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The Stock Market Valuation of IT Innovations: Evidence from the Investment Banking Industry

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Abstract

It is always a challenge to teach students IT skills and capabilities in a non-IT course setting. However, there is an increasing tendency for IT innovations initiated outside the IT organization. It is thus all the more important for educators from non-IT disciplines not only to keep up with technological development but also to motivate students to learn IT skills in a non-IT course setting such as in a finance classroom. In this paper, we examine the role of IT innovations in a non-IT organization such as an investment bank. We empirically investigate whether IT innovations can bring added market value to the investment banking industry. We find that an investment bank that invests heavily in IT innovations outperforms its industry peers in the stock market. The implication of this finding highlights the need for our educators to motivate our students to gain knowledge of IT even for non-IT disciplines.

Keywords: Information technology, innovation, cost of IT, stock market, IT productivity.

1. INTRODUCTION

Motivating business students to learn information technology (IT) skill sets and gain knowledge about IT innovations in a finance course setting is a unique challenge.

Following the dotcom burst and failures of more than 5000 internet businesses, we have witnessed in the real corporate world a massive layoff from the IT industries and in the classroom a sharp decline in the enrollment of students majoring in information technology and systems. Under this context, business students and practitioners alike are questioning the value of investing time and money in information technology. Meanwhile, in the real corporate world, the survivors and success stories of 21st century electronic business are most often successful brick-and mortar companies, rather than the hot internet start-ups of the late nineties (Tabor, 2005). More ironically, electronic commerce research shows an increasing tendency for IT projects and IT strategy to be initiated outside the IT organization (Swanson, 1994). This phenomenon indicates that corporate decision makers believe that IT and IT innovations can bring competitive advantage and add certain value to the firm. Thus, it is all the more important that we teach our business students to understand the role of IT and IT innovations in a non-IT course setting.

It is under this motivation that we examine the role of IT innovations in a non-IT organization such as an investment bank. Specifically, we empirically investigate whether IT innovations can bring added value to the firm in a non-IT industry such as the investment banking industry. Our findings in the investment banking industry confirm our results in our study on IT industries (Boasson and Boasson, 2005).

The remainder of this study is organized as follows: relevant literature review in Section 2; data description in Section 3; empirical tests and results discussion in Section 4; and conclusion in the final section.

2. RESEARCH CONTEXT

There is significant scholarly interest in understanding the relationship between IT investments and firm performance. However, findings to date remain mixed: while some studies find a positive relationship between IT investments and firm performance (Banker et al, 1990, Brynjolfsson and Hitt 1995, 1996; Lichtenberg 1995; Dewan and Min 1997; Bharadwaj et al. 1999, Stratopoulos and Dehning 2000), others fail to find any significant relationships at all. The earlier literature on the relation between IT and productivity finds an absence of a positive relation between spending on IT and productivity or profitability. This inconclusive result from these earlier studies is what Strassman (1990) and Loveman (1994) called "IT productivity paradox". In an age where management carefully weighs the costs and benefits of every discretionary investment dollar, finding evidence of the returns on IT investments is critical.

In our view, one possible reason for these inconclusive results may be that most studies measure firm performance in terms of accounting profits and returns such as return on equity (ROE), return on assets (ROA), and return on investments (ROI). These accounting measurements capture only the snapshot of one point in time of a firm's past or existing rather than future expected cash flow. Moreover, it is well-known that these accounting returns can be easily manipulated by managers via their earnings management. More importantly, the intangible value that comes with IT innovations cannot be easily captured in accounting terms. According to Alan Greenspan, Federal Reserve Board Chairman, "There are going to be a lot of problems in the future as accounting is not tracking investments in knowledge assets." (Standfield, 2005). Thus, previous researchers have yet to examine whether the stock market is able to capture the potential and future intangible assets associated with IT innovations, especially in a non-IT organization such as an investment bank.

We select the investment banking industry subset to examine the IT innovation's impact upon the market valuation of the firm because technological advances and technological innovations have become the key factors in this industry's development. Growing client demand for specialized investment products have led to a wide array of financial product innovations, such as various new hedging vehicles, derivative products, and specialized mutual funds. Advances in technology have lowered transaction costs and raised market efficiencies. Computers are used to calculate a firm's exposure to market movements, compute regulatory capital positions, and monitor developments in markets worldwide. Some trades are executed automatically via computer to speed market response and transaction time. To gain competitive advantage, many investment banks invest heavily in IT innovations.

However, IT innovation projects can be very difficult to manage, sometimes failing spectacularly (Financial Times, 1998) and often falling short of management expectations (Compass, 1999). Given the magnitude of IT innovation projects and their impact on a firm's operations, they can significantly affect the volatility of firm performance. Anecdotal evidence suggests that firms differ markedly in how they manage such projects and what they gain from them in return. Some firms, for example, have experienced spectacular operational and strategic benefits from IT (Kraemer, Dedrick & Yamashiro, 2000) while others have experienced equally spectacular failures (Financial Times, 1998).

Thus, the constant question raised to the CEOs and CIOs in the investment industry is: can these heavy expenditures in IT innovations translate into better shareholder value or stock market performance? In this paper we attempt to address this question by examining the relationship between IT innovations and stock market performance in the investment banking industry.

3. THE DATA

In order to examine IT innovations in the investment banking industry, we collected 10 years (1994-2003) of data on IT innovations from *Information Week 500* survey. *InformationWeek* provides IT-related data such as IT innovations rankings, IT budgets, number of IT employees and other IT-related information as part of an annual published survey. We use IT innovations rankings and IT budget as a proxy for IT innovations and investment. We use IT innovation ranking data because data on IT budget and other variables are no longer disclosed on firm level basis from 1998. The rationale for using the data from the *InformationWeek 500* survey is that this data source has been used extensively in other similar studies (Brynjolfsson and Hitt 1996; and Lichtenberg 1995). According to *InformationWeek*, the companies that are selected into the InformationWeek's top 500 ranking are the top companies that are distinguished by crisp and efficient technology strategies that cut costs and optimize productivity. To obtain a spot in this annual ranking of the *InformationWeek 500*, companies must demonstrate a pattern of technological, procedural, and organizational innovation. The selection process entails identifying and ranking the companies after an extensive mail, phone, and fax study. Senior IT executives are surveyed on their organizational priorities and spending plans for the year ahead.

For each year, we matched each of these 500 top IT innovative firms with its industry competitors using six-digit NAICS and four-digit SIC codes. We extract market and accounting data from Compustat and CRSP databases, and matched yearly returns, market value, book assets, R&D, and other accounting data to these sampled firms. To minimize the potential effect of outlier observations on the results, variables are winsorized by adjusting all values in the top and bottom percentiles to be equal to their 1st and 99th percentile values.

4. RESEARCH METHOD

To capture IT innovations, we use the annual ranking data on IT innovations and IT budgets from the *InformationWeek 500*.

To measure the intangible value that is inherent in IT innovations but is not recognized by accounting values, we calculate the ratio between a firm's total market value and total book value. To measure the stock market performance and shareholder value creation, we use the Tobin's Q ratio which is used extensively in the finance literature. This ratio was developed by James Tobin of Yale University, Nobel Laureate in Economics, who hypothesized that the combined market value of all the companies on the stock market should be about equal to their replacement costs. The Q ratio is calculated as the market value of a firm's assets divided by the replacement value of the firm's assets (Tobin 1969). If the market value reflected solely the recorded assets of a company, Tobin's Q would be one. If Tobin's Q is greater than one, then the market value is greater than the value of the company's recorded assets. This suggests that the market value reflects some unmeasured or unrecorded assets of the company. High Tobin's Q values encourage companies to invest more in capital because they are "worth" more than the price they paid for them. On the other hand, if Tobin's Q is less than 1, the market value is less than the recorded value of the assets of the company. This suggests that the market may be undervaluing the company.

We compute Tobin's Q for each firm and for each year as follows:

$$\text{Tobin's Q} = V_i / A_i \quad (1)$$

where

V_i = the total market value of the firm i, (i.e. the sum of the market value of equity, preferred stocks and debt), and

A_i = the book value of firm i's total assets, proxy for firm size.

Tobin's Q reflects a number of variables, including not only the recorded assets of the company, but also market or investor sentiment, analysts' views of the prospects for the company, or speculation such as bid rumors, and most important of all, Tobin's Q captures the intellectual capital of the company. Thus, the advantage of using Tobin's Q for measuring the intangible value associated with IT innovations is that Tobin's Q measures the extent to which the market recognizes the firm's *future* rather than the

past profitability, and in particular, the firm's potential competitive advantage and growth opportunities. Brainard and Tobin (1968), Tobin (1969) and Tobin (1978) suggest that it is through Q that financial markets affect real economic activity.

In order to compare stock market performance between the firms that are engaged in heavy IT innovations and their peers, we adopt the independent-samples *t*-test procedure. Because this procedure can compare the mean difference between the two independent sample groups, it is thus appropriate to use this procedure to compare the mean difference of Tobin's Q between the IT innovating investment firms and the non-IT innovating investment firms so as to investigate whether one group outperforms the other group.

A series of *t*-tests, frequency tests, and descriptive statistics were run for each year comparing the mean Tobin's Q value between the firms included in the *InformationWeek 500* and their respective industry peers from 1994 to 2003.

5. EMPIRICAL RESULTS

In this section, we present the empirical results for the IT industries.

Table 1 shows the empirical results for the investment industry from 1994 through to 2003. The results show that the mean and median Tobin's Q values are higher for the firms that are selected as IT innovators in the *InformationWeek 500* than for their industry peers and this mean difference is statistically significant for each year. The gap is especially large for the year 1997 when the mean and median Tobin's Q values for the IT innovators in the investment industry are 6.323 and 2.893 respectively, whereas the mean and median Tobin's Q values for their industry peers are 2.209 and 1.822 respectively. This result is statistically significant with a *t*-stat of 2.592 and *p*-value of 0.015. Comparing all the years, IT innovative investment banks outperform their industry peers in terms of Tobin's Q with the mean and median values of 3.867 and 2.248 respectively, versus 2.111 and 1.841 respectively. This result is statistically significant with a *t*-stat of 2.199 and a *p*-value of 0.033.

Table 1. IT Innovation Investment Banking Industry: Tobin's Q 1994 – 2003

	Information Week Firms			Industry Peers			Difference			
	Mean	Median	St. Dv.	Mean	Median	St. Dv.	Mean	Median	t-stat	p-value
1994	3.973	1.204	6.055	1.101	0.812	0.895	2.872	0.392	1.966	0.062
1995	4.282	1.601	6.006	1.376	1.010	0.982	2.906	0.592	2.160	0.041
1996	4.658	1.945	5.964	1.739	1.361	1.347	2.919	0.584	2.204	0.036
1997	6.323	2.893	7.497	2.209	1.822	1.595	4.114	1.071	2.592	0.015
1998	4.514	2.527	5.660	1.346	1.152	3.162	3.168	1.375	1.933	0.063
1999	4.691	2.616	4.917	2.389	1.569	1.955	2.302	1.047	1.941	0.061
2000	3.503	2.651	2.893	1.992	1.558	1.988	1.512	1.094	1.707	0.095
2001	2.595	2.127	1.225	1.325	1.114	1.356	1.270	1.014	2.456	0.036
2002	1.819	1.500	0.848	0.627	0.986	2.274	1.192	0.514	2.420	0.023
2003	2.308	2.155	0.809	1.330	1.517	1.514	0.978	0.639	2.406	0.028
All Years	3.867	2.248	3.347	2.111	1.841	1.643	1.756	0.407	2.199	0.033

These results indicate that those firms engaged in IT innovations consistently outperform their industry peers in the stock market valuation year after year, even after controlling for firm size.

Figure 1 shows graphically the difference in Tobin's Q between the IT innovative firms in the *InformationWeek 500* and their industry peers in the investment banking industry. There is a constant gap in terms of Tobin's Q over the study time period between the IT innovators and their industry peers showing that IT innovators consistently outperform their industry peers.

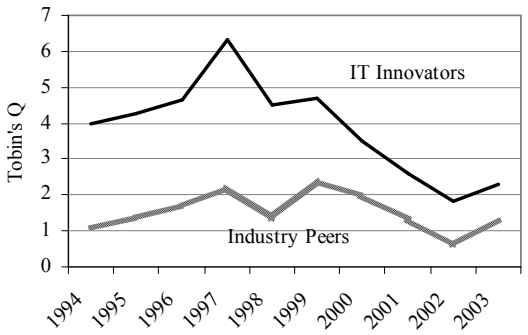

FIGURE 1. IT INNOVATION INVESTMENT BANKING INDUSTRY: TOBIN'S Q 1994 - 2003

6. CONCLUSION

Overall, our empirical results show that IT innovators selected by the *InformationWeek 500* from a non-IT industry such as the investment banking industry consistently outperform their industry peers in terms of Tobin's Q values and the results are statistically significant.

These findings indicate that IT innovations could potentially upgrade a firm's competitive advantage and create growth opportunities even for non-IT industry. These intangible values are often ignored in the accounting book but are captured in the forward-looking stock market.

In conclusion, the implications of these findings suggest that IT innovations play a crucial role in creating market value not only for IT industries but also for the investment banking industry. In other words the findings indicate that an investment bank that invests heavily in IT innovations can outperform its industry peers in the stock market.

This evidence highlights the need for our educators to motivate our students to gain knowledge of IT even for non-IT disciplines such as the finance discipline.

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