are used as a major organizational resource differs widely. Although many firms have attempted to use IT to obtain gains in effectiveness and efficiency, often they have fallen short of their objectives. Even organizations that evaluated the tangible and intangible benefits of IT have not approached IT decisions from a "totality of the firm" perspective or make decisions that consider the impact on firm value or wealth maximization. Even research studies have provided only mixed results on the strategic and other benefits of IT. While some studies have provided empirical support of the advantages of IT investments, others did not find such support.

The studies that found evidence of IT investments on firm performance based their results on individual case studies (Clemons and Row, 1988). As such, generalizing the results to all firms is difficult.

VALUE RELEVANCE OF IT INVESTMENTS

The IT literature supports the notion that IT investments are necessary for operational and strategic survival and in many cases do provide significant benefits to the user firm. The records and the information produced by financial services firms, more so than others, are heavily dependent on electronic calculations and the accuracy of those calculations (Swift, 1999). Because of the volume of financial transactions, undetected errors in calculations and records could lead to huge losses and mis-

use. Customers are always concerned about access to their accounts, cash, and accuracy of information. If customers believe that their institution has problems reconciling records daily or in backing up sensitive information, they would react drastically by closing their accounts or switching to other institutions. Even more significant than financial losses, such errors would undermine customer confidence since the financial services industry is built on customer trust and confidence (Graham, 1999).

Financial services firms, like other organizations, are compelled to incur IT expenditures to support various inter and intra-organizational activities (Brynjolfsson et al., 1998). Because these investments are made with the objective of using IT to improve organizational effectiveness and efficiency, IT has become a critical organizational resource (Boynton & Zmud, 1994). If a financial services firm recognized the investments in IT as a strategic opportunity to reduce transaction costs and improved data processing, it could view the expenditures as a strategic investment. On the organizational side, IT activities help in developing a common dialogue throughout the financial services industry leading to improvements in value chain interfaces and in managing risk of the business partners and customers (Bielski, 1999).

Although investment in IT has received considerable attention from researchers, there is little evidence on how the stock market perceives investments in IT. Earlier, we raised two questions. Does the market react to disclosures about IT investments? In the case of IT expenditures, does the market view the disclosures as a one-time event with no long-term-impact or does the stock market consider IT-related disclosures as investments with long-term consequences and treat the disclosures as value relevant for investor decision making? We examine both these questions. Using IT investment-related disclosures, we examine whether disclosures relating to IT expenditures are relevant to investors in assessing the market value of equity. Our findings are consistent with the notion that IT-related disclosures capture value-relevant information not reflected in earnings or book value of equity. Several sensitivity checks indicate that our results are robust.

Another important question is, did the market react positively or negatively to IT-related disclosures? Answering this question was much more difficult. We review the likely positive aspects first. Most firms recognize most IT projects to be operationally and strategically important (Verity, 1998). Some firms (e.g., Allied Signal, Inc.) use IT investments to gain competitive advantages. Firms with strong IT systems reap benefits while firms without adequate IT systems lose in the competitive marketplace (McFarlan, 1994). Financial service firms that did not invest adequately in IT will lose customers and business and in turn, this would have an impact on their long-term profitability and net worth. Others argue that IT investments can have a negative impact on firm value because of the sizeable expenditures and because organizations that invest more and more in IT redirect resources from other projects, which means lower growth in productivity (Miller, 1998). Thus, it is not clear whether IT expenditures will have a positive or negative effect and whether the net effect was beneficial for the average financial services firm is an empirical issue.

RESEARCH DESIGN

The objective of this paper is to examine the impact of IT-related expenditures and whether disclosures about IT related

expenditures are relevant to investors in assessing the market value of equity, specifically financial services firms. We use a model developed by Ohlson (1995) to examine the value-relevance of IT costs. In simple terms, his model indicates that market value is determined by earnings, book value of equity, and other market-relevant information.

Our choice of Ohlson's model is motivated by the following reasons. First, it is a commonly used valuation model in accounting and finance research. Second, Ohlson's model has fewer independent variables relative to other valuation models (see Landsman, 1986; Grove et al., 1990). The implication of this feature is that sample size can be maximized, as missing data for independent variables is less of a concern. Finally, measurement error associated with the independent variables is also less of a concern for Ohlson's model because earnings and book value of equity are readily available from the firm's financial statements. However, other valuation models often use proxies to measure independent variables and thus, measurement error is introduced due to use of poor proxies.

In summary, we examine whether investments in IT are value-relevant to investors, i.e., associated with market value of equity after controlling for earnings and book value of equity. An incremental association with market value would support the notion that IT investments are perceived by investors as value-relevant.

Model Development

We estimate a cross-sectional model to examine the value-relevance of IT costs as illustrated below:

MV_t is market value of equity at the end of three months after the close of the fiscal year:

BV_{t-1} is book value of equity at the beginning of the year. $EARN_t$ is income before extraordinary items at time t; Barth et al. (1996) find core deposit intangibles (*CORE*) to be positively related to market value of equity. Since *CORE* is likely to be associated with IT investments, we include *CORE* as a control variable. *CORE* is not available for non-banking firms and is therefore coded as zero for non-banking firms. Following Barth et al. (1996), we define *CORE* as domestic deposits minus time deposits in excess of $100,000. We include a second control variable, *Y97,* to capture time-specific effects. *Y97* equals 1 for year 1997 and 0 for 1998. IT_t is the estimate of total IT investments costs at time t.

Following Amir (1993), we deflate all variables except *Y97* by BV_{t-1} to mitigate heteroskedasticity. We also estimated model (1) in undeflated form and used an alternate deflator—book value of equity at time *t*. The tenor of the results remains unchanged when we use this alternate deflator.

Consistent with the prior research, we predict a_1, a_2, and $a_3 > 0$. We interpret the *IT* variable as an "other value-relevant" variable in Ohlson's model. Thus, observing $a_5 > 0$ is evidence that estimates of IT costs capture value-relevant information not reflected in *BV* and *EARN*.

Since the reported IT-related costs are susceptible to measurement error, we take the following steps to mitigate the influence of such error (Maddala, 1977). First, the reported IT-related costs scaled by the beginning book value of equity are

$$\frac{MV_t}{BV_{t-1}} = \alpha_0 + \alpha_1 \frac{EARN_t}{BV_{t-1}} + \alpha_2 \frac{BV_t}{BV_{t-1}} + \alpha_3 \frac{CORE_t}{BV_{t-1}} + \alpha_4 Y97 + \alpha_5 \frac{IT_t}{BV_{t-1}} + \mu_t \qquad (1)$$

rank-transformed. Then the rank-transformed variable is normalized to a mean of 0 with a standard deviation of one. Our conclusions remain unchanged when the regression models are run without these transformations.

SAMPLE SELECTION

Since our focus is on the financial services industry, we search the *Compustat PC Plus* database to identify firms in the following four-digit SIC codes: 6021 (national commercial banks), 6022 (state commercial banks), 6035 (savings institutions-federally chartered), 6036 (savings institutions not federally chartered), 6099 (functions related to deposit banking), 6111 (federal credit agencies), 6141 (personal credit institutions), 6162 (mortgage banks), 6199 (finance services), 6211 (security brokers and dealers), 6282 (investment advice), 6311 (life insurance), and 6351 (surety insurance).

From this initial list, we identified firms that reported estimates of IT investments in their 1997 or 1998 annual reports. Next, we identified firms for which the following information was available on the *Compustat PC Plus* database for the years 1997 and 1998: market value of equity at the end of three months after fiscal year-end, income before extraordinary items, book value of equity at the beginning of the year, total assets, and tax rate. Finally, we hand-collected from the financial statements information to calculate the core deposit intangible variable. The final sample totaled 171 firm-year observations. Table 1 provides the industry distribution for the sample of financial institutions included in this study.

RESULTS

An examination of the variance inflation factors (VIFs) does not suggest a serious multicollinearity problem.

Table 1: Industry Distribution for Sample Firms

Four-Digit SIC Code	Industry	Number of Firm-Years
6021	National commercial banks	75
6022	State commercial banks	41
6035	Savings institutions-fed chartered	24
6036	Savings institutions-not fed chartered	2
6099	Deposit banking functions	2
6111	Federal credit agencies	1
6141	Personal credit institutions	3
6162	Mortgage bankers	1
6199	Finance services	3
6211	Security brokers and dealers	12
6282	Investment advice	4
6311	Life insurance	2
6351	Surety insurance	1
	Total Number of Observations	171

Table 2. Descriptive Statistics and Correlations

Panel A: Descriptive Statistics[a]

Variable	Mean	Standard Deviation	Minimum	25%	Median	75%	Maximum
MV_t/BV_{t-1}	4.048	3.819	0.448	2.289	3.147	4.618	34.200
$EARN_t/BV_{t-1}$	0.179	0.095	-0.310	0.140	0.173	0.207	0.751
BVE_t/BV_{t-1}	1.273	0.375	0.723	1.069	1.169	1.352	3.913
$CORE_t/BV_{t-1}$	8.669	6.889	0.585	5.488	8.453	10.961	47.174
IT_t/BV_{t-1}	0	1.000	-1.716	-0.868	0	0.868	1.716

Panel B: Correlations[b]

Variable	MV_t/BV_{t-1}	$EARN_t/BV_{t-1}$	BVE_t/BV_{t-1}	$CORE_t/BV_{t-1}$	IT_t/BV_{t-1}
MV_t/BV_{t-1}	1.000	0.598***	0.420***	0.009	0.217***
$EARN_t/BV_{t-1}$	0.717***	1.000	0.315***	0.181**	0.110
BVE_t/BV_{t-1}	0.507***	0.358***	1.000	0.346***	0.079
$CORE_t/BV_{t-1}$	0.114	0.118	0.292***	1.000	0.051
IT_t/BV_{t-1}	0.021	0.087	-0.006	0.186**	1.000

[a]Total number of observations equals 171.

MV_t is market value of equity at the end of three months after the close of the fiscal year; BV_{t-1} is book value of equity at the beginning of the year. $EARN_t$ is income before extraordinary items at time t; $CORE_t$ is core deposit intangibles at time t that equals domestic deposits minus time deposits in excess of $100,000. IT_t is the estimate of total IT-related costs at time t. The IT_t/BV_{t-1} is rank-transformed and then normalized to a mean of zero with a standard deviation of one.

[b]Pearson correlations are above the diagonal. Spearman rank correlations are below the diagonal.

*** and ** indicate statistical significance at the 0.01 and 0.05 levels, respectively.

Chatterjee and Price (1977) indicate that VIFs in excess of 10 signify serious multicollinearity problems. The highest VIF is 1.37 (not reported), indicating that multicollinearity is not serious. Table 2 shows that the correlation between market value and the IT variable is positive. Table 3 presents the results on the value relevance of IT cost disclosures. The results support the notion that IT investments are associated with market value.

Tests for Robustness of Findings

We conducted several additional analyses to investigate the robustness of our findings. First, we reestimated the model (1) with the following variations: we used BV_t as an alternate deflator (Amir, 1996). This step forces a_2 to 1 and includes it in the intercept term. Therefore, we predict $a_0 > 0$. Intercept is positive and significant at the 0.10 level. *EARN* is positive and significant at the 0.01 level. *CORE* and *Y97* are not significant at the 0.10 levels. *IT* is positive and significant at the 0.05 level. In a different run, we estimated model (1) in undeflated form without normalizing the IT variable. *EARN* and *BV* are both positive and significant at the 0.01 level. Both *CORE* and *Y97* are positive but not significant at the 0.10 level. *IT* is

Figure 3: Value Relevance of IT Related Cost Disclosures

$$\frac{MV_t}{BV_{t-1}} = \alpha_0 + \alpha_1 \frac{EARN_t}{BV_{t-1}} + \alpha_2 \frac{BV_t}{BV_{t-1}} + \alpha_3 \frac{CORE_t}{BV_{t-1}} + \alpha_4 Y97 + \alpha_5 \frac{IT_t}{BV_{t-1}} + \mu_t \qquad (1)$$

Variable (expected sign)	Coefficient	t- value
Intercept (?)	-3.893	-4.35***
$EARN_t/BV_{t-1}$ (+)	20.482	7.84***
BVE_t/BV_{t-1} (+)	2.443	3.51***
$CORE_t/BV_{t-1}$ (+)	0.012	0.32
Y97 (?)	0.250	0.55
IT_t/BV_{t-1} (+)	0.011	2.44**
Adjusted R^2		0.42
F statistic		25.83***

Total number of observations equals 171.

MV_t is market value of equity at the end of three months after the close of the fiscal year; BV_{t-1} is book value of equity at the beginning of the year. $EARN_t$ is income before extraordinary items at time t; $CORE_t$ is core deposit intangibles at time t that equals domestic deposits minus time deposits in excess of $100,000. *Y97* equals 1 when year is 1997 and 0 for 1998. IT_t is the estimate of total IT-related costs at time t. The IT_t/BV_{t-1} is rank-transformed and then normalized to a mean of zero with a standard deviation of one.

*** and ** indicate statistical significance at the 0.01 and 0.05 levels, respectively for the two-tailed tests.

positive and significant at the 0.01 level.

Second, we examined the possibility that our results are driven by firm size. We reestimated model (1) by including total assets as a proxy for size. In accounting and finance literature, total asset is the most frequently used proxy for size. Even the Federal Deposit Insurance Corporation (FDIC) classifies banks on the basis of asset size. Once again, *IT* is positive and significant at the 0.01 level.

Third, we examined the influence of outliers in driving the results. We deleted the top 2% and bottom 2% of *IT*. Altogether, seven observations (about 4% of the total sample) were deleted. Model (1) was re-estimated using the remaining 164 observations. The adjusted R^2 for the model is 0.42. Both *EARN* and *BV* are both positive and significant at the 0.01 level. *CORE* and *Y97* are positive but not significant at the 0.10 level. *IT* is positive and significant at the 0.01 level.

In summary, the above additional and sensitivity checks suggest that our findings are not statistical artifacts driven by variable definition or model misspecification.

Does Value-Relevance Vary with the Level of IT Investments?

Next, we turn to the question whether the value-relevance of IT disclosures vary

Table 4: Value-Relevance of IT-Related Cost Disclosures

Firms Partitioned Based on the Degree of Progress Toward It-Compliance

$$\frac{MV_t}{BV_{t-1}} = \alpha_0 + \alpha_1 \frac{EARN_t}{BV_{t-1}} + \alpha_2 \frac{BV_t}{BV_{t-1}} + \alpha_3 \frac{CORE_t}{BV_{t-1}} + \alpha_4 Y97 + \alpha_5 \frac{IT_t}{BV_{t-1}} + \mu_t \qquad (1)$$

Panel A: Low Progress (Number of Observations = 86)		
Variable (expected sign)	**Coefficient**	**t- value**
Intercept (?)	-3.538	-4.51***
$EARN_t/BV_{t-1}$ (+)	16.491	6.95***
BVE_t/BV_{t-1} (+)	2.475	4.62***
$CORE_t/BV_{t-1}$ (+)	0.047	1.84*
Y97 (?)	0.679	1.86*
IT_t/BV_{t-1} (+)	0.005	1.83*
Adjusted R^2		0.55
F statistic		22.07***
Panel B: High Progress (Number of Observations = 85)		
Variable (expected sign)	**Coefficient**	**t- value**
Intercept (?)	-4.230	-2.87***
$EARN_t/BV_{t-1}$ (+)	22.817	5.34***
BVE_t/BV_{t-1} (+)	2.192	1.77*
$CORE_t/BV_{t-1}$ (+)	-0.038	-0.54
Y97 (?)	0.345	0.19
IT_t/BV_{t-1} (+)	0.019	2.04**
Adjusted R^2		0.40
F statistic		12.34***

Firms are divided into low and high progress groups based on the degree of IT-related costs. Firms above (below) median are classified as high (low) progress firms. MV_t is market value of equity at the end of three months after the close of the fiscal year; BV_{t-1} is book value of equity at the beginning of the year. $EARN_t$ is income before extraordinary items at time t; $CORE_t$ is core deposit intangibles at time t that equals domestic deposits minus time deposits in excess of $100,000. *Y97* equals 1 when year is 1997 and 0 for 1998. IT_t is the estimate of total IT-related costs at time t. The IT_t/BV_{t-1} is rank-transformed and then normalized to a mean of zero with a standard deviation of one.

***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, for the two-tailed tests.

with the extent of IT investments. In other words, is the magnitude of association between IT investments and the stock market value of equity greater for those firms that have invested significantly in IT relative to banks that did not invest? We argue that the magnitude of the association between IT costs and market value of equity should be greater for firms that disclosed investments in IT relative to firms that did not disclose investments in IT.

Firms that have made greater invest-

ment in IT are more likely to reap the benefits associated with IT such as, enhanced customer confidence and loyalty, and availability of mission-critical information systems. On the other hand, banks that have made little or no progress toward IT investments are at the risk of losing customers to peer institutions.

We estimate the total IT costs (*PROGRESS*) as a proxy for IT investment efforts. We partition our sample into low and high progress groups based on *PROGRESS*. Firms above (below) median are classified as high (low) progress firms. We estimated model (1) for each of these groups and the results are reported in Table 4.

For the low progress group, IT is positive and significant at the 0.10 level. For the high progress group, it is positive and significant at the 0.05 level. While the stock market favorably values the IT disclosures for both the groups, it is interesting to note that the absolute value of a_5 for the high progress group is about four times larger than a_5 for the low progress group. This is consistent with the notion that high progress firms are more likely to succeed and will be in a better position to reap the benefits of IT investments relative to low progress firms.

SUMMARY AND CONCLUSIONS

In this study, we examine the market's assessment of IT decisions by firms. We hypothesized that the market's reaction to announcements about IT investments would help managers determine how their decisions affect the value of the firm and whether their decision was made from a "totality of the firm" perspective and if so, was it in the right direction. We chose financial services firms because these firms are highly dependent on IT. Financial services firms that are not prepared to invest in IT face the risks of disruptions in business. For most financial services firms, IT investments increase their credibility with their customers, suppliers, and competitors and at the same time, provide significant savings in data storage and processing costs. In short, many financial services firms use IT as a strategic necessity to gain competitive advantage.

IT investments that help firm strategy have been the subject of considerable attention from IS researchers during the last ten years. With greater competition, customer demands, and shrinking margins, most firms realize that IT investments are the key to their long-term success, innovation, and growth. However, it is not yet clear whether investment in IT is a significant determinant of long-term value for a firm. Therefore, using an event methodology, we examine whether investors react either positively or negatively to announcements about IT.

We use IT expenditure disclosures costs as an example, to illustrate this issue. We report the association between IT costs and share prices of financial services firms making such disclosures. We test the joint hypothesis that IT costs are relevant to the equity valuation of financial services firms and that these costs were sufficiently reliable to be reflected in share prices. After controlling for earnings, book value of equity, and size, we found IT costs to be significantly and positively related to share prices. We also found that while IT costs had incremental information content, they seemed to have less of an impact on market value of equity than earnings or book value of equity. This is consistent with the notion that IT costs were susceptible to more estimation error than the book value of equity. Overall, our findings were robust to alternate specifications and sensi-

tivity checks.

The findings of this study support the notion that the stock market considers investments in IT as a significant and value-increasing activity for the average firm. In short, stock market participants seemed to confirm the notion that, despite some short-term costs, firms that chose to invest in IT stood to reap significant long-term benefits. Our findings are also consistent with Brynjolfsson and Yang (1998) who document that computer capital is valued by the stock market at least four times greater than the market values for each dollar of conventional assets.

Our work thus contributes to several streams of research. On the practical side, managers and academics have long debated the tangible and intangible benefits associated with investments in IT, and research on the economic benefits of IT has produced mixed results. By examining investment in IT for an IT-dependent industry, financial services, our research enhances our understanding of the economic benefits of investment in IT. On the theoretical side, our study provides evidence that investments in IT is a source of long-term growth and competitive advantage. It draws on the resource-based view of the firm and argues that investment in IT is an integral component of a firm's long-term resource. For managers, our findings will be useful in understanding that IT investments have the ability to increase the value of their firms. The analysis and results provide a benchmark for assessing IT investments made by the firm.

Earlier studies primarily examined the impact of IT investments on internal performance measures such as material costs or operating expenses. While these studies pointed to the direct benefits of IT, they did not increase our awareness of long-term and intangible benefits, e.g., firm value. Therefore, by linking IT investments to firm value, our study regards IT investment as an intangible asset. We believe that such a linkage contributes to the growing literature on the value-relevance of non-financial information.

The event-study methodology would be useful to address the value-relevance of assets whose benefits are difficult to quantify or in understanding the circumstances in which investments in certain classes of assets are made. If an asset is considered a strategic necessity or has long-term uses, the market would perceive it accordingly. At this time, the value-relevance research as it relates to IT investments is not extensive. Much additional research needs to be done to determine whether or not strategic information systems provide competitive advantage to a firm. By examining market reaction to various types of IT investments and in various industries, managers can enhance their understanding of the value of IT investments.

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