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Do Green IT Announcements Improve Market Value Of Firms?

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DO GREEN IT ANNOUNCEMENTS IMPROVE MARKET VALUE OF FIRMS?

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Abstract

With the increasing announcement of green IT initiatives by firms, there is a need to investigate the financial impact of these announcements on a firm’s market value. Invoking the resource-based view, this study analyzes the impact of specific types of green IT announcements on a firm’s market value using the event study methodology. Our sample comprises 160 news reports of green IT initiatives by publicly traded firms over a 6-year period. The findings indicate that green IT announcements result in a 0.38% average cumulative abnormal increase in stock price over a 2-day event window. The results further reveal that there are positive relationships between the green IT announcements on “sustainable products and services” and the use of “collaboration” technologies with the cumulative abnormal returns. Implications for research and practice are discussed.

Keywords: green IT, event study, abnormal returns, market value, announcements.
1 INTRODUCTION

“Citigroup began tracking its virtualization efforts in January 2007. So far, 10 percent of Citi’s North American IT environment is virtualized, which saves the company about $1 million per year” (Michelle Erickson, Citigroup Green IT Director, Jan 28, 2009).

“New “Mini-IBM” Modular Data Centers Deliver up to 50 Percent Energy Savings - IBM (NYSE: IBM) today said it would expand its efforts to deliver energy efficiency technologies to global businesses facing skyrocketing energy costs, environmental concerns and corporate sustainability requirements” (Marketwire, Jun 11, 2008).

The increasing cognizance of environmental responsibility in public discourse has resulted in an increase in announcements with regard to improving environmental performance by firms. This is illustrated by the growth in sustainability related investments by firms (Haanaes et al. 2011) e.g., green IT. Green IT is defined as computing technologies that are energy-efficient and have minimal adverse impact on the environment (Boudreau et al. 2008). The salience of technology in shaping firms and society (Orlikowski 2008) suggests that green IT will be a crucial component of a firm’s environmental initiatives.

One key corporate objective behind such sustainability initiatives is the enhancement in brand reputation and market value (Berns et al. 2009; Haanaes et al. 2011). Hence, it is worthwhile to examine the potential change in market value that might result from green IT announcements as it also provides a measure of the importance assigned to green IT announcements by investors. Investors are at the top of the corporate governance structure and their reactions to any corporate initiative are crucial determinants of the sustainability of the initiatives. If green IT announcements evoke positive reactions from investors, then firms will tend to be more motivated to engage in such initiatives. Conversely, negative or neutral reactions would suggest that investors have not yet imbied the idea of green IT.

Despite the fact that the adoption of green IT has gained prominence in the past few years (Haanaes et al. 2011), there are a few firms that have engaged in green IT for a longer time-period than others. These firms regularly announce their green IT initiatives. An examination of the investors’ reaction to their green IT announcements will be a pointer to the importance attached to green IT by the investors. Green IT announcements are of different types; some are related to investments in energy-efficient assets, while others are related to the announcements of new environment-friendly product or services. There is also an imperative to examine if the different types of green IT announcements have a different impact on the investors’ reactions. Green IT is a recent development and investors may have different reactions to such announcements, depending on whether the firm has a reputation for being innovative or otherwise. Our key research questions are thus:

1. How much do investors care about green IT announcements?
2. Do investors have different reactions to the different types of green IT announcements?
3. Do investors have different reactions to the green IT announcements for innovative firms versus non-innovative firms?

This paper makes the following contributions. First, using event study methodology, this is the first study to provide empirical support of the impact of green IT announcements on the market value of firms. In doing so, we contribute to the literature on green IT as well as to the body of literature on sustainability initiatives. Second, the paper also empirically examines the differential impact of the different types of green IT announcements on the market value of firms. In doing so, it indicates the relative importance of the different types of green IT announcements in the eyes of the investors. Third, the paper also provides insights as to whether the investors view green IT announcements by the innovative firms and non-innovative firms differently.

Prior studies using event study methodology to examine the impact of IT related announcements and IT failure have used the Resource-Based View (RBV) (Bharadwaj et al. 2009). Following them, we...
integrate RBV with the green IT quadrant proposed by Corbett (2010) to examine the importance attached to green IT announcements by investors.

2 BACKGROUND AND HYPOTHESES

The extant literature has examined the value of IT from the theoretical lens of RBV. The basic tenet of RBV is that the possession and deployment of resources and capabilities which are valuable, rare, imitable and non-substitutable create sustained performance advantage for the firm (Barney 1991). Capabilities have been defined as firm-specific information-based tangible or intangible processes (Bharadwaj et al. 2009).

Green IT involves investment in IT with the objective of addressing the concerns about the adverse environmental impact of an organization’s operations. The engagement of organizations in green IT represents a portfolio of resources that competitors cannot acquire, develop and use easily due to the institutional barriers (Molla and Cooper 2009), various organizational issues such as culture, strategy imperative (Chen et al. 2009), and the technological prowess of a firm (Berns et al. 2009). The engagement in green IT also signifies the development of capabilities within the firm to effectively utilize environment-friendly computing technologies, integrating such technologies with the existing technologies inside the firm, and the development and deployment of processes to facilitate the harnessing of such technologies. Thus, green IT is also associated with the development of new capabilities. Hence, green IT can potentially create sustained competitive advantage for the firm.

Green IT announcements signal a firm’s engagement in green IT. Investors tend to view such announcements favorably as it suggests that the firm is taking steps to be sustainable and reduce waste. Investors may consider the involvement in green IT as an indicator of the firm’s effort to create or cater to new markets comprising environmentally-conscious customers. It will also indicate to the investors that the firm wants to improve operational performance by using new green technologies. Green IT is found to be positively associated with the various corporate pay-offs such as improved profitability and better operational performance (Mithas et al. 2010; Thambusamy and Salam 2010). Hence, investors may be more confident about future growth prospects of the firm and reward the firm by giving positive returns in addition to the returns from the market conditions. Based on this discussion, we hypothesize that:

\[ H1: \] Green IT announcements result in positive abnormal returns for the firm.

2.1 Types of green IT

Corbett (2010) analyzed the green IT topics discussed in the CIO articles and suggested four main types of green IT based on their underlying technological characteristics: (i) information to support decision-making; (ii) direct IT assets and infrastructure; (iii) collaboration; and (iv) sustainable products and services. “Information to support decision-making” includes the business intelligence applications, enterprise asset management, manufacturing systems controls, analysis of operations, processes, functions and calculators for carbon-footprint or environmental impacts. “Direct IT assets and infrastructure” include the data centers, energy efficient hardware, server virtualization, monitoring systems and cloud computing. “Collaboration” includes the green IT applications to foster collaboration without increasing carbon-footprint such as telecommuting. “Sustainable products and services” include the applications of green IT to create new environment-friendly products such as new online services. We adopt Corbett’s typology to classify the various announcements with regard to green IT. The rationale is that this typology helps us to classify the announcements based on the IT artifacts discussed by the CIOs, who are responsible for green IT implementation in their firms. In addition, this classification summarizes the green IT applications included in various industry surveys in a succinct manner. Hence, classification of green IT announcements based on this typology will be a concise reflection of actual practices.
Prior research has found a positive association between business intelligence (BI) and firm performance in different sectors (Elbashir et al. 2008). BI is now increasingly recognized by executives as the key to a firm’s effectiveness (Watson and Wixom 2007). The salience of BI in ensuring better firm performance is illustrated by the Continental Airlines example. Continental Airlines, which was on the verge of bankruptcy in the 1990s invested $30 million in BI and reaped a $500 million return on its BI investment with an ROI of over 1000% (Williams and Williams 2006). Hence, the use of green IT applications to provide “information to support decision-making” is expected to have a positive impact on firm performance. Investors will expect that, like other BI success-stories, green IT applications for “information to support decision-making” will help firms to not only improve their environmental performance but also operational performance through better asset utilization. This can be achieved by the utilization of green IT applications on enterprise asset management. Green IT applications, focused on the analysis of operations and processes, and manufacturing system controls, can help firms to devise lean processes, thus reducing waste and wasteful expenditures. Green IT applications such as the calculators for carbon-footprint will also provide better visibility for various business processes, which in future will assist firms to design efficient and effective business processes. Hence, the announcements about the use of green IT applications to provide “information to support decision-making” will evoke positive reactions from the investors. Hence, we hypothesize that:

**H2: Green IT announcements on “information to support decision-making” are positively associated with abnormal returns for the firm.**

Green IT announcements on “direct IT assets and infrastructure” entail investments in IT hardware such as green data centers, virtualization software and hardware, installation of monitoring system such as smart sensors and moving IT infrastructure to cloud computing platform such as Amazon EC2. Investments in such IT assets and infrastructure result in expenses for the firm with probable returns in the form of lower life cycle cost (Environmental Leader 2011). IT hardware such as green hardware has the capability of being both financially and environmentally efficient by reducing energy consumption (Toledo and Gupta 2010). Technologies such as virtualization offer benefits for example reduced hardware maintenance cost and faster server deployment (Muehlberger 2005). Cloud computing offers economic benefits such as the elasticity and transference of the risk of under-utilization and saturation (Armbrust et al. 2009). Smart sensors facilitate the better monitoring of processes. Thus, the deployment of direct IT hardware and infrastructure will create positive impressions in the minds of investors that the firm is serious about taking advantage of the new technologies to improve its performance. Hence, there will be positive abnormal returns for the firm due to the announcements on green IT assets and infrastructure. It follows that:

**H3: Green IT announcements on “direct IT assets and infrastructure” are positively associated with abnormal returns for the firm.**

“Collaboration” comprises a wide variety of technologies ranging from telecommuting to collaborative technologies such as social media tools. The objective behind the employment of such tools in a firm is to reduce the conveyance cost without adversely influencing collaboration and communication inside the firm. Studies examining the financial benefits of telecommuting have found support for the association between telecommuting and the dollars saved in the firm (Shafizadeh et al. 2000). The benefit of collaboration is illustrated by IBM, which has reported annual savings of $700 million in real estate cost. Likewise, AT&T reported an annual saving of $550 million and productivity improvement (Nidumolu et al. 2009). Consequently, investors are likely to perceive the employment of such collaboration technologies to have a positive impact on the firm’s financial performance. New collaborative technologies such as social media have been increasingly used by firms to gain business value and connect with the customer (Jones 2010). Thus, green IT announcements on “collaboration” will evoke positive reactions as it will indicate that the firm is investing in a tested technology with a proven track-record of positive financial impact. Hence, green IT announcements on “collaboration” will evoke high abnormal returns for the firm. We therefore hypothesize that:
H4: Green IT announcements on “collaboration” are positively associated with abnormal returns for the firm.

Green IT announcements on “sustainable products and services” comprise the announcements of new products or services with minimal environmental impact such as e-book readers, new online services, and various product stewardship initiatives. Product stewardship initiatives include the introduction of products and services with lower toxin content and take-back programs, where firms take back their products at the end of the life cycle for effective disposal e.g. HP’s Planet Partners recycling program (HP Eco Solutions 2010).

Such initiatives provide competitive advantage to firms as customers, due to their concern about the environment, are expected to prefer cleaner products and services (Mithas et al. 2010). The increasing awareness about the environment has created a segment of customers, who are willing to pay a premium for products that have less adverse environmental impact or are manufactured by environment-friendly processes (Miller Zeller Green Survey 2010). Hence, sustainable products and services enable organizations to differentiate their products from competition and thus acquire sustained competitive advantage. It also allows organizations to cater to a new market segment and improve their revenue. This is illustrated by the HP Envy 100 e-All-in-One printer, which is the world’s first PVC free printer and is considered as one of the best printers in 2010 (PC World 2010).

Investors will treat green IT announcements on “sustainable products and services” favorably as it will indicate to them that firms are forming new initiatives to target a new market segment and are future-oriented. The introduction of new products and services will be considered as the firm’s effort to distinguish itself from competition and thus gain competitive advantage. It will also indicate to investors that the firm has acquired new capabilities. Hence, they will reward the firm with positive abnormal returns based on the market scenarios. Based on the above discussion, we hypothesize that:

H5: Green IT announcements on “sustainable products and services” are positively associated with abnormal returns for the firm.

2.2 Innovativeness of the firm

Research in IS have defined IS innovation as the innovation in the firm’s application of digital computer and communication technologies (Swanson 1994). Green IT also involves a firm’s application of new communication technologies aimed at reducing the adverse environmental impact of a firm’s operations. Hence, green IT falls under the category of IS innovation. Prior research has found support for the relationship between the announcements associated with IS innovation and risk effects (Dewan and Ren 2007). In addition, green IT initiatives are relatively new and entail significant exploration. Firms that are perceived to be innovative tend to be considered as more capable of new exploration and the subsequent exploitation of technologies. Thus, investors tend to treat green IT announcements from such firms favourably and reward them with higher abnormal returns. Likewise, firms that are not considered to be innovative tend to be viewed as being less capable of handling new technologies and investors tend to treat the announcements as risky initiatives for such firms. Hence, the abnormal returns, if any, will be less for such firms. We summarize the above arguments in the following hypothesis:

H6: Abnormal returns will be larger for innovative firms compared to non-innovative firms.

3 METHOD

To test the hypothesized relationships on a sample of green IT announcements, we compiled news report related to green IT from several sources including those websites dedicated to corporate social responsibility and sustainability such as www.environmentalleader.com, www.csrwire.com, and news databases such as Factiva. Table 1 shows the terms used to identify the green IT announcements.
Table 1. List of search terms

<table>
<thead>
<tr>
<th>Green IT</th>
<th>Corporate Social Responsibility (CSR)</th>
<th>Energy Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green IS</td>
<td>Green Products and Services</td>
<td>Emissions</td>
</tr>
<tr>
<td>Environment</td>
<td>Green Supply Chain</td>
<td>Smart Grid</td>
</tr>
<tr>
<td>Clean Technology</td>
<td>Sustainability</td>
<td>Green computing</td>
</tr>
</tbody>
</table>

Our sample selection and coding methodology comprised four steps (Figure 1). Firms with other key announcements in close vicinity of green IT announcements were dropped to prevent confounding the impact of green IT announcements. We also excluded firms with very high or very low cumulative abnormal returns (in excess of six standard deviations) as they are outliers, which may significantly influence the average cumulative abnormal return for the sample and hence result in biased estimates. Our final sample comprised 160 announcements for 39 firms (4.10 announcements per firm).

Step 1: Identification of sources and search terms
- Websites dedicated to environment initiatives, and sustainability initiatives, news database (Factiva) identified as sources.
- Search terms developed based on initial examination of sustainability related news.

Step 2: Identification of green IT announcements
- Total of 210 announcements selected as sample.

Step 3: Exclusion of green IT announcements from non-publicly traded firms and classification of green IT announcements into various types.
- Announcements from non-publicly traded firms were precluded. 197 announcements were retained. Green IT announcements that were made on the same day as other announcements such as dividends, earnings were dropped. 183 announcements were retained. Green IT announcements from 23 firms were close to other announcements such as board restructuring or with cumulative abnormal returns in excess of six standard deviations, hence were dropped.
- 40 green IT announcements were coded into the various types by one of the authors and a practitioner. The coding showed high inter-rater reliability. Remaining 120 announcements were coded by one of the authors.

Step 4: Collection of stock-price data
- Stock price data for a 2-day event window (-1,0) and 120 trading event window (-120, -2) for firms with green IT announcements were extracted from the CRSP database.
- Market portfolio returns data for the S&P 500 index extracted from CRSP database

Figure 1. Coding methodology

3.1 Event coding

We coded the green IT announcements for green IT types. Forty announcements (about 25%) were randomly selected and were coded in terms of the green IT types (Corbett 2010) by one of the authors and a practitioner. The reliability of coding for the different types was tested using the Perrault and Leigh (1989) reliability index. The index values were above 0.8, indicating high inter-rater reliability. Coding disagreements were discussed and resolved after deliberation. One author coded the remaining 120 announcements. We provide an illustrative sample of the classification into the various green IT types in Table 2.
News Announcement | Green IT Type
---|---
Autodesk Chooses SAP(R) Carbon Impact on-Demand Solution to Help Measure and Manage Carbon Footprint (2 December, 2009) | Information to support decision-making
Emerson Builds New Energy-Efficient Data Center (8 Sep., 2008) | Direct IT Assets and Infrastructure
BT Cuts CO2 Footprint 15% With Videoconferencing (22 May, 2007) | Collaboration
IBM Launches Green Consulting Service (1 July, 2008) | Sustainable products and services

Table 2. Classification of announcements into different types of green IT

### 3.2 Operationalization of firm innovativeness

We used the 50 most innovative companies list prepared by FastCompany (www.fastcompany.com) from 2008 to 2010, and Businessweek innovative companies list (www.businessweek.com) from 2005 to 2010 to determine which firms in our sample are considered as innovative. Those firms whose names were present in the list were coded as innovative firms and the remaining firms were coded as being the non-innovative firms.

The Businessweek’s innovative companies list is based on the survey of senior executives across the globe where senior executives list those organizations whom they consider as pioneers in offering innovative products, service experiences, processes, and business models. The financial performance of the top-ranked companies are also used to arrive at the final list. The FastCompany innovative companies list is based on expert recommendations, analysis of products offering of the companies and financial performance. We argue that these lists provide a reliable list of innovative firms, as it takes into account the experts’ recommendation, analysis of companies’ characteristics as well as financial performance.

### 3.3 Control variables

Prior research utilizing the event study methodology has considered firm and industry characteristics as important controls (Bharadwaj et al. 2009). We control for firm characteristics by using the logarithm of the firm’s total number of employees as a proxy for firm size. We control for industry characteristics by creating a dummy (green sector), which comprises the firms that deal predominantly with green products and services. The various variables and their measures are summarized in Table 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data Type</th>
<th>Measures</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>Continuous</td>
<td>Difference between expected return based on prior trading window and actual return</td>
<td>CRSP database</td>
</tr>
<tr>
<td>Information to support decision-making</td>
<td>Categorical</td>
<td>(Absence of Information to support decision-making) 0, Presence of Information to support decision-making 1</td>
<td>Databases (FACTIVA) and websites</td>
</tr>
<tr>
<td>Direct IT assets and infrastructure</td>
<td>Categorical</td>
<td>(Absence of direct IT assets and infrastructure) 0, Presence of direct IT assets and infrastructure 1</td>
<td>Databases (FACTIVA) and websites</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Categorical</td>
<td>(Absence of collaboration) 0, Presence of collaboration 1</td>
<td>Databases (FACTIVA) and websites</td>
</tr>
<tr>
<td>Sustainable products and services</td>
<td>Categorical</td>
<td>(Absence of sustainable products and services) 0, Presence of sustainable products and services 1</td>
<td>Databases (FACTIVA) and websites</td>
</tr>
<tr>
<td>Firm size</td>
<td>Continuous</td>
<td>Log of employee strength</td>
<td>COMPUSTAT</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>Categorical</td>
<td>(Non-innovative) 0, Innovative 1</td>
<td>Businessweek and FastCompany</td>
</tr>
</tbody>
</table>
Table 3. Variables and their measurements

<table>
<thead>
<tr>
<th>Green sector</th>
<th>Categorical</th>
<th>(Non-green sector 0, green sector 1)</th>
<th>Categorization based on trade reports</th>
</tr>
</thead>
</table>

3.4 Event study methodology

We use the event study methodology to estimate the abnormal returns associated with green IT announcements. Our methodology is based on the market model of daily stock price returns (MM Model). We estimate the abnormal return (AR) for stock $i$ on day $t$ as $AR_i = R_i \mu - (\alpha_i + \beta_i R_m)$ where, $R_i$ is the return of the stock $i$ on day $t$; $R_m$ is the return for S&P 500 on day $t$, and $\alpha_i$ and $\beta_i$ are the intercept and slope of the equation for stock $i$ respectively. Following prior research, we select a short event window (-1, 0) comprising the event day and the day prior to it as a shorter event window to more accurately reflect the impact of specific announcements (Dewan and Ren 2007; Bharadwaj et al. 2009). We used an estimation window of 120 trading days prior to the event and ending two days before the event (-120, -2) to estimate the abnormal return. The average of the daily abnormal returns over a two-day event window for individual stock provides the average cumulative abnormal return for the sample.

We use the student’s t-test to test if the average cumulative abnormal return is significantly different from zero.

The empirical specification for our remaining hypotheses (H2 – H6) is therefore:

$$\text{CAR}_{-1,0} = \beta_0 + \beta_1(\text{information to support decision-making}) + \beta_2(\text{direct IT assets and infrastructure}) + \beta_3(\text{collaboration}) + \beta_4(\text{sustainable products and services}) + \beta_5(\text{innovativeness}) + \beta_6(\text{firm size}) + \beta_7(\text{green sector}) + \varepsilon.$$

As discussed, our sample comprises firms that are engaged in green IT and thus have more than one announcement in the analysis period. Hence, our data resembles an unbalanced panel-data linear model, as there will be a different number of observations for different firms. There is also the possibility of serial correlation within a panel as the return from an announcement may be linked to earlier announcements. We address these issues through GLS regression with correlated disturbances. We use the panel specific autocorrelation as the observations for the same firms will not be independent. GLS regression has been used in prior research in similar contexts (Bharadwaj et al. 2009). We also tested for heteroscedasticity in the data by conducting the Breusch-Pagan (B-P) test after running a normal OLS regression. The Chi-square value ($\chi^2 = 1.07, p = 0.30$) is insignificant. Hence, heteroscedasticity is not a problem. Therefore, we use a homoskedastic panel for our analysis.

4 RESULTS

The summary statistics are shown in Table 4 and correlation matrix in Table 5 respectively. We compute pairwise correlation coefficients for the various variables. The average CAR based on a 2-day estimation window is positive and significant (Average CAR $-1,0 = 0.0038, t = 1.88, p<.05$, one-tail). Hence, H1 is supported. The results of GLS regression are shown in Table 6.
Table 4. Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR (in percentage)</td>
<td>0.4</td>
<td>2.56</td>
<td>-7.10</td>
<td>18.10</td>
</tr>
<tr>
<td>Information to support decision-making</td>
<td>0.3</td>
<td>0.46</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Direct IT assets and infrastructure</td>
<td>0.1</td>
<td>0.35</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Collaboration</td>
<td>0.1</td>
<td>0.26</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sustainable products and services</td>
<td>0.5</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Firm size</td>
<td>4.8</td>
<td>0.50</td>
<td>2.81</td>
<td>5.63</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>0.5</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Green sector</td>
<td>0.8</td>
<td>0.36</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5. Correlation matrix

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Coefficient</th>
<th>Std error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information to support decision-making (H2)</td>
<td>0.008</td>
<td>0.01</td>
</tr>
<tr>
<td>Direct IT assets and infrastructure (H3)</td>
<td>0.014</td>
<td>0.009</td>
</tr>
<tr>
<td>Collaboration (H4)</td>
<td>0.015*</td>
<td>0.009</td>
</tr>
<tr>
<td>Sustainable products and services (H5)</td>
<td>0.018**</td>
<td>0.009</td>
</tr>
<tr>
<td>Innovativeness (H6)</td>
<td>0.001</td>
<td>0.003</td>
</tr>
<tr>
<td>Green sector</td>
<td>-0.009*</td>
<td>0.004</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.004</td>
<td>0.003</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.021</td>
<td>0.02</td>
</tr>
</tbody>
</table>

** p < 0.01, * p <0.05 (one-tail)

Table 6. Regression results

The results show that the coefficient for “information to support decision-making” (β=.008, p>.05) is positive but not significant. Hence, H2 is not supported. The coefficient for “direct IT assets and infrastructure” (β=.014, p>.05) is also positive but not significant. Therefore, H3 is not supported. The coefficient for “collaboration” (β=.015, p<.05) is positive and significant. Therefore, H4 is supported. The coefficient for “sustainable products and services” (β=.018, p<.05) is positive and significant. Therefore, H5 is supported, indicating positive relationship between green IT announcements on sustainable products and services and cumulative abnormal returns from the stock. The coefficient for innovativeness is not significant (β=.001, p>.05), thus H6 is not supported. Among control variables, green sector is significant and has negative coefficient (β=.009, p<.05). This is counter-intuitive and interesting as one would expect to observe positive relationship between green sector and cumulative abnormal returns.

In order to test the robustness of our findings, we considered an alternative estimation window (-200, -50). The average CAR based on this estimation window is similar to our estimates based on estimation window of (-120, -2) (Average CAR_{-1,-0} = 0.0036, t-value = 1.89). This suggests adequate robustness of our estimates. Due to the small sample size, the sample cannot be assumed to be
normally distributed\(^1\). Hence, we conduct non-parametric tests such as sign test and rank test to examine if our results are robust against normality assumption. These tests have been used in prior research such as Dewan and Ren (2007). By conducting sign test, we judge whether the proportion of positive and negative abnormal returns differs against an assumed 50 percent split under the null hypothesis of no reaction to the event. The significance of the tests value (\(p = 0.016\), one - tail) provide supports for our hypothesis that the reaction to the event is manifested in the form of positive abnormal return. The signrank test (sum ranks for positive abnormal return = 7469, \(p = 0.039\), one – tail) shows the support for the positive abnormal return.

The results are summarized in Table 7.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Proposed relationship</th>
<th>Hypothesized effect</th>
<th>Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Green IT announcements ---&gt; returns</td>
<td>+</td>
<td>Yes</td>
</tr>
<tr>
<td>H2</td>
<td>Green IT announcements on information to support decision-making ---&gt; returns</td>
<td>+</td>
<td>No</td>
</tr>
<tr>
<td>H3</td>
<td>Green IT announcements on direct IT assets and infrastructure ---&gt; returns</td>
<td>+</td>
<td>No</td>
</tr>
<tr>
<td>H4</td>
<td>Green IT announcements on collaboration ---&gt; returns</td>
<td>+</td>
<td>Yes</td>
</tr>
<tr>
<td>H5</td>
<td>Green IT announcements on sustainable products and services ---&gt; returns</td>
<td>+</td>
<td>Yes</td>
</tr>
<tr>
<td>H6</td>
<td>Innovativeness of the firm ---&gt; returns</td>
<td>+</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 7. Summary of results (Supported hypotheses are in bold)

5 DISCUSSION AND IMPLICATIONS

5.1 Discussion

The results show that investors, as important stakeholders in a firm, give due importance to green IT announcements by the firm, thereby supporting H1. The average cumulative abnormal returns experienced by a firm due to green IT announcements are similar to the effects observed in other event studies concerned with IT investment announcements. Prior studies have found average CAR values ranging from 0.09% to 0.36% for IT investment announcements (Bharadwaj et al. 2009). The results from the GLS regression analysis shows a lack of support for H2 that green IT announcements on “information to support decision-making” are associated with abnormal return. This suggests that investors do not give significance to green IT applications similar to the existing BI applications. Investors treat such initiatives as a tactical initiative which will help firms in their daily operations without any major strategic imperative as such applications are not targeted toward objectives such as the analysis of new markets, thus not evoking any positive reaction. Investors also view the utilization of such applications as a minor initiative from the perspective of expenses for the firm as such applications will be considered as an addition to existing enterprise resource management systems in the firm. Hence, there is an absence of significant association between the green IT announcements on “information to support decision-making” and abnormal returns. The lack of support for H3 shows that investors are not very confident about a firm’s abilities to reap benefits from the green IT assets. One plausible explanation is that such technologies are still evolving and hence, investors are wary of issues such as the integration of green IT assets with the existing IT assets and the security risks associated with technologies such as cloud computing. The results show that there is support for H4, namely, green IT announcements on “collaboration” are positively associated with abnormal returns. This is expected as the use of collaboration technologies is primarily aimed at reducing the conveyance expenses for the firm, which would improve market value. Further, many collaboration

\(^1\) We thank an anonymous reviewer for pointing this issue.
technologies has been in existence for a long time and there is evidence of significant cost-savings due to such initiatives. Investors may perceive the investments in collaboration technologies as less risky compared to the direct IT assets as there is less probability of risks such as security and incompatibility with existing IT infrastructure. In addition, there is documented evidence of the positive impact of collaboration technologies. Hence, they may reward firms with positive abnormal returns, when firms announce these collaboration initiatives.

The results support H5, namely, green IT announcements on “sustainable products and services” are positively associated with abnormal returns. This suggests that investors attach significance to such announcements and consider them as indicators of the firm’s efforts to expand its market and acquire competitive advantage. There was no support for H6 that abnormal returns for firms that are considered innovative will be higher compared to the firms that are considered as being not innovative. One plausible explanation is that given the increasing importance of sustainability, both innovative and non-innovative firms tend to give due attention to green IT.

Among the control variables, size is not significant. This result is not consistent with prior event studies that have found size to be significantly associated with abnormal returns. In the present context, the risk inherent in new technologies may be similar for small firms and large firms. Hence, size is not significant. Industry sector was found to be significant, which concurs with the findings from the previous event studies. The negative relationship between green sector and abnormal return is surprising. One plausible explanation is that in the green sector, investors expect firms to engage in green IT and hence does not reward firms with higher abnormal returns on such announcements. By announcing green IT initiatives, firms are just meeting the basic expectations of the investors.

5.2 Implications for research

This study has several implications for research. First, this study focuses on the wealth effects (positive abnormal returns). Future research can examine if the risk effects are significant. In the case of significant risk effects, future research can examine whether the risk effects are more significant than the wealth effects.

Second, the study does not find any support for the relationship between firm size and abnormal returns. This is inconsistent with the prior event studies. The reasons behind the absence of a relationship between size and abnormal market returns require further exploration in future research.

Third, the relationship between the innovativeness of the firm and abnormal returns in present context is not supported. Green IT falls under the category of IS innovations, and hence one expects innovative firms to be rewarded more compared to the non-innovative firms. Future research is needed to examine the reasons behind the lack of a relationship between the innovativeness of firm and abnormal returns.

Fourth, this study is restricted to the market reaction reported in the U.S. The U.S. is a developed economy and hence investors are assumed to be more aware of the environmental issues. This may influence their reactions to green IT announcements. In emerging economies, local investors may be less concerned about the environmental impact of the firm and hence may attach less significance to green IT announcements. Whether the magnitude and direction of abnormal returns are similar across economies require further exploration.

Fifth, this study is restricted to the impact of green IT announcements on abnormal returns. The success of the green IT initiatives is also dependent upon the various institutional factors such as existing environmental laws. With the growing concern about global warming and climate change, governments are increasingly framing legislations that reward firms engaged in green IT. Future event studies can examine the impact of such legislations on the market valuations of green firms.

Sixth, this study provides some indication of which types of green IT announcements are associated with abnormal returns. Future research can examine in greater depth why certain types of green IT announcements have a stronger effect on abnormal return compared to others.
5.3 Implications for practice

This study has several implications for practice. First, this study provides empirical evidence that the market rewards green IT announcements. Such evidence could be used by executives and top management to justify greater investments in green IT initiatives.

Second, the lack of support for some types of green IT (namely “information to support decision making” and “direct IT assets and infrastructure”) suggests that investors may be wary of risks associated with green IT. Hence, firms need to develop mechanisms such as stringent security rules, service level agreements and announce them with green IT announcements such as direct IT assets and infrastructure to evoke positive reactions from the investors.

Third, the results provide empirical evidence that announcements of “sustainable products and services” are positively associated with abnormal returns. This suggests that firms need to invest in sustainable products and services as investors reward such initiatives and perceive such initiatives as an indicator of firm’s efforts to acquire competitive advantage.

Fourth, the results suggest that announcements on “collaboration” are associated positively with abnormal returns. This could be used as a justification by top executives to invest in collaborative technologies and technologies such as teleconferencing and virtual rooms.

Fifth, the results also indicate that there are no significant differences in abnormal returns for innovative and non-innovative firms. This highlights to practitioners that many firms, regardless of their innovativeness are investing in green IT.

6 LIMITATIONS

Like any other event study, this study has several limitations. First, this study assumes that the market is efficient and hence, stock price accurately reflect the information about a firm. Second, this study is based on newspaper releases, and it is plausible that there may be unofficial leakages (or rumors) of a firm’s announcements prior to the newspaper reports. Third, as green IT is still an emerging phenomenon; the market may be reacting cautiously to it. It is plausible that estimates of abnormal returns may not accurately reflect the importance attached to green IT by investors. Future research can use other measures of impact. Fourth, the sample for this study comprises only positive green IT announcements. We could observe very few negative green IT announcements such as the failure of the green IT initiatives and hence did not consider it as part of our sample. A plausible explanation is that green IT is an emerging phenomenon and hence presently there is more news on the initiation or adoption of green IT initiatives rather than the failure of such initiatives. The negative green IT news such as the “failure of virtualization” was more prominent in 2011; however, there was a lack of stock-data for recent time frame. In addition, prior studies such as Bharadwaj et al. (2009) have examined the impact of either positive or negative announcements on the market value of the firms. We therefore restrict ourselves to positive announcements only.

7 CONCLUSION

From a theoretical standpoint, this study contributes to the research on green IT by empirically examining the impact of green IT announcements on market valuation. Our results empirically establish the role of green IT announcements in evoking positive reactions from the investors. Further, our study shows that among the green IT types, “collaboration” and “sustainable products and services” evoke a positive response from investors. Announcements on direct IT assets and infrastructure” and “information to support decision making” have no relationship with the cumulative abnormal returns. This study is an initial step in examining the wealth effects of green IT announcements. Future research can provide a deeper view of how firms can develop mechanisms to allay the investors’ fears so as to evoke stronger positive reactions from investors, and can also investigate the risk effects associated with green IT.
References


