Assessing Green IT Initiatives Using the Balanced Scorecard

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By expanding the balanced scorecard to incorporate sustainability perspectives, the authors analyze current green IT initiatives to explore how IT can contribute to enterprise-wide sustainability performance.

Because traditional performance measures focus primarily on financial indicators, they are insufficient for evaluating investments in initiatives seeking continuous improvement and innovation. The balanced scorecard (BSC) was developed to offer a more holistic way to measure performance.[1,2] The BSC provides a framework for translating a firm's strategic vision into a set of performance measures and evaluating success with a comprehensive framework with four dimensions:

- The *financial* dimension focuses on the bottom-line to address shareholder expectations.
- The *internal operations* dimension helps organizations excel as they meet their financial and customer objectives.
- The *customer* dimension helps organizations determine how best to offer solutions.
- The *innovation and learning* dimension focuses on exploring and exploiting opportunities that emerge over time.

As green IT initiatives become increasingly common across organizations in various industries, we need ways to align them with performance measurement indicators like those the BSC describes. Such indicators are critical to ongoing organizational commitments to sustainability. Otherwise, investments in sustainability initiatives might flourish during times of economic success only to be downsized when they adversely impact the bottom-line during economic crises.[3]

Researchers have adapted the BSC in various ways. Adaptations for sustainability measures tend to emphasize the triple bottom-line: economic, social, and environmental performance.[4,5] Here, we present a sustainability adaptation of the BSC, which we used to examine recent green IT initiatives and determine how they contribute to enterprise-wide performance.

Adapting the BSC for Sustainability

BSC adaptations for sustainability sometimes integrate sustainability indicators into one or more of the traditional dimensions and sometimes add
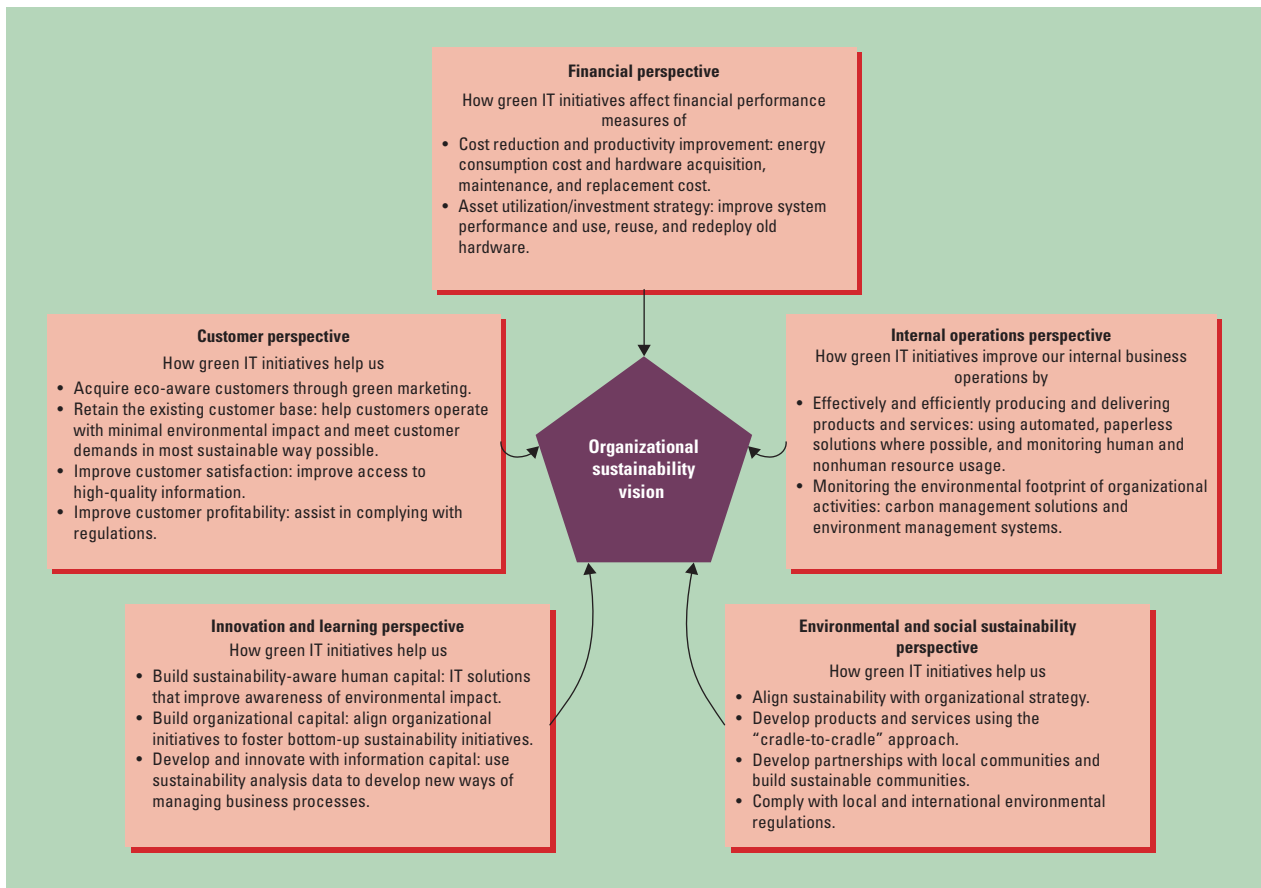
Figure 1. The sustainability balanced scorecard (BSC). The framework incorporates sustainability perspectives into the original four BSC dimensions and adds a fifth dimension for environmental and social sustainability perspectives.

a new dimension.[6] Integrating environmental and social dimensions into the existing BSC is pertinent when they are strategically relevant. However, for environmental and social dimensions that aren't directly strategically relevant, adding a dimension with a nonmarket perspective is necessary.[3] Adapting earlier BSC research,[1,5] we developed a sustainability BSC (see Figure 1).

Examining Green IT Initiatives

To understand green IT initiatives and their focus areas, we searched the Lexis/Nexis database of press releases and business wires for announcements from January 2009 to June 2010. Press releases provide contemporary self-reports of companies' activities or projects. Although they usually position the firms involved positively, they offer a viable account of company-related activities in areas such as executive appointments, relocations, investments, and projects.

We filtered the search results for relevant announcements of green IT initiatives, then analyzed these according to the perspectives identified in the sustainability BSC in Figure 1. (For more information on our methodology, see the "Collecting the Green IT Data" sidebar).

General Patterns in the Initiatives

Our analysis yielded two general patterns in the green IT announcements.

First, the majority mention two sets of companies: green IT vendors (such as Wyse and Verdiem) and client organizations from a variety of industries, including financial (Marshal and Ilsey), healthcare (Metro Health), education (University of Arizona), food (Cadbury), apparel (La Perla), and government (City of Seattle). Most were US organizations, though a few were international, such as the Bank of New Zealand.

Second, the green IT announcements most frequently mentioned three initiative categories: virtualization, cloud computing, and PC power management software.

Collecting the Green IT Data

We collected the data for analyzing green IT initiatives by searching the Lexis/Nexis database of press releases and business wires with the keywords "green IT" and "green computing" from January 2009 to June 2010. Although the specific keywords limited the scope of our findings, we tried to overcome this limitation by selecting broad keywords to uncover announcements of different types of green IT initiatives.

A total of 683 articles matched "green IT" and 129 announcements matched "green computing." We removed duplicates and nonrelevant articles, resulting in a total of 669 articles in our dataset.

In the first phase of data analysis, we examined all 669 announcements, analyzing the contents and assigning words or phrases to conceptual green IT categories:[1] product or service, award, conference, initiatives, survey, or other. We selected the subset (47 announcements) for more detailed analysis.

In the second phase, we coded each of the 47 initiatives with respect to the five dimensions of the sustainability BSC to evaluate the initiatives' focus. Two of the authors independently coded each announcement (88 percent intercoder reliability), and we resolved disagreements through discussion and consensus.

We identified only instances that specifically mentioned particular BSC dimensions. Further studies are required to determine whether the sustainability BSC perspectives that didn't appear in our dataset reflected their inapplicability or lack of importance as a catalyst for a green IT initiative.

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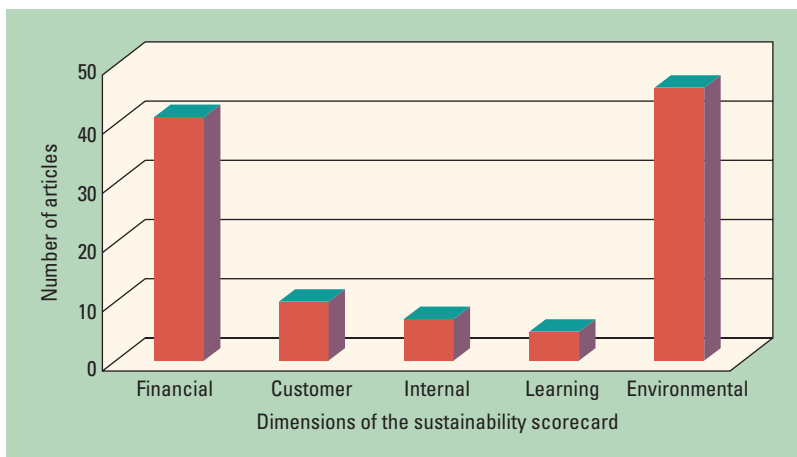

Figure 2. The distribution of green IT initiative announcements. Most announcements focused on financial and environmental benefits.

The virtualization initiatives aimed at improving hardware utilization by running multiple virtual computers on a single physical computer. This reduces operational expenses by decreasing power consumption and hardware acquisition costs. Virtualization strategies can be applied at the desktop level by replacing personal computers with thin clients or by consolidating servers in data centers.

Cloud computing initiatives used platform-as-a-service (PaaS), infrastructure-as-a-service (IaaS), or software-as-a-service (SaaS) approaches. Examples include moving in-house email servers to a SaaS provider, resulting in substantial energy savings. In some cases, these efforts included unified email management, which moved companies from a fragmented email environment to a holistic one covering archiving, e-discovery, continuity, security, and policy management for corporate communication and data.

PC power management solutions let companies centrally control and reduce the energy used by PCs on their network without affecting end-user productivity. The software helps deploy company-wide energy-saving policies such as automatically turning off monitors or suspending PCs after a predefined period of inactivity.

Sustainability BSC Perspectives

Figure 2 shows the breakdown of green IT initiatives mentioned in the final dataset of 47 announcements across the five sustainability BSC dimensions (some initiatives spanned multiple dimensions). The following descriptions quote from nine example announcements. We identify them here by the companies mentioned in the newswire and list them with dates and URLs in Table 1. (The URLs offer easy access to the announcements, though these newswire were originally located through PR Newswire and Business Wire using the LexisNexis database.)

Table 1. Example green IT press release announcements.*

Company and Source	Announcement Title	Date (2009)	URL
King County and Verdiem, Business Wire	"King County Turns on Verdiem and Reduces Energy Consumption by Nearly 40 Percent"	27 May	www.reuters.com/article/idUS101559+27-May-2009+BW20090527.
US Air Force and CA, PR Newswire	"U.S. Air Force 45th Space Wing Launches Successful Virtualization Initiative Using CA ARCserve Backup and CA XOsoft Cloud-Based Replication to Help Meet Cost Cutting and Service Objectives"	31 Aug.	http://arcserve.com/us/About-Us/Recent-News/Press-Releases/2009/US-Air-Force-45th-Space-Wing-Launches-Successful-Virtualization-Initiative-Using-CA-ARCserve-Backup-and-CA-XOsoft-Cloud-Based-Replication-to-Help-Meet-Cost-Cutting-and-Service-Objectives.aspx.
Metro Health and Wyse, Business Wire	"Metro Health Village Implements Wyse Technology's Healthcare IT Solutions"	22 Oct.	www.news-medical.net/news/20091022/Metro-Health-Village-implements-Wyse-Technologys-healthcare-IT-solutions.aspx.
Rockhurst University and Wyse, Business Wire	"Rockhurst University Cuts IT Support Cost and Reduces Energy Bill by 80% with the Introduction of Client Virtualization Hardware and Software Solutions from Wyse Technology"	4 Nov.	http://eon.businesswire.com/news/eon/20091104005296/en/Cuts-IT-Support-Cost/Introduction/Reduces-Energy-Bill-80%25.
ServInt, Business Wire	"ServInt Expands with Opening of New Data Center in Los Angeles"	10 Nov.	www.servint.net/pr-111009.php.
Denver Regional Transportation District and Wyse, PR Newswire	"Denver Regional Transportation District (RTD) Deploys Wyse Technology to Green Its Virtual Desktop Infrastructure"	18 Aug.	www.prnewswire.com/news-releases/denver-regional-transportation-district-rtd-deploys-wyse-technology-to-green-its-virtual-desktop-infrastructure-62246722.html.
Volvo, Business Wire	"Greener Commuting at Volvo by Use of CO_2 'Pedometer'"	27 May	www.volvogroup.com/group/global/en-gb/newsmedia/pressreleases/_layouts/CWP.Internet.VolvoCom/NewsItem.aspx?News.ItemId=63757&News.Language=en-gb.
Verari, Business Wire	"Containerized Data Center Solution from Verari Systems and Cisco Provides Cloud Computing Solution for NASA's Nebula Cloud Platform"	2 Dec.	www.spaceref.com/news/viewpr.rss.html?pid=29722.
SAP, PR Newswire	"SAP Increases Focus on Sustainable Business"	2 Mar.	www.sap.com/press.epx?pressid=10988.

The announcements are listed in the order in which they appear in the article.

Financial. Most announcements in our dataset mentioned both environmental and financial benefits. Investments in green IT projects typically reduced energy consumption, leading to lower utility costs. For example, the use of PC power management software in Seattle "helped King County departments achieve PC energy cost reductions ranging up to 62 percent—equal to about 140-thousand dollars in savings" (King County and Verdiem).

The relation between financial and environmental BSC perspectives is also evident in an announcement by the US Air Force 45th Space Wing, which manages launch operations for the US Department of Defense space programs. The agency "saved at least $180,000 in hardware and support costs by virtualizing its IT infrastructure…. The project successfully cut hardware-related costs by at least $180,000 and reduced carbon emissions by more than 50%" (US Air Force and CA).

Internal Operations. Some announcements mention specific improvements in the company's internal operations as a result of green IT projects. Most notably, such efficiencies are related to faster data access or more efficient process execution. Process improvement from using virtual desktops over traditional personal computers is a representative example from our dataset.

The Metro Health Village healthcare provider reported, "[With virtual desktops] it takes fewer

than 15 seconds for a doctor to access a patient's information rather than the several minutes it would take to log in to a PC, open up the applications, and call up the data" (Metro Health and Wyse). However, doctors weren't the only ones to benefit from increased process efficiencies; other healthcare team members gained from having real-time access to patient information: "That information has to move in real time among team members coordinating care for a patient. It also has to move rapidly to the patient's location—from surgery suites to patient rooms to the front desk to the pharmacy, faster than a patient can be wheeled from one location to another" (Metro Health and Wyse).

Customer. In most cases, process efficiencies obtained through green IT initiatives translated into improved customer service and satisfaction. In particular, if the process involved customer contact, increased efficiency resulted in better customer service. For example, Rockhurst University reported that "virtual clients helped us meet our students' needs by delivering greater availability, quieter working conditions, and reducing our environmental impact" (Rockhurst University and Wyse).

The customer perspective also benefits when some of the savings translate into cost advantages for clients, as illustrated in this excerpt from a ServInt press release: "[The new green data center] enables us to meet the demanding data requirements of selected clients in the fastest, most economical way possible … to ensure an optimal customer experience" (ServInt).

Innovation and Learning. We classified green IT initiatives that focused on employee job satisfaction and opportunities for innovation and learning into this dimension. Internal process efficiencies have implications not only for customer satisfaction but also for improving employees' job satisfaction by freeing their time to perform value-added tasks. As the Denver Regional Transportation District reported, "In addition to the cost savings, the success of the thin clients is best measured by our ability to serve customers and support our own staff through greater availability and more efficient use of IT staffing. My staff used to spend about 20% of their time on user support…. The IT staff is freed up

from having to maintain PCs" (Denver Regional Transportation District and Wyse).

The sustainability BSC's innovation perspective refers to a company's ability to improve and learn. For example, Volvo's IT department developed a mobile application, CO_2 pedometer, which let employees track their carbon footprints when commuting to work. These results led Volvo employees to change their commuting behavior substantially: "Their journeys were registered using software in their mobile phones and a concept developed by Volvo IT. By changing their behavior the group succeeded in reducing their carbon footprint by more than 30%" (Volvo).

Environmental and Social Sustainability. A main objective of adopting green IT initiatives is to achieve specific environmental goals. This is best illustrated in the reported advantages of containerized data centers, which "are built and deployed in a few months, not years, and result in increased power and cooling efficiency over brick-and-mortar data centers (e.g., PUE = 1.05)" (Verari). In addition to direct environmental benefits, some companies showed a broader concern for the environment, as ServInt illustrates in this press release: "ServInt will also offset the carbon-footprint of [the new green data center] by 110 percent through reforestation projects, as it does with all its facilities" (ServInt).

Overall, most of the initiatives in our sample focused on greening the IT infrastructure by reducing energy consumption or recycling e-waste. This finding could be the result of our keyword selection, "green IT" and "green computing," which are more likely to be associated with greening *of* IT. Very few initiatives in our analysis focused on greening *by* IT—for example, by reducing the environmental impact of other organizational areas with innovative IT-enabled solutions. Only a few initiatives focused on using IT to make broader cross-cutting organizational business processes more efficient or to increase automation or reduce paper use.

The Sustainability Challenge: Collaboration and Balancing the Triple Bottom-line

The challenge of sustainability provides multiple opportunities for synergistic collaboration among multiple parties. In our sample, we

observed a few partnerships among a diverse range of industry players. For example, Duquesne Light Company, a Pennsylvania electric distribution company, met state regulations by partnering with its client organizations, including the University of Pittsburgh Medical Center, to help it reduce its energy consumption by identifying PC power-management solutions from various green IT vendors.

Other companies are similarly partnering with their clients to help them become more sustainable. As a SAP press release explains, these organizations have a dual challenge with respect to sustainability: "to both address sustainability internally and to enable [our] customers to meet the same challenges" (SAP).

Although the transition to triple bottom-line monitoring has been touted as a significant step toward integrating sustainability-related metrics into overall performance, organizations haven't yet adequately balanced economic, social, and environmental components into their performance measures.[7] Rather, they consider these components in a hierarchical fashion with financial metrics playing a dominant role. With pervasive deployment of green IT initiatives, organizations need to take a more balanced approach, thereby truly incorporating sustainability as a meaningful performance measure.

Recommendations

Our analysis of news releases reveals interesting patterns and the notable absence of some types of initiatives. On the basis of our observations, we have the following recommendations for top management and IT professionals.

Encourage a Bottom-up Development of BSC

As organizations develop an environmental strategy, they should encourage bottom-up participation from various stakeholders throughout the organization in planning and implementing sustainable initiatives.

Consider how Volvo's CO_2 pedometer application helped its employees monitor their commuting carbon footprint and change their behavior voluntarily. Volvo also created a car-sharing program to ensure that employees had access to cars while at work, which required top management support. Organizations should identify initiatives that encourage such grassroots employee involvement to maintain the momentum of sustainability initiatives.

Take Holistic Approach to Sustainable Initiatives

Companies can evaluate green IT initiatives with a dual focus on environmental and economic indicators because the two are closely related. Reductions in energy consumption often translate to specific cost savings for organizations. The relation between these two dimensions is evident in our analysis, but the links with the other dimensions, though underrepresented in our data, shouldn't be ignored. These other dimensions represent larger focus areas where IT can have significant impact in helping organizations meet sustainability objectives.[8]

For example, some green IT initiatives (environmental) translate into more efficient operations or processes (internal operations), which often result in higher job satisfaction for employees (innovation and learning), which in turn can lead to more satisfied customers (customer), and finally produce better financial outcomes for the organization (financial). However, not all green IT initiatives lead to immediate economic benefits—some require a long-term outlook.

Balance Greening *of* IT with Greening *by* IT

Our analysis results suggest that most initiatives are about the greening *of* IT, highlighting the substantial environmental impact of using IT. Notably absent were IT-enabled solutions that use technologies such as sensors and RFID tags to monitor and improve the use of various resources. Such resources could be human (manual or labor-intensive processes) or nonhuman (such as water and electricity), and the solutions could involve decision support tools and data analytics for analyzing an organization's carbon footprint and reducing its environmental impact.[9]

Establish Partnerships

Many large and small organizations are increasingly collaborating to develop green IT products and services. Stakeholders should effectively span boundaries, both within and across organizations, to develop a holistic approach to sustainability issues.

Explore the Social Dimension

Our analysis uncovered no initiatives specifically targeting the development of socially sustainable business practices. Although our data source didn't yield initiatives in this dimension, examples of such practices include Google and Microsoft's movement of data centers to rural localities and powering them using alternative energy derived from vast stores of cattle waste.[10] Another example is SAP's work with rural communities in South Africa to develop mobile procurement solutions. These applications will enable local small shop owners to order their supplies using simple messaging services and, as a result, will improve availability of goods in villages.[11] These initiatives highlight the social dimension's importance.

Our review of green IT initiatives confirms IT's tremendous potential for enabling organizations to address the triple bottom-line of economic, social, and environmental performance. Further research using different research methodologies is necessary to better understand the success of green IT initiatives. For example, qualitative studies that rely on semistructured interviews, observations, and the examination of documents and processes will give us richer insights into how and why organizations make decisions regarding green IT initiatives. Furthermore, surveys could broaden our understanding of the types, motivations, and outcomes of green IT initiatives, and the contingencies involved across a wide range of organizations.

As our understanding of these initiatives improves, IT can increasingly play a holistic role in enterprise-wide sustainability, preventing the fragmentation of organizational sustainability efforts and helping address challenges in measuring successful outcomes. 🖵

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