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## Green IT.

The Fast-track to Enterprise Sustainability

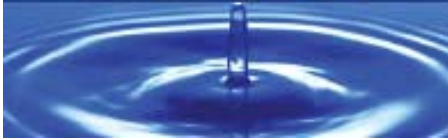


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For decades, the business community has mainly viewed the Environment as a cost to be avoided or marginalized. Today, an enormous perceptual shift is underway, which we call “the green wave.” From magazines to television to movies, the concept of “going green,” which emphasizes environmental sustainability and reducing greenhouse gas emissions, has worked its way into the foreground of public consciousness. Consumers, lawmakers, investors, not-for-profit groups, governments, and other stakeholders comprise the driving forces behind this transformation because people across all strata are becoming increasingly convinced that human consumption is capable of overwhelming the ecosystem. Even the most ardent skeptics are arguing that whether the crisis is real no longer matters because consumers have made it a political issue. Depending on your view, “going green” may or may not be a priority, but companies have no choice but to ride the “green wave” or get knocked over by it.





“I would try to take advantage of—and capitalize on—a green movement, whether I believed in it or not. If you’re a CEO, you have no option today.” Jack Welch, April 12, 2007.

Several progressive companies have quickly realized that going green isn’t purely an altruistic effort; instead they have determined that environmental initiatives have strategic import and financial merit on their own. More specifically, they can lead to enhanced profitability, lower operational and financial risk, improved workforce productivity, enhanced public image, and a better ability to attract and retain skilled workers. Green has also created rapidly growing new markets for sustainable products and services. Green, in other words, can lead to a new type of competitive advantage, especially for the companies that move quickly and realize benefits early – before market conditions and regulations increase the costs associated with environmentally sustainable practices.

So what does this mean for IT? At first glance, the computers on our desks or servers in a data center don’t seem to have a huge environmental impact. But, underneath the technology are electronic components, which consume substantial amounts of electricity and produce significant amounts of heat – not to mention that they often contain heavy metals and other toxins that pose disposal issues. Clearly, IT must play a big part in going green, if a company is to be effective at it.

Unlike the typical scenario where the company drives IT, this is a case where IT can propel the company toward a new type of competitive advantage. The “greening of IT” offers the opportunity to gain almost immediate ROI through reduced energy costs, as well as boost workforce morale and productivity, enhance the company’s reputation in the marketplace, and satisfy anticipated regulatory requirements around energy use and global greenhouse gas emissions. Consequently, savvy CIOs can use IT as the catalyst to jumpstart “green” change throughout the company, putting it on the sustainability fast-track to better compete in the United States and around the world. (Table 1)

## Environmental IT imperatives

When it comes to sustainability, most IT functions don’t have good grades. IT is a relatively young discipline and it has typically achieved its targeted ROIs. As a result, companies have usually ignored most IT operational issues outside of processing, access, and storage performance and reliability. Until recently, IT’s energy consumption was not even on most companies’ radar screens, particularly because energy costs were lower and greenhouse gas emissions weren’t in the corporate lexicon, let alone considered a corporate responsibility.



## No longer.

Escalating energy prices, brownouts, blackouts in many parts of the United States and the world, and global climate change have brought IT’s elevated energy consumption and its contribution to greenhouse gas emissions into corporate awareness. In addition, how IT is housed and supplied is raising red flags as Sick Building Syndrome generates more and more lawsuits, as productivity is factored into the bottom-line, and as packaging and waste management are eating further into corporate budgets.

## Converging factors are driving IT to green

Different companies, of course, have different IT requirements. However, IT typically represents 30 percent to 40 percent of a company’s energy consumption. If your IT function has a data center, you face a real challenge. A recent study found that energy consumed by servers and related infrastructure equipment around the world doubled between 2000 and 2005. The volume of servers in data centers, particularly low-end servers, represented 90 percent of that growth in power consumption.<sup>1</sup> CIOs can no longer ignore the environmental impact of IT due to a number of converging factors, which include:

**Global climate change.** Because IT consumes a disproportionate amount of electricity, it also accounts for a disproportionate amount of a company’s carbon footprint. No matter how you look at it, IT is directly contributing to global warming.

**Green building regulations.** Green buildings are not simply becoming mainstream – even preferred – workplaces; they are becoming mandated facilities. The US Green Building Council’s Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ has proven so dependable and effective that 22 cities, counties, and states have adopted some level of LEED criteria for their new and renovating facilities, including IT data centers and employee workspaces.<sup>2</sup>

**Impending regulations.** It is no longer a question of “if,” but rather “when” we will see regulations related to national energy efficiency and greenhouse gas emissions. According to a Pew Research Center poll in January 2007, 55 percent of Americans believe that global warming is a problem that requires immediate government action. Several cities are already taking the lead. New York City, for example, has instituted plans to reduce its greenhouse gas emissions by 30 percent.<sup>3</sup> IT functions that help reduce their companies’ carbon footprints will not only reap cost savings, but also give their companies a competitive advantage over those that wait. Once U.S. regulations are in place, companies should expect to see many of today’s energy efficiency incentives from utilities and federal, state, and local governments disappear.

1 InformationWeek, “Data Center Energy Consumption Has Doubled Since 2000,” 02-15-07.

2 Caitlin Bennett, US Green Building Council, 202-742-3761, cbennett@usgbc.org

3 The Pew Charitable Trusts Public Opinion and Polls, “Global Warming: A Divide on Causes and Solutions, Public Views Unchanged by Unusual Weather,” 01-24-07. www.pewtrusts.org

Table 1 – State of “Green” Around the World

	U.S.	Europe	Asia	Rest of World
<b>Renewable Energy</b>	<p>Wind power generating capacity increased 53% in the last 2 years in the U.S.</p> <p>Google installed 9,212 photovoltaic panels at its Mountain View, CA headquarters.</p> <p>PepsiCo purchased 1 billion kilowatt hours of renewable energy credits to provide all of the electricity used at all of its U.S. facilities over the next 3 years.</p>	<p>The U.K. imposes a 10% Climate Change levy on business according to the level of their traditional energy source consumption. Renewable energy sources are not taxed.</p> <p>The U.K. requires all utility companies to derive at least 15% of their energy from renewable sources by 2015.</p> <p>Spain requires all buildings over 3,000-square-meters in size to use photovoltaics for 100% of their energy needs.</p>	<p>Asia's renewable energy projects are typically generating an 18% to 24% ROI.</p> <p>India is beginning to replace diesel-powered generators in villages with bio-mass generators that burn a common Indian weed.</p> <p>China's Renewable Energy Law requires power grid operators to purchase renewable energy and provides incentives for commercial and residential installations of photovoltaic systems.</p>	<p>A report by the European Renewable Energy Council and Greenpeace finds that renewable energy can fill half the world's energy needs by 2050.</p> <p>Projects in Bahrain, Dubai, Lebanon, and Jordan use renewable energy technologies and strategies. South Africa's non-grid rural electrification program is using renewable energy technologies to bring electricity to the 54% of rural households currently without power.</p>
<b>Energy Conservation</b>	<p>Buildings consume 39% of the U.S.'s total energy supply. Between 1995 and 2005, DuPont cut its energy consumption by 7% below its 1990 levels and saved more than \$2 billion. New York State is requiring major reductions in building energy consumption within 5 years. EPEAT establishes energy efficiency standards for computer technologies.</p>	<p>The EU's Directive on Energy Performance of Buildings (EPBD) sets energy efficiency requirements for new buildings and major renovations, and requires regular inspections of building systems.</p> <p>The EU's Green Building Programme requires owners and tenants to reduce their primary energy consumption by 25%.</p> <p>All buildings in the EU that are being renovated, rented, or sold must display Energy Passports, which detail their energy efficiency.</p>	<p>Japan's Energy Conservation Law imposes strict restrictions on energy consumption in office, factories, residences, and other buildings.</p> <p>Adherence to India's Energy Conservation Building Code will become mandatory in 2009/2010.</p> <p>China's medium and long-term Energy Conservation Plan requires new buildings to use 50% – 65% less energy than comparable standard buildings.</p>	<p>Energy-efficient buildings are being constructed in several African nations, including the naturally- ventilated Eastgate Harare office-retail complex in Zimbabwe.</p> <p>Mexico's Program of Energy Savings in Federal buildings has cut energy consumption by 13% to 20%, depending on the building.</p>
<b>Green Buildings</b>	<p>Boston, Washington, D.C., Grand Rapids, and Pasadena lead mandates to private green building construction and renovation. Miami, Chicago, and San Francisco will follow soon.</p> <p>Adobe Systems is first organization in the world to earn 3 LEED-Platinum ratings.</p> <p>Bank of America constructs \$1 billion LEED-Platinum headquarters tower in NYC. As of January 2007, 824 buildings had earned LEED ratings, and 6,415 buildings had registered for LEED ratings.</p> <p>The average LEED-certified building uses 36% less total energy than a comparable standard building.</p>	<p>Are pioneers in green building design, technologies, and development.</p> <p>Several EU members have voluntary and mandatory green building programs in place.</p> <p>Spain's Technical Building Code mandates green criteria for new construction and renovation of all building types.</p> <p>Berlin's Reichstag was renovated to green standards.</p> <p>The U.K.'s BREEAM green building standard has certified over 65,000 buildings.</p>	<p>India's Green Building Council creates indigenous LEED India green building rating system.</p> <p>India has 3 LEED Platinum buildings.</p> <p>Japan's Green Building Council creates CASBEE green building standard.</p> <p>China has mandated green building standards for all 2008 Summer Olympics facilities in Beijing.</p> <p>Since June 2006, all new buildings, expansions, and renovations in China must implement the national evaluation standard for green buildings.</p>	<p>In June 2005, mayors from 50 cities around the world – including Copenhagen, Delhi, Islamabad, Istanbul, Jakarta, London, Rio de Janeiro, and Shanghai signed the UN's "Urban Environmental Accords," which set out 21 specific actions for sustainable living.</p> <p>The Building Code of Australia includes green criteria.</p> <p>The World Green Building Council has 10 members, including Mexico and the United Arab Emirates.</p>
<b>Driving Innovation</b>	<p>UTC is creating new green technologies, like the Otis Gen2 elevator, which generates electricity.</p> <p>Citigroup commits \$30 billion to invest in clean energy and alternative technologies over the next 10 years.</p>	<p>Finland's Proventia Group produces several green technologies, such as machines that cut-up, separate, and recycle TV and computer components.</p> <p>Green products ranging from compact detergents to green building technologies are finding greater EU market demand.</p>	<p>China is becoming a leader in photovoltaic systems.</p> <p>Chinese companies have developed porous hard surface pavement bricks that support stormwater management and groundwater recharge.</p>	<p>The Asian Development Bank estimates that the world market for environmental goods and services will grow to \$836 billion by 2015.</p> <p>Australia's Tec Eco Pty.'s Eco-Cement absorbs carbon Dioxide.</p>
<b>GHG Emissions</b>	<p>The U.S. emits 25% of the world's greenhouse gases.</p> <p>Buildings emit 39% of the nation's greenhouse gases.</p> <p>300 U.S. mayors have committed their cities to meeting the requirements of the Kyoto Protocol.</p> <p>Several states have legislated GHG reductions.</p> <p>In April 2007, the Supreme Court ruled that the EPA must regulate carbon dioxide emissions under the Clean Air Act.</p>	<p>The EU signed and ratified the Kyoto Protocol.</p> <p>The U.K. is on target to reduce its GHG emissions by 15% to 18% below 1990 levels.</p> <p>The City of London has legally committed to cutting its carbon dioxide emissions by 20% by 2015, and by 60% by 2050.</p> <p>Greenhouse gas emissions in the EU-15 dropped just 0.8% between 2004 and 2005.</p>	<p>Since 2000, 51% of the world's greenhouse gas emissions have come from China, due primarily to its coal-fired power plants.</p> <p>China is building more than one large coal-fired power plant per week. not yet ratified the Kyoto Protocol.</p>	<p>Worldwide, the growth rate of greenhouse gas emissions tripled in the last decade, due mostly to coal-fired power plants.</p> <p>169 countries and governmental entities – but not the U.S. – have ratified the Kyoto Protocol.</p> <p>Australia has signed but has not yet ratified the Kyoto Protocol.</p> <p>Australia emits more GHG per capita than any other country.</p>

**Green IT = greater profit.** Green significantly lowers IT's overhead costs, particularly energy use. As companies become aware of the true cost of IT, CIOs may soon be expected to address and report on energy consumption as part of their overall fiduciary responsibilities to the company. However, it is not wise to wait. Taking a proactive stance on energy efficiency and enterprise sustainability now will likely yield significant annual cost savings and ROI and enhance the CIO's standing within the corporation. Adobe Systems' \$1.4 million green renovation of its San Jose, California headquarters, for example, boasted a 10.5 month payback, generated a 121 percent ROI, and saves Adobe \$1.2 million annually. Even the simplest steps can yield great benefits. Adobe spent \$153,095 installing "Watt-Stoppers," a series of outlets and power strips connected to motion sensors that turn off office equipment like computer monitors in unoccupied rooms. This modest outlay has generated a 253 percent ROI.<sup>4</sup>

Green can also improve the IT workforce's productivity. Green workplaces can improve productivity over the short- and long-term by 5 percent to 16 percent compared to standard buildings, according to the US Green Building Council and other studies.<sup>5</sup> Just a 1 percent increase in productivity is worth \$3 per square foot to a company annually, or \$600 to \$700 per employee per year.<sup>6</sup>

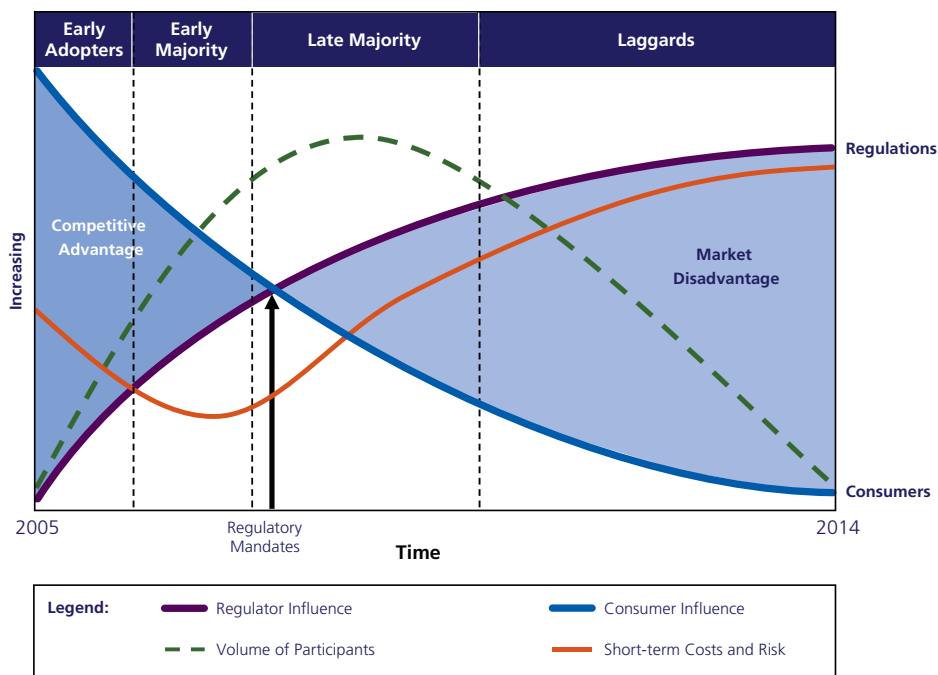
**Other financial gains:** A Green IT strategy can help a company to capitalize on a welcome variety of governmental incentives and utility company rebates. For instance, Adobe Systems received \$389,000 in

grants and equipment purchase rebates from the State of California and PG&E (Pacific Gas & Electric) for the energy-conserving technologies they installed in its headquarters complex.<sup>7</sup>

Other examples of incentives include: the New York State Green Building Tax Credit program, which gives state tax breaks to commercial projects that incorporate LEED-based strategies; California's Savings by Design program – sponsored by four of the state's largest utility companies – which provides subsidies for energy-efficient non-residential buildings; and the Federal Energy Policy Act of 2005, which provides a tax deduction of up to \$1.80 per square foot for commercial buildings that reduce heating and cooling energy consumption by at least 50 percent.<sup>8</sup>

Corporations are going green now, because much less risk is attached to Sustainability initiatives. Early Adopters can benefit from over two decades of international strategies, technologies, and experience generated by earlier green innovators and pioneers. Additionally, competitive advantage firmly lies with companies who choose to be among the Early Adopters and Early Majority. The benefits earned, however, must be realized early, or market conditions and regulations may reduce the competitive advantage and increase the costs associated with instituting green practices. Waiting for government mandates before going green, on the other hand, leaves companies among the Late Majority or Laggards who will face the highest level of capital investments and, therefore, the highest level of risk. (Fig 1)

**Fig 1 – Regulations vs. Consumer Influence and Competitive Advantage Over Time**



Competitive advantage firmly lies with companies who choose to be among the Early Adopters and Early Majority.

4 Charles Lockwood's Personal interview with Randy Knox, Senior Director, Global Facilities Services, Adobe Systems, 04-19-07; Business 2.0, "The Greenest Office in America," September 2006; CNN Money, "The Greenest Office in America," 09-06-06; Facilities Net, "Smooth Operations," 09-23-06; San Jose Mercury News, "Adobe goes green, cuts costs – S.J. Headquarters uses environmental tech," 01-17-06; San Jose Mercury News, "Adobe headquarters receives 'green' honor," 12-05-06; USGBC Press Release, "Adobe Headquarters Awarded Highest Honors from U.S. Green Building Council," 12-05-06; and Adobe Systems Inc., "Adobe Goes Green – Platinum Certification for Leadership in Energy and Environmental Design" document.

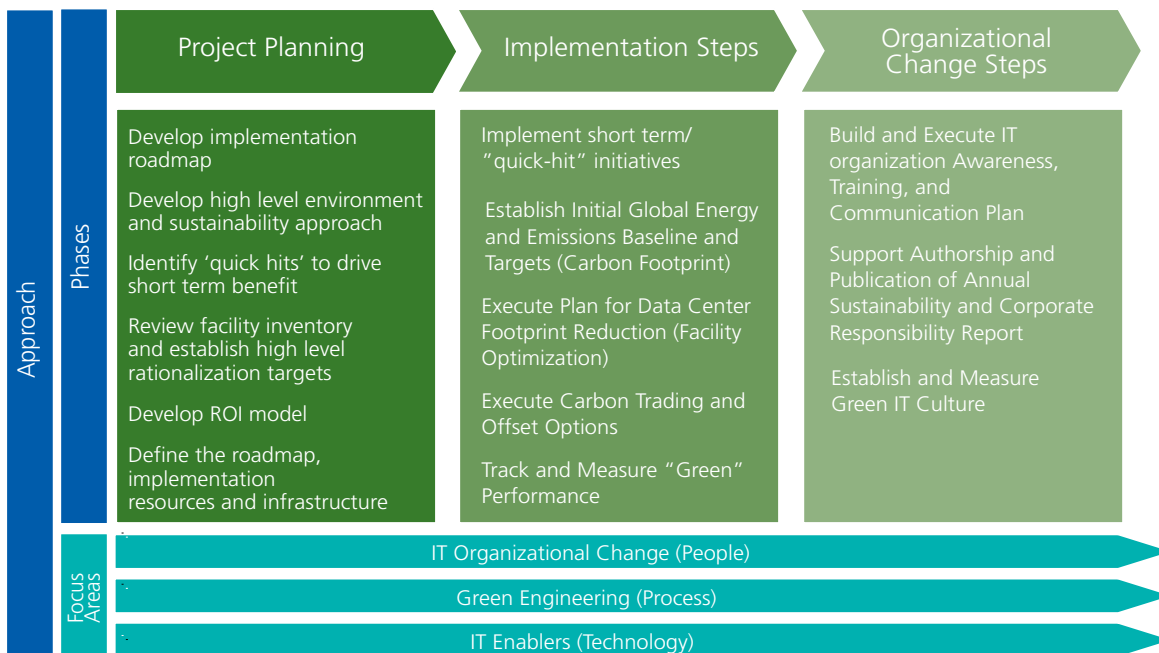
5 US Green Building Council ([www.usgbc.org](http://www.usgbc.org)), Heschong Mahone Group ([www.h-m-g.com](http://www.h-m-g.com)) "Windows and Offices: A Study of Office Worker Performance and the Indoor Environment – CEC PIER 2003," Carnegie Mellon University Center for Building Performance and Diagnostics ([www.arc.cmu.edu/cbpd](http://www.arc.cmu.edu/cbpd)).

6 "Green Building Costs and Financial Benefits" and "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force," 2003, Gregory H. Kats, Capital E ([www.cap-e.com](http://www.cap-e.com)).

7 See fn 4, supra.

8 USGBC ([www.usgbc.org](http://www.usgbc.org)) "LEED Initiatives in Governments and Schools," Natural Resources Defense Council ([www.nrdc.org](http://www.nrdc.org)) "New York's Green Building Tax Credit," Savings By Design. ([www.savingsbydesign.com](http://www.savingsbydesign.com)), US Department of Energy ([www.energy.gov/taxbreaks.htm](http://www.energy.gov/taxbreaks.htm)).

Fig 2 – Approach and Best Practices for Fast-tracking the Greening of IT



## Fast-tracking the greening of IT

IT is being driven to green, but before a CIO can act effectively, he or she must first identify what – within the full spectrum of sustainability measures – IT needs to do. A three-step approach can help put IT on the fast-track to going green. (Fig 2)

Step One is the planning step, where, during a preliminary assessment of the IT environmental footprint, sustainability measures are identified and prioritized. The goal is to identify opportunities to reduce operating costs and environmental impacts, as well as to develop the roadmap for implementing these measures, along with identifying resource and infrastructure requirements. In Step Two, the measures are implemented and tracked. Step Three addresses "green" organizational change within the IT function and, subsequently, the company as a whole.

An effective greening of IT calls for more than a baseline assessment of environmental impacts and a list of opportunities for managing them more effectively. Instead, it demands a holistic approach that is geared toward developing and aiding the implementation of a comprehensive "Green IT" program. The objectives of this program should include reducing IT operating costs, shrinking the IT environmental footprint, supporting the tracking and reporting of environmental performance, and bolstering IT's reputation as a fiscally and environmentally responsible function that can drive the way the rest of the company behaves.

### IT organizational change through Green IT

The "Green IT" change imperative begins at the top with the CIO. It should then be transferred via a Green IT Change Plan down to the IT function and, ultimately, outward to the rest of the company. The Green IT Change Plan should focus on creating a Green IT

culture, which will support, strengthen, and spread IT's sustainability efforts. One essential component of creating a Green IT culture is the continuous education and training of all IT personnel and executives regarding the business imperative for environmental sustainability. This will help generate buy-in for the green program among IT personnel and others throughout the company.

In addition, the Green IT Change Plan should include incentives and rewards for IT personnel who embrace continuing education, implement sustainable practices, such as recycling, and develop new ways to further the greening of IT. Many IT personnel are currently focused on traditional measures of system performance, so they may be unaware of Green IT practices and options. An effective way to help generate buy-in and promote Green IT Culture is to provide incentives for exceptional environmental performance.

A systems or network engineer, for example, might be rewarded for building a system that has the same capabilities as a standard architecture, but requires 50 percent less energy. Or, to encourage IT personnel to become more energy efficient, IT executives could calculate and publish targeted energy metrics and provide rewards for those who meet or exceed them. This technique should also stimulate healthy competition to see who can be the "greenest."

Other elements of the Green IT Change Plan should include steps to identify green collaborators – companies and consultants committed to enterprise sustainability – and to incorporate them into the IT function's practices and programs. Finally, the Green IT Change Plan should prioritize both long-term strategies – such as workplace renovations and organizational changes within IT and the company as a whole – as well as short-term initiatives to help accelerate the greening of IT, particularly those that provide quick results, generate a strong ROI, and lead to greater company buy-in.

## Green engineering

Simply preparing the IT function for change and instilling green ideals in employees are only the first steps in leveraging IT to get the entire company on the fast-track to enterprise sustainability. An IT function must also re-engineer its tools and processes around the company's sustainability imperatives. These processes range from defining the IT function's green vision to the day-to-day tracking and management of the "business of IT." So what are the key sustainability processes that CIOs and their direct reports must consider? The following provides a framework for action:

**Develop a Green IT strategy.** Determine the long-term strategic vision of Green IT and how it furthers the company's goals toward enterprise sustainability.

**Evolve IT architecture and standards.** This process is driven by the assessment of the green target environment and the IT strategies required to attain it.

**Manage IT vendor relationships.** Develop and manage relationships with vendors who focus on green IT products and services. Develop Green IT products and services. Provide Green IT products and services in the context of the sustainability goals of both the IT function and the rest of the company.

**Deploy Greener IT products and services.** Manage the deployment of Green IT products and services. Some of the key focus areas around this process are: customer (end-user) focus, rollout planning, effectiveness of training, and application/system support during and shortly after deployment.

**Manage operations of the Green IT environment.** The process encompasses data, hardware and software environments, and telecommunication capabilities. Management of the operations environment includes establishing performance metrics, running daily jobs, maintaining the IT systems' contingency plans, and supporting end-users.

**Support and train users.** Develop and deliver training materials to end-users regarding how to use new, greener hardware (e.g., thin clients) and software, and provide technical support as required.

**Develop and manage user relationships.** Build an interactive relationship with end-users that encourages feedback and user-initiated improvements as they relate to green IT.

**Plan annual IT sustainability milestones.** Plan annual milestones based on the company's long-term strategic goals and correlate those goals with the direction and long-term strategy of IT sustainability.



## Enablers of Green IT

The final component of the greening of IT approach is to understand the "big picture" in terms of IT's energy utilization and carbon footprint. "Our industry is at the leading edge of a major shift from an obsession with raw compute power to the cusp of becoming obsessed with computer efficiency," forecasts Kenneth Romans, Senior Vice President of Operations at Fidelity Investments Systems Company.<sup>9</sup> To determine which energy-efficient technologies and IT strategies to implement, the IT function must first clearly understand how its IT equipment is performing and how that equipment is impacting the company and the environment, ranging from energy consumption to greenhouse gas emissions.(Fig 3) Thus, all energy-consuming IT equipment must be metered and monitored. This single step can reveal everything from inefficient IT facilities to points of power hemorrhages and minor problems that can be fixed easily.

### Energy management and emissions tracking software

IT can draw on a variety of emissions tracking and energy management software already on the market to monitor its energy use. One energy management software package, for example, recently identified utility company billing errors that led to a \$1 million refund.<sup>10</sup> However, emissions tracking and energy management software is still in its nascent stage, so off-the-shelf packages will most likely require varying degrees of customization to meet an IT function's needs.

### Power-efficient hardware and alternative energy

IT must become much more energy efficient if it is going to reduce greenhouse gas emissions and achieve early sustainability wins for the overall company. But, corporate demands on IT keep rising, leading to cluster-based computing and other strategies that consume vast amounts of energy and generate a significant amount of heat. What can IT do to offset these realities?

First, invest in new, high-efficiency technologies, especially more efficient microprocessors and storage technologies. Chips that run multiple applications reduce the number of individual servers that IT needs to deploy. Sun Microsystems, for example, came out with its Niagara chip, which runs on only 70 watts of electricity (one-third of the energy consumption of a typical industry chip), and it runs much cooler than typical servers. As a result, current Niagara servers in use are emitting 257,000 less tons of carbon dioxide annually than standard servers.<sup>11</sup> MAID (massive array of idle disks) technology is another prime example of new energy-efficient technology. It powers down a major portion of a storage subsystem when it is not in use and saves energy upfront by lowering heat loads, which reduces air conditioning use.

Second, deploy energy efficient user workstations. The EPA recently restructured its Energy Star requirements for personal computers, making them so rigorous that only 25 percent of products in the marketplace could meet the new standards.<sup>12</sup> A new green computing standard – EPEAT – which was introduced in mid-2006, evaluates both computer energy and waste issues. Already, more than 300 computer models have met this standard.<sup>13</sup>

9 Wall Street & Technology ([www.wallstreetandtech.com](http://www.wallstreetandtech.com)), "CIO Challenge," Paul Allen, September 2006.

10 10 Ways to Save! – EnergyCap, <http://www.energycap.com/10ways.asp>

11 Fast Company ([www.fastcompany.com](http://www.fastcompany.com)), "Dawn of the Dead," June 2007.

12 Xerox Press Release ([www.csrwire.com](http://www.csrwire.com)), "Xerox Redesigns Products for Lower Energy Use, Meeting Tough New EPA Energy Star Criteria," 04-12-07.

13 Green Electronics Council ([www.greenelectronicscouncil.org](http://www.greenelectronicscouncil.org)), EPEAT Web site ([www.epeat.net](http://www.epeat.net)), and Greenbiz.com "Environmentally Friendly computers and Monitors Hit the Market," 07-24-06.

Finally, install renewable energy systems for all IT equipment or purchase renewable energy credits for IT operations. Renewable energy generation technologies, from photovoltaic systems to geothermal and wind turbine systems, are advancing rapidly and their costs are coming down.

### Cooling redesign and upgrade

Jim Gargan, Vice President at IBM, calls data-center power consumption and cooling “the IT battlefield for the next decade.”<sup>14</sup> Cooling of data centers continues to be a major component of overall IT electricity consumption with vendors, such as Hewlett-Packard, IBM, Sun, and Liebert, scrambling to differentiate themselves in the market. Cooling, however, starts with space design and building systems. A study of 19 computer rooms by the Uptime Institute research group found that those rooms wasted more than 60 percent of their capacity because of poorly designed layout and airflow, among other problems.<sup>15</sup>

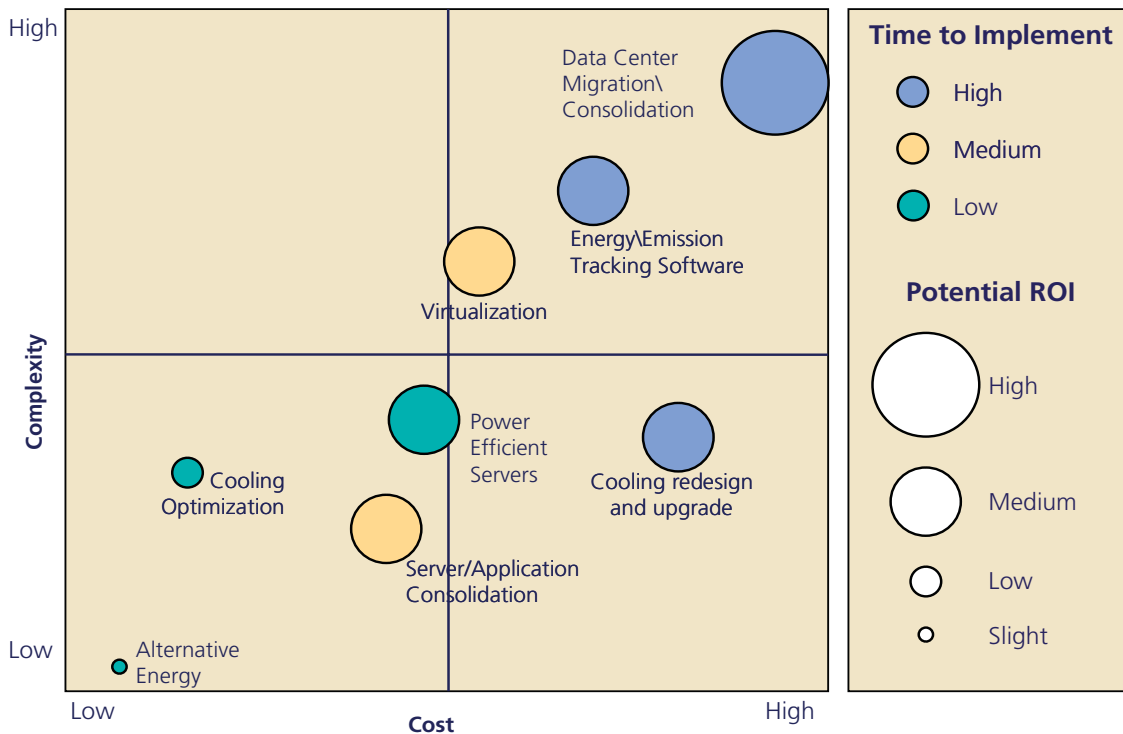
IT can derive considerable savings in its existing data centers simply by following leading practices in data center layout and rack and server arrangements. Effective strategies include raised floors to improve air flow, moving cooling systems closer to servers to concentrate cold air in the right place, alternating hot and cool server aisles to improve air flow, and using water-based air conditioning systems.

Another option is to select servers that have cooler processors. Dual and multi-core processors reduce heat generation. IT can also choose from a variety of data-center cooling products that have recently come on the market, including liquid- and refrigerant-based systems that attach directly to server racks, or even to microprocessors. ISR’s SprayCool M-Series direct chip-cooling technology, for example, sprays a liquid mist onto a cold plate surrounding the microprocessor. This technology removes more than half of the heat generated by the microprocessor. Alternatively, HP’s Modular Cooling System uses chilled water to distribute cool air through the server racks. Yet another option is IBM’s eXchanger, which places a chilled-water system directly behind servers to cool them. The Georgia Institute of Technology found that the eXchanger cut the air conditioning requirements of its 1,300-square-foot supercomputer center in half.

### Consolidation

IT consolidation strategies lower both energy consumption and IT’s carbon footprint by reducing the number of physical IT components, such as data centers and servers. Consolidation is an opportunity to “clean house” and design a smarter, more sustainable facility. Application and server consolidations, in particular, are granular and require deep IT analysis. This type of consolidation, however, may yield substantial annual savings with minimal additional investment. Server consolidation is becoming increasingly commonplace today,

Fig 3 – Technology Enablers



Technology enablers in the top right quadrant generally have the highest reward but are also high in cost and complexity. Conversely, Technology Enablers in the bottom left quadrant are less complex and costly, but typically have a lower ROI.

14 InformationWeek (www.informationweek.com), “New Cooling Technologies Tackle Data Center Heat,” 09-25-06.  
15 Ibid.

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with 39 percent of respondents to a recent Computer Economics survey indicating their companies have completed an IT consolidation project, and another 26 percent stating their companies are currently engaged in one.<sup>16</sup> A key component of application and server consolidation is virtualization, which provides a means to better utilize IT's existing hardware, operating systems, and space. Virtualization technology, like VMware, comes with a high upfront cost, but, on average, it has a three-year ROI.

## Green purchasing policies

What the IT function buys – from computer equipment to paper – directly impacts how green IT is and how green its suppliers are. If an IT function only purchases technologies with Energy Star, EPEAT, and other energy efficiency ratings, it can significantly reduce its energy consumption and greenhouse gas footprint, and it will help drive technology manufacturers to develop products that earn energy efficiency ratings. Wal-Mart, for example, is creating a program that encourages suppliers to aggressively reduce their own greenhouse gas emissions. Similarly, Bank of America strongly encourages its suppliers to continually exceed environmental performance expectations, thereby giving preference to those suppliers and products who do.<sup>17</sup>

## Waste Management

A green IT function needs a waste management program that impacts every employee and all of its purchasing policies. This program should encompass:

**In-house recycling.** Recycle office products, including paper, cardboard, plastic, printer toner, equipment batteries, PC mice, and cables.

**End-of-life.** Develop green end-of-life strategies for servers, personal computers, printers, facsimile and copy machines, and technology peripherals (e.g., PDAs, mice, company-issued mobile phones, and barcode readers/scanners).

**Manufacturer recycling.** Lease or purchase IT equipment from companies and manufacturers that recycle their products at the end of their useful lives.

**Recycled content.** IT equipment, furnishings, and office products should be made with recycled materials.

**Packaging minimization.** All products and equipment purchased or leased by IT should come with minimal packaging – that still protects the product from damage – to reduce natural resource consumption and waste.

## Risks of greening IT

Many CIOs consider the cost of going green to be a risk, but experience and trends alike suggest they have nothing to fear. Greening a workplace to LEED-Certified or LEED-Silver standards today, for example, costs no more, and sometimes less, than constructing a comparable standard facility or renovating an existing one. Plus, the U.S. Green Building Council (USGBC) has certified more than 35,000 LEED Accredited Professionals around the United States – architects, engineers, contractors, and others – who have the knowledge and experience to effectively green an IT workplace on a standard budget.

CIOs also fear that they'll make mistakes and pay the price for being on "the bleeding edge" of the green wave. This, too, is a false fear. While going green has recently become a trend in the United States, many countries, as well as companies in the United States and around the world, have been employing sustainability measures for years. Today's CIOs have more than two decades of information and experience on which they can build, from greening workplaces to conserving energy. For instance, several technology product manufacturers, such as HP, IBM, and Sun, have years of experience providing energy efficient technologies that also minimize greenhouse gas emissions.

Ironically, the greatest risks generally come from in-house. In some companies, stakeholders and executives are uninformed about the benefits and necessity of going green and, therefore, do not support green IT programs. Without support from the top, many green initiatives do not fulfill their potential. Thus, a CIO must have strong stakeholder and management support even before he or she proposes a Green IT program.

Similarly, many IT functions are overburdened and preoccupied with other important programs and activities, so they don't make a dedicated effort to the Green IT initiative. They wait until the last minute to complete the work; they approach it in a piecemeal, haphazard fashion; or they let project after green project fall through the cracks, significantly diminishing the many benefits of sustainability, cutting ROI down to pennies, and hurting IT's environmental standing in the company.

Conversely, if the CIO tries to pack too much at once into a Green IT program, he or she risks neglecting other vital IT programs and processes, which can harm the IT function and the company as a whole. Many companies, however, have already bought-in to sustainability, and going green has become a broad-based initiative. CIOs who are planning to green IT will often find that they are not alone and isolated in their companies. They aren't even pioneers. They may, in fact, be at risk for being slow to implement their company's sustainability policies within IT.



<sup>16</sup> Data center conference poll shows server consolidation is still a major goal – Gartner Jan 29, 2007.

<sup>17</sup> Bank of America ([www.bankofamerica.com/environment](http://www.bankofamerica.com/environment)).



## The future

As more and more IT functions and their companies become aware of the impact of IT's energy consumption and level of greenhouse gas emissions, we expect them to start employing a wide variety of new strategies to reduce IT's environmental footprint. One such strategy, that could become a new service offering for outsourcing providers, is a "Green Server Farm," an energy-efficient green data center whose equipment runs on solar and other renewable energy sources. Green Server Farms would be attractive to companies who outsource their IT infrastructures and want to become more sustainable and to enhance their green brands in the marketplace.

Another new strategy, which is already being employed by some progressive companies, is to make environmentally-based location decisions for new IT workspaces. More specifically, companies are starting to locate their data centers in cooler climates to minimize the need for air conditioning. Additionally, companies are beginning to seek locations with easy access to alternative and renewable energy sources, like small hydroelectric plants. For instance, Google has built a new data center at The Dalles, Oregon, to take advantage of the location's cool climate and hydroelectric power plant, and PepsiCo located a Tropicana manufacturing facility near a city landfill so that it can use the methane gas from the dump to help power the facility. Similarly, companies are also finding that the waste heat generated by IT components and other equipment can be harnessed to help warm the workplace. For example, Genzyme's LEED-Platinum headquarters in Cambridge, Massachusetts, uses the waste steam from an adjacent power plant to run its heating and cooling systems.

## Not if, but when

Enterprise sustainability is here to stay. The real question is not whether IT should go green, but when? Can your company really afford to wait until federal regulations are mandated, then spend vast sums of capital and face significant risks just to play "follow the leader"? Or should savvy CIOs demonstrate the vision and capabilities beyond the traditional role of IT to drive their companies onto the enterprise sustainability fast-track? IT is being driven to go green, and the companies who use IT "quick wins" as the catalyst to promulgate sustainability throughout the rest of the company will be the ones that reap the most rewards from this movement.



## Case study: Green data centers

### Highmark Incorporated

Highmark Inc. is one of the largest health insurance companies in the United States. Its 86,579-square-foot Data Center in Harrisburg, Pennsylvania, processes up to 500,000 claims and responds to 33,000 customer queries a day. Its electronic network connects to more than 100 hospitals and 15,000 health care providers. The two-story facility has office and support areas, along with 28,000 square feet of data center floor space on the upper story and a mechanical/electrical plumbing plant on the lower floor. Opened in November 2005, it earned a LEED-Silver rating from the US Green Building Council in 2006, and a Tier-3 certification from The Uptime Institute (a computer and communication scientific, educational, research, and product-testing organization). Intended to operate 24/7, and considered by Highmark to be a “mission critical facility,” the Harrisburg Data Center has redundant electrical feeds from two different power substations and is backed up by an uninterruptible power supply and two 2-megawatt diesel generators capable of running the facility for 72 hours if power is ever lost from both substations. The Data Center employed several sustainable-design techniques to earn its impressive environmental rating. First, the hillside helps to keep the building cool. Second, the upper level was designed to mitigate heat with a three-foot-high raised floor and 15-foot-high ceilings. Third, individual work areas have their own temperature and lighting controls. Fourth, the Data Center is cooled with an innovative system that includes a chilled-water piping system and redundant chilled-water loops. Rainwater to cool the Data Center is collected on the roof, filtered, treated, and stored (up to 100,000 gallons) in special containers under the loading dock’s concrete apron.

## Case study: Journey to Green IT

### Sun Microsystems, Inc.

Sun Microsystems is a market leader in delivering high-end server and personal computing technologies and data center optimization services to its customers. The SunFire T1000 and T2000 servers have the highest throughput for their server class while requiring less power, cooling, and space. Sun technologies are enablers for fast-tracking to green, but the company is also in a unique position because it is able to prominently “walk the talk” when it comes to enterprise sustainability.

Sun is a well-known early adopter and leader in making enterprise sustainability an integral part of its corporate culture. The company has already passed several enterprise sustainability milestones, including the migration to thin clients, which require less power to operate, and the consolidation of its data centers around the world (four into one in the United States; three into one in Europe), which now operate in green facilities. Through its Open Organization Program, Sun has also been able to close one-sixth of its office locations, thereby conserving energy and other resources.

When Sun jumped on “the fast-track to green,” its initial focus was to reduce IT capital expenses quickly to demonstrate that ROI from environmental projects can be realized in less than a year. Sun began by identifying and picking off “the low hanging fruit.” The ability to access and analyze financial and energy-consumption data was critical to identifying and prioritizing Sun’s Green IT projects. Also, the IT function emphasized the financial opportunities associated with sustainability measures to bring Finance on board early on. As IT established a proven track record for selecting green projects with quick payback, it became easier to get buy-in to pursue the bigger, more complex Green IT initiatives. Today, Sun continues to be both proactive and aggressive in its enterprise sustainability program. One of the company’s current initiatives is to reduce the overall energy used in manufacturing its products.

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## Green IT.

The Fast-track to Enterprise Sustainability

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