ABSTRACT

This study applies the event study method, a method to measure how a firm’s stock price reacts to new information, to a list of publicly traded Australian firms, to investigate the impact of information and communication technology investments on the market value of the firm. We select 217 announcements relating to IT investments over a period from 1996 to 2006. Positive abnormal returns are observed on the announcement day of each of three distinct time periods; during the technology bubble (1996 to 1999), during the Year 2000 bug (Y2K bug) period (2000 - 2001), as well as the period afterwards that ensued to 2006. These are all statistically significant. We also find similar results when categorizing announcing firms into two broad industry groups; IT firms and non-IT firms. We value-weigh each announcement based on firm size and find that the market’s assessment of the returns to IT investments is more favorable towards smaller firms than larger firms for the whole sample, across all periods and the two industry groups. On a whole, the research shows that IT investment announcements over the whole sampled periods yield statistically significant positive abnormal returns. This is valid for the announcement day, and over two event windows; the first one comprising the day before to the day after the announcement, and the second one encompassing the period 5 days before to 5 days after the announcement was made. These results are of practical relevance for the particular Australian market under investigation given the comparatively high levels of spending on IT in Australia in relation to other OECD countries.
INTRODUCTION

Since the advent of Information Communication and Technology (IT) in the workplace, one question in particular lingers in the minds of most investors and users of this technology, exactly what value does IT provide to firms? Solow (1987) argues that there is insufficient evidence to link investments in IT to gains in productivity. Helped by his famous words, which are quoted by Brynjolfsson (1993) that “we see computers everywhere except in the productivity statistics” (pg. 67) this fueled much debate and interest in IS research. IS researchers responded to Solow’s statement by studying the area of IT value more closely. This has led to numerous approaches and methods, which attempt to capture and measure the broader value IT generates for the firm (Berghout and Renkema 2001). Certain measures focus on the value IT investments add to productivity whilst others focus on financial outcomes.

Brynjolfsson (1993) argues that the statistics showing a distinct correlation between increases in IT spending and decreases in productivity for the U.S. economy are invalid, as their models are underspecified and do not take into account all relevant factors in explaining productivity other than IT. He states that very large changes in capital stock are needed to demonstrably affect total output under standard assumptions about typical rates of return. Brynjolfsson and Hitt (1996) find that the value IT investments add to firm output is both economically and statistically significant. We find similar results in the studies by Dewan and Min (1997) and subsequently by Dewan and Kraemer (2000). However, Gordon (2000) shows also contrary results, which suggest that only a few industries sustain productivity gains (firm productivity and performance in this paper refer to how efficient or effective a firm utilizes its assets to generate profits).

Brynjolfsson (1993) offers four explanations as to why a paradox remains and why there is difficulty in equating firm gains to IT investments. The term ‘productivity paradox’ was coined in response to Solow’s (1987) statements that as new IT is introduced in firms, productivity of the workforce may go down and not up. The four explanations are; measurement errors in productivity statistics that may not account for the types of benefits managers typically attribute to IT, such as increased quality, customer services, speed and responsiveness. The second explanation relates to the time it takes for the benefits of IT to flow through to the bottom line results of the firm, this may be due to lags resulting from learning and adjustment. Another explanation relates to IT not necessarily adding to firm output but still being beneficial for the firm. The fourth explanation suggests that
investments in IT may not be productive at the firm level due to mismanagement of IT. Stratopoulos and Dehning (2000) hypothesize that the reason why there is a weak link between IT investment and financial performance is the ineffective implementation of IT projects in firms. They find evidence showing that firms, which are successful users of IT, yield superior comparable financial performance to less successful users of IT, but this advantage is short lived. This may be due to competitors imitating IT projects, hence erasing any sustainable first mover advantage from investing in IT. They conclude that if the two factors of high failure rates and high investment in IT are combined then there should not be any positive correlation between the amount invested and performance. They quote Strassman (1997) as saying that the correlation between the amount invested and performance will continue to be insignificant even when controlling for such factors as industry, nature of investment in IT among others.

A large portion of the literature focuses on the area of the realized value and payoff of IT. However, as Im, Dow and Grover (2001) point out, it is difficult to establish causality between IT investments and firm level output performance because many factors influence firm performance. There is growing interest in the relationship between IT and the value of firms (Kamssu, Reithel and Ziegelmayer 2003) because of the rapid rise in technological innovation over the years, and its importance to the smooth operation of firms (Dos Santos, Peffers and Mauer 1993). A greater understanding of the market value impact of IT investment announcements is of interest to both industry and academia given that IT investment expenditure continues to rise, along with the need to justify this expenditure.

A robust, proven and interesting way in which one may study the relationship between IT investments and firm performance is through an event study. As Seiler (2004) points out, an event study is a methodology that is used to measure how a firm’s stock price reacts to newly released information. In short, this is achieved by analyzing a number of firm announcements to determine how the market reacts to such news. It is based on the premise that if an investment yields a positive Net Present Value (NPV) resulting from net discounted cash flows, the market value of a firm should increase (Dos Santos, Peffers and Mauer 1993). NPV is a measure of the benefits expected to generate a return in excess of the firm’s required financial rate of return (also known as the hurdle rate). If the firm is publicly listed on a stock exchange, and trading in an efficient market, the change in market value should be reflected in its stock price soon after such an announcement is made (Dos Santos, Peffers and Mauer 1993; Hunter 2003). Furthermore, such changes in stock prices allow us to calculate the returns to IT investments (Dos Santos, Peffers and Mauer 1993).

If the market re-values a firm’s stock price based on an IT investment announcement, then it is reasonable to assume that there will be an impact on the market value of a firm (Dos Santos, Peffers and Mauer 1993). The examination of stock price reactions to IT investment announcements is used to measure the market’s assessment of the expected impact of IT investments on firm value (Dos Santos, Peffers and Mauer 1993). Subramani and Walden (2001) argue that if investors can foresee future benefits to firm performance from IT investment announcements, this would lead to positive returns. To achieve our research contributions as outlined in the accompanying text box we use the event study method.

There are seven previous studies, which have explicitly investigated the market value impact of IT investment announcements. They provide the following results: Dos Santos, Peffers and Mauer (1993) evaluate IT investments and address the question of whether IT investments affect the market value of firms. They look at a sample of 97 IT investments in the U.S. over the period from 1981 to 1988, and find that stock price reactions to proposed IT investments are not significantly different from zero for the whole sample and across financial services and manufacturing firms. The results from this pioneering study did not show a significant effect of all IT investments on excess returns. However, an interesting discovery is that those IT investments, which are classified as
innovative, result in positive changes in firm value. The effect of non-innovative IT investments including follow-up investments is shown to be negative. These results indicate that the market during the period of 1981 to 1988 expects positive returns from firms, which invest in innovative IT. Im, Dow and Grover (2001) extend Dos Santos, Peffers and Maurer’s (1993) study by sampling 238 IT investments from 1989 to 1996. Their contribution was in addressing firm size and other confounding factors such as time lags. Industry sector effects are controlled for to enhance the internal validity of the findings. They find that on average IT investment does not increase the market value of the firm. Chatterjee, Pacini, and Sambamurthy’s (2002) study focuses on two specific IT investment types namely infrastructure and applications. They find that IT infrastructure investments have a significant impact on the market value of firms in the U.S. Another finding presents evidence to suggest that IT infrastructure investments are more closely associated with increases in market value than investments in IT applications. These results provide a strong foundation and justification for making substantial investments in IT infrastructure. Dehning, Richardson and Zmud (2003) take a step forward by including all the announcements from the previous three major studies (Dos Santos, Peffers and Maurer 1993; Im, Dow and Grover 2001; Chatterjee, Pacini, and Sambamurthy 2002). A total number of 350 announcements in the U.S. cover the period between 1981 and 1996. The focus is on the impact that an investment’s IT strategic role has on the market value of a firm. They find positive abnormal returns to IT investment announcements in industries where IT has a transforming strategic role to play. Hunter (2003) compares stock price returns of two types of IT investment announcements in the U.S. The first are investments that utilize existing organizational capabilities called exploitative investments; the second are investments in acquiring new capabilities called exploratory investments. In studying this area, Hunter (2003) examines 150 announcements of IT investments between 1990 and 1997 and finds that on average, financial markets considered IT investments more likely to destroy value than to increase it. The two types of IT investments yield a significantly negative impact to the market value of the firms. These findings suggest that there are three important determinants of the market value of the firm: the characteristics of IT investments themselves, the industry and the strategic context within which these investments are made (Hunter 2003). Roztocki and Imai (2003) investigate whether there is a possible connection between investments in IT and changes in the market value of firms in Japan. They studied 36 announcements over 2001 to 2002 and did not find any reliable evidence that shows IT investments add value to firms. Finally, Ranganathan and Brown (2006) look at whether a sample of 116 ERP investments had an affect on the market value of firms in the U.S. over a five-year period between 1997 and 2001. They find greater increases in market value of firms where ERP purchases include multiple value-chain modules, where ERP projects are implemented across multiple organizational divisions, or where ERP projects are implemented across multiple geographical sites. The market value impact of IT investment announcements across three periods Friedman (1953) and Fama (1965), who held the traditional rational markets view, argued that although investors may trade in an irrational manner, this does not substantially affect stock prices. This is, because arbitrageurs will trade against these irrational positions and in doing so will eliminate irregularities, which cause stock market bubbles to occur, which happens when the price of stocks rises to the point of being overvalued in comparison to any stock value measure. It is widely reported that a stock market bubble did exist for IT stocks in the lead up to the year 2000 especially as firms spent enormous amounts of money trying to safeguard their businesses against the impacts of the Y2K bug. Figure 1 displays the combined value of all firms included in the technology heavy NASDAQ Composite index.
It shows a clear spike in periods leading up to and during the year 2000.

This figure shows a steady rise of the NASDAQ Composite from the beginning of 1996 to the end of 1998, then a much greater rise in 1999. The graph also shows that in the 3 month period from the beginning of 2000 when people thought the Y2K bug would occur to the highest point in the technology (related stock market) bubble that there was further growth in the Composite. The bubble officially burst on the 10th of March 2000 amidst a number of multibillion dollar sell orders for major IT companies including IBM, Cisco and Microsoft. This sparked a downturn trend for the proceeding year and a half until the end of 2001. Figure 1 shows a period of stabilization from 2002 onwards after the burst of the technology bubble.

From the review of the literature, we find no study with a sample period extending from the mid 1990s to 2006, more specifically no study has yet tested for the technology bubble and the Y2K bug impact using an event study. The periods during the technology bubble (1996 to 1999), during the Y2K bug (2000 to 2001) and the period following (2002 to 2006) are examined. Figure 2 captures the sample periods by all existing studies including this one.

As shown in Figure 2, most studies cover the period between 1980 and 1995 with few studies conducted post 1995 to 2006. It leads us to investigate whether the market assessed the returns of IT investments differently in each of the three periods discussed above.

The market value impact of IT investment announcements across two industry sector groupings

According to the OECD (2004), IT investment in Australia has more than doubled from 1980 to 2001 and that apart from the U.S. and Australia there is little evidence that IT using industries have experienced productivity growth. We use the Global Industry Classification Standard (GICS) - GICS is a joint product by Morgan Stanley Capital International and Standard & Poor to standardize industry classifications used worldwide and according to the Australian Stock Exchange (ASX), it currently covers 27,000 firms globally, allowing for cross-country industry comparison studies - to divide two broad industry sector groups. Of the

Figure 1. NASDAQ Composite from 1994 to 2005

Figure 2. Sample periods in existing studies
distinguished group, the first relates to IT firms belonging to the software and services as well as technology and hardware sectors, all other firms are grouped as non-IT firms or IT using firms.

Dos Santos, Peffers and Mauer (1993) find that the industry, in their case financial services and manufacturing, has no affect on the impact of IT investment to firm value. Im, Dow and Grover (2001) find that non-financial services firms have a larger market value impact than financial services firms. Chatterjee, Pacini, and Sambamurthy (2002) find that IT infrastructure investments enhance value across a range of industries and this enhanced value is not industry specific. Hunter (2003) positions his study within the retail industry and argues that there is a need for future researchers to control for industries. This leads us to investigate whether IT investments made by non-IT firms yield larger abnormal market returns than IT investments made by IT firms.

**The market value impact of IT investment announcements based on firm size**

Apart from Im, Dow and Grover (2001), who show that there is a correlation between firm size and positive returns, there is little reported evidence that larger firms yield higher returns than smaller firms do. Stuart (2000) argues that there is a need to control for firm size. This study tests for firm size effect by calculating equally weighted and value-weighted cumulative abnormal returns (CARs) for the entire sample, for each of the three time periods and across the two broad industry groups. In equally weighted calculations of CARs we treat all firms making announcements the same, and do not discriminate based on firm size. In value-weighted calculations of CARs we discriminate announcements according to the firm’s size based on the firm’s market capitalization using the number of issued shares multiplied by current market stock price.

This identifies whether the size of the firm impacts CARs by comparing results across equally weighted CARs and value-weighted CARs. This leads us to investigate whether firm size impacts the market’s assessment of the returns of IT investments across the entire sample, for each of the three time periods discussed above and across the two broad industry sector groupings.

**The market value impact of IT investments across countries**

Overall, the literature shows mixed results and that, on a whole, IT investment announcements do not consistently result in economically or statistically significant positive abnormal returns. This may be due to different periods being examined, or the different types of announcements under examination. The majority of the studies are U.S. based thus little is known in terms of the impact of IT investments on firm value in other countries. Dewan and Kraemer (2000) argue that the concentration of previous studies on U.S. based firms has opened up the question of external validity of these findings beyond the domain of these studies. We therefore investigate whether announcements of IT investments on average in Australia are positively associated with CARs.

The next section we describe our research design and estimation method with a special emphasis on the selection of our sample and the calculation of the stock return. The paper then concludes with the presentation and discussion of our findings.

**Research Design**

In this section, we discuss our research assumptions, sampling and data collection technique, along with the estimation method for calculating normal, abnormal and cumulative abnormal returns including a discussion on the estimation period and event window chosen for the study.

**Research Assumptions**

We base our research on a number of assumptions; that the market does not anticipate the information contained in the IT investment announcements collected before the announcement is made public. Markets are efficient in that stocks reflect all relevant information (McWilliams and Seigel 1997). Any new information relevant to pricing those stocks is impounded in an unbiased manner into the market price. Events are unanticipated
in that abnormal returns are a result of investor reaction (Dos Santos, Peffers and Mauer 1993; McWilliams and Siegel 1997). Individual stock returns over time can be predicted to some degree, based on historical stock returns. Events are not confounded by eliminating other factors (McWilliams and Siegel 1997). Firm prices reflect expected future earnings, and deviations from that will be arbitraged away.

Data Sampling and Collection

For this study we took Bacon’s (1992) definition of IT investments being “Any acquisition of computer hardware, network facilities, or pre-developed software or any in house systems development project, that is expected to add to or enhance an organization’s information systems capabilities and produce benefits beyond the short term” (pp. 335-336). We collated the sample by identifying a number of events from a database, which stores all announcements made to the market through the Australian Stock Exchange (ASX) by Australian firms from 1990 to present day. A group called the Securities Industry Research Centre of Asia-Pacific (SIRCA) maintains the database called ‘Signal G’, and provides data services to individuals interested in academic research in the Australian financial market. We searched for IT investment announcements within Signal G using the following keywords based on Bacon’s (1992) definition of an IT investment; ‘information technology’, ‘computer’, ‘hardware’, ‘software’, ‘system’ along with the following words ‘investment’, ‘acquisition’, ‘purchase’ and ‘development’. We found 291 matching announcements. To improve sample reliability we employed two people to filter the announcements and remove any confounding factors. Together, a finance academic and an IT practitioner worked through all 291 announcements to remove any announcements that appeared as duplicate, irrelevant or negative meaning that they have been rejected or abandoned by the announcing firm or where the firm was not established long enough to obtain price data for the event period. We were left with 217 matching positive announcements, i.e. those announcements that focus on investments that have either already been made or are being delivered. These announcements were made by 188 firms across 20 industries from 1996 to 2006. Appendix A contains a sample list of announcements. Figure 3 illustrates the number of announcements for each year across all the data period.

There are 53 announcements between 1996 and 1999, 113 announcements between 2000 and 2001 and 51 announcements from 2002 to 2006. The period around the Y2K bug has approximately twice the number of announcements in the sample relative to the two other periods, highlighting the importance of controlling for different periods in the dataset. There are 93 IT investment announcements made by IT firms and 124

![Figure 3. IT investments by year](image-url)
announcements by non-IT firms. The non-IT firms belong to any one of the following industry sectors; banking, capital goods, commercial services, consumer and durables, consumer services, diversified financials, energy, food and staples retailing, food beverage and tobacco, health care equipment, materials, media, pharmaceuticals and biotechnology, real estate, retailing, telecommunication services, transportation and utilities.

**Estimation Method for Returns**

All seven studies discussed in the literature review used event studies to carry out their research. The event study method features prominently in financial research as a valuable analytical tool to detect the wealth effect of an event (Binder 1998; MacKinlay 1997; McWilliams and Siegel 1997; Peterson 1989; Subramani and Walden 2001), and has become the standard method of measuring stock price reaction to an event or announcement (Binder 1998). The main benefit of an event study is that it is relatively easy to apply because the only data needed are the publicly traded firm’s name, event dates and stock prices (Im, Dow and Grover 2001). The other benefit according to Mc Williams and Siegel (1997) is that the data it relies on is historical and cannot easily be manipulated by the announcing firm.

The underlying basis of event studies is that prices of stocks are determined by investors’ reaction to new information of these unanticipated events (Fama, Fisher, Jensen and Roll 1969). This reaction is important because it is based on whether investors believe an announcement will bring future expected cash flows (McWilliams and Siegel 1997; Wells, 2004). If the release of this information is perceived to be good news, an increase in abnormal returns should be expected (Im, Dow and Grover 2001).

**Data Frequency**

Seiler (2004) argues that observations concerning returns made only once a month are far too infrequent to isolate the event from the period before and after the announcement. The most commonly used frequency for event studies is once daily (Seiler 2004). Peterson (1989) argues that tests using daily returns are more powerful than those using monthly returns and on this basis we obtain daily prices for each announcing firm using a database also maintained by SIRCA called the ‘ASX daily data database’. In calculating market returns we use the market index called the All Ordinaries Index obtained through SIRCA’s ‘All Ordinaries Index database’.

**Estimation Period and Event Window**

The estimation period is “the period of time over which no event has occurred. It is used to establish how the returns on the stock should behave in the absence of the event” (Seiler 2004, pg. 424). Care has to be taken with this estimation because as Peterson (1989) states the greater the accuracy of the event date the more powerful the test. The estimation period is not standard for all studies; Seiler (2004) recommends that when defining the estimation period researchers should attempt to make the interval wide enough to capture the relationship between the stock and the market, but not so wide, so that the estimated relationship no longer applies to the firm today. Thus, consistent with recommendations from the literature (Peterson 1989) the estimation period of -205 days to -6 days before the event date (0), is used for this study.

Seiler (2004) defines the event window as being “the number of trading periods examined preceding and following the event date” (pg. 424). Again, in line with earlier research, we chose two event windows; -5 to +5, and -1 to +1. Seiler (2004) also underlines the importance of identifying the event date: the event date is defined as “the time when the market first learns of the relevant new information (the event)” (Seiler 2004, pg. 217). He points out “studies have shown that discrepancies and reporting delays exist among providers. The less accurate you are in identifying the event date, the less powerful the test, and therefore, the less able you are to accurately measure the impact of the event on the firm” (pg. 218). Having acquired our announcement data from SIRCA who source their data directly from the ASX, we are confident that the announcement date is accurate.
The concepts of event window, event date and estimation period are depicted in Figure 4.

**CALCULATING RETURNS**

The event study methodology allows us to compute each firm’s abnormal return that is “the difference between the actual return and the expected return, where the expected return for each of the days in the event window is predicted using a regression” (Seiler 2004, pg. 221). In order to calculate the abnormal return we need to compute each firm’s actual and expected return. We use the risk-adjusted model, which according to Gallagher and Looi (2005) is for a particular stock ‘s’ “the return on stock ‘s’ less the value-weighted benchmark (All Ordinaries Index) return on the characteristic-matched portfolio to which stock ‘s’ belongs” (pg. 131). In short, in order to determine whether IT investment announcements have an impact on their firm’s stock price we estimate what the stock price would have been had there been no announcement and compare it to the actual returns during the event window (Peterson 1989). Positive abnormal returns show that the market favored the IT investment announcement and vice versa.

A firm’s stock return is calculated using the following formula (Kamssu, Reithel and Ziegelmayer 2003):

\[ R_{jt} = \alpha_j + \beta_j R_{mt} \]

\( R_{jt} \) = rate of return for firm j on day t

\( R_{mt} \) = rate of return on the market portfolio on day t

\( \alpha_j \) = intercept term

\( \beta_j \) = systematic risk of firm j

If investors feel that the event will be of value to the firm they will react favorably and this is reflected in a positive abnormal return for the firm’s stock in excess of the average stock market return around the date of the IT investment announcement (Subramani and Walden 2001). In other words, stock returns are subject to some degree of noise or random statistical fluctuation, but an event study is looking for returns that exceed this normal level of variation. The abnormal return is calculated as follows (Subramani & Walden 2001):

\[ AR_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt}) \]

\( AR_{jt} \) = Abnormal Return on stock j for each day in the event window

\( R_{jt} \) = return on stock j for each day in the event window

\( \alpha_j \) = intercept term for firm j measure over the estimation period

\( \beta_j \) = systematic risk for stock j measured over the estimation period

\( R_{mt} \) = return on the market for each day in the event window

The CARs representing the aggregated average abnormal returns for the period, are calculated as follows (Kamssu, Reithel and Ziegelmayer 2003):

\[ CAR = \frac{1}{N} \sum_{j=1}^{N} \sum_{t=t_i}^{t_f} AR_{jt} \]

\( N \) = Number of firms

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**Figure 4. Event window, event date and estimation period**
RESULTS

The results of the study are reported firstly for the whole sample, then across the three periods and industry groups and ending with firm size. The mean abnormal return is used to show the average market value impact of announcements for each day in the event window whereas the cumulative abnormal return is used to show the collective impact of announcements in the event window (-1 to +1, and -5 to +5). Appendix B contains a summary of the results. Figure 5 displays the mean abnormal returns for the entire sample on each day of the event window (-5 to +5):

It is evident that there is some activity prior to the announcement date suggesting possible leakage of announcement, especially the day before the announcement. The mean abnormal return on the announcement day for the whole sample is 3.70%, statistically significant at the 1% level. The subsequent decline in returns after the announcement date is consistent with an efficient market, that is, all or most of the gains or losses are impounded on the announcement day. After the announcement, the firms generate a normal return, which is clearly depicted in the graph showing returns returning to approximately zero the day after the announcement. However, on the days, +2 to +4 there is a negative impact, but this impact is not statistically significant. The market is reacting positively although not statistically significant on the fifth day following the announcement. An analysis of the 2000 - 2001 period shows that there is on average a positive abnormal return on the 5th day after the announcement of approximately 7%. One explanation is that firms during the 2000 - 2001 period were making relatively more announcements than in other periods as Figure 3 indicates. Further analysis will determine whether this is the case or if there is another more suitable explanation. In terms of the calculated CARs, the full sample results in a positive CAR of 4.81% for the -1, +1 window significant at the 1% level and 5.90% for the -5, +5 window at a 5% significant level. These results suggest that the market in Australia does positively assess the returns of IT investments. The analysis below will help reveal where there may have been differences in value across time, industry and/or firm size.

Results across three periods

The returns across all three periods under examination are captured in Figure 6.

The figure 6 highlights that on average the market is positively assessing the returns of IT investments on the day that they are announced, with the exception of 2002 - 2006 which saw further positive abnormal gains the day after the announcement. The returns on announcement day for all periods are statistically significant at the 1% level. In 1996 - 1999 the return is 4.9%, in 2000 - 2001 the return is 3.87% and 2002 - 2006 the return is 1.84%. This suggests that despite that burst of the technology bubble, the market still sees
IT investments as value creating although mean abnormal returns in 2002 - 2006 dropped to 1.84%. The CARs across these three periods are interesting because, while they are all positive, there are some differences. In 1996 - 1999 the CAR is 4.27% in the -1, +1 window statistically significant at the 1% level, and 12.96% in the -5, +5 window, which is very high, but not statistically significant. In 2000 - 2001 the CAR for the -1, +1 window is 5.05% significant at the 1% level and 4.62% in the -5, +5 window, significant at the 5% level. The CAR for the period after the Y2K bug (2002 - 2006) is 4.82% significant at the 5% level in the -1, +1 window. This is lower than in the 2000 - 2001 period and only slightly higher than the CAR for 1996 - 1999. For 2002 - 2006 the CAR in the -5, +5 window is only 1.46%, representing quite a substantial decrease compared to previous years although not statistically significant.

Overall, before the technology bubble burst we see positive abnormal returns (4.90%) on the announcement day for IT investments. After the burst of the bubble the market’s reaction declined, for instance in 2000-2001 the positive abnormal return on the announcement day dropped to 3.97% and again to 1.84% from 2002 to 2006, all of which are statistically significant to the 1% level. This suggests that despite reducing abnormal returns after the technology bubble, the market still sees value in IT investments and this is specifically highlighted by the positive returns during 2002 - 2006.

The returns for the 2002 - 2006 period are shown in Figure 7:

![Returns for 2002 - 2006](image_url)

Figure 7. Returns for 2002 - 2006
The initial abnormal return in the 2002 – 2006 period on announcement day of approximately 2% is statistically significant at the 1% level. There is a further increase the day after by over 1% suggesting possibly that the market is more hesitant in this period to react to IT related announcements than it was the case in prior years. One imperative question, which can be raised from this analysis, is - whether the Y2K period fundamentally altered the way the market assessed IT events.

The returns for the 2000 - 2001 period are captured in Figure 8.

There is some activity prior to the announcement in the 2000 – 2001 period suggesting possible leakages occurred although not statistically significant.

The returns for the 1996 - 1999 period are captured in Figure 9.

For the 1996 - 1999 period the market on average has an approximate return of 5% on the announcement day, which is statistically significant at the 1% level and 5% for 5th day after the announcement, which again is very high, but not found to be statistically significant. The market reactions before the announcement day are shown in the three figures certainly challenge the base assumption of event studies that leakages do not occur.
RESULTS ACROSS TWO INDUSTRY SECTOR GROUPINGS

The returns by IT firms and non-IT firms based on the GICS industry classifications are captured in Figure 10.

The mean abnormal return for IT firms on the announcement day for all periods is 2.68% significant at the 1% level, while the mean abnormal return for non-IT firms on the announcement day for all periods is nearly twice as much at 5.04%, also statistically significant at the 1% level. This shows that the market believes that IT using firms will be able to generate greater future cash flows from their IT investments than IT producing firms. There is no statistical difference in these predicted values suggesting these two broad industry groupings do not categorise IT value.

RESULTS BY FIRM SIZE

The returns for equally-weighted and value-weighted CARs in the -1, +1 window are captured in Figure 11.

The returns for equally weighted and value-weighted CARs in the -5, +5 window are captured in Figure 12.

![Figure 10. Returns by IT firms versus non-IT firms over 1996 – 2006](image)

![Figure 11. Returns for small vs large firms in the -1, +1 window](image)
The data across the entire sample, across each of the three periods as well as across the two broad industry groups is analyzed. The equally-weighted CARs across all the sample are given equal weight for each announcement irrespective of firm size or other possible announcement characteristic. The result for the whole sample in the -1, +1 window is 4.81%, which is statistically significant at the 1% level. The result for the whole sample in the -5, +5 window is 5.90%, which is also statistically significant at the 5% level. To test whether firm size affects the result, each announcement in the sample is weighted relative to the firm’s size as measured by its market value. Across the two windows -1, +1 and -5, +5 for the whole sample the value-weighted CARs are 1.04%. The CAR for the 1996 - 1999 period in the -5, +5 window is 12.96% when equally-weighted and -0.21% when value-weighted for the same window. Looking at the results across the two industry groups shows that the market believes that smaller firms will generate greater future cash flows from their IT investments than larger firms will. These results indicate that the market has assessed the returns to IT investments more favorably for smaller firms than for larger firms across the full sample, in all firms, in all industries and all years.

**ROBUSTNESS OF EVENT STUDY**

To secure robust outcomes we took several measures; the study not only computed the mean abnormal returns, but also the CARs across various event windows (-5, +5, and -1, +1). This coupled with a cross-sectional analysis of time and industry as subsets including firm size aided to improving the robustness of the results. Furthermore, statistical significance was determined using the two-tailed T test, which is quite standard for this kind of research and allowed us to determine whether the results were statistically different from zero. Robustness was also enhanced by the high degree of confidence in the event dates supplied by the data provider, SIRCA, who obtained them directly from the ASX and by the fact that we employed two experts to remove any events that might have confounded the sample.

**DISCUSSION**

The results for the full sample over the event window -1, +1 show the highest positive CAR of 4.81% compared to other studies with a similar event window. Dehning, Richardson and Zmud (2003) report a CAR of 0.38%, Chatterjee, Pacini and Sambamurthy (2002) 0.26%, Im, Dow and Grover (2001) 0.16%, Dos Santos, Peffers and Mauer (1993) 0.09%,
Hunter (2003) -0.85%, Roztocki and Imai (2003) -1.28% and Ranganathan and Brown (2006) 0.83%. The results of this study indicate that the market on a whole favorably rewards firms making IT investments.

For this study, the CARs for each of the three periods of study for an event window of -1, + 1 are positive in the 1996 - 1999 period, 4.25%, in the 2000 - 2001 period, 5.05%, and in the 2002 - 2006 period, 4.82%. The market’s reaction to IT investment announcements is consistent across these three periods, and shows only a 0.80% increase in CARs in the 2000 - 2001 period compared to the preceding period. There are only two comparable studies we could find over a similar sample period. Roztocki and Imai's (2003) study of 36 IT investment announcements in Japan over a similar period 2001 - 2002 reports a negative result in -1.28% CAR. Ranganathan and Brown (2006) study 116 IT investment announcements from 1997 to 2001 and report a CAR result of only 0.83%.

One of Hunter’s (2003) findings suggest that the type of industry the announcing firm belongs to is an important determinant of the market value of the firm. Being motivated by this finding we set out to see whether industry has an affect on the market value of firms and report a relatively large difference in our results across two broad industry groupings. The CAR for IT firms making IT investment announcements in our sample is 2.29%, while non-IT firms making IT investment announcements yield a CAR of 8.16% for the event window -1, + 1. This shows that the market believes non-IT firms are more able to generate greater future cash flows from such investments than IT firms are, as reflected in the higher CARs.

In terms of firm size, our study shows that the market assesses the returns on IT investments more favorably for smaller firms than larger firms across the full sample, in all firms, in all industries and all years. These results are consistent with Im, Dow and Grover’s (2001) finding showing that there is a correlation between smaller firms and higher returns.

**CONCLUSION AND FUTURE RESEARCH**

Stock market investors consider the trade-off of risk and return in assessing the viability of firm investments and their ability to contribute to growth opportunities of the firm (Chatterjee, Pacini and Sambamurthy 2002). Thus, we use the event study method to investigate whether or not IT investments have an impact on the market value of firms. The results demonstrate that IT investments are value-creating initiatives. Overall, these results show that IT investment returns in Australia over 1996 - 2006 and across industry groups are positively assessed by the market as evident in the statistically significant positive CARs, not reported in this scale before. It is evident that firms utilizing IT are the ones that the market believes will yield greater benefit from their IT investments than those by IT producing firms. In addition, for the whole sample, across industry groupings, and different periods of time smaller firms yield greater market returns than larger firms.

Future research may also extend this and other studies in the field by focusing on other types of IT investment announcements and the timing of such investments. For example, a firm may announce an IT investment that they are planning to make, that is presently under negotiation or those investments that have already been made. At present there are no studies that control for timing of the investment. What is still unclear is how the market reacts to a broad set of IT investments, those that are made to help change a business, improve the business, stay in business or run the business. An additional contribution could be made by conducting a series of interviews with equity analysts, brokers and fund managers in order to gauge what importance they have placed on IT announcements in making their judgments and technical reports on firms. Lastly, future research may benefit by testing longer event windows than those used in existing studies to investigate whether there is a sustained market reaction over the longer term.
**APPENDIX A**

A sample list of announcements for this study is listed in Table 1 below:

<table>
<thead>
<tr>
<th>Firm Code</th>
<th>Ann. Date</th>
<th>GICS Industry Grouping</th>
<th>Announcement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPW</td>
<td>19980319</td>
<td>Software &amp; Services</td>
<td>HOA to purchase an Electronic Billing System</td>
</tr>
<tr>
<td>SYB</td>
<td>19980821</td>
<td>Health Care Equipment &amp; Services</td>
<td>Melbourne Automated Fare Collection Project</td>
</tr>
<tr>
<td>USC</td>
<td>19981019</td>
<td>Utilities</td>
<td>Waste Service awards Olympic Site Emission Control System</td>
</tr>
<tr>
<td>VCL</td>
<td>20000519</td>
<td>Real Estate</td>
<td>Enters System management arena with cost effective competitor</td>
</tr>
<tr>
<td>ITG</td>
<td>20000706</td>
<td>Consumer Services</td>
<td>$1 Million Deal - Software Package</td>
</tr>
<tr>
<td>TTI</td>
<td>20000710</td>
<td>Transportation</td>
<td>Global Distribution Agree. Signed with Freehills Technology Services</td>
</tr>
<tr>
<td>SCP</td>
<td>20001019</td>
<td>Commercial Services &amp; Supplies</td>
<td>Finalizes agreement with Sausage Software</td>
</tr>
<tr>
<td>JLA</td>
<td>20010628</td>
<td>Energy</td>
<td>Minister launches drivers license system</td>
</tr>
<tr>
<td>OBJ</td>
<td>20010718</td>
<td>Pharmaceuticals, Biotechnology &amp; Life Sciences</td>
<td>RSL Com Signs OBJ to provide operational &amp; support systems</td>
</tr>
<tr>
<td>ANZ</td>
<td>20011101</td>
<td>Banks</td>
<td>Launches Australia’s first chip credit card system</td>
</tr>
<tr>
<td>IWL</td>
<td>20011123</td>
<td>Diversified Financials</td>
<td>Renews Contract to Supply Software Platform to CBA</td>
</tr>
<tr>
<td>UCL</td>
<td>20020731</td>
<td>Materials</td>
<td>Technology Investments</td>
</tr>
<tr>
<td>APK</td>
<td>20030210</td>
<td>Utilities</td>
<td>Microview announces document mgmt software</td>
</tr>
<tr>
<td>ADB</td>
<td>20040225</td>
<td>Banks</td>
<td>Adelaide Bank Awards Sirius Tender for Telephony &amp; Call System</td>
</tr>
</tbody>
</table>


APPENDIX B

A summary of the results from this study is found in Table A2 below:

Table A2. Summary of results from this study

<table>
<thead>
<tr>
<th>Mean abnormal returns</th>
<th>EW CARs ^</th>
<th>VW CARs ^^</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day -5</td>
<td>Day -4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results A: Full sample of IT investments across all firms and all years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Sample (N=217)</td>
<td>0.15%</td>
<td>0.46%</td>
</tr>
<tr>
<td>Mean ARs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Results B: Analysis of returns across three time periods for all firms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years 1996 - 1999 (N=53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ARs</td>
<td>0.31%</td>
<td>1.73%</td>
</tr>
<tr>
<td>Year 2000 - 2001 (N=113)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ARs</td>
<td>0.77%</td>
<td>0.63%</td>
</tr>
<tr>
<td>Year 2002 - 2006 (N=51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ARs</td>
<td>-1.37%</td>
<td>-1.22%</td>
</tr>
<tr>
<td>Results C: Analysis of industry (IT and Non IT firms) across all years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Firms (N=93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ARs</td>
<td>0.55%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Non-IT Firms (N=124)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ARs</td>
<td>-0.38%</td>
<td>0.86%</td>
</tr>
</tbody>
</table>

^ represents equally weighted CARs; ^^ represents value-weighted CARs to test for firm size effect;

* statistically significant at the 1% level (p-value based on two-tailed T-test); ** statistically significant at the 5% level (p-value based on two-tailed T-test).
REFERENCES


The Market Value Impact of IT Investment Announcements


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