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2011
Issue 4

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Building sustainable companies

Alan McGill
Partner, Sustainability & Climate Change practice
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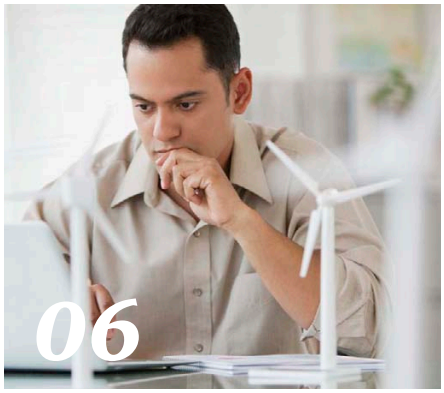

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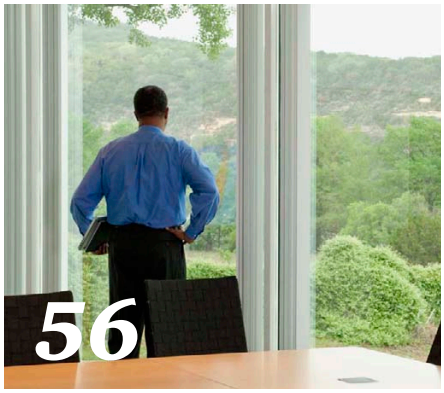

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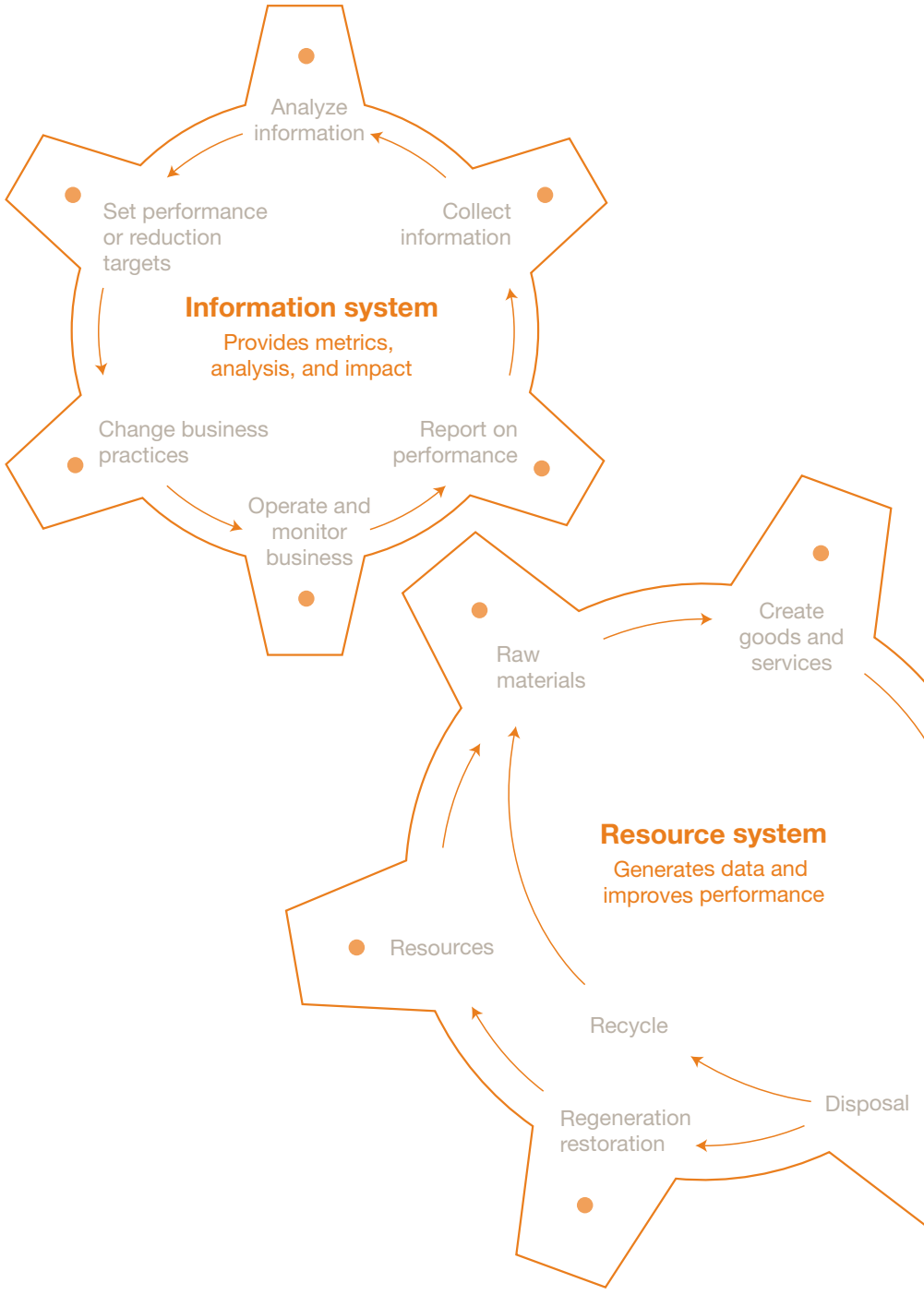

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Industry perspectives

During the preparation of this publication, we benefited greatly from interviews and conversations with the following executives:

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Chaco Culture National Historic Park: A wonder and a warning

Tom DeGarmo

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Message from the editor

In a quiet, peaceful setting about 160 miles from Albuquerque, New Mexico, is Chaco Culture National Historic Park. Formerly inhabited by the Anasazi (or "ancient ones," as so named by the later arriving Navajos), the ruins at Chaco today are impressive enough for structures built 1,000 years ago. In its prime, Chaco boasted "condos" with as many as 800 rooms, and the Anasazi road structure fanned out from Chaco in multiple directions for hundreds of miles—evidence of which can be seen from space even today.

Chaco didn't grow from fewer than 100 basket makers and farmers in the 5th century CE to thousands by the 11th century without astounding social, cultural, and technological inventions. The area around Chaco during the Anasazi era was never wet enough to support farming that relied heavily on water. But the Anasazi developed dry farming techniques and prospered as a civilization. A fairly wet year would be followed by a few dry years, but their ability to store food and harvest as much as possible during wet years carried them through the dry years.

What they didn't factor in was a dry period that didn't last a few years, didn't last a decade or two, but a dry period that lasted 50 years. From 1130 to 1180 CE, so little rain fell that alluvial springs dried up, crops died before producing a harvest, and the Anasazi were exposed to severe environmental distress. In a little more than 50 years, Chaco was transformed from perhaps the most advanced aboriginal society in North America to an abandoned ruin.

It wasn't as though the Anasazi were unskilled in the face of a challenging ecosystem. They had developed methods and techniques to overcome years of drought. What they couldn't imagine and therefore did not plan for was the actual depletion of a critical resource—water—for 50 years. In human scale, 50 years is effectively forever for a resource as critical as water.

Was there something they might have done differently had they known? Could they have maintained their civilization despite a 50-year drought if they had used different approaches? Or was it all inevitable?

We'll probably never know. But the Anasazi, along with a number of other cultures documented by Jared Diamond in *Collapse: How Societies Choose to Fail or Survive*, are our endowment. They represent lessons learned the hard way, lessons our societies are increasingly paying attention to. And because companies are embedded in societies, they are increasingly subject to laws, regulations, and market forces that in essence represent concerns about societal survival and sustainability.

And as Jared Diamond describes in *Collapse*, human societies can, with the right governance structures, establish a sustainable relationship with the resources they rely upon. Japan's Edo period (1603–1867) is one example of forest restoration and management—Japan is one of the few regions in the world that is more forested today than it was in 1500.

How did it happen? New policies that approved the private ownership of trees prompted individual villagers to plant trees, so they could sell the trees for income. Over time and with increasing participation, the practice evolved to the creation of forest plantations. The outcome was a cycle where the act of replenishing the forest was part and parcel of the act of consuming the forest for economic activity.

What does this all have to do with IT and emerging technologies—the usual target of the *Technology Forecast*? Our research indicates that companies are increasingly being measured in terms of the sustainability impact of the manufacturing, distribution, and use of their products and services, not just the consumer and financial value they create.

We find that the real opportunity for IT is to facilitate an information-driven transformation of enterprise and value chain operations, so that sustainability considerations are embedded in ongoing operations. Sustainability is embedded when every part of the business makes decisions that intelligently weigh the economic, environmental, and social impacts on the long-term ability to sustain the business. This represents a major new enterprise domain for IT to help with information, data architectures, analytics and modeling, and support for innovation systems focused on making sustainability strategic.

This issue of the *Technology Forecast* explores how sustainability can become an integral part of doing business and contribute to corporate reputation and financial results. The first article, "Sustainability: Moving from compliance to leadership," on page 06, examines sustainability as an embedded enterprise process, driven by metrics and the technology to collect and share them. The second article, "Closing the loop on sustainability information," on page 32, looks at software available now to collect and distribute data to help employees make decisions that weigh the environmental, social, and economic impacts of operations. The third article, "The CIO's next leadership opportunity: Sustainability," on page 56, examines steps the IT executive can take to move the enterprise forward.

This issue also includes interviews with executives at enterprises that are leading the practice of embedding sustainability or creating the next generation of solutions necessary to do so:

- David Kepler of The Dow Chemical Company describes how Dow has systematized the management of sustainability to maintain industry leadership on this important issue.
- Peter Graf of SAP details how sustainability is about long-term business models and what CIOs can do to give their organizations an edge.
- Pat House of C3 shares how information-driven transformation can make energy strategic and transform industry value chains to be more sustainable.
- Amit Chatterjee and Michel Gelobter of Hara Software describe how managing energy is transformational and starts any organization on a sustainability journey.
- Chris Peters of Intel explains the role IT plays in embedding sustainability within IT and the business at Intel.
- Ryan Whisnant of SunGard details the company's journey to get a handle on energy management in its operations.

At PwC, we embrace a broad definition of sustainability, which is aligned with our business strategy and embodies our commitment to be a responsible leader in the marketplace, with our people, for our communities, and to the environment.[1]

Please visit pwc.com/techforecast to find these articles and other issues of the *Technology Forecast* online. If you would like to receive future issues of this quarterly publication as a PDF attachment, you can sign up at pwc.com/techforecast/subscribe.

As always, we welcome your feedback and your ideas for future research and analysis topics to cover.

1 Details about PwC's efforts on sustainability are available at http://www.pwc.com/us/en/about-us/corporate-responsibility/index.jhtml

Sustainability: Moving from compliance to leadership

Sustainability's future is embedded in operations. A combination of metrics and information technologies will transform sustainability from an outside-in initiative to just the normal way of doing business.

By Vinod Baya and Galen Gruman

Sustainability[1] is often considered nice to do when convenient, but it can actually reward both the top line and the bottom line. Consider these results from three companies that embed sustainability practices throughout their operations.

The Dow Chemical Company, which created a Sustainable Chemistry Index, increased its sales of sustainable chemistry[2] products between 2009 and 2010, rising from 3.4 percent to 4.3 percent of all revenue. By 2015, it expects such sales to be 10 percent of revenue.

SAP, which established 400 sustainability metrics embedded in its processes, saved $250 million between 2008 and 2010 in energy costs. It expects absolute energy consumption to remain at 2000 levels through 2020, despite continuing global expansion.

Intel saved $136 million in 2010 from 11 employee environmental projects, and the company includes environmental performance goals throughout its operations, extending to its global value chain.

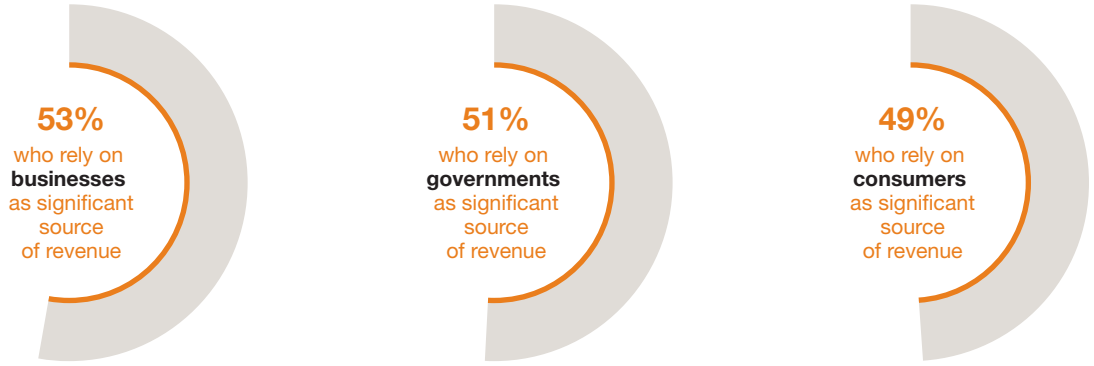
Dow, SAP, and Intel share a common understanding of how to advance on sustainability over the long term: It is not a separate function or activity but a core value embedded in the company. The environmental and social impact of products and operations is integrated with how the enterprise creates economic value. Through strategy and systems that provide useful information and meaningful incentives, each part of the business understands how it contributes to the company's long-term success.

1 By sustainability, PwC means the processes by which enterprises manage their economic, environmental, and social obligations and the opportunities to create long-term competitive advantage and growth. These are also often referred to as people, planet, and profit in popular media. Although particular examples and illustrations may speak to only one of these three elements, the term encompasses all of them.

2 Sustainable chemistry is Dow's cradle-to-cradle concept that encompasses a life cycle view of the company's products and processes with the objective of minimizing footprint by using resources more efficiently and reducing impact on the environment.

Figure 1: CEOs see big opportunities to make their companies more responsive to society's expectations.

CEOs who will change strategies because customers are factoring environmental and corporate responsibility practices into purchasing decisions:



Base: All respondents who responded yes to the question "For each of the following end customers, do they directly represent more than 33% of your revenue today?" and who replied they would make a "significant change" or "some change" in strategy (businesses=870, governments=176, consumers=548)
Source: PwC, *14th Annual Global CEO Survey*, January 2011.

"We've matured to the point where sustainability is systematized in our business management and our operational execution."

—David Kepler, Dow

"We've matured to the point where sustainability is systematized in our business management and our operational execution," says David Kepler, executive vice president of business services, chief sustainability officer, and chief information officer at Dow.

At companies like these, sustainability is part and parcel of how the enterprise conducts itself. They embed sustainability processes, practices, and metrics throughout their operations, and they use technology to present information not collected before to influence business decisions and individual behavior. "We are using software to create transparency," says Peter Graf, chief sustainability officer at SAP. "We set targets for sustainability goals and make the progress visible to encourage awareness and personal accountability."

This issue of the *Technology Forecast* explores how sustainability can become an integral part of doing business and contribute to corporate reputation and financial results. This first article examines sustainability as an embedded enterprise value, driven by metrics and the technology to collect and share them. The second article, "Closing the loop on sustainability information," on page 32, looks at software available now to collect and distribute data to help employees make decisions that weigh the environmental, social, and economic impacts on the long-term ability to sustain the business. The third article, "The CIO's next leadership opportunity: Sustainability," on page 56, examines steps the IT executive can take to move the enterprise forward.

Sustainability: The emerging context of business operations

You can think of sustainability as a feel-good issue that you can support when it's convenient to do so. Or you can think of it as the emerging context in which businesses must operate as customers engage more with the concept of being green, as competitors adopt sustainability practices for business advantage, and as governments regulate behavior to reduce pollution and ensure long-term stocks of raw materials, or to seek more positive relationships between society and industry.

In PwC's *14th Annual Global CEO Survey* (2011), CEOs saw big opportunities in making their enterprises responsive to social expectations. Whether

they primarily sell to businesses, government, or consumers, half of the CEOs anticipated changes to their business strategies because customers are factoring environmental and social responsibility practices into purchasing decisions. (See Figure 1.)

Failure to broadly adopt sustainable business practices will tarnish corporate reputations, which happened in the 1990s when the extensive use of child labor by apparel and other manufacturers hurt their reputations.

The lack of genuine sustainability practices will cause scarcity of essential materials (through pollution, depletion, and waste), from foodstuffs to fuels, from wood to water. This scarcity will raise the costs of inputs and limit the product and service options available. Failure to act now presents risks to the future growth and long-term viability of businesses.

Conversely, the adoption of real sustainability practices will burnish corporate reputations and, most importantly, allow continued economic and business success for the long term.

But how do businesses make sustainability part and parcel of how they operate, how they source, how they manufacture, how they distribute, and how they service? Addressing sustainability will require a behavior shift.

"A lot of companies still think of sustainability as: 'I have my business plan. How do I layer sustainability thinking on top of that?'" Kepler says. "Our view is that sustainable development is a combination of how you achieve economic value, along with how you integrate the environmental and social impact into strategy and operations." This prompts the need to internalize the concerns around environmental and social impact, which if kept external result in an approach where sustainability becomes a separate activity, layered on top of existing operations.

Dow created a new metric called the Sustainable Chemistry Index (SCI), which aggregates the economic performance of sales with the environmental and social impact, and is regularly measured and reported. This measure integrates the life cycle analysis and impact of products with business thinking and decisions, so ongoing actions result in a more sustainable manufacturer and solution provider. For example, business unit leaders include a review of their SCI performance as part of the business strategy review.

Similarly, SAP established 400 sustainability key performance indicators (KPIs) and embedded them in existing processes to create visibility of sustainability performance. "Every employee can go to the portal and see the computing stats, review the energy consumption trends in buildings, and discover printing data for every printer," Graf says.

The next step is to provide feedback on individual actions. "We are also looking at a project to see if we can break down our overall footprint on an individual basis," Graf says. "Such visibility changes behavior."

Among its methods, Intel links individual compensation to environmental performance, promotes employee sustainability groups, funds innovative environmental projects, and rewards employees who deliver significant sustainable impact. "A key role and challenge for the Intel IT sustainability program office is to start embedding sustainability-oriented decision making, activities, and best practices throughout our daily business activities, so we can transition sustainability from a program to a mind-set," says Chris Peters, IT director of the Industry Engagement Group at Intel.

You can think of sustainability as a feel-good issue that you can support when it's convenient to do so. Or you can think of it as the emerging context in which businesses must operate.

Sustainability is embedded when every part of the business makes decisions that intelligently weigh the economic, environmental, and social impacts on the long-term ability to sustain the business.

Managing the commons: Extending to industry value chains

The sustainability efforts of any one entity can have a limited impact and can put a business at a disadvantage if others in the value chain, upstream or downstream, do not act. Often the actual impact of any individual sustainability behavior is unclear, beyond those activities that have a direct cost, such as the purchase of paper and electricity.

The good news is that awareness of sustainability issues, coupled with customer pressure and government regulation, is causing entire business networks—value chains and cross-industry groups—to act together to adapt their processes to support sustainability. This joint action is becoming increasingly possible as standards emerge to measure and value the sustainability attributes involved, such as energy efficiency, carbon emissions, water usage, resource renewability, labor practices, trade practices, and social impacts.

These standards—and the underlying metrics—set the stage for understanding the impact of sustainability attributes, which means that individual businesses can make decisions that have a known impact across the ecosystem. For example, in 2007 Nike created the Considered Apparel Index to score the environmental attributes of its apparel. In 2010, it released a web interface to this index, called the Environmental Apparel Design Tool, which designers use early in the product creation process to inform design and development decisions and to reduce the environmental impacts related to materials, manufacturing waste, and garment treatments. The tool allows suppliers to understand Nike's approach to scoring apparel products for sustainability while providing feedback to Nike.

"A key part of the strategy is transparency," says Tom Sedory, IT director of strategy and sustainability at Nike. "Our efforts have to be visible to the industry to let others see, evaluate, use, and develop further."

The journey to embed sustainability in business

Few people would argue against protecting the environment or responsible citizenship. But few businesses make decisions with environmental and social impact as a routine concern. "Sustainability should be embedded as a natural extension to the existing processes," suggests Jon Chorley, chief sustainability officer of Oracle Corporation. "It needs to transform from a project-based orientation to an operations orientation."

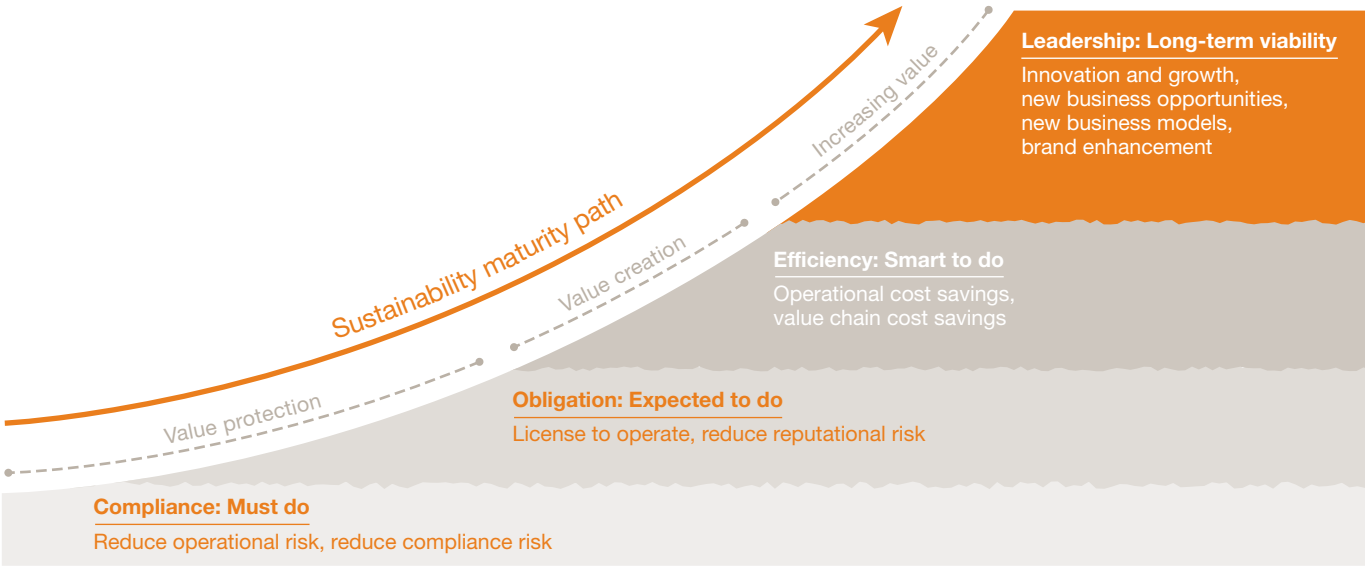
To achieve an operations orientation, PwC believes that companies will move through a maturity path along a continuum that spans compliance, obligation, efficiency, and leadership. In the process, they will embed sustainability in operations. (See Figure 2.)

The must do: Complying with regulations

Compliance with government regulations is a key external driver and the legally required must-do task. Regulations large and small will constrain decisions and options. Some are indirect, such as recent US federal regulations mandating greater light bulb efficiency that alter the products available for purchase. Others are quite direct, such as the carbon cap-and-trade schemes deployed in Europe, California, and Australia, and China's recent tightening of permissible emissions by commercial vehicles.

It can be difficult to assess the direct value for complying with regulations beyond avoiding civil penalties. But the economic and other impacts used to justify the regulations can be helpful in setting a common valuation for various sustainability activities, which then can create direct enterprise value. While

Figure 2: The sustainability maturity path: as organizations embed sustainable practices in operations, they move along the continuum from compliance to obligation to efficiency to leadership. Information technology is an enabler of this journey.



compliance alone has been an adequate corporate response in the past, social attitudes toward sustainable practices will have more impact in the future. Just being compliant will not be enough, because regulations will be slow to catch up to market expectations and competitive reality.

The obligated to do: License to operate

Dealing with stakeholders' perceptions of corporate obligation to act is the second stage of maturity. It is typically associated with the large-scale impacts of industry and what to do about them. Larger enterprises attract the highest expectations, or obligations, to act.

"When multinationals have broad footprints across the world and operate in as many countries as they do, expectations are associated with the companies that are beyond just making a profit for their shareholders back in some other part of the world," says Gary Niekerk, director of global citizenship at Intel. (See the sidebar, "Sustainability and industry leadership," on page 13.)

Even if their practices are not much different from others or not under their direct control, industry leaders are expected to "do the right thing" or risk reputational damage and lost business if they don't. Many original equipment manufacturers (OEMs) and brands that have a large impact on the market have been a subject of criticism for the labor or manufacturing practices of their suppliers. Enterprises that have taken appropriate actions have benefited from bolstering their reputations. Meeting the obligation by promoting sustainable methods becomes a source of differentiation from competitors. In meeting the obligations, companies can turn environmental and social challenges into new business opportunities. By seizing these opportunities, they shape the world and advance toward leadership.

The smart to do: Efficient use of resources

Efficiency has been a key internal driver for sustainable practices and is the low-hanging fruit when moving beyond compliance and obligation. Waste of resources is costly. Reuse and reduction of waste reduces cost and creates new revenue streams. Efficiency in all forms reduces costs, and so it is no surprise that many organizations have promoted sustainability efforts that result in reduced direct costs.

> ***"Energy [and other resource] management will likely become the basis for organizational and national competitiveness, with financial and market advantages accruing to those that systematically and strategically optimize their use of energy and resources."***
>
> —Pat House, C3

Figure 3: Of the CEOs surveyed, 64 percent see environmentally friendly products and services as an important part of their overall innovation strategy.

To what extent do you agree or disagree with the following statements about your expectations regarding your company's innovation strategy over the next three years?

Our innovations will lead to **operational efficiencies** that provide us with a competitive advantage

Our innovations will lead to significant **new revenue opportunities**

An important part of our innovation strategy is to develop products or services that are **environmentally friendly**

Businesses will look more to their **suppliers** for product innovation

Base: For the first, second, and third items, all respondents who "agree" or "agree strongly" with the question as shown (global=1,201). For the fourth item, all who receive more than 33% of total revenues from businesses and responded they would make a "significant change" or "some change" in strategy because they expect businesses will rely more on suppliers for product innovation (global=870).
Source: PwC, *14th Annual Global CEO Survey,* January 2011.

"A key role and challenge for Intel IT... is to start embedding sustainability-oriented decision making, activities, and best practices throughout our daily business activities."

—Chris Peters, Intel

Common examples include reduced energy usage in the data center, reduced water usage in manufacturing and office facilities, reduced paper usage in the office, and reduced material usage in packaging. These efficiencies reduce costs while also aiding sustainability through the reduced use of resources. Dow, for example, has saved $9.8 billion since 1994 from energy-efficiency efforts that required an investment of less than $2 billion.

Such efficiencies make sense with or without a sustainability impact, but pairing their contributions to the bottom line with their environmental and social impact creates an even greater incentive to support sustainability.

Leadership: Embedding sustainability

The fourth and most mature stage of becoming a sustainable business is market leadership. Sustainability leaders embed real, measurable, ongoing commitments to sustainability practices as a strategic differentiator, going beyond the immediate benefits of compliance, obligations, and efficiency. Sustainability is embedded when every part of the business makes decisions that intelligently weigh the economic, environmental, and social impacts on the long-term ability to sustain the business.

When embedded, sustainability actually becomes a key driver of innovation and growth. "We've evolved our use of the term *corporate responsibility*. We now talk about it as sustainable business and innovation, and it is a key to how we think about driving long-term growth," Nike's Sedory says.

In the 2011 PwC survey, 64 percent of the CEOs said that environmentally friendly products and services are an important part of their innovation strategy. (See Figure 3.) When linked to business strategy, sustainability becomes a core enterprise value. By becoming embedded in operations, sustainability objectives can become a part of long-standing measures of enterprise performance, such as profitability, innovation, growth, and industry leadership.

The leadership opportunity is not limited to enterprises, but extends to countries. "Energy [and other resource]

Sustainability and industry leadership

A conversation with Gary Niekerk of Intel on industry leadership and the sustainability agenda in the supply chain

PwC: When we think about sustainability, there seems to be a license to operate issue for businesses of a certain size and scope and in a certain industry leadership position. That is, the society puts the burden on those businesses to do certain things. Does that play into the thinking around sustainability?

GN: Absolutely. We have a lot of discussions about our license to operate because we have a significant manufacturing footprint, unlike some of the other ICT [information and communications technology] companies that outsource their manufacturing. We have large operations that use significant amounts of water, chemicals, and energy, and we are very aware of the footprint and relationship we have in the community.

You're right—when multinationals have such broad footprints across the world and operate in as many countries as they do, expectations are associated with the companies that are beyond just making a profit for their shareholders back in some other part of the world. It's about how you operate as a global citizen, and there are expectations around environmental issues, human rights, and social issues that are much different today from what they were 10 or 20 years ago. We operate essentially at the license and the will of the public, and if they don't want you there, as we've seen with governments in the Middle East, at some point you won't be allowed to operate. So it is something to keep in mind.

PwC: Intel operates in a supply chain with many other participants. You are a member of the EICC [Electronic Industry Citizenship Coalition]. What role is that serving for Intel?

GN: We were part of the original group that helped put together the EICC, and we're heavily involved. For us, this really started around the supply chain and how can we set standards in the supply chain around human rights, labor, health and safety, and environmental issues.

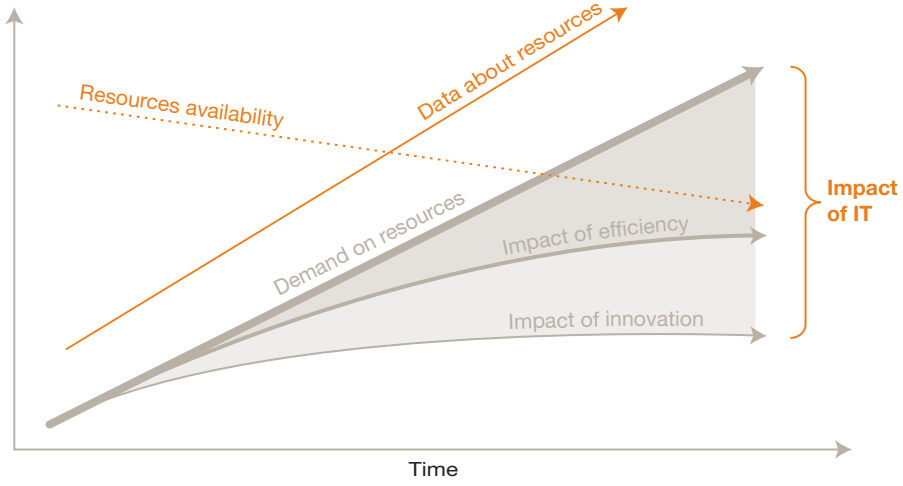
Previously, we would audit a company and then several other brands would audit three or four times for the same types of issues. This was inefficient, duplicative, and disruptive to the company being audited as well. The vision, as far as auditing, is that an enterprise would perform an audit, and then those audits would be shared among the members so you would increase the efficiency.

A lot of the environmental focus was originally on compliance with environmental regulations, but it's starting to do more around broader sustainability issues. Now we're asking our suppliers many more questions about their actions regarding carbon, water, and waste, and we're incorporating that into our scorecards that we use to grade suppliers. Traditionally those things would've been about quality, cost, and availability; now we're adding pieces about sustainability issues.

PwC: A key trend in sustainability involves integrated reporting, so combining your economic, environmental, and social performances together. Is there value to reporting sustainability metrics in financial terms?

GN: Yes. Internally, we have been working on a value framework model with our finance people. We've brought them in early, and we've tried to look beyond traditional ROI [return on investment] to how do we move these decisions we make regarding sustainability from just risk management and operational considerations to creating shared value. To make operations more energy efficient and save money, that's pretty straightforward; you're going to do those things. But how do you account for things that affect your brand, goodwill, social innovation, market expansion, and identifying new customers? How do you measure the social value of the $100 million we invest annually in education? We're trying to figure that out. The challenge is to comprehend all these factors and integrate them into your decisions, when classic ROI alone may not be there on a product development issue or on an internal operational issue. These are some open questions we are wrestling with as we speak.

Figure 4: As resource availability is decreasing, the data about resources is increasing. Sustainability provides the context for using data and information technology to advance on efficiency and innovation.



"Technology is accelerating the use of sustainability as a driver of growth, particularly information technology, as it allows greater monitoring, independent verification, transparency, and accuracy of resource usage and its impact."

—Alan McGill, PwC

management will likely become the basis for organizational and national competitiveness, with financial and market advantages accruing to those that systematically and strategically optimize their use of energy and resources," predicts Pat House, senior vice president of strategy at C3.

Compliance is an "outside-in" approach in regard to where the goals are established and how individual stakeholders relate to the topic. Engaging with sustainability to meet obligations, then for efficiency, and ultimately for market leadership transcribes a path that converts outside concerns into inside engagement. It becomes a meaningful component of every business decision.

The crucial role of information in embedding sustainability

IT is playing an important role in the transition from compliance to market leadership. "Technology is accelerating the use of sustainability as a driver of growth, particularly information technology, as it allows greater monitoring, independent verification, transparency, and accuracy of resource usage and its impact," says Alan McGill, a partner in PwC UK's Sustainability & Climate Change practice.

Sustainability has emerged as a key social issue due to one broadly accepted reality: environmental resources once believed to be limitless are increasingly seen as limited. Any limited resource needs to be managed for efficient use. "We used to live in a world where energy was cheap and information was expensive. Now, information is a resource that is becoming limitless, and energy and other environmental resources are becoming constrained," says SAP's Graf.

In an increasingly digitized world, the sustainability journey is about using the limitless nature of information to become better at managing constrained resources. "Information technology transforms energy usage into something that is manageable," says Amit Chatterjee, founder and board member of Hara Software. IT is accustomed to managing the flow of materials in enterprise resource planning, supply chain management, and other systems. What has been missing is the flow of sustainability-specific information about those materials across the full value chain.

Over the long term, the role of IT is to provide information to help strike the balance between the availability of

resources and the demand for resources. (See Figure 4.) Achieving such balance has the potential to eliminate volatility in the supply or prices of necessary resources, avoid the unintended consequences of business operations, and address many of the grand challenges facing the world today.

Closing the loop with information

Many enterprises have started to look at the life cycle of their products and services and track the environmental and social impact by taking a cradle-to-cradle or cradle-to-grave view of them—the closed-loop resource system shown in Figure 5. Coupled with this system is the life cycle of information—from its collection to analysis for setting targets, to changes in business practices, and to reporting on performance—making up the closed-loop information system. When these two closed-loop systems—resource and information—conceptually interact, they become the basis for embedding sustainability in operations. The integration of operational information with sustainability impact enables employees to make decisions that weigh the environmental, social, and economic concerns with the long-term ability to sustain the business. Figure 6 shows how adopting the closed-loop framework makes advancement on a sustainability maturity path possible.

On this path, the role of information spans the following key objectives to demonstrate readiness for embedding sustainability.

Figure 5: The coupling of two closed-loop systems—one on resources and the other on information—provides a framework for embedding sustainability.

Embedding is achieved by tagging resources with sustainability-related information and providing information at the point of action to drive sustainable choices and behaviors.

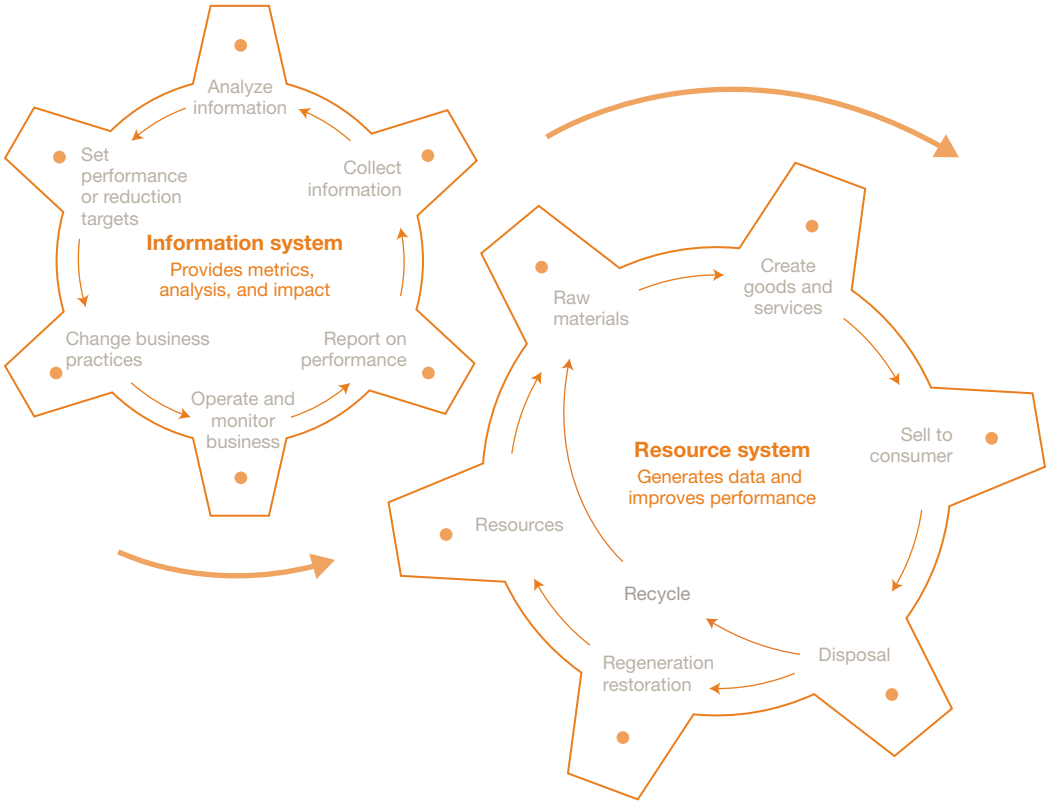
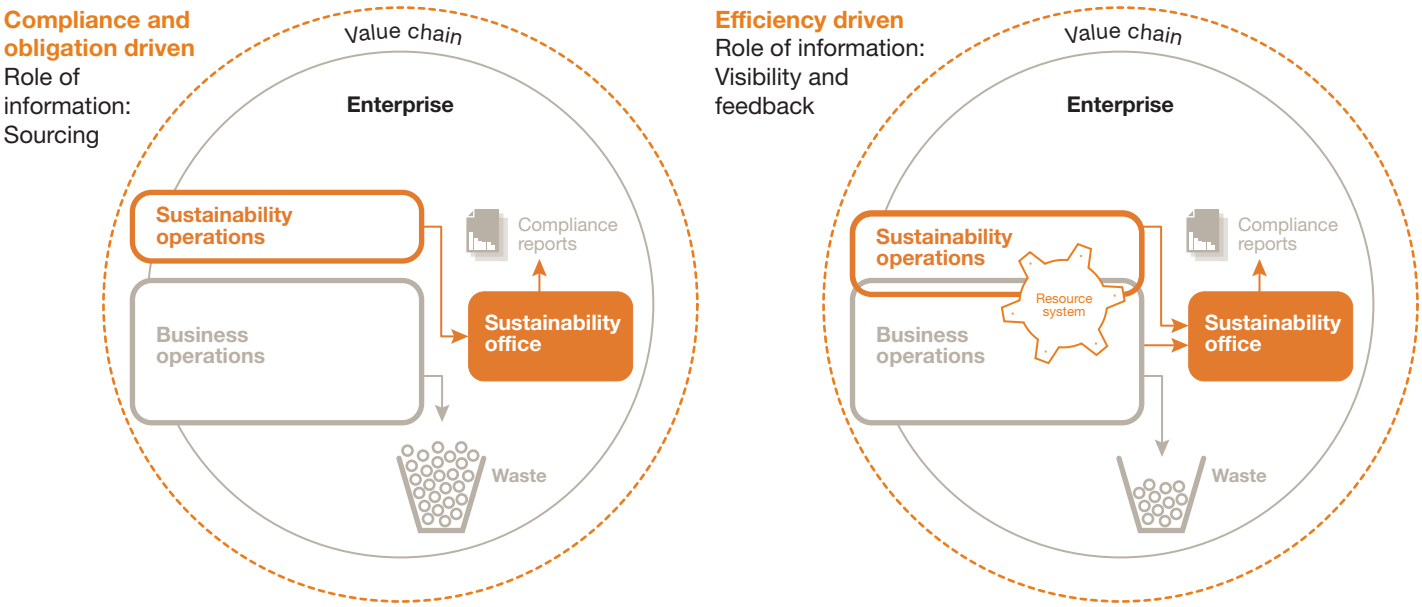


Figure 6: The closed-loop systems enable the sustainability maturity journey.



"Sustainability should be embedded as a natural extension to the existing processes. It needs to transform from a project-based orientation to an operations orientation."

—Jon Chorley, Oracle

Synthesize: Define and collect information

Much sustainability activity today is driven by the need to reduce the environmental footprint. While there is an economic basis to do so, the underlying metrics are unlikely to be adequate for a future in which sustainability is strategic and drives the top line and the bottom line. Industry-specific metrics are needed to integrate economic, environmental, and social dimensions across the life cycle of products and services. For example, Nike defined the Considered Apparel Index, the Outdoor Industry Association defined the Eco Index, and Dow defined the Sustainable Chemistry Index.

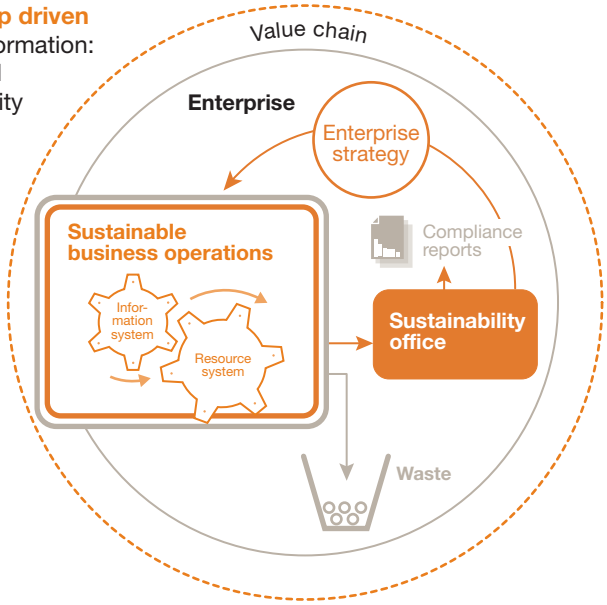
"Sustainable chemistry is a high-level way to look at life cycle management, the attributes of your business model, and the products you make, and then to evaluate its level of sustainability," Kepler says. "SCI touches all parts of our business. It looks at all [environmental, social, and profit impact] of them collectively and shows where you have an impact and where you can make changes," he adds. At Dow, SCI has become a basis for assessing the sustainability performance of products, processes, business units, business models, and individuals. (See Table 1.)

Table 1: Dow's Sustainable Chemistry Index blends the following eight factors to determine products that have sustainable chemistry advantages.

1. Renewable/recycled content	5. Social need
2. Resource management	6. Manufacturing/transportation
3. Life cycle benefit	7. Product application
4. Manufacturing efficiency	8. Public policy/end of life

Source: http://www.dow.com/sustainability/goals/chemistry.htm

Leadership driven
Role of information:
Embedded
sustainability



Engage: Information at the point of action

Sustainability performance depends on individual actions taken by all employees. Raising awareness to drive employee engagement is essential to embed sustainability values. IT plays an important role here. "When you're developing and reporting and really working on being transparent, a whole new internal conversation occurs around all the indicators. It raises awareness and forces companies to look at how they're performing," says Ryan Whisnant, director of sustainability at SunGard.

Many people use e-mail signatures that promote awareness for reducing printing and paper usage. It would be more powerful if every time somebody goes to print, a pop-up says, "This print is going to cost $x. Do you really want to do that?" Most printers are not set up to provide that prompt, but policy-based tools can allow this process-level sustainability reinforcement. By bringing the information about the environmental impact to the point of action, individual action will more frequently be the sustainable choice.

SAP uses information this way. "When employees book a flight, we will tell them what the carbon footprint of that flight will be. Employees are empowered to take this additional information into consideration when making a decision to travel," Graf says. SAP has embarked on a project to break down its total environmental footprint to the individual level. Such visibility changes behavior, because individuals can compare against location or enterprise averages. "All these approaches are positively influencing behavior," Graf notes.

This type of embedding can go much further when the metrics and desired sustainability impact results are known across the value chain. "Acting sustainably—at a corporate and individual level—becomes the new normal if we can understand and control the impacts of our choices upstream and downstream on stakeholders we may never meet, as well as the 'boomerang' benefit on us at the point of action," says Nic Delaye, director in PwC's Sustainable Business Solutions practice. For example, Nike's Environmental Apparel Design Tool is used by designers to surface information about the environmental impacts of material, dye, and related choices in the value chain.

"Acting sustainably—at a corporate and individual level—becomes the new normal if we can understand and control the impacts of our choices upstream and downstream on stakeholders we may never meet, as well as the 'boomerang' benefit on us at the point of action."

—Nic Delaye, PwC

Integrate: Modeling the unintended consequences

Environmental and social considerations were historically seen as external factors, and most enterprises did not understand or model them. As a result, questions about footprint, end-of-life of products, and other considerations were never raised. "Such questions usually are not asked until after the product is developed and it's successful, and the result at times is unintended consequences on society or the environment," Dow's Kepler says. "Frankly, they're unintended many times because you didn't sit down and model market adoption impacts up front."

By having a model of the relationships among the various dimensions during the creation of products and business initiatives, many unintended consequences can be avoided or planned for. IT has a large role to play in such modeling.

In some cases, that means working with existing enterprise applications and data sources and applying them to financial, manufacturing, and other business processes. For example, the evaluation process for building a new campus could include energy-efficiency ratings, green tax incentives, off-gassing ratings, improved employee productivity and retention, reduced employee health costs, and sustainable-source warranties in materials used. The building industry has standard metrics and warranties in these cases. As standards evolve for, say, measuring toxicity impact, water usage, and carbon emissions, those factors could be added to existing processes and information systems as part of the evaluation criteria used within a business and across its value chain.

Such modeling and visibility should not be limited to the enterprise. They must extend to the value chain. When resources are tagged with sustainability-related information, it's possible to know much more about the relative performance of value chain partners. "Buyers of goods and services can place demands on their suppliers and can actually know whether those demands are being met in ways they could never do before," Delaye says. Such visibility is essential, because when enterprises create sustainability targets, they often make assumptions about the performance they can get from value chain partners.

The emerging practice of embedding with financial metrics

Much of the information for sustainability is nonfinancial, such as tons of greenhouse gas emissions, gallons of water used, tons of waste disposed, and so on. However, it's possible to translate this information into financial metrics. This applied-valuation concept is familiar to all businesses. After all, money is a set of metrics and shared valuations for the basket of economic activities—goods, services, labor, intellectual property, goodwill, and so on. And financial metrics are the most fundamental measurement used across business decisions and processes.

Existing financials usually do not include the cost of inefficiency, the cost of environmental damage, and the present and future value of the environment and its resources that businesses and people use to sustain themselves. However, metrics are beginning to emerge that include these effects, opening the door to more programmatic sustainability decisions. The most complete accounting for these assets also incorporates people, culture, social infrastructure (such as education), and the macroeconomic impacts of enterprise behavior.

"Taking the nonfinancial drivers of sustainability that are critically important to a business and putting a valuation on them in economic terms means that people will understand

> ***"We are also looking at a project to see if we can break down our overall footprint on an individual basis. Such visibility changes behavior."***
>
> —Peter Graf, SAP

the impact of sustainability concerns on their business much better," says PwC's McGill. "The organization will be better positioned to know where the risks and opportunities for innovation are and where they should focus their scarce resources and avoid potential disruptions to business." (See the sidebar, "Environmental and social P&L account," on page 19.)

Athletic apparel manufacturer PUMA has taken this approach to embedding sustainability, using emerging modeling and valuation methods to develop an environmental profit and loss statement. PUMA released the first environmental profit and loss statement in May 2011.[3]

In many ways, emerging sustainability developments are redefining the notion of externalities and the definition of cost. "Once this is done, it's possible to use cost as an honest measure that also includes considerations for sustainability," forecasts Chorley of Oracle.

3 "PUMA and PPR HOME announce first results of unprecedented Environmental Profit & Loss Account," PUMA news release, May 16, 2011, http://about.puma.com/?p=6644.

Environmental and social P&L account

A conversation with Alan McGill of PwC UK on the emerging prospects of an environmental (and social) P&L account

Alan McGill specializes in nonfinancial performance measurement, reporting and assurance. He currently leads PwC's work with the Carbon Disclosure Project, sits on the Climate Disclosures Standard Board, and is the project director that set up The Prince of Wales Accounting for Sustainability Project.

PwC: Alan, you recently advised PUMA in creating an environmental profit and loss [EP&L] account. What is the motivation for any enterprise to create an environmental or social P&L?

AM: Taking the nonfinancial drivers of sustainability that are critically important to a business and putting a valuation on them in economic terms means that people will understand the impact of sustainability concerns on their business much better. They will have an integrated view of key environmental drivers and will be able to denominate these issues in a comparable base unit. This capability will facilitate a better understanding of the interrelationships of these value drivers. The organization will be better positioned to know where the risks and opportunities for innovation are and where they should focus their scarce resources to avoid potential disruptions to business.

With an EP&L [environmental P&L], this is effectively the first time that PUMA has been able to look at its business with a different lens. Now, PUMA has a much better understanding of the key risks within its supply chain and where those risks are. It can quantify the economic value of the risks. At the same time, the EP&L is also identifying significant opportunities for PUMA with regard to how it can reengineer and transform its supply chain, how it interacts with its suppliers, how it can decouple resource use and growth, and how it innovates within its business model.

From a competitive position, companies that have an EP&L can manage their cost base much more effectively, because they will better understand how and from where cost increases might appear. As a direct result, they can plan for these increases and cope with rising prices better, because of the business insight they have.

PwC: How will such results impact existing operations?

AM: With a quantified EP&L, enterprises will effectively be able to send the right pricing signals up and down the value chain to influence changes that are necessary from a sustainability standpoint. They will be able to use a market mechanism

continues to next page ›

that most people and enterprises understand to make progress on their corporate goals. The result is that sustainability concerns become embedded in operations, and they help the achievement of overall corporate strategies.

For example, if companies can work out how to take the economic cost from the EP&L—and social P&L—account and integrate it into the procurement processes, then existing processes and market mechanisms might drive a decision that's different from what companies might have concluded previously. The environmental and social impact now would be factored into the pricing model. When done right, the processes will favor suppliers that allow a company to improve its sustainability performance, innovate, and deliver growth.

PwC: Does information technology [IT] have a role here?

AM: Technology is accelerating the use of sustainability as a driver of growth, particularly information technology, as it allows greater monitoring, independent verification, transparency, and accuracy of resource usage and its impact.

IT has a role to define and facilitate how information is tagged and shared across the value chain, so that resources and environmental information can be integrated with traditional financial costs. The ability then to share that information internally and with the value chain, easily and quickly, will be transformative for enterprises and industries. IT's role and impact can be very powerful, because it will give great new insight to businesses.

PwC: What does this mean over the long term?

AM: If I abstract a little, what EP&L—and social P&L in the future—is starting to do is demonstrate that the pure financial information around the P&L that a company makes now will be insufficient for understanding the performance of the company in the 21st century. It has been very relevant and it was right to have the financial P&L when we were in the 19th and 20th centuries, because we were in a very different position as resources were considered limitless. That is not true anymore.

Profit currently is the dominant measure of success in our economic system. Increasingly, though, there is recognition that historic financial performance is unlikely to be sufficient to assess the long-term prospects of a business where the dynamic of wealth creation is changing.

"With an EP&L, this is effectively the first time that PUMA has been able to look at its business with a different lens."

In response, businesses are disclosing significantly more nonfinancial information that underpins how value is and will be created. Disclosures include detailed plans for low-carbon products and services, and employee incentives to reduce greenhouse gas emissions.

Essentially, a key piece of information—information around environmental and social concerns—has been missing from most business operations. With an integrated view that blends financial, environmental, and social performance, you have increased business insight with which to manage the risks and opportunities in the future.

Conclusion

Behind most sustainability initiatives today are ways of thinking that separate a company's core business and its impact on the world. But businesses with mature sustainability practices do not view them as a department or center in the organization. Rather, sustainability practices are dimensions embedded in all decisions and processes, part of the entire business—just as financial considerations and performance metrics are. Yes, there should be sustainability experts in the company—just as there are experts in finance, HR, sales, product design, and sourcing—but as long as sustainability is considered a separate, standalone activity, it won't meaningfully occur.

Sustainability at the core is an information challenge. Synthesizing, engaging, and integrating sustainability information provide the context for how sustainability concerns will influence enterprise strategy. "Good sustainability data will allow managers to see their businesses and value chains in a whole new way. This is the future of strategy," suggests Andrew Winston, founder of Winston Eco-Strategies.

The true indicator of success is that sustainability behavior becomes second nature. By embedding sustainability dimensions into products, services, and business processes—from performance reviews to sourcing decisions—companies can more quickly get that second-nature result.

Second nature will be extremely important as sustainability becomes a major strategic concern in the next decade. As organizations engage with sustainability, their journey will take them from a focus on compliance to a demonstration of leadership using sustainability as a way to drive innovation and growth.

As businesses mature in their sustainability efforts—from compliance to obligation, then efficiency, and ultimately to market leadership—they will travel a path that converts outside concerns into inside engagement, transforming existing processes to make sustainability a core activity. Sustainability will stop being a separate concern and will become embedded in ongoing business operations and strategic priorities.

IT is playing an important role. By making visible the consumption and impact of environmental and social resources in products, services, and business operations, IT accelerates the use of sustainability as a driver of growth.

> ***"Good sustainability data will allow managers to see their businesses and value chains in a whole new way. This is the future of strategy."***
>
> —Andrew Winston, Winston Eco-Strategies

Ultimately, embedding sustainability means tagging resources with sustainability-related information and providing information at the point of action to drive sustainable choices and behavior. That information at the local facility, enterprise, and value chain can send the relevant sustainability information or "pricing" signal throughout the organization and its suppliers, and steer the business toward more sustainable choices or outcomes.

Such embedded information available to people and made part of business processes will lead to making sustainability practices, well, sustainable.

Systematizing sustainability

David Kepler of Dow describes the connection of sustainability to corporate strategy and how the company maintains industry leadership on this important issue.

Interview conducted by Vinod Baya, Bo Parker, and Saverio Fato

David E Kepler

David E. Kepler is executive vice president of business services, chief sustainability officer (CSO), and chief information officer (CIO) for The Dow Chemical Company. He is a member of Dow's Executive Leadership Committee, which is responsible for the company's corporate strategy and financial performance.

As CSO, Kepler is responsible for guiding the sustainable business development of the company and is charged with leading the company's commitment to set the standard for sustainability, including the achievement of the company's aggressive 2015 sustainability goals. He chairs Dow's Sustainability Committee. In addition, Kepler chairs the Sustainability External Advisory Council (SEAC).

In this interview, Kepler shares how Dow has systematized the management of sustainability by synthesizing metrics that integrate environmental and social concerns with economic value and strategy.

PwC: David, you have a unique role in that you lead both the IT and sustainability functions. What is the rationale for doing so at Dow?

DK: There is an organizational rationale, but some of it might be personal as well. I've been with the company for more than 35 years, with the first 25 primarily in information technology. After I became CIO, I assumed responsibility for other operational areas that aligned logically with IT. These were functions such as supply chain, procurement, and facilities management. This allowed Dow to create a business services group. Because I was a senior leader who knew Dow, there was a logical extension to bring environment, health, and safety [EHS] into business services. This has evolved into the chief sustainability role.

The skill sets I've built during my experience as CIO have helped in the CSO role, because both require an understanding of the strategy and making sure that resources and priorities get linked to that strategy. Effective execution depends on how you link multiple businesses to some common themes in the company and then drive a change of behavior. The enterprise-wide, cross-business-unit coordinating experience as CIO has been very useful in making the case for sustainability.

Having an enterprise-wide perspective is a strong base to build from. But it's not enough. Sustainability has to be

"Sustainable development is a combination of how you achieve economic value, along with how you integrate the environmental and social impact into strategy and operations."

personal. You can't fully succeed in this role without a fundamental belief that a company like Dow can have a significant and meaningful role to play in finding solutions to some of the major issues facing our planet. Dow is uniquely positioned to make a difference from a sustainability perspective. This is a value shared widely across our organization.

PwC: Does it create visibility that would not exist if the roles were led by separate executives?
DK: Yes, it does. As CSO, I have visibility into the linkages of how sustainability is impacting our strategy, and as CIO, I have visibility into how the strategy in turn will impact our operations.

Dow has been involved with the concept of sustainable development since the 1980s; we've had executive-level coverage of EHS for more than three decades now. As sustainability became integrated with our strategy, the sustainability executive leadership has taken on new dimensions. Today, aligning sustainability with IT and other functions reflects that.

PwC: How do sustainability concerns integrate with Dow's business strategy?
DK: We advanced on sustainability dramatically by setting 10-year improvement goals. Right now we are working toward the second set of 10-year goals, the 2015 goals we set in 2006. The relevancy of our sustainability goals is tied to our corporate strategy. Certain trends, if left unchecked, in the world, are not sustainable, whether that's energy, housing, water supply, or environmental demands of consumer growth in the emerging world. But these are challenges that the world must address, and Dow has solutions to these challenges, to enable sustainable growth.

From a strategy perspective, these are addressable markets with real business opportunity for Dow. There's value in the company picking key megatrends that have a commercial potential. Trends like sustainable energy; infrastructure needs around water, transportation and housing, or human health; and food productivity create markets that fit our core capabilities. By applying screening criteria to our investment and new product development decisions, we effectively integrate sustainability with our strategy.

PwC: It seems every enterprise is making some efforts around sustainability. What do you think separates the leaders from the pack? How does Dow maintain its leadership status on this important issue?
DK: My view is that we've matured to the point where sustainability is systematized in our business management and our operational execution. When you look at what differentiates us in terms of responsible operations, it is that we have been executing with a disciplined, company-wide metrics approach since the early 1990s—at a global level—and doing so with very specific targets. As a result, sustainability has become embedded in our operations and management systems.

Also, we've become much more extroverted about sustainability during the last four or five years. We now think about our environmental and social impact and the value of our products within a broader view around solving world challenges. The shift has been significant for us. We're building sustainability into our business leadership thinking and no longer limiting its focus to operational performance alone.

PwC: You talked about disciplined metrics. Can you provide an example and how they are used?
DK: Let me provide some context first. When we completed our goals in 2005 and looked at setting the next set of goals, we realized that we could continue to optimize our footprint for responsible operations, but it probably wasn't enough. The combination of how we listened to the outside—for instance, through our Sustainability External Advisory Council—and where we were going with our corporate strategy resulted in the next set of goals being much more externally focused. We already had metrics for setting targets around safety, emissions, greenhouse gas, and energy efficiency, and we looked at new areas around product safety, sustainable chemistry, and breakthroughs to world challenges.

Sustainability opportunity

The Dow Chemical Company increased its sales of sustainable chemistry products from 2009 to 2010, rising from 3.4 percent to 4.3 percent of all revenue. By 2015, it expects such sales to be 10 percent of revenue.

Sustainable chemistry was one area where we really wanted to work with the outside stakeholders and build their input into our thinking. Sustainable chemistry is a high-level way to look at life cycle management, the attributes of your business model, and the products you make, and then to evaluate its level of sustainability. So we created the Sustainable Chemistry Index [SCI].

PwC: How is SCI being used?
DK: There wasn't really a good methodology externally to look at life cycle and sustainable products for an entire company. Our sustainable chemistry goal allows us to look at eight attributes; three of them are risk oriented, asking questions such as: How safe is it to produce and ship a product? What is the impact, in terms of the real or perceived view, on human health? Then there are questions on energy use. What kind of material does it use? Is that material renewable and abundant? Finally, the impact or value added to society. We rate these questions and come up with a scoring system that helps us to compare, analyze, and systematically measure our progress, business by business and as a company as a whole.

When the businesses think of products and product development, they may have a great product on one of those dimensions but not necessarily on all those dimensions. SCI encourages them to continue to think about their products holistically and innovate to build more sustainable solutions.

PwC: We have come across a quotation from your CEO, Andrew Liveris. He says: "Sustainability is making every decision with the future in mind." Is SCI an example of a new metric helping to drive all decisions with the future in mind?
DK: Absolutely. SCI touches all parts of our business. There are very few perfect solutions that optimize everything, but SCI provides a view of areas where you need to improve. Sustainability is not just finding a product or business model that works on one aspect of environmental or social impact or profit. A sustainable solution needs to look holistically at all three. SCI looks at all of them collectively and shows where you have an impact and where you can make changes.

PwC: In your view, where can companies go wrong with sustainability? What should they do differently?
DK: A lot of companies still think of sustainability as: "I have my business plan. How do I layer sustainability thinking on top of that?" Our view is that sustainable development is a combination of how you achieve economic value, along with how you integrate the environmental and social impact into strategy and operations.

When we look at sustainable chemistry, we literally sit down and try to rate our products and bring the three views together. We rate a lot of variables. It's like a quality index that you can then move forward and ask: "How can we

make these products better, and how do we take our learning and put it into our next product development cycle?" The objective is to systematize sustainability so that the choices you make in material or design are right when you start a new product or business.

Another area is when companies focus only on compliance. I would say that if you start with just compliance in mind, then you never really develop a point of view of the best way to do something in an integrated manner. You're always going to argue about tradeoffs between economic and sustainable practices. You should evolve and mature so that you have a point of view of how to do something in a way that balances the three dimensions of sustainability: the economic, environmental, and social dimensions.

PwC: What is the role of IT in advancing sustainability? Does sustainability challenge the IT organization on any dimensions that are unique to sustainability as a business concern?

DK: One challenge for the IT organization is to take these trends and first integrate them back into operations. They do need to understand the context of sustainable operations inside a company. For instance, when we're looking at some of our new products, we're putting in systems to enable and model the environmental impact to provide information about how our products should be sustainably installed and used. In some sense, this is a traditional business problem in how you link and integrate information, in this case so that sustainability is systematized and embedded in operations and products.

We can look at the analogy of IT use in the 1970s and 1980s when IT was largely automating processes. Having faster systems that could monitor and analyze started to influence the business model itself over time, especially when technology advancement was greater than the underlying market trends. The trends were actually reshaping how people did work. Similar is the scope and impact of IT's role in sustainability. IT will shape how work is or will be done differently for more sustainable outcomes.

"One challenge for the IT organization is to take these [sustainability] trends and first integrate them back into operations. They do need to understand the context of sustainable operations inside a company."

Cost savings

Dow has saved $9.8 billion since 1994 from energy-efficient efforts that required an investment of less than $2 billion.

PwC: What are some open challenges from a sustainability standpoint where IT can help?

DK: When you think about the future, new business opportunity, the full life cycle of resources being used, the supply chain being built, you have to consider what happens if you're successful in a market, and achieve scale.

The need is to model questions such as: What resources are needed? What is the footprint of the supply chain? What is the end of life for the product? Such questions usually are not asked until after the product is developed and it's successful, and the result at times is unintended consequences on society or environment. Frankly, they're unintended many times because you didn't sit down and model market adoption impacts up front. IT has a role to work with domain experts to build the necessary modeling capability, to factor in to implementation plans.

Another open challenge is to understand the interfaces and quantify the relationships between the environmental, social, and financial concerns. We're working with the Nature Conservancy[1], for example, to understand those interfaces between the environment and our operations. How do you value ecosystem services? I think this is a key opportunity for us, and that's where we're still learning and IT has a role to play here.

PwC: You chair the Sustainability External Advisory Council [SEAC]. What role does this council play and how does it interact with your sustainability efforts?

DK: I think it's always necessary to get a stakeholder view from people who aren't directly in your business. For us, SEAC is a way to bring in other constituencies to get their views and perspectives on strategy and impact. We've had the external advisory board for almost 20 years now. Early on, we had a similar process with community panels locally. In the 1980s we recognized that we may have had a view of the science, but other people had perspectives different from ours. So to bring in a diversity of views, we created the global advisory council.

We try to get the council involved earlier to provide a perspective on major projects or strategy that we usually would not see in our normal market interaction. That's been very helpful. We sit down and go through major projects on strategy implementations with them and we ask: "Here's how we plan to implement. Are we thinking through this in the right way?" They'll give us input or advice, and we'll modify our thinking around that advice. It helps us to think beyond just customers and markets and consider our place in providing solutions to world challenges.

1 Background on Nature Conservancy and other partnerships can be found at: http://www.dow.com/sustainability/change

"We now think about our environmental and social impact and the value of our products within a broader view around solving world challenges."

Tapping information to drive sustainability

Peter Graf of SAP details the role information and information systems will play in driving sustainability.

Interview conducted by Vinod Baya

Peter Graf

Peter Graf is the chief sustainability officer and executive vice president of sustainability solutions at SAP. He is responsible for developing sustainable solutions that best serve the needs of SAP's global customers, while also driving sustainable operations within SAP.

During his tenure at SAP, Graf has held various management roles. Previously, Graf was the executive vice president of solution marketing at SAP. In this role, Graf was responsible for shaping the company's industry solution, application, and platform strategy.

Based at SAP Labs in Palo Alto, California, Graf holds a master's degree in computer science and economics as well as a Ph.D. in artificial intelligence.

In this interview, Graf details how sustainability is about long-term business models and what CIOs can do to give their organizations an edge.

PwC: You head the sustainability function at SAP. What does sustainability mean to SAP?

PG: In 2008, our executive board decided to make sustainability the purpose of SAP. In essence, this means we exist for the sake of helping companies manage their operations in a world where resources become scarce, prices become more volatile, consumers are connected over the Internet, environmental concerns and regulations are proliferating, and social aspects have a serious potential impact on a company's results. So, while we have always been focused on managing the resources of a company, the developments that we see in the world today force us to rethink what enterprise resource management actually means as the importance of resources shifts. One important aspect of our sustainability strategy, therefore, is our commitment to become more sustainable in our own operations. This gives us the experience and credibility in the market to be successful.

PwC: What are the core challenges for companies to move forward on sustainability?

PG: I'd say there are three key challenges today. First, companies need to look beyond pure economics and better understand the environmental and social impact of their operations. You really can't separate environmental and social concerns from your bottom line any longer—just think of recent environmental disasters or cases of social injustice. On the other side, look

"We set targets for sustainability goals and make the progress visible to encourage awareness and personal accountability."

at where companies thrive because they deliver shared value to themselves and the communities in which they operate. Second, sustainability needs to be seen as an opportunity and not only as a risk. Many companies still wait for environmental or social legislation to hit and see this as a risk, rather than trying to understand how to create competitive differentiation from sustainability. The third challenge is moving from having a sustainability strategy to making your corporate strategy a sustainable one. That's a profoundly different and much more challenging task.

PwC: How should they do that?
PG: Sustainability is about ensuring that the company can continue to deliver value in the long run. And for this to happen, all parts of the business must take sustainability into account, from procurement to manufacturing, distribution to accounting, and innovation to customer management. Therefore, making your strategy sustainable requires the company to strategically address critical areas, including operational risk (including the health and safety of workers as well as environmental compliance and incident management), resource productivity (including optimizing the use of natural resources or energy), sustainable supply chains and products, and, finally, creating a sustainable workforce. For this effort to be effectively managed, and for sustainability performance to be measured, companies invest in software.

PwC: What you're talking about is really business model transformation.
PG: Absolutely. That's why it's so interesting. We don't see transformations of this scale happen too often, but when they hit, their impact is significant. The Internet and globalization are two such transformations that are similar in scale and longevity. They create new winners (search engines, online stores on the Internet) and new losers (travel agents, book stores). So, for example, if you look at an oil company, there are two scenarios for the future. Either oil consumption will rise, prompting the company to spend more money finding oil, or people will turn to alternative sources of energy, lowering the cost of oil. So how will that company transform itself? Those are the fundamental questions, and they all start with the current focus on sustainability.

PwC: What role does software play in the sustainability trend?
PG: For me, the use of software is to (a) collect information, (b) analyze information, (c) set targets and put these targets into the organization, and then (d) operate.

Enterprises have so many choices in how they can act on sustainability. They need an optimization function that looks across all options. They can't do that without software. For example, we are using our software to manage the energy-efficiency question: "What gives me the most financial return and what other options do I have?"

We have also created an internal abatement curve using our software. This curve visually shows the financial impact of making changes across our operations. For example, my curve tells me that through the use of videoconferencing capabilities, we can remove another 39,000 tons of carbon by 2015. And for every ton that we remove, our analysis says that the company saves 654 euros. That's the bottom line financial implication.

Another example is our internal deployment of our Sustainability Performance Management software, where we track 400 key performance indicators [KPIs]. We cascade those KPIs in dashboards that we use to track our performance against goals across the course of the year. This includes leveraging these dashboards as a tool for discussion and decision making during our quarterly sustainability councils with our co-CEOs and the board.

PwC: How is information you collect in these systems being used to change the behaviors of employees?
PG: We are using software to create transparency. Every employee can go to the portal and see the computing stats, review the energy consumption trends in buildings, and discover printing data for every printer. How much has been printed in black and white vs. color? Are we printing less or more as a company or in this office? We set targets for sustainability goals and make the progress visible to encourage awareness and personal accountability.

Energy

SAP sources 48 percent of its energy worldwide from renewable sources. In Palo Alto, California, it's 100 percent renewable.

We also plan to present useful information to help influence actions. For example, when employees book a flight, we will tell them what the carbon footprint of that flight will be. Employees are empowered to take this additional information into consideration when making a decision to travel.

We are also looking at a project to see if we can break down our overall footprint on an individual basis. Employees would receive a message that says, "Your footprint in the company this year is that much, and x percent of our employees have a smaller footprint than you." Such visibility changes behavior. We already have competitions going between teams and across our global offices. All these approaches are positively influencing behavior.

PwC: What are some results of your sustainability initiatives?
PG: Just on the energy front, SAP sources 48 percent of its energy worldwide from renewable sources. Here in Palo Alto, it's 100 percent renewable—wind energy, plus the solar energy derived from the 650 panels on our roof. Collectively in the years 2008, 2009, and 2010, our energy-efficiency efforts created savings of a quarter billion dollars. We live the business case.

Last year we reduced energy consumption by 6 percent in spite of the fact that we grew revenues by 20 percent. Our goal is to reduce total emissions back to the levels of 2000 by 2020 and we're 25 percent of the way to our target already.

PwC: How should CIOs build a system to address sustainability efforts?
PG: They need to focus on three different layers. The first is a transactional layer. This is about opening up the transactional systems, so people can access the data relevant for sustainability that already exists. The second layer consists of sustainability solutions that take the data and put it into perspective so people can collect, analyze, report, set strategies, set targets, and cascade targets—all from a sustainability viewpoint. It is not just an analytical system; it's an enterprise performance management system. The third layer is putting this information into everybody's hands—in a mobile manner —so they can access this information wherever they are.

And then, finally, there's one other step that is often not understood. In today's enterprise systems, processes are designed to be linear: from extraction, production, distribution, point of sales, retail, consumption, to landfill. That's how the systems are designed. The longer-term perspective is to use enterprise systems to connect the design of a product with the recycling of a product, so that we come closer to a cradle-to-cradle view of the world.

PwC: So from a linear to a closed-loop system?
PG: Yes. It's a dramatic change and offers a completely new way of thinking about software. We can extend the edges of processes in a way that they connect. We have recycling administration, and we're also working on this idea in product life cycle management. These systems need to be designed so that they can connect.

PwC: How is this software different from systems such as ERP [enterprise resource planning] and SCM [supply chain management] and associated business intelligence solutions?
PG: It's all about visibly connecting two types of business data—financial numbers and numbers we previously didn't track. SAP, for example, has always tracked financial resources, human resources, and capacities, but the company has never tracked energy, water, wood, or any other type of natural resource. We never tracked these as there was no perceived need, because it was considered infinitely available. Now we are starting to manage these areas as a scarce resource, which is why applying enterprise resource planning and management is essential.

The existing systems, however, continue to play a role here. For example, you can go to the travel and expense system and harvest financial data about the fuel consumed by employees on the road, because that is getting expensed—you have the airlines tickets, the purchasing data, all the electricity you buy. You can harvest a lot of data that already exists, but now the next step is to put it into the context of resource constraints.

PwC: Will the impact of sustainability solutions be different from ERP, CRM [customer relationship management], SCM, and other enterprise systems?
PG: When we implement supply chain management systems, we make the supply chain planners our heroes. When we put out CRM systems, we make the head of sales and the account executives heroes. Sustainability software is about making everyone a hero in the company. It's about giving everyone that transparency and the information to make the right decisions.

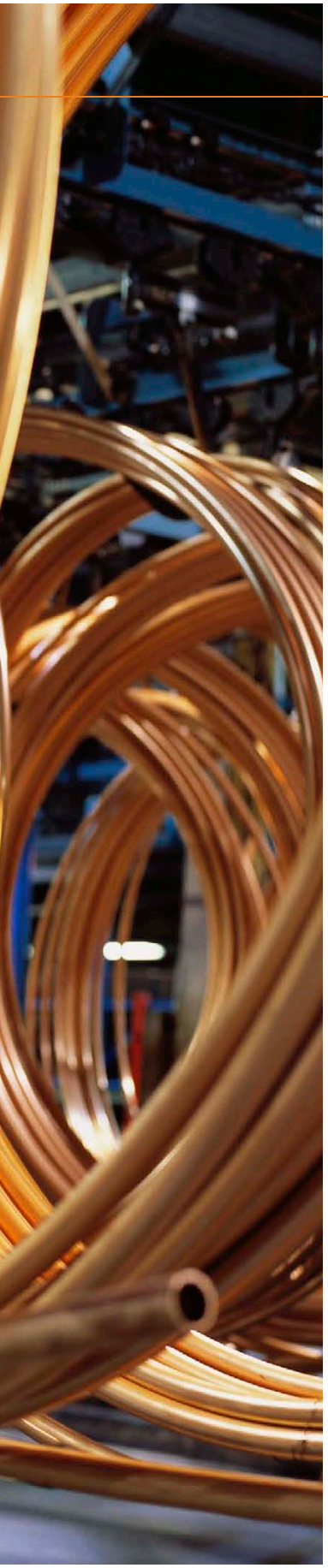
PwC: Sustainability concerns impact the full supply chain. What is the impact on the supply chain you operate in?
PG: We obviously drive sustainability requirements into our own supply chain. But for us the supply chain challenges we face are mostly downstream, not upstream. We've analyzed the 188,000 SAP systems that are in use at customer sites, and we've created visibility into the footprint of our customers' systems in energy consumption. We can see what kind of products constitute those systems.

We've also created a benchmark on energy efficiency to drive our development. Internally, when our developers create a system, we've put in a standard that manages the energy efficiency on a transactional basis. We measure how many kilowatt-hours of electricity a system needs to achieve a defined business throughput.

The developers need to write the code in a way so that it's energy efficient. And we have the first partners coming out that are now competing on this benchmark.

"The longer-term perspective is to use enterprise systems to connect the design of a product with the recycling of a product, so that we come closer to a cradle-to-cradle view of the world."

PwC: From an enterprise software standpoint, how is addressing sustainability different from other solutions?
PG: To look to the future, I think it's important to understand a key change we are witnessing today. We have mastered the flow of material. What we haven't mastered yet is the flow of information with the material. Or, for that matter, the information attached to anything that is being exchanged. Information attached to energy. Information attached to products. I'm not just saying this is the recipe or bill of material of a product; I'm saying this is the toxicity, this is the environmental impact, and so on. To put it in a nutshell, we used to live in a world where energy was cheap and information was expensive. Now, information is a resource that is becoming limitless, and energy and other environmental resources are becoming constrained. The sustainability journey is about using information to become better at managing the constrained resources.



Closing the loop on sustainability information

Key technologies for instrumenting, monitoring, analyzing, and reporting enable enterprises to advance sustainability efforts internally and across their extended value chains.

By David Kelly, Heather Ashton, and Vinod Baya

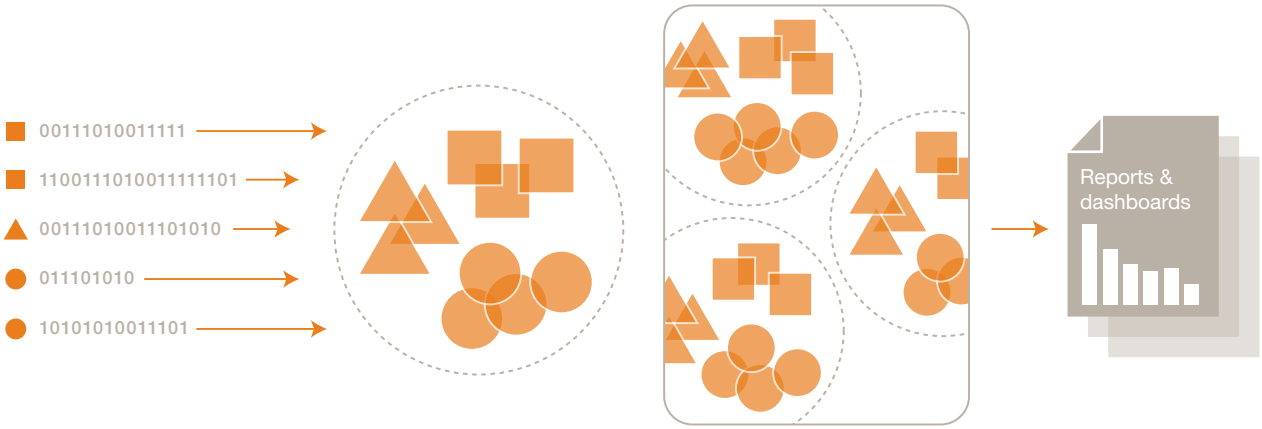
As the old adage goes, businesses cannot manage what they do not measure. Becoming a sustainable enterprise starts with information rarely or never collected in the past. Sustainability requires internal and external information sharing and collaborative efforts to track the impact of energy, water, waste, and other resources and processes (manufacturing, storage, distribution, and so forth) across the product life cycle and business operations.

Tracking and analyzing information across the life cycle—from design to shipping to disposal to reuse—is the only way to fully understand and begin to achieve sustainability goals. Taking more modest steps focused on efficiency will also deliver measurable results. According to The Climate Group, information technology has the potential to deliver emissions savings of 15 percent (the equivalent of 7.8 billion metric tons of CO_2e) from global emissions by 2020, largely by improving efficiency across economies.[1]

As discussed in the article, "Sustainability: Moving from compliance to leadership," on page 06, the role of IT is to create visibility and feedback across the enterprise and extended value chains so that sustainable practices become embedded in ongoing operations. Doing so will support the staff engagement with sustainability and will support the creation of closed-loop feedback systems that drive changes in design, sourced material, and business processes to improve sustainability. Visibility is about consumption, waste, labor practices, and so on, and feedback is about the impact of decisions or changes. Over time, this coordinated use of information will embed sustainability practices in enterprise operations, rather than positioning sustainability as a separate compliance or reporting activity as it is in most enterprises today.

1 The Climate Group, *Smart 2020: Enabling the low carbon economy in the information age*, 2008.

Figure 1: Emerging technologies that collectively can advance sustainability efforts and objectives



Instrumentation technologies:
Sensors and related advancements that surface sustainability information to allow downstream analysis and management

Enterprise sustainability planning systems:
Systems that aggregate, record, track, and analyze information on environmental and social resources within the enterprise to plan and manage these resources

Value chain–oriented processes and technologies:
Mechanisms to surface and share sustainability information across the extended value chain to create visibility and feedback

Sustainability reporting technologies:
Generation of reports for ongoing management, compliance, and feedback to all stakeholders

PwC identifies four key emerging information technology areas to address enterprise sustainability. These four areas span the life cycle of information from where it is created to where it is reported, as shown in Figure 1.

- ***Instrumentation technologies*** help surface and collect information germane to sustainability.
- ***Enterprise sustainability planning (ESP) systems*** provide a broader context for aggregating, managing, and analyzing captured information.
- ***Value-chain–oriented processes, practices, and technologies*** help organizations extend strategic sustainability efforts beyond internal corporate boundaries.
- ***Sustainability reporting technologies*** can take the aggregated information and provide performance metrics to stakeholders.

Instrumentation

Most enterprises have little experience—and no mechanisms—for collecting data about the environmental and social impacts of their products and operations. Current efforts to collect sustainability-related information are manual and nonstandard. Emerging instrumentation methods bring the promise of allowing organizations to move away from ad hoc, manually oriented accounting to more automated solutions. "As much as you can, you want to remove that manual portion of the process and just have the energy data feed directly into the system," says Ryan Whisnant, director of sustainability at SunGard. "I would anticipate that we're going to see more and more moves in that direction."

For example, by using devices that have complex sensing software to track and communicate resource consumption and movement, companies can gain a much better understanding of their energy usage habits and may be able to respond to market volatility with intelligence that can lead to strategic decisions.

Through enhancements to areas such as heating, ventilation, cooling, and control systems, companies can improve their visibility of information about energy consumption in buildings and facilities. According to one estimate, heating, ventilation, air conditioning, and lighting are responsible for more than 70 percent of a building's energy consumption.[2] Building automation and control companies such as Honeywell, Johnson Controls, Schneider Electric, and Siemens offer instrumentation products and systems aimed at greater control over new or existing buildings. Emerging end-user products such as smart thermostats from Nest and Ecobee allow control via the Internet and learn over time to save energy.

The more advanced version of energy instrumentation is part of the smart grid vision. The smart grid is a concept to promote more responsible, reliable, and strategic use of energy resources. Smart grids are intelligently integrated electrical networks that not only distribute electricity but also provide much richer monitoring and measurement capabilities that will encourage more sustainable practices. This is accomplished by placing sensing, control, and reporting devices at all points along the energy chain, creating a closed feedback loop that helps suppliers understand customer usage patterns, respond to events that occur anywhere in the energy chain, and provide incentives for changing consumption patterns to reap savings on energy prices.

Many initial efforts in instrumentation are limited. For example, often a latency of data flow—sometimes as long as 24 hours—prevents some early smart meter architectures from enabling quick response. In an ideal situation, the data would trigger an immediate adjustment to energy flows, driving higher efficiencies, leveling consumption patterns to avoid extremely high peaks, or preventing blackouts.

To facilitate the collection and real-time reporting of information related to resource consumption, many businesses have begun to use the smartphone. With its GPS capabilities, the ubiquitous smartphone is evolving into a platform for the instrumentation of corporate resource management.

For example, CarbonTrack is an iPhone application offered by SAP that allows users to track carbon footprints from daily commuting or business trips.

Enterprise sustainability planning applications

The next component in the strategic approach to sustainability is to manage all the information that can quantify, track, analyze, and provide feedback and visibility into sustainability performance and lead to appropriate business decisions. Applications for managing environmental resources are known in the market by many names—carbon management, energy management, and energy and resource management, among others. With origins in measuring greenhouse gas, energy usage, or carbon footprint, these applications aspire to manage all environmental resources such as water, precious metals, waste, and so on, as well as social impact. For the purpose of the discussion in this article, PwC calls this application category enterprise sustainability planning (ESP) software.

With an enterprise sustainability planning solution implemented throughout a global enterprise, companies can consider information in the context of business operations, linking resources such as water and energy to products and services across their life cycle.

2 Joe McKendrick, "Smart buildings: the first 'killer app' for smart grid?" *SmartPlanet*, April 26, 2011, http://www.smartplanet.com/blog/business-brains/smart-buildings-the-first-8216killer-app-8217-for-smart-grid/15295.

Table 1: Emerging features and functions of enterprise sustainability planning (ESP) solutions

Features commonly available in most ESP products today	Emerging features available in leading ESP products today	Features to expect in the future from ESP products
• Data collection from multiple sources • Auditing of data sources and quality • Visualization of consumption, with the ability to drill up and down • Reporting on sustainability performance • Software-as-a-service delivery • Forecasting of sustainability performance • Tracking of consumption on dashboards • Prebuilt analytics	• Automation of data collection • What-if scenario analysis • Decision support • Project and portfolio management of sustainability initiatives • Support for value chain visibility and tracking • Modeling capability for facilities and operations	• Real-time capture and feedback to operations • More granular data that is identified to tasks, components, individuals • Modeling and analysis of impact of changes on sustainability performance • Embedding of sustainability metrics in operational systems • Benchmarking across enterprises and customers • Carbon trading and brokering

This list is not exhaustive, but is a snapshot of the features and functions that are evolving as the market takes shape.

Source: PwC analysis

In their short lifetime, ESP applications have quickly evolved as a key system of record for corporate sustainability. The features and functions these products offer are evolving rapidly. Table 1 provides a list of features that can be expected now and in the future from this class of solutions. For most enterprises, the journey of using these solutions starts with implementation in local facilities or departments. However, the tools create the most value when metrics, visibility, and impact occur at the enterprise level.

With an ESP solution implemented throughout a global enterprise, companies can consider information in the context of business operations, linking resources such as water and energy to products and services across their life cycle. In addition to tracking resource consumption, the objective of ESP solutions is to help CIOs and business leaders place a value on these resources and then find ways to enable innovations in sustainable products, reduce consumption, mitigate exposure, and change business practices to optimize resource use. "Enterprises have so many choices in how they can act on sustainability. They need an optimization function that looks across all options. They can't do that without software," says Peter Graf, chief sustainability officer at SAP. Modeling and analysis capabilities in ESP solutions allow businesses to target the most optimal returns.

Because sustainability is a relatively new category for enterprise applications, the nascent market is approached from various entry points, each with its own frame of reference, but there are already more than 100 vendors. Table 2 provides a sampling of vendors and their areas of focus.

The opportunity for the vendors is to make energy and other environmental resources something that enterprises manage in a more automated manner. "The energy sector has really never leveraged information technology in a meaningful way," says Amit Chatterjee, founder and board member of Hara Software. "At Hara, as we engage with our customers, we find that after all these years of Internet communications, there's still a lot of use of paper, phone, and fax," Chatterjee continues, suggesting the potential for automation.

Table 2: A sampling of enterprise sustainability planning (ESP) solution vendors

Vendor	Heritage	Solutions and solution components	Strengths
C3	Emerging vendor founded in 2009	The C3 Enterprise Energy and emissions management solution includes the following products: C3 Energy, C3 Sustainability, C3 Mitigation, C3 Incentives, and C3 Foundation (includes C3 Modeler)	Solutions focus on optimizing the energy value chain, from generation to consumption, using data, metrics, and analytics. Transforms energy into a strategic asset through financial optimization.
Climate Earth	Emerging vendor founded in 2007	Solution for environmental business intelligence and footprinting system for supply chains, product carbon modeling, and supplier metrics	The solution focuses on impact from the supply chains; environmental impacts are quantified cradle to gate and are integrated with financial data. The company recently released a supply chain water management extension.
Enablon	Environment, health, and safety vendor	Six suites: Corporate Responsibility, Sustainable Supply Chain, Energy and Carbon Management, QEHS Performance Management, Risk Management and Internal Control, and Corporate Governance and Legal Management	Solutions also focus on non-environmental concerns such as labor practices and anticorruption initiatives; common architecture and data model across all modules.
Enviance	Emerging vendor founded in 1999	Environmental ERP solutions for greenhouse gas (GHG) and carbon accounting, sustainability and CSR, environmental regulatory compliance, health and safety, and enterprise performance management	Users can perform financial risk assessments based on environmental performance. Solutions include access to applications on mobile devices.
Hara Software	Emerging vendor founded in 2008	Hara Environmental and Energy Management (EEM) applications include the following: Discover, Plan, Act, Innovate, and Value Chain	Solutions provide benchmarking information on sustainability successes across an enterprise and its customers. The Value Chain module allows users to track supplier sustainability efforts, creating a transparency-to-results process.
Honeywell	Established facilities management vendor	Cirrus Environmental Information System (EIS) and Predictive Emissions Monitoring System (PEMS)	Tight hardware and software integration with a building automation and control system provides real-time visibility and control of energy usage.
IHS	Established technical information and analysis vendor	Environmental sustainability management products span environmental compliance, health and safety, GHG and energy, corporate responsibility, product stewardship, and incident/crisis management	Related solutions in energy & power, design & supply chain, defense, commodities, and forecasting complement the sustainability solutions for tighter integration with decision support and related analytics.
Johnson Controls	Established facilities management vendor	Panoptix building efficiency system and Metasys Building Management System	Real-time visibility and control of energy usage; open system platforms that provide for third-party system integration.
Oracle	Established enterprise applications vendor	Several solutions across three areas: risk and performance management, business operations, and IT infrastructure	Tight integration with Oracle ERP and Oracle Business Intelligence tools enables the embedding of sustainability concerns in enterprise operations.
SAP	Established enterprise applications vendor	Several solutions across sustainability performance management, EHS, carbon management, sustainability analytics, green IT, carbon impact, and recycling compliance for products and packaging	Tight integration with SAP's ERP and analytics solutions enables the integration of sustainability performance in operations. The Carbon Impact solution enables a focus on product life cycle analysis.

This list is not exhaustive and is not an evaluation of vendors' products, but is a snapshot of evolving capabilities as the market takes shape.

Abbreviations:

ESP = Enterprise sustainability planning

ERP = Enterprise resource planning

EHS = Environment, health, and safety

GHG = Greenhouse gas

QEHS = Quality, environment, and health & safety

CSR = Corporate social responsibility

Source: Websites of respective companies, 2011

"Enterprises have so many choices in how they can act on sustainability. They need an optimization function that looks across all options. They can't do that without software."

—Peter Graf, SAP

The opportunity for enterprises is to embed sustainability in operations, much like financial processes are. "With modest extension to existing processes, one can incorporate sustainability impact into the standard process," explains Jon Chorley, chief sustainability officer of Oracle Corporation. This has many advantages. "With this discipline, we will have traceability to the data source, ability to reconcile information, all without a parallel business process or training of people," Chorley continues.

Facilities play a large role in energy consumption and sustainability practices. Therefore, facilities and building energy management vendors are moving into the ESP market. Because these vendors—Honeywell, Johnson Controls, and Siemens, among others—also provide instrumentation solutions, their ESP solutions can be set up to automate data collection by pulling it directly from facilities or utility providers.

Enterprise resource planning (ERP) vendors, such as SAP and Oracle, also provide ESP solutions. Because the ability to collect data from a vast array of sources across the enterprise is critical to this application category, an ERP vendor has extensive experience to contribute.

Vendors focused on governance, risk, and compliance (GRC), as well as environment, health, and safety (EHS), have been making inroads into sustainability as well. In this category, Enablon, Enviance, MetricStream, and IHS are active. By tracking a variety of environmental performance data, they enable users to assess the financial risks a company faces based on environmental resource usage profiles.

Juxtaposed with these vendors are various pure-play startups in sustainability: CarbonView, ENXSUITE, Hara Software, Locus Technologies, Verisae, and others offer ESP solutions to tap into the market for energy tracking and corporate sustainability. Being pure-play companies, their opportunity is to seed new processes for sustainability.

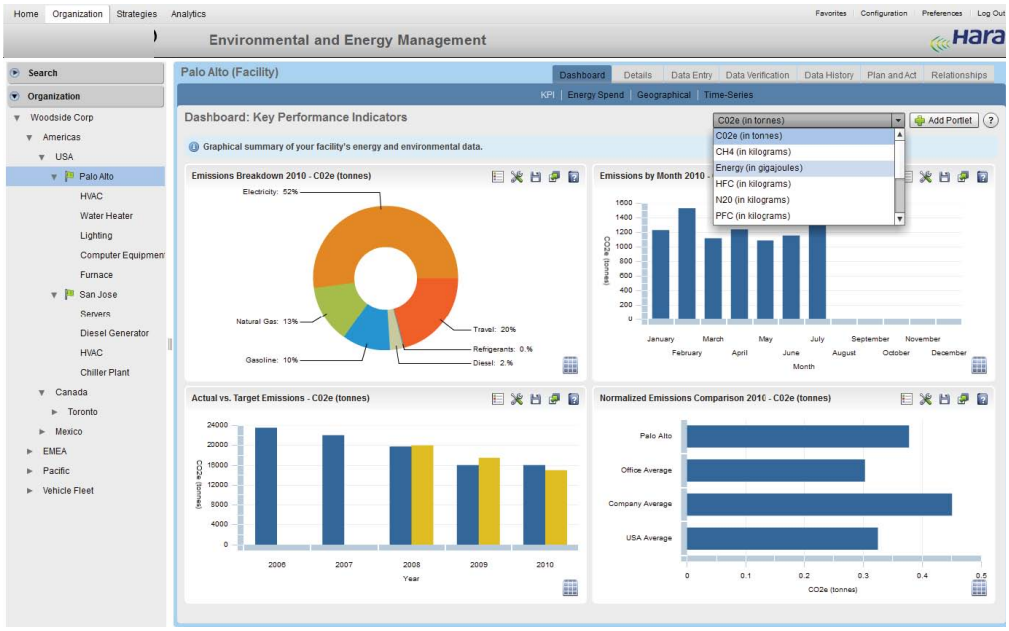
"The net effect [of ESP systems] is providing an enterprise-wide view of their current spend, which I call a transparency-to-results process," Chatterjee says. The results are often visualized on dashboards that bring together sustainability information and put it in the context of business operations, as shown in Figure 2 from Hara Software. Users can establish monthly "maximum emission" goals and can monitor their progress against personal goals for reducing their carbon footprint.

In the market for monitoring structures, ECODE from EcodeOnline.com and Path to Net Zero from Kingspan Insulated Panels are two examples of smartphone applications aimed at sustainability. ECODE provides access to green building resources, including information about products and a carbon footprint calculator that tracks energy usage, such as electricity, oil, automobile gasoline, airline travel, and recycling behavior. Path to Net Zero is a free tool for architects to simulate the process of improving the energy efficiency of buildings.

As sustainability vendors continue to explore ways to use new platforms, such as mobile, the instrumentation will continue to evolve. The proliferation of smart devices at all points along the energy chain will enable businesses to optimize everything from new building plans to employee travel choices that contribute to reducing their carbon footprints.

Figure 2: Example of a dashboard providing sustainability information in the context of business operations

In this case, the dashboard shows the emissions breakdown in operations in various geographies by type of energy source, usage over time, progress toward a goal, and comparison with various benchmarks.



Source: Hara Software

Value chain mechanisms to drive sustainability

For many enterprises, an estimated 70 percent of the carbon footprint is in the value chain. Thus, the value chain holds the key to transformational business practices that will impact a company's total footprint. "Real value is created for the full energy value chain by having two-way visibility and collaboration between the supplier and user," explains Pat House, senior vice president of strategy at C3, suggesting that sharing and collaboration within the value chain are essential to improving sustainability performance. Various mechanisms and approaches have emerged to create visibility and feedback in value chains for sustainability.

They include the following:

- ESP vendors focusing their solutions on the value chain
- Industry groups leading the creation of standards, frameworks, and information systems for sustainability in specific verticals
- Life cycle analysis applications, which model and account for resource use during the life cycle of any product from cradle to grave or cradle to cradle
- Approaches that affect sustainability during the design of the products

ESP solutions focusing on value chains

Although they offer solutions for the enterprise, some ESP vendors concentrate primarily on managing sustainability-related information from the value chain. C3, with its initial focus on the electric energy industry, expects sustainability to be an information-driven transformation of the value chain. "The solution [to sustainability challenges] is … providing an information-driven transformation so that resources can be managed as strategic assets across the entire energy continuum from generation through transmission and distribution to end-user consumption," explains Pat House of C3.

> ***"With modest extension to existing processes, one can incorporate sustainability impact into the standard process."***
>
> —Jon Chorley, Oracle

Other vendors, such as Climate Earth and Trucost, bring more of a financial focus to understanding impact from the value chain. In addition to quantifying the environmental impact, they put a price on the impact so that the sustainability performance can be understood in financial terms. Both use environmental databases with profiles or flows of industry sectors or value chain activity to determine their valuation.

Industry groups get involved

Recognizing that the achievement of many sustainability goals requires the cooperation of the supply chain, industry groups are forming to emphasize the information sharing aspect. "Retailers want to know about their suppliers' energy and greenhouse gas emissions, waste generation, the materials they're using, and where those materials are sourced from. Also, each supplier wants similar information of their suppliers, and so on. One of our objectives is to make sure that they have rapid access to accurate information," says Adam Siegel, vice president of sustainability at the Retail Industry Leadership Association, which represents retailers in the United States.

The role of industry groups is to ensure a systematic, collaborative approach to sustainability, preventing duplicated efforts, confusion, and disparate goals. They accomplish such objectives by creating standards, methods, and systems to facilitate the sharing of information. Table 3 shows a sampling of industry organizations that facilitate information sharing and their focus.

The life cycle approach

Life cycle assessment (LCA) applications constitute another technology sector that has become a primary information source for sustainability efforts. Product-based companies have used LCA tools for nearly two decades, and the tools require expert practitioners trained in the software. LCA tools focus on a particular product and its footprint across the value chain. A key strength of LCA is that it studies whole product systems, which enables businesses to avoid mitigating one environmental impact while exacerbating another. LCA vendors include GaBi Software, EcoScan, SimaPro, and Umberto.

Table 3: Industry groups facilitating information sharing and collaboration in value chains

Group name	Mission	Focus	Representative members	System/standard supported
AIAG (Automotive Industry Action Group), Corporate Responsibility Initiative	Provide all stakeholders access to information, education, and the tools needed to continually improve the environments in which they operate	Set standards to decrease cost and confusion in the reporting process. Surface product issues and resource savings for suppliers and OEMs	CAT, Chrysler, Ford, GM, Honda, Nissan, Toyota	Design, implement, and manage systems to address all regulatory and customer issues
BICEP (Business for Innovative Climate and Energy Policy)	Work directly with key allies in the business community and with relevant members of the US Congress to pass meaningful energy and climate change legislation	Provide an arena for businesses to advance climate and energy policies that counter the far-reaching risks and challenges posed by global climate change	This group is coordinated by Ceres. Representative members: Ben & Jerry's, eBay, Gap, Levi Strauss, Nike, Starbucks, Timberland	
Carbon Disclosure Project (CDP)	Accelerate solutions to climate change and water management by putting relevant information at the heart of business, policy, and investment decisions	Extend awareness beyond direct emissions to include climate change risks and opportunities across the supply chain	More than 3,000 organizations across the globe report their emissions, water use, and climate change strategies through CDP	Global process for supply chain disclosure
Ceres	Integrate sustainability into day-to-day business practices for the health of the planet and its people	Formed after the 1989 Exxon Valdez oil spill, Ceres created a 10-point code of corporate environmental conduct	AFL-CIO, Environmental Defense Fund, Friends of the Earth, National Wildlife Federation, Rockefeller Financial Asset Management	GRI (Global Reporting Initiative)
EICC (Electronic Industry Citizenship Coalition)	Promote an industry code of conduct for global electronics supply chains to improve working and environmental conditions	Develop and manage a code of conduct that encourages broad adoption of corporate social responsibility (CSR) best practices	Adobe, Apple, Dell, EMC, HP, Intel, Microsoft, Oracle	E-TASC (Electronics-Tool for Accountable Supply Chains), Carbon Reporting System (Enablon), VAP (Validated Audit Process)
GeSI (Global e-Sustainability Initiative)	Started in 2001 to further sustainable development in the information and communications technology (ICT) sector	Foster global and open cooperation and promote technologies that foster sustainable development	Alcatel-Lucent, AT&T, Cisco, Deutsche Telekom, HP, Lucent, Microsoft, Motorola, Sprint, Swisscom, Verizon	E-TASC (Electronics-Tool for Accountable Supply Chains), VAP (Validated Audit Process)
GSCP (Global Social Compliance Programme)	To harmonize existing efforts and deliver a common, consistent, and global approach for the continuous improvement of working and environmental conditions in global supply chains	Encourage buying companies' engagement and direct participation; these companies include retailers and brand manufacturers in textiles, electronics, toys, furniture, food, footwear, etc.	Carrefour, Chiquita, Dole, Globus, HP, IKEA, Tesco, Wal-Mart	GSCP Reference Tools
Retail Sustainability Initiative, Retail Industry Leaders Association (RILA)	Lead the retail industry in the development of solutions to environmental compliance and sustainability challenges; promote, share, and collaborate on sustainable practices in the retail industry	Focus on the following five areas: communicating, reporting, and engaging; energy and greenhouse gas (GHG) emissions; environmental compliance; product and supply chain; waste and recycling	Costco, IKEA, REI, Target, Wal-Mart; 9 of the top 10 US retailers are members	Conferences and committees so far; standards under development
Sustainable Apparel Coalition	To reduce the environmental and social impacts of apparel and footwear products around the world	Foster pre-competitive collaboration that can accelerate improvement in environmental and social performance for the industry	Adidas, ASICS, Gap, Hanes, H&M, Levi Strauss, Nike, Nordstrom, Timberland, Wal-Mart	Sustainable Apparel Index

Source: Websites of respective industry organizations, 2011

Table 4: Design tools supporting product design and value chain interactions

Name of tool	Developed by	Details	Comment
Environmental Apparel Design Tool	Nike	Helps apparel designers evaluate waste, energy, toxics, and water in materials and the manufacturing of products during design. Web-based tool; free to all.	Open source tool provided by a brand
Eco Index Tools	Outdoor Industry Association	Provides companies throughout the value chain a way to benchmark and measure their environmental footprint, and to identify areas for improvement and decisions on sourcing and product life cycles.	Open source tool provided by an industry association
Eco Materials Advisor	Autodesk	Provides an easy-to-read dashboard display that shows key indicators, such as energy usage, CO_2 footprint, water usage, and materials cost. Users can explore the effect of material choices or design on a digital prototype's footprint.	Vendor-provided tool
SolidWorks Sustainability	Dassault Systèmes	Measures the environmental impact over the life cycle of a product in terms of four factors: carbon footprint, air acidification, water eutrophication, and total energy consumed. A dashboard displays the current value and offers alternative choices.	Vendor-provided tool
Windchill Compliance	PTC	Tracks and manages the compliance of products, beginning early in the innovation process and continuing throughout the product life cycle.	Vendor-provided tool

Source: PwC analysis and vendor/company websites

Taking a design approach

As much as 60 percent of a product's environmental footprint is established in the design phase.[3] Therefore, some enterprises have chosen to use a design tool to facilitate information sharing and feedback in the value chain. Table 4 shows examples of solutions that create visibility into environmental impact during design.

Nike has created a web-based program it calls the Environmental Apparel Design Tool. (See Figure 3.) The tool helps apparel designers evaluate waste and toxins generation, as well as energy and water consumption in sourced materials and in manufacturing. It makes these issues visible at design time, allowing companies throughout the supply chain to benchmark and measure the environmental footprint of their products, so they can identify areas for improvement and make informed sourcing and product life cycle decisions.

Industry groups, too, can approach sustainability from a design perspective. The Outdoor Industry Association has developed Eco Index, a tool[4] that helps companies reduce their environmental impact.

Vendors of CAD/CAM and other design software, such as Autodesk, Dassault Systèmes, and PTC, are working to extend their capabilities into sustainability modeling. These tools will help product design engineers determine carbon footprint, energy consumption, and the impact of raw material selection from sourcing through manufacturing, use, and disposal.

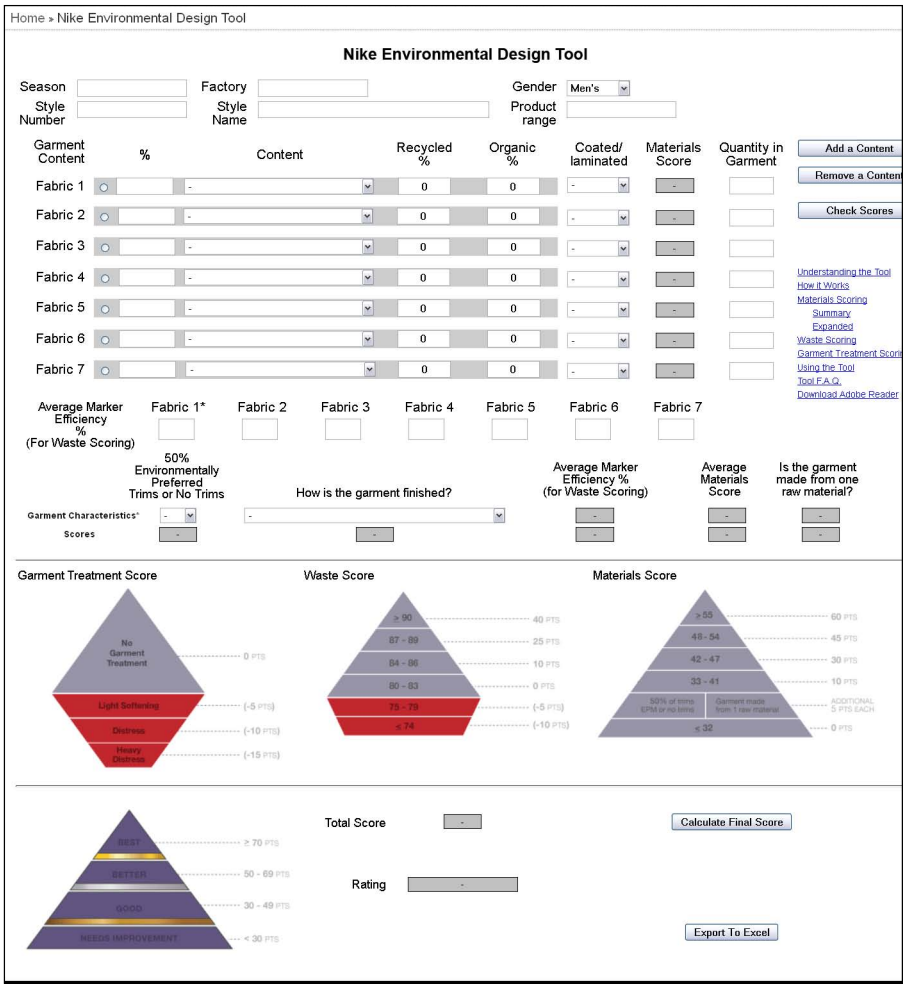
Although internal resource management and energy-conscious business decisions will continue to be areas where companies use technology to contribute to sustainability efforts, the real impact will need to be at the value chain level. PwC expects the technology offerings to mature during the next several years as companies search for the best way to involve their trading partners upstream and downstream in sustainability efforts.

3 Summer Rayne Oakes, "How the Eco Index is Leading Apparel to a Green Future," GreenBiz.com, July 7, 2011, http://www.reuters.com/article/2011/07/07/idUS377990781520110707.

4 http://www.outdoorindustry.org/gov.csr.ecoindex.html

Figure 3: Nike's Environmental Apparel Design Tool

Nike's Environmental Apparel Design Tool helps the company's supply chain partners get feedback on their environmental footprint and make sustainable choices of fabrics and chemicals used in manufacturing.



Source: http://www.nikebiz.com/Pages/CalculatorPage.aspx

Sustainability reporting

To successfully implement a sustainability strategy, IT organizations also need to focus on the technologies and tools that enable different stakeholders (employees, consultants, business partners, government agencies, and more) to obtain and analyze sustainability data. Sustainability reporting should make a clear link between corporate financial reporting and corporate environmental, social, and governance (ESG) objectives.

Reporting provides feedback in a closed-loop system. "Sustainability is not a separate thing; it is integrated into the strategy," says Tom Sedory, IT director of strategy and sustainability at Nike. "Reporting is critical in that it gives an opportunity to pause, gain insights, and learn to drive our strategy."

Sustainability reporting comes in different forms. For example, most ESP solutions have modules for generating sustainability and regulatory reports. However, organizations may also

"Real value is created for the full energy value chain by having two-way visibility and collaboration between the supplier and user."

—Pat House, C3

want to consider a range of diverse sustainability reporting standards, or take advantage of solutions from software vendors that focus primarily on the generation of Extensible Business Reporting Language (XBRL)-based, standards-oriented reports.

Standards

What constitutes a sustainability report depends on the audience and on the standards or expectations the report must address. Currently, there is no mandatory single standard for sustainability reporting. Instead, a range of standards from industry organizations or governmental agencies define different types of reports. In many cases, sustainability reports will be used in conjunction with traditional financial or investor reports. Table 5 provides perspective on some of the major standards.

Sustainability reporting standards will continue to evolve. However, organizations will want to monitor the progress of standards from organizations such as Global Reporting Initiative (GRI) and Ceres, which may have the largest overall impact. GRI is widely regarded as a defacto standard. While an increasing number of enterprises are releasing sustainability reports, over the long term the trend is toward integrated reports, also called triple bottom line. Integrated reports bring together economic, environmental, and social impact information in a single financial report. In May 2011, PUMA released the first environmental profit and loss (P&L) statement that provides environmental impact in financial terms. The company plans to release a social P&L later in 2011.

XBRL reporting software vendors

In addition to various sustainability standards, organizations may also consider turning to XBRL and XBRL-based reporting applications. XBRL is a flexible business reporting language and open standard for communicating business information. Based on the Extensible Markup Language (XML), XBRL is developed by XBRL International, which includes organizations and government agencies.

While XBRL is a collection of open standards and specifications, several software vendors now provide XBRL-based reporting applications for a range of uses, from financial and US Securities and Exchange Commission (SEC) filings to economic policymaking. To date, XBRL has frequently been applied to financial information, yet global initiatives are extending it to nonfinancial areas such as sustainability reporting.

With the need for collecting, sharing, and analyzing information across value chains and different potential user populations, XBRL is a strong fit for sustainability-oriented reporting, including requirements such as triple bottom line reporting. From an industry perspective, this market is still maturing, with no clear leader.

One way XBRL supports sustainability is through specific taxonomies that define how data is reported. For example, the GRI has created a GRI taxonomy for XBRL that incorporates the GRI Sustainability Reporting Guidelines, while the Spanish Association of Accounting and Business Administration has released an XBRL taxonomy for social responsibility scorecards.

Table 5: A sampling of sustainability management and reporting standards

Name of standard	Governing body	Focus	Description
Carbon Disclosure Project (CDP)	Carbon Disclosure Project	Help large organizations monitor and reduce their carbon footprint and communicate that to the investor and analyst communities	Acts on behalf of 551 institutional investors, holding US$71 trillion in assets under management and some 50 purchasing organizations.
Facility Reporting Project	Ceres	Sustainability at individual facilities	US-based standard for reporting on sustainability efforts and metrics at individual facilities.
GHG Protocol for Product Life Cycle Accounting and Reporting	World Resources Institute (WRI)	Report on greenhouse gas (GHG) emissions and removals associated with a specific product	A general framework for companies to make informed choices to reduce greenhouse gas emissions from the products (goods or services) they design, manufacture, sell, purchase, or use.
GHG Protocol for Project Accounting	World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD)	Greenhouse gas reporting	International accounting protocol for quantifying and managing greenhouse gas emissions. Provides a framework for almost all GHG standards and programs.
GHG Protocol for Scope 3 Accounting and Reporting	World Resources Institute (WRI)	Report on scope 3 (indirect emissions resulting from value chain activities) GHG emissions	Standardized step-by-step approach to help companies understand their full value chain emissions impact so they can focus efforts on the greatest GHG reduction opportunities.
Global Compact (UNGC)	United Nations	Policy initiative to align organizations in the areas of human rights, labor, environment, and anticorruption	A framework for CSR reporting. Provides 10 principles for companies to report against. Can support triple bottom line reporting.
Global Reporting Initiative (GRI)	Global Reporting Initiative network	General sustainability reporting, including environmental, social, and governance	GRI's G3 Sustainability Reporting Framework is one of the leading sustainability reporting standards. In addition to environmental reporting, GRI also covers social and economic aspects.
ISO 14000 series	International Organization for Standardization (ISO)	Report on how the processes for producing a product negatively affect the environment (air, water, or land)	Used to design and implement effective environmental management systems. Includes frameworks that emphasize continuous improvement.
SA 8000	Social Accountability International (SAI)	Audit and report on employee rights and working conditions	Based on rights defined by UN and various international labor organizations. Covers child labor, forced labor, wage, discrimination, and other concerns.
XBRL	XBRL International	General reporting	XML-based standard for corporate financial reporting that has been extended through different taxonomies to include sustainability information.

Source: Websites of respective standards, 2011

Rivet Software is one example of a vendor providing XBRL reporting solutions that can support sustainability requirements. Sustainability data collected throughout an organization or by other applications can be mapped into an XBRL taxonomy and exported into an XBRL reporting solution, such as Rivet's Crossfire. Putting sustainability data into XBRL can make it possible to integrate different sets of data, such as GRI Indicator data with SEC GAAP data. This integration enables users to drill down and across different data sets to analyze and understand correlations.

While many organizations consider XBRL reporting solutions a baseline for financial reporting, such solutions can also pay off in other types of reporting. Future development of XBRL solutions and increased refinement and use of sustainability-oriented XBRL taxonomies such as GRI's will simplify the use of sustainability metrics, processes, and practices.

Conclusion

The role of technology is to create visibility into the consumption of environmental and social resources so enterprises can engage with the information to transform products, processes, and related practices to optimize resource consumption and embed sustainability sensitivities in ongoing operations.

Emerging technologies span the information life cycle from instrumentation to the management of the enterprise footprint and through the management of the value chain impact and reporting. As enterprises continue to strive toward integrated reports that include the triple bottom line, they will need to rely on these developing technologies to achieve sustainability goals.

The proliferation of smart devices will drive instrumentation that supports the capture and surfacing of data about resources such as energy, water, and wood. ESP systems will continue to provide the enterprise-level systems for this information, helping to turn it into actionable, strategic data that can lead to dynamic business decisions. These ESP solutions will also link to and eventually support the management of value chain sustainability efforts, in which companies move away from information silos and toward a flow that supports the cradle-to-cradle nature of the product life cycle.

PwC expects forward-thinking organizations to continue to drive sustainability initiatives across the value chain, whether through industry groups, trade associations, or within a specific value chain. Technologies such as life cycle analysis, design tools, and XBRL reporting will continue to support these efforts. Eventually, these technologies will coalesce into a streamlined methodology for surfacing, capturing, measuring, tracking, and optimizing resource consumption patterns across industries. At that point, the promised benefits of sustainability can finally be realized.

"The net effect [of enterprise sustainability planning systems] is providing an enterprise-wide view of their current spend, which I call a transparency-to-results process."

—Amit Chatterjee, Hara Software

Transforming energy value chains for sustainability

Pat House of C3 shares how information can transform energy value chains to be more sustainable.

Interview conducted by Vinod Baya and Bo Parker

Pat House

Pat House is the co-founder, vice chairman, and senior vice president of strategy at C3. She co-founded and served as vice chairman and executive vice president of Siebel Systems. Before joining Siebel Systems, she held managerial and executive positions at Verbatim, Oracle, and Frame Technology. House is chairman of the Mary Mae Foundation, a nonprofit organization providing affordable housing for teachers, and she is a member of the board of directors of First Virtual Group, the Hewlett Foundation, and The Carnegie Endowment for International Peace.

In this interview, House discusses how optimizing resources across the energy value chain can help organizations achieve their financial, operational, and environmental goals.

PwC: From a sustainability perspective, what is the challenge that you are addressing for businesses?

PH: Two market forces—volatile energy costs and stakeholder pressures to cut greenhouse gas [GHG] emissions—are creating a new business and public mandate to make energy and emissions a management priority. As organizations increasingly focus on controlling their energy costs, they also face intensifying pressure from stakeholders—including investors, customers, employers, and regulators—not only to disclose their GHG emissions, but also to substantially reduce them.

To redefine the way in which they manage energy and emissions, many organizations are increasingly taking a systematic, data-driven approach. A primary challenge is that energy and emissions data typically are fragmented across multiple sources, locations, formats, and owners. There is no consolidated data repository, nor is there a system in place to centrally manage energy and emissions across the enterprise.

PwC: What is the solution to these challenges?

PH: The solution is the systematic application of information technology to monitor, mitigate, and monetize resources within an enterprise and across its value chain. C3 is delivering enterprise software applications and content libraries that enable organizations to optimize their energy and emissions strategies and meet their sustainability goals.

"Two market forces—volatile energy costs and stakeholder pressures to cut greenhouse gas [GHG] emissions—are creating a new business and public mandate to make energy and emissions a management priority."

There is a growing awareness among organizations that the efficient use of energy and other resources, and the resulting reduction in emissions, is a requirement for continued market leadership. Organizations are therefore seeking a road map and a robust set of solutions to strategically source, manage, and ultimately reduce their energy consumption and emissions, providing an opportunity to simultaneously reduce costs and improve business performance.

The solution is to enable an energy and emissions optimization cycle—essentially providing an information-driven transformation so that resources can be managed as strategic assets across the entire energy continuum from generation through transmission and distribution to end-user consumption. What organizations need is the ability to do so in a structured, systematic, and automated manner, providing capabilities to collect, analyze, benchmark, and report energy and emissions data, as well as evaluate, optimize, and report on energy and emissions mitigation projects. We have designed our product family to do so.

PwC: Why should enterprises manage these resources? Isn't meeting regulations adequate?
PH: Organizations face increasing financial and operational pressures from energy costs and price volatility, as well as from investor, customer, and regulatory concerns about emissions and environmental impacts. As a result, organizations are intensifying their focus and taking a more strategic approach to energy and emissions management.

C3 software solutions are designed to help organizations address their requirements in managing and optimizing their use of energy and the associated GHG emissions.

Commercial and industrial enterprises as well as municipalities and government entities benefit financially, operationally, and environmentally by becoming energy and resource efficient. As a consequence, they also reduce waste and emissions, contributing to the social mandate for a cleaner and more sustainable environment.

PwC: You mentioned an information-driven transformation of the energy value chain. What is the transformation here?
PH: At the core of this information-driven transformation is the smart grid, which enables the systemic, dynamic, and real-time information flow across the entire energy infrastructure from generation through transmission, distribution, and end-user consumption. The transformation extends into the way organizations manage, measure, procure, and ultimately optimize energy throughout their extended value chains. It also implies profound changes in the way energy suppliers and consumers interact, leading to more collaborative supplier-customer relationships across the energy sector. The energy information transformation has immediate impact in creating significant financial and competitive value for both energy suppliers and consumers.

"The solution [to sustainability challenges] is the systematic application of information technology to monitor, mitigate, and monetize resources within an enterprise and across its value chain."

Real value is created for the full energy value chain by having two-way visibility and collaboration between the supplier and user, which has not been the case so far in the energy industry. With the additional information and collaboration, energy providers become value-added, strategic partners rather than commodity suppliers. Energy consumers are able to optimize their energy procurement, consumption, and the resulting emissions.

PwC: Pat, you co-founded and helped build Siebel Systems into a successful enterprise software company, and now you've helped co-found and build C3. Are you finding any key differences between the two experiences in how the solutions evolved and are being adopted?
PH: The similarities lie in the fact that the fundamental role of enterprise software is to embody and enable the replication of best practices, improving operating efficiency and effectiveness.

What C3 is enabling for energy, resource, and emissions management is forward-looking, strategic decision making, both in real time and over extended time horizons. Some unique requirements in this market are the ability to handle exceptionally large data sets, potentially approaching petabytes in scale, as well as multivariate optimization capabilities, enabling organizations to meet their financial, operational, and sustainability goals.

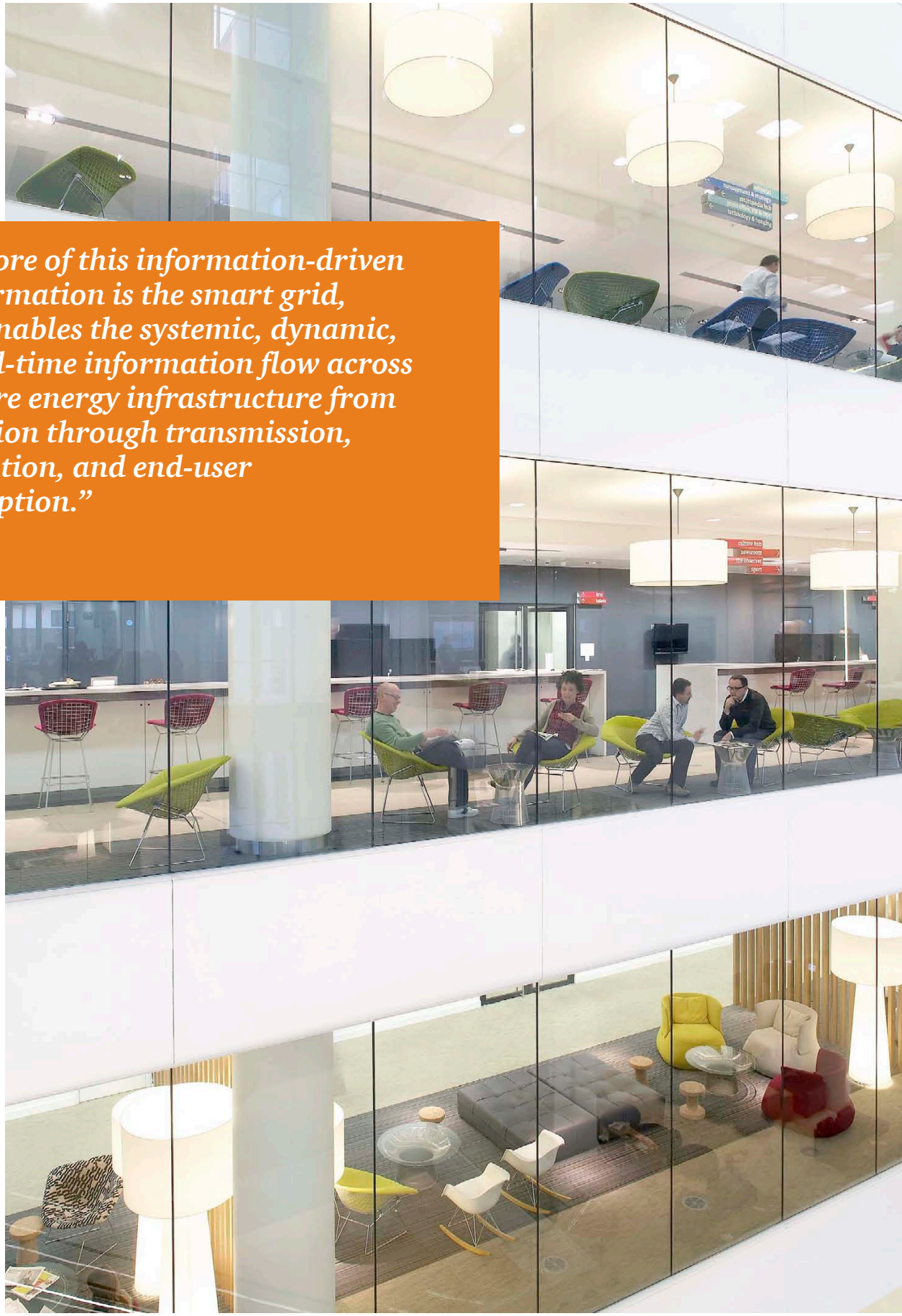
PwC: Does this trend relate to any of the disruptions or innovations of the past?
PH: Statistical process control enabled by information technology caused a significant disruption in the manufacturing sector. Robust information technology and sophisticated statistical measurement techniques were applied to monitor and improve manufacturing output, globally reshaping competitive and economic dynamics across the manufacturing sector.

Energy management, too, will likely become the basis for organizational and national competitiveness, with financial and market advantages accruing to those that systematically and strategically optimize their use of energy and resources.

PwC: How does your solution allow enterprises to advance their sustainability objectives?
PH: C3 helps organizations develop and implement their sustainability strategies. Using C3, organizations are establishing systems and processes to monitor and measure their energy and resource consumption, not only in the aggregate, but also across their operating units, allowing them to identify opportunities for improvement. They are able to compare themselves against industry norms to determine and report how they rank competitively in their overall sustainability performance.

PwC: What is the role of the CIO here?
PH: In addition to the responsibility to implement and operate information technology solutions, the CIO has the responsibility to create an integrated viewpoint from a business angle, which will help position the organization competitively from a standpoint of energy, resource, and emissions management. C3 not only enables an organization to meet its sustainability goals, but it also gives the CIO new opportunities to use information to create market differentiation and competitive advantage.

"At the core of this information-driven transformation is the smart grid, which enables the systemic, dynamic, and real-time information flow across the entire energy infrastructure from generation through transmission, distribution, and end-user consumption."



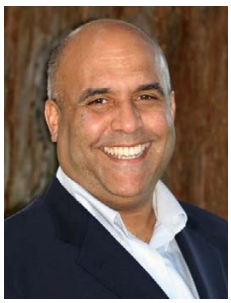
Managing energy for sustainability

Amit Chatterjee and Michel Gelobter of Hara Software describe how energy management transforms an enterprise toward sustainability.

Interview conducted by Vinod Baya and Bo Parker

Amit Chatterjee

Amit Chatterjee is a founder, board member, and ex-CEO of Hara Software. He is a thought leader on green economy innovation, energy independence, and entrepreneurship and was selected as one of the most influential people in business as part of Fortune magazine's 40 Under 40 list for 2010. Prior to founding Hara, he led SAP's governance, risk and compliance unit.



Michel Gelobter

Michel Gelobter is chief green officer at Hara and a leading sustainability and climate strategist. Gelobter is founder and chairman of the board of Cooler, a for-profit social venture. Prior to Cooler, Gelobter was president of Redefining Progress, the think tank that helped design the world's most aggressive climate legislation, which was signed into California law in August 2006.

In this interview, Chatterjee and Gelobter describe how managing energy is transformational and starts any organization down the sustainability road.

PwC: What are your clients' challenges and how are you addressing them?

AC: When you look at the future rising costs of energy, it is probably the third most expensive unmanaged cost item for any Fortune 500 company. Likely people are number one, real estate is number two, and energy costs are number three. Organizations have a great mechanism for thinking about how to manage people, and a good mechanism for real estate, but they don't have a very good perspective around how to manage energy. The energy sector has never really leveraged information technology in a meaningful way. At Hara, we're looking at it, and as we engage with our customers, we find that after all these years of Internet communications, there's still a lot of use of paper, phone, and fax. So I looked at Hara and thought about what we could build or do that would be significant and relevant to the Fortune 500: can you capture and quantify the value of energy that an organization is consuming into a single system of record, and then guide them to a reduction? The net effect is providing an enterprise-wide view of their current spend, which I call a transparency-to-results process.

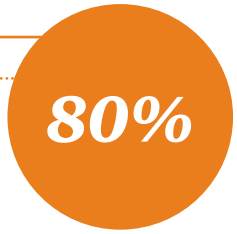
PwC: How does managing energy relate to sustainability?

AC: When you think of sustainability as a topic, it's a lens through which you look at the health of a company. When I look at a company through the lens of finance, certain things pop up. Similarly, sustainability is a lens through which you see the long-term health of your

Potential for using information

"About 80 percent of why we don't have more efficiency and conservation is because of imperfect information."

—Michel Gelobter



company and evaluate it using metrics associated with the impact on the environment and society, but in the end it's the same as financials.

MG: Business ecosystems need environmental resources, and you need a functioning planet with that resource base to sustain you for the long term. Businesses also impact the environment from their operations. For the first time, businesses are realizing that their resource base is not unlimited. In fact, it's never been unlimited. In a variety of ways, resource shortages are forcing businesses to evaluate, manage, and conserve these resources as part of their business processes.

About 80 percent of why we don't have more efficiency and conservation is because of imperfect information—an example of that is what academics call the principal agent problem—with tenants and landlords not talking to each other about energy use, the disconnects between buildings, between IT and the IT manager, and among the facilities manager, the CFO, and the energy manager, and so on. These are classic and old problems, and they relate to information. Making the information transparent is the way to address this problem, which is what we are doing to influence the management of energy and other resources. Also, energy optimization is not an incremental business if you take it seriously. It's a transformational business that shapes your business toward sustainability.

PwC: Most organizations operate in industry ecosystems, and a large energy footprint can exist in the supply chain. How do your solutions affect the supply chain?
AC: The supply chain story was actually something that became relevant to our customer base last year. As we worked with retailers and manufacturers, it became very obvious that they wanted to not only understand what their total impact was but also their supply chain's impact. In October 2010, we released our Value Chain module.

Ironically, one of the first customers to use it was not the channel master but one of the suppliers. I called the customer and said, "I understand that you wanted to license this module. What's the logic?" And they said, "Reporting, because a particular retailer is asking me to. But if I start to understand how my suppliers are working on reducing energy use, I believe I have stronger negotiating positions against my competition." So it's a domino effect in the supply chain.

PwC: How does this understanding influence the dynamics in the supply chain?
AC: Let's take a phone, for example. If a semiconductor manufacturer creates a chip that goes into this phone and is efficiently produced, then the manufacturer can hold differentiated pricing. That's probably where we've seen the most interesting action. The supplier can now say, "In the creation of this phone, which normally would have taken you 100 kilowatt-hours, because of our semiconductor it's now only 40 kilowatt-hours. Our pricing should remain the same, because you're actually saving money on operations." That's where you're going to start seeing real innovation as opposed to forcing someone to tell you how much energy they've used.

When a supplier changes its products and practices, the benefit accrues to all customers using the supplier, although the work may have been done for a particular customer. The supplier has an economic incentive to talk to its customers about innovations it is doing and can do from a sustainability perspective. As you go farther down the supply chain, all the different components that go in a product, the supplier has an incentive to understand the flow of energy so that it can make an economic argument to hold differentiated pricing.

MG: We are in a world where supply chains are increasingly linked to the health of the companies they serve. What is changing because of sustainability is that environmental costs are increasingly being internalized, whether it's directly or what you are buying through your supply chain. The transformation has to do with the transparency and availability of information. For instance, Levi Strauss moved from having environmentally based terms of engagement with suppliers to basing its terms of engagement on the United Nation's millennium development goals.

> *"When you look at the future rising costs of energy, it is probably the third most expensive unmanaged cost item for any Fortune 500 company."*
>
> —Amit Chatterjee

PwC: So once enterprises use a system like yours to save on energy costs, say 10 percent, where do they go next?
MG: There is no end to that 10 percent. Like any other business process, managing energy is also about ongoing and continuous improvement. Let me give you some examples. The economy of China has been improving its energy efficiency 5 percent every year for the last 30 years. California has improved 3.5 percent every year for the last 30 years. The United States, on average, has improved 2 percent a year for the last 30 years. All this was without concerted systems and sophisticated management.

PwC: What features are your customers requesting that are not in your products yet?
AC: For the most part, our customers today have really figured out their total energy and sustainability impact. They've experimented with a variety of reduction techniques that have led them to certain cost savings. Now they're starting to say, "As I start to modify my operations, there are externalities I need to understand so that I can forecast and play scenarios to make better decisions about where I put my facility or how I execute a particular business process." And that could be everything from heating degree days to cooling degree days to thinking about the occupancy flow of an office building on an average day, the price of natural gas, or the price of oil.

On the basis of all those factors, a company's executives could then make a business decision that yes, even though solar panels are not profitable in today's scenario within the company's time period of cost to capital, they know that if oil moves to this number, which they have high confidence it will, this actually does make a lot more sense. That net effect allows companies to not only go after the low-hanging fruit of energy-reduction opportunities, but also shift their attention to bigger projects that are a little more technically demanding and allow them to factor in what they believe the scenario of the future will look like.

PwC: So business model scenario planning capabilities allow companies to model the relationships between inputs and outputs and the overall impact of environmental or social changes?
AC: Right. For example, should a company stop expanding in the international territories because there's not enough fresh water in that area for the company to be able to manufacture its goods? A life sciences customer actually ran into that issue because it didn't know about the constraint. The company wanted to double its factory, so it went through the work of planning, etc., and eventually the project got shut down. The company was surprised. The project was shut down because the amount of water that the company consumed was already 25 percent of the watershed of the region that it was in, and if it doubled its capacity, the company would have essentially consumed 50 percent of the watershed. If you don't manage the environmental perspective and its impact on your business model, you will get blindsided by really dangerous situations. That complication set the company back, because it couldn't produce its drug; the market for its drug was growing and it was not in a position to meet the demand.

PwC: What is the role of the CIO with respect to sustainability?
AC: Part of the reason we've built the company the way we have is that we believe information technology transforms energy usage into something that is manageable. So, you shift now to a situation where CIOs can actually identify energy cost-saving benefits via their technology infrastructure. And IT organizations are starting with what I would say is the "clean up your own house" approach—the greening of data centers and technology resources.

Then third and probably most important is tracking how existing business processes are consuming energy and natural resources. Creating that as a decision framework for line of business owners is something that the CIO can provide in terms of reporting metrics.

PwC: How much can they do that without needing to ask permission or to seek investment from business unit leaders?
AC: Most of the time, the first step is gathering the information, which they can do on their own. Case in point: I knew we had a business when a customer gave us a contract for about 1,400 facilities. We gathered all the information and I walked back in and said, "What do you think your energy footprint is?" And he said, "Probably $50 to $80 million." I said, "Try a quarter of a billion."

CIOs have that data because they own the ERP [enterprise resource planning] system and they own the payables. The utility bill data sits there. They just need to use a Hara system so they can then hand a report back to a customer or a line of business owner and say, "Here are the 17 facilities that run, here's where they're at, and by the way you're the seventh worst in our organization. You can do something about it." And they can drive that transformation pretty easily.

PwC: You are offering a SaaS [software-as-a-service] solution and therefore you aggregate data across several customers. Does that allow you to create benchmarks that benefit all?
AC: One of the benefits of SaaS is that you can extract aggregate data that can lead to benchmarks. Most of our customers opt in to be able to receive that benchmark data, which means that for them to see the benchmarks, they must give their data. You can see it in two ways. One is within your own community: Within your 1,800 retail sites, who's the best performing and who's the least performing. The second is within the regional community: Show me all the commercial buildings in Indianapolis under 25,000 square feet. How do I look? And so on.

Over time, we will see a greater aggregated benefit. We become the Consumer Reports for actual technologies. As customers go into Hara and look at a biomass boiler, or they use tinted windows or LED lights, they can actually identify the ROI [return on investment], the payback period, and the overall framework for each one. So when company executives look at their Indianapolis facility and they're considering a fuel cell, for example, they can look at the other places in that geography that used fuel cells, what their expected results were, and what their actual results were.

> ***"Energy optimization is not an incremental business if you take it seriously. It's a transformational business that shapes your business toward sustainability."***
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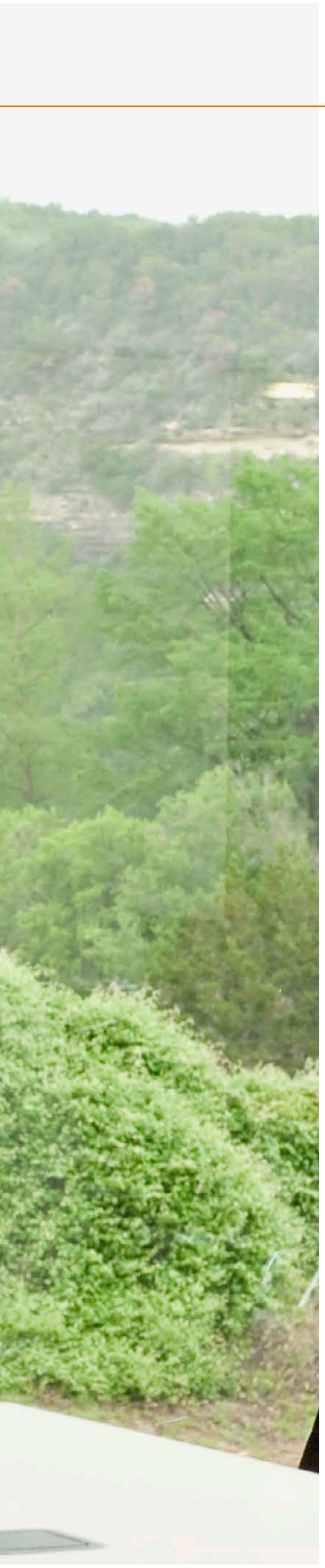
> —Michel Gelobter



The CIO's next leadership opportunity: Sustainability

By focusing on the role of information, CIOs can drive engagement and embed sustainable practices across IT, the enterprise, and value chains.

By Vinod Baya and Bud Mathaisel

Sustainability is one of the most important strategic initiatives enterprises will undertake in the coming decade. Progress on sustainability is also largely about surfacing new information and then guiding the behavior of staff and others to take appropriate actions based on that information. As discussed in the article, "Sustainability: Moving from compliance to leadership," on page 06, the future of sustainability is to embed sustainable practices in business operations, so that it stops being a separate initiative and becomes part and parcel of how a business operates. Information technology makes this possible. Embedding sustainability is the systematic adoption of sustainable practices that integrate the environmental and social impact of products and operations with how economic value is created by the enterprise.

The use of information systems for sustainability efforts is still in its early phase. This presents CIOs with some unique opportunities, particularly given the enterprise-wide and value-generating nature of sustainability. "Sometimes, as in the case of sustainability, a single business unit cannot pull all of the weight on some of the goals. Effective execution depends on how you link multiple businesses to some common themes in the company and then drive certain types of behavior," explains David Kepler, executive vice president of business services, chief sustainability officer, and chief information officer at The Dow Chemical Company. Kepler's comments remind us that CIOs have special insight that comes from working on past enterprise-wide initiatives, insight that is pertinent to sustainability.

Deploying infrastructure that surfaces relevant information, creates visibility, and provides feedback across the enterprise and its value chains embeds sustainability practices throughout operations. Given the importance of new metrics and information, embedding sustainability is a natural role for the CIO and the next strategic leadership opportunity and responsibility for IT. "The CIO has the responsibility to create an integrated viewpoint from a business angle, which will help position the organization competitively from a standpoint of energy, resource, and emissions management," suggests Pat House, senior vice president of strategy at C3.

Sustainability is one of the most important strategic initiatives enterprises will undertake in the coming decade.

CIOs have always managed information infrastructure; what is different about sustainability is that it requires tracking information not collected or managed by existing systems. "SAP, for example, has always tracked financial resources, human resources, and capacities, but the company has never tracked energy, water, wood, or any other type of natural resource," says Peter Graf, chief sustainability officer at SAP. "We never tracked these as there was no perceived need, because it was considered infinitely available. Now we are starting to manage these areas as a scarce resource, which is why applying enterprise resource planning and management is essential."

CIOs can demonstrate real leadership with sustainability—may in fact need to take the lead—by surfacing information that educates, motivates, and changes decision making within the enterprise.

The three dimensions of CIO sustainability leadership

PwC sees CIOs contributing to sustainability efforts along three dimensions (Table 1), which range from activities that the CIO controls to those for which he or she would need to collaborate with the enterprise or value chain partners. The objective in all cases is to provision information so sustainability practices are embedded in operations:

1. Embedding sustainability in IT—The set of actions to measure, monitor, and manage the environmental and social footprint from the use of IT resources, both within and outside IT operations. CIOs must demonstrate success on this dimension, often referred to as green IT, to have the credibility to contribute to other dimensions. The passion begins at home.

2. Embedding sustainability in the enterprise—The internal systems and processes needed to enable the rest of the enterprise to monitor, measure, and manage their environmental and social footprint. Most commonly this includes managing energy and water use as well as waste production across all facilities and internal operations.

3. Embedding sustainability in the value chain—The collaborative activities around the data needed to measure, monitor, and manage the environmental and social footprint in value chains. Others in the value chain affect the sustainability performance of any enterprise; therefore, cooperation and collaboration across the value chain are essential and can have the most overall impact.

The three dimensions are also consistent with the traditional IT control domains, from things IT controls fully to those that IT internally influences, to engaging and collaborating with external partners. Moving a CIO's focus toward outward strategic influences is consistent with the current patterns in IT leadership and the emerging role of the CIO. (For more information, see the following three PwC publications: *I for innovation: The next-generation CIO; The situational CIO;* and *The value-creating CIO*.)

Embedding sustainability in the IT function

IT organizations have engaged in green IT for some time. There are many examples of best practices; industry organizations, such as the Green CIO (GCIO), encourage collaboration on these initiatives; and vendors offer tools to help. All these constitute the many choices CIOs have to transform IT operations from a sustainability perspective. Table 2 lists some of the most commonly employed initiatives. Best practices are continuing to evolve, and enterprises are sharing their experiences for the benefit of others.

Table 1: The three dimensions of a CIO's role in sustainability

Dimensions	Embedding sustainability in the IT function	Embedding sustainability in the enterprise	Embedding sustainability in the value chain
Degree of IT control/influence/ participation	IT exercises a high degree of control	IT can exercise significant influence by surfacing and presenting data in an operations context	IT can exercise a high degree of participation in identifying metrics, setting standards, and promoting collaboration and sharing
Need for collaboration with non-IT function	IT can operate quite independently	IT needs close collaboration with business units	IT needs close collaboration with business units and value chain participants
Source of sustainability footprint	IT operations spanning data centers, IT assets, IT services, and others	Non-IT operations such as manufacturing, logistics, real estate, business travel, and others	Operations of value chain partners
Potential for impact on overall sustainability objective	Varies by industry, very high impact for IT-intensive industries	High impact for all enterprises	Very high impact for all industries
Key question	What can IT and IT users do to embed sustainability in IT operations?	What can the rest of the enterprise do to embed sustainability in business operations?	What can the value chain partners collectively do to embed sustainability in value chain operations?

Source: PwC analysis.

IT is also often the largest buyer of electricity and therefore faces risk not unlike technology businesses. "Because we're a technology business and what we do relies on access to affordable and reliable energy, highlighting the potential risks around any kind of energy price volatility is necessary to understand risk," explains Ryan Whisnant, director of sustainability at SunGard. Visibility into the overall footprint and exposure helps to manage the risks associated with volatility in electricity prices.

Green IT approaches mostly focus on the data center, where much of the computing and energy use occurs. With cloud computing and associated trends, new approaches are emerging to improve data center efficiency. Although the emphasis on reducing costs for cooling is considerable, increasing server utilization through techniques such as virtualization offers greater potential to improve a data center's energy productivity compared to exclusive focus on cooling or efficiency of the power source, according to research from Microsoft. (See Figure 1.)

CIOs have always managed information infrastructure; what is different about sustainability is that it requires tracking information not collected or managed by existing systems.

Table 2: Most frequently and commonly employed IT initiatives for sustainability

- Server, router, and client refresh with more energy-efficient replacements
- Virtualization and consolidation of servers
- Data center efficiency
- Eliminating redundant applications
- Sourcing power from renewable sources
- PC power management
- Printer consolidation and managed print services
- Improved asset life cycle management: waste and recycling programs

Source: PwC analysis.

"You should evolve and mature so that you have a point of view of how to do something in a way that balances the three dimensions of sustainability: the economic, environmental, and social dimensions."

—David Kepler, Dow

In addition to increasing utilization, server refresh also can pay dividends, since older servers can be very inefficient. At Intel, 64 percent of servers globally in 2010 are newer, but 60 percent of the energy consumed is by servers that are from 2007 or earlier. "Proactive Server Refresh, a program we initiated in 2007 to refresh our servers on a four-year average cadence, has been the single biggest business value driver within our IT sustainability program for energy footprint reduction," says Chris Peters, IT director of the Industry Engagement Group at Intel.

Reducing the power consumption of servers and other hardware is an important point of concentration, but energy efficiency in the data center is also a function of the design of the applications in use. Applications are generally provisioned with far more IT resources (servers, CPU, memory, and so forth) than necessary. New benchmarks and metrics can help here. "We've created a benchmark on energy efficiency to drive our development. Internally, when our developers create a system, we've put in a standard that manages the energy efficiency on a transactional basis," says SAP's Graf. The purpose is to enable developers to write applications to be more energy efficient.

IT's influence also extends to other groups that consume IT and related resources. For example, IT can encourage users to reduce paper consumption, turn off equipment not in use, and promote the use of teleconference or videoconference facilities in lieu of travel. As common practices, some IT organizations build in a sleep mode for unattended devices and make duplex printing the default.

The monitoring and deployment of green IT approaches can result in significant savings while benefiting the environment. Intel IT has been engaged in IT sustainability for more than a decade. In 2010, Intel IT implemented projects that reduced the consumption of IT-associated emissions by about 60,000 metric tons of CO_2 and saved Intel's business approximately $5.8 million.

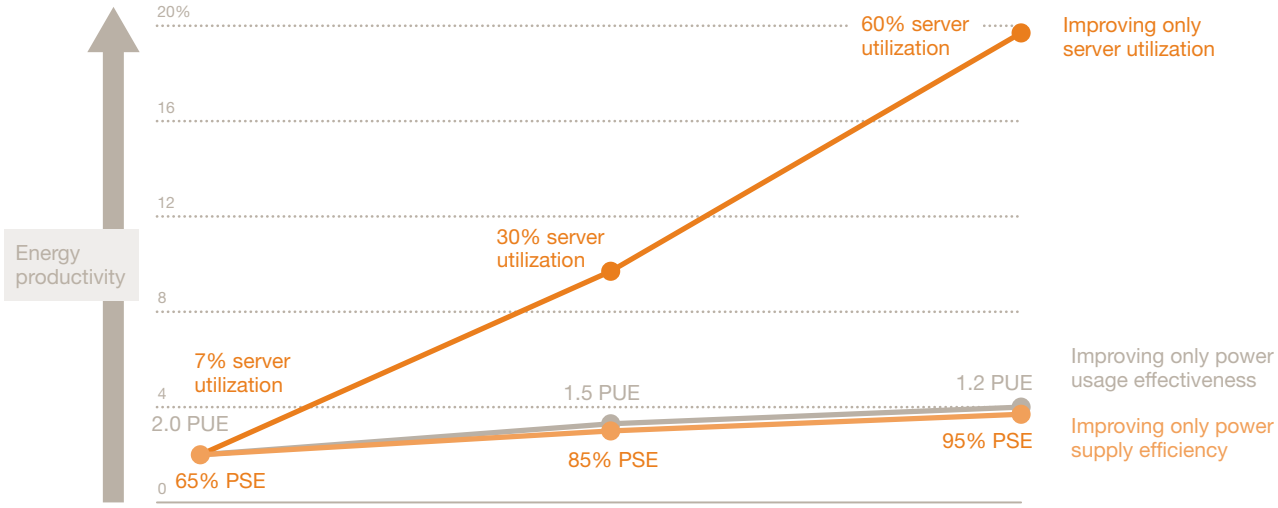
Green IT is a mandatory starting place for most CIOs. The specific opportunities may vary by industry and geography, and regulations or other mandates are important considerations, but the fundamentals for sustainability in IT and by the users of IT are universally applicable. The good news is that embedding sustainability in the IT function is a natural for CIOs, and well-known best practices can help.

Embedding sustainability in the enterprise

Using successful IT initiatives as a starting point, CIOs can move to bigger targets. The greater payback over time is to influence the design of enterprise business processes as they impact the management of energy, water, waste, and other resources.

CIOs already manage some of the enterprise systems that relate to sustainability, particularly those supporting regulation and compliance initiatives. For instance, efforts to reduce hazardous substances in electronics (RoHS) were founded on the information systems for manufacturing and the value chain, and were driven by IT. Other compliance systems in environment, health, and safety are also driven by the IT function.

Figure 1: Improving utilization delivers better data center efficiency than improving power supply efficiency or power usage effectiveness.



Power usage effectiveness (PUE) refers to the ratio of the total amount of power used by the data center facility to the power delivered to the IT equipment. Power supply efficiency (PSE) refers to the efficiency of conversion from AC to DC power.

Source: Mark Aggar, *The IT Energy Efficiency Imperative*, Microsoft Corporation, June 2011.

Looking to the future, the focus on compliance alone is not enough. "If you start with just compliance in mind, then you never really develop a point of view of the best way to do something in an integrated manner. You're always going to argue about tradeoffs between economic and sustainable practices," explains Kepler of Dow. "You should evolve and mature so that you have a point of view of how to do something in a way that balances the three dimensions of sustainability: the economic, environmental, and social dimensions," Kepler continues. Expanding beyond compliance gives CIOs an opportunity to educate other senior leadership on the requirements to create the integrated view necessary to embed sustainability.

CIOs can proactively use information they already manage to get started. "CIOs can actually identify energy cost-saving benefits via their technology infrastructures," says Amit Chatterjee, founder and board member of Hara Software, which makes environmental resource management (ERM) solutions. By analyzing information in the existing systems, CIOs can give their business unit colleagues visibility into how existing business processes are consuming energy and natural resources. This can spark several opportunities to generate cost savings or innovations for sustainability.

One way to get business unit leaders involved is by identifying potential savings that more sustainable operations can generate. CIOs can pull together information from existing enterprise

Expanding beyond compliance gives CIOs an opportunity to educate other senior leadership on the requirements to create the integrated view necessary to embed sustainability.

> *"CIOs can actually identify energy cost-saving benefits via their technology infrastructures."*
>
> —Amit Chatterjee, Hara Software

resource planning (ERP), payables, utility bills, and related systems; generate a view of energy consumption across the enterprise; and create visibility into which facilities are underperforming—all without the need to seek investment from business unit leaders.

New technologies and solutions as discussed in the article, "Closing the loop on sustainability information," on page 32 are providing new tools for CIOs. Sustainability-oriented applications bring the capability to quantify, monitor, analyze, and report on resource consumption and related metrics. As these applications are deployed and integrated with other applications, enterprises begin the journey toward embedding sustainability concerns in ongoing processes. While implementing any sustainability-related application will borrow considerably from past implementation efforts, there are significant differences to keep in mind as well. Table 3 highlights some of the key differences between sustainability-oriented applications and past enterprise applications.

Embedding sustainability in the value chain

Taking the steps to drive sustainability concerns into everyday decision making may be just the start. Most organizations are discovering that the majority of their impact on resources, and therefore their biggest sustainability opportunities, are outside the enterprise. In the first major effort by a large enterprise to publish an environmental P&L, athletic apparel maker PUMA reported that internal operations accounted for 15 percent of the economic value of its greenhouse gas emissions, whereas its supply chain accounted for 85 percent. This sort of insight is motivating entire industries to partner and collaborate in the service of sustainability.

CIOs have many ways to facilitate sharing and collaboration with outside organizations. Nike, for instance, has developed its Environmental Apparel Design Tool to create visibility and feedback around sustainability issues in the supply chain[1]. This tool allows designers to evaluate, score their design across thousands of material and style choices, and make decisions that help Nike achieve its sustainability objectives. Using the tool, Nike and its supply chain partners can model—before manufacture—the impact of material choices and manufacturing process choices on its sustainability footprint.

1 Nike's Environmental Apparel Design Tool can be accessed at http://www.nikebiz.com/Default.aspx.

Table 3: How sustainability-oriented applications initiatives are different from previous generations of enterprise applications

Characteristics	Sustainability-oriented applications	Past enterprise applications
Which information is necessary to collect and track?	Environmental and social information	Business operations information
Are there processes for surfacing the information?	Processes for surfacing the information largely do not exist and need to be seeded with instrumentation or collection methods	Processes for surfacing the information have always existed, although they were manual before the deployment of enterprise applications
Was information tracked before implementing the application?	Not tracked	Tracked, but manually or in a nonstandard manner
What processes are supported?	Processes with closed-loop feedback, as in cradle-to-cradle and cradle-to-grave methods	Processes that are largely linear and open loop, as in order-to-cash, procure-to-pay, and other end-to-end processes
What is the original scope of implementation?	Starts at the enterprise level and should extend to the value chain	Most implementations started in departments and were integrated for enterprise-level visibility
Who would use the application?	Everyone in the enterprise and then in value chains	Usually only those in the function relevant to the application
Any differences in adoption patterns?	Adoption is starting around the world in emerging and established regions alike	Adoption started in North America and spread to the rest of the world

Industry groups, too, are playing a key role in setting standards and systems for sharing pertinent information in the value chain. The Outdoor Industry Association has created the Eco Index, an environmental assessment tool for the outdoor apparel, footwear, and equipment industry. The index is based on analysis of chemicals for toxicity, equipment and materials efficiency in reducing waste, as well as indicators for social responsibility and fair labor practices. Indicators for end of life, packaging, and facilities are also included. CIOs can tap these standards to integrate their systems with suppliers and extend visibility to allow the entire value chain to move toward a common goal.

CIOs can make contributions at the industry level as well. For example, in industry standards organizations, CIOs and their delegates can serve on specifications committees and help craft industry agreements. This experience would be familiar for some IT organizations. Take the case of RosettaNet, a standards organization covering electronics industry manufacturing and repair. IT took the lead in driving agreements between suppliers and original equipment manufacturers (OEMs) where end-to-end processes important to the industry spanned individual organizations, such as an order-to-cash process. The potential exists for CIOs to provide similar leadership in industry-wide sustainability.

"The CIO has the responsibility to create an integrated viewpoint from a business angle, which will help position the organization competitively from a standpoint of energy, resource, and emissions management."

—Pat House, C3

A framework for embedding sustainable practices in business operations

Most enterprises do not have a model or framework for how to ensure consistent embedding of sustainability in operations. Any framework should cut across strategy, structure, people, and operations. In PwC's experience, the progress across 13 indicators in these four categories is essential for systematization of sustainability. These indicators are illustrated in Figure 2.

Raising the profile of sustainability requires IT to engage with information it is not accustomed to collecting or managing. CIOs can look back on their experiences implementing human resources management systems within the enterprise for lessons about how to advance sustainability. From an IT perspective, there are strong parallels between the evolution of IT for sustainability and for talent management as detailed in the sidebar, "Parallels between sustainability and human resources management," on page 66.

Like any large transformation or initiative, the best practice is for the CIO (or the chief sustainability officer) to create a program office to manage changes for sustainability. "One of the first things we did was create a dedicated IT sustainability program office," says Chris Peters of Intel. The program office defines metrics and develops processes for collecting them.

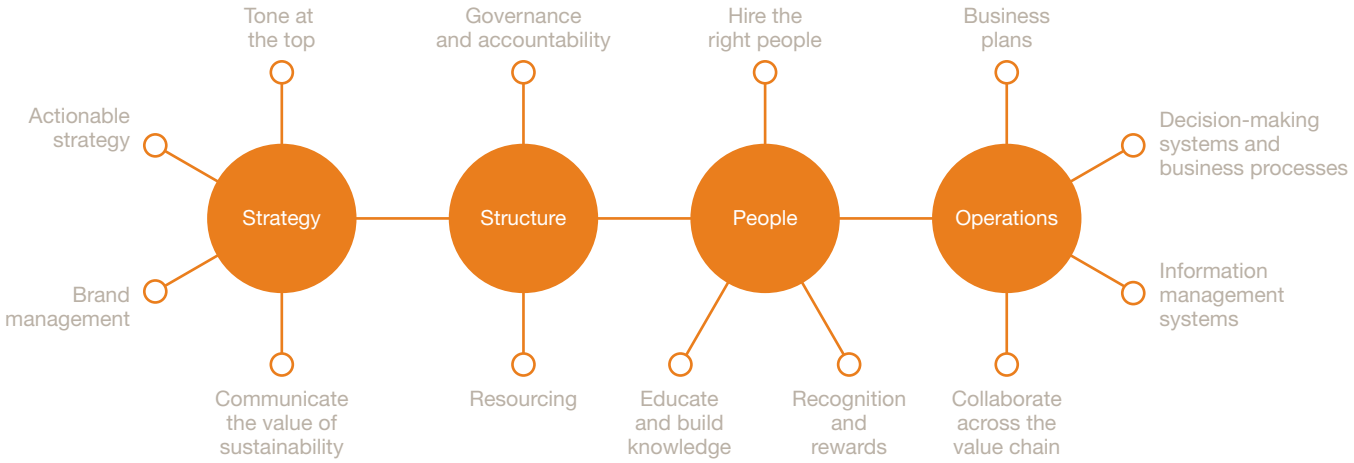
Emerging enterprise sustainability planning (ESP) systems can be used to aggregate information and publish sustainability metrics from across the enterprise to facilitate other activities. While the program office could be essential to get sustainability initiatives off the ground, the need for this office and its role will be less or unnecessary as sustainability becomes embedded in ongoing operations.

Acting on sustainability: Role of process transformations

When embedding sustainability in existing operations—in product design, plant operation, transportation, logistics, or others—existing processes will require changes. The CIO and IT department are experienced in process transformations. They have the broadest perspective on information flow and process. Process redesign can take two forms. One is to help redesign the process that creates the information needed. Identifying the carbon footprint, translating activities into carbon footprint equivalents, cataloguing data on the footprint, and providing analytics tools to help manage the carbon footprint are examples of new information generation activities.

A second form of process redesign tackles the transactions and sequence of events in enterprise operations. Examples include major changes that can optimize distribution, reduce supplier production of pollutants, and improve supplier reuse of resources.

Figure 2: A framework for embedding sustainability in operations that engages the enterprise at all levels from strategy, structure, people, and operations



Although process reengineering methods are familiar to most CIOs and IT departments, a few differences in the sustainability reengineering design process should be addressed:

- ***Measures and metrics—***Define sustainability measures and indices that provide an integrated view across environmental, social, and economic dimensions, such as the Sustainable Chemistry Index used by Dow and the Considered Design Index used by Nike. The sustainability measures are in addition to the metrics normally considered in process reengineering, such as time to market.

- ***Closed-loop systems—*** Sustainability is about closed-loop systems, so the life cycle (cradle-to-grave or cradle-to-cradle) must be in the process flow. This includes replacement, recycling, and eventual disposal. Traditional process redesign is typically linear and not closed loop.

- ***Multiple relationships—***In the past, process redesigns were about optimization. When one factor was considered, such as time or cost, such optimization was feasible. Sustainability is more complex and will involve multiple variables. The focus should be on developing models that explore the relationship between the economic, environmental, and social dimensions so that progress is not limited to just making tradeoffs.

- ***Central repository—***Be prepared to be the source of all information globally that is used to measure, monitor, and manage sustainability. One repository for all sources is the best method for collecting, distilling, analyzing, and publishing data.

Sustainability might be the ultimate challenge in the process reengineering discipline. CIOs have been practicing business process reengineering (BPR) for decades, but it can be even more global in its scope and consequences in the sustainability context.

Parallels between sustainability and human resources management

CIOs can build on experience from human resources management to advance on sustainability.

Sustainability is not the first time an enterprise journey begins with compliance, then leads to a transformation marked by embedded practices with information technology as the key driver, and ultimately achieves lasting competitive advantage. The evolution of human resources management has parallels to the path PwC expects sustainability to take, with IT playing an integral role.

Enterprises have been managing human resources for as long as they have existed. In the pre-industrial age, there were no human resources departments, but laborers and apprentices worked for supervisors or craftsmen who were nominally responsible for their safety and welfare. The Industrial Revolution gave rise to factories, and a related rise in unhealthy and unsafe work conditions led to labor riots. Over the years, the US government created and enforced statutory regulations to provide basic rights and protections for workers. In 1902, NCR (National Cash Register Company) established the first known human resources department to handle issues related to worker grievances, safety, dismissals, legal rights, wage management, and so on. This practice soon spread to other companies.

The compliance responsibilities of human resources departments accelerated in the 1960s and 1970s with the passage of several federal laws, including the Equal Pay Act of 1963, the Civil Rights Act of 1964, the Occupational Safety and Health Act of 1970, and the Employee Retirement Income Security Act of 1974. Today, compliance obligations go well beyond such laws to include professional certifications, ethics and integrity policies, and so on.

Before laws were established, none of these areas was a core requirement for most enterprises, as they were not seen as a source of differentiation or competitive advantage. With each new government regulation, compliance became a higher priority for enterprises because they had to comply to avoid legal penalties.

Compliance led enterprises in the right direction, but it still took time—less for some enterprises and much longer for others—to grasp the notion that human talent was not being optimally used and that without changes to human resources management, there would be implications for overall economic development and national competitiveness.

Managing human resources today brings together a range of concerns across compliance, cost, competitive advantage, strategy, and others. Employee-related priorities have evolved beyond compliance into better ways to run a business, particularly how an enterprise attracts, develops, and retains talent. Enterprises continue to innovate their employee development, career paths, coaching, evaluations, and reward mechanisms. Meeting the objectives of these programs is not only the responsibility of the human resources department, but increasingly of every manager and employee.

At leading enterprises, these concerns have become embedded with larger business processes and are part and parcel of the enterprise culture, ingrained in its core value systems. How enterprises address these concerns is now a source of differentiation and competitive advantage under the broader umbrella called talent management within the human resources management function. Now that enterprises have established processes for following the law, the focus for many enterprises has moved beyond compliance objectives to nurturing talent, providing challenging places to work, and promoting a culture of innovation, learning, and making a difference in the world.

Along the way in this human resources transformation, IT had an important role. At first it played a reporting role by gathering data and documentation to demonstrate compliance with the regulations. Next the IT role extended to bringing visibility and feedback within the employee base, by creating transparency and openness around career path, learning opportunities, growth opportunities, innovation, coaching, collaborations, and so on. IT also tracks new metrics around development, contribution, retention, and others. These are all made possible by deploying systems that make developing, managing, and retaining talent part of everyone's role and responsibility—and that embed these activities in the enterprise culture. Now progressive practices in talent management are a source of differentiation and competitive advantage for all enterprises. Leading enterprises are rewarded by attracting top talent and being named to lists of the best places to work.

This process reengineering is evolutionary and follows the continual process improvement pattern. It will not proceed with a big bang.

Ultimately, process reengineering considerations will be the basis for the best long-term sustainability programs—this is the CIO's forte. As CIOs and IT organizations evolve through the progressive dimensions of sustainability, insightful breakthroughs embed sustainability into new ways of doing business.

Conclusion

Information is the DNA for driving awareness, understanding, and embedding sustainable practices in enterprises and their value chains to ensure long-term economic growth. As a result, the CIO has the opportunity to be the chief sustainability enabler. Many CIOs have established solid foundations for the systems they deliver today. The next step may be to build on that foundation, using their skills to be strategic enablers of this important next wave.

CIOs can progressively approach sustainability on three dimensions: aspects they control (the IT function), aspects they influence (the enterprise), and aspects on which they collaborate (the value chain).

Sustainability essentially will have an evolutionary nature and will never be finished. Thus, a sustainability journey must start in a way that is straightforward, understandable, and actionable. From there, CIOs can chart a path of progressive enablement.

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Embedding sustainability into everyday actions

Chris Peters explains the role Intel IT plays in embedding sustainability within IT and business.

Interview conducted by Vinod Baya and Bo Parker

Chris Peters

Chris Peters is an IT director with Intel IT's Industry Engagement Group. Peters applies an integral knowledge of Intel IT operations as he works closely with strategic IT decision makers worldwide to share IT best practices. His goal is to deliver better business value from IT innovation and investment. Intel IT provides the infrastructure and services required to design, manufacture, supply, and market products for one of the world's largest semiconductor manufacturers.

In this interview, Peters discusses how IT at Intel is greening the data center and embedding sustainable actions in everyday activities.

PwC: What role is Intel IT playing with respect to the company's overall sustainability initiatives?
CP: IT plays a very critical role in being able to support Intel's corporate sustainability initiatives. Sustainability and corporate responsibility are about more than simply good citizenship. Sustainability involves reducing waste, energy, and water consumption, and making the business more sustainable in the long run.

In addition to reducing our own IT carbon footprint, Intel IT can also positively reduce Intel's carbon footprint by delivering services to our employees such as videoconferencing, power management practices, and green printing services. All these initiatives bring a very tangible impact to the corporation. Making IT green is a means to an end, the end of making Intel's business more sustainable and cost efficient.

PwC: What key actions did your IT organization take to support sustainability?
CP: One of the first things we did was create a dedicated IT sustainability program office. We formally appointed a senior IT manager responsible for defining and putting the necessary metrics, strategies, and processes in place internally. We decided to focus on a core metric of carbon footprint (CO_2) reduction as well as reducing water, energy, and other resource consumption, and we adopted internal IT goals to manage our IT energy footprint and contribute to Intel's energy reduction of 5 percent per year from 2007 to 2012. We have been

"We have reduced our server count from 100,000 down to 75,000. The business capability in that time from a network, storage, and compute standpoint has grown 35 percent to 50 percent annually."

able to deliver on these goals in the past several years. Additionally, we participate as active members of Climate Savers and Green Grid.

Moving forward, a key role and challenge for the Intel IT sustainability program office is to start embedding sustainability-oriented decision making, activities, and best practices throughout our daily business activities, so we can transition sustainability from a program to a mind-set.

PwC: How can IT play a role in embedding sustainability-oriented activities and mind-set?
CP: We know we can measure and impact the things that we absolutely control in IT, such as lowering data center power consumption, increasing server utilization—and our initial focus was on these controllable metrics. The challenge is how do we embed new behavior throughout all of our IT organization and throughout the business?

In IT, we have an opportunity to partner with our business leaders, understand workflows, and then work to apply new technology solutions that can give employees and business leaders the opportunity to make better, more sustainable decisions during their daily work environment. For this reason, Intel IT places an emphasis on Lean Six Sigma certification and business process change management as a core skill set for IT employee development. I will use an example: a daily activity like printing paper. If, as individuals, we automatically send print jobs to the local printer but never pick the job up, we're just wasting paper. We implemented a solution we call greenprint, so that the job prints only when the user enters a PIN code at the printer. Now nearly everything that is printed is picked up, and there's less resource waste.

In this way, IT can reduce business waste beyond managing our own IT footprint. That's the end state we're trying to get to.

PwC: What are you doing to raise awareness about sustainability and what everyone can do?
CP: We are committed to raise awareness among employees both inside and outside IT, and there are a few things that we have done. One is through Intel's employee bonus program. For the last three years, there's been an IT sustainability component in the corporate formula that determines the year-end bonus amount that employees get; this ties sustainability goals to existing mechanisms of employee compensation. Additionally, we have created an internal Environmental Excellence Award that incentivizes employees to generate efficiency ideas in support of sustainability. Employees can submit ideas competing for financial grants to fund localized activities; the best ideas also get recognized and shared.

We also use existing communications mechanisms to make employees aware of the importance of sustainability. Intel IT develops an internal newsletter called Digital Edge that goes out to employees about services that we provide. We have used this newsletter to communicate our goals for sustainability and the progress we are making. We also push information about new initiatives, such as tips on PC power management settings and greenprint, and we let employees know about the availability of new services, encourage them to use these services, and provide tips on how best to utilize these services in their daily activities. Through this process, we let employees know how they can directly contribute toward achieving corporate sustainability goals.

We also create awareness for the importance of IT sustainability outside of Intel. Each year we release an Annual IT Performance Report directed at our industry peers, which includes information about the importance and business value benefits of sustainability initiatives.

PwC: What are some techniques that you are using to make data centers more green?
CP: We're using new products and technologies in combination with a variety of innovative approaches to better manage power efficiency within our global data center network.

Proactive Server Refresh, a program we initiated in 2007 to refresh our servers on a four-year average cadence, has been the single biggest business value driver within our IT sustainability program for energy footprint reduction. Newer servers offer better energy efficiency—performance per watt—which allows us to meet 45 percent annualized growth in compute capacity with fewer servers, consuming less space and

"A key role and challenge for the Intel IT sustainability program office is to start embedding sustainability-oriented decision making, activities, and best practices throughout our daily business activities, so we can transition sustainability from a program to a mind-set."

power. Additionally, the new servers draw less power for the same workload with a built-in capability to take power consumption up and down depending on the actual load on the server.

Another approach we found especially beneficial in our facilities is airflow management. Innovations that can improve airflow management reduce the amount of power consumption dramatically, and they can be as simple as cable placement in the back of a server or as extensive as changing data center designs, like raised floor approaches that create hot and cold aisles for airflow isolation. Intel IT has been recognized across the industry for some unique innovations in chimney management—where we consolidated the backs of the servers together into an isolated chimney that gets vented uniquely; this approach prevents hot air recirculation without the need to reconfigure the facility for a raised floor.

We've also completed successful proof of concepts with free cooling—the use of untreated, external air to cool a data center. During a proof of concept in New Mexico, we found that 75 percent of the time we can cool our data centers without pre-treatment or pre-cooling input air. This approach offers significant savings of cooling systems, power, and infrastructure capability, which in turn expands available capacity inside those data center facilities.

PwC: Those are some good innovations. How much more potential exists to make data centers greener? Are we at the beginning, middle, or end?

CP: It's a long-term commitment to make our data center greener, and we remain committed to aligning our efforts and investments as they support efficiency within our business. We've reduced our data center count from 150 down to 90 in the last several years. We have reduced our server count from 100,000 down to 75,000. The business capability in that time from a network, storage, and compute standpoint has grown 35 percent to 50 percent annually. Our capability is growing dramatically while we're shrinking our footprint, so efficiency is going up. We still have a long way to go, and we continue to see opportunities to reduce and drive further consolidation. We're asking ourselves several questions around our data center facilities as we evaluate business needs and available technology: When do we consolidate? When do we retrofit? When do we upgrade? When do we retire our end-of-life assets? And we're putting the decision metrics in place while enabling business goals, such as service quality, capacity, velocity, and cost efficiency.

Intel has been the largest purchaser of green power and renewable energy credits in the US for the past three years, illustrating our long-term commitment. We have 2.85 billion kilowatt-hours annually that are related to renewable energy sources or renewable energy credits, so it's a big piece also with solar installations on our sites and things like that.

PwC: What are some examples of IT creating an impact outside of the data center?

CP: From an innovation perspective, I want to mention videoconferencing. Over the past several years, we've had a significant emphasis to incrementally deploy more video collaboration solutions. We're finding that videoconferencing capability is significantly reducing the amount of travel required of our employees. Last year, just through these efforts, we estimate we saved about 57,000 travel hours. Our video capabilities have been increasing year over year, so what we saw in 2010 was about 27 percent over the previous year and we emphasize more capability going forward. While there is the bottom line cost savings of avoiding travel costs, we're also helping the impact to the environment by reducing our carbon footprint. We estimate the associated travel avoidance resulted in expense savings of $26 million to Intel, and it also helped us reduce an estimated 22,000 tons of carbon dioxide emissions.

PwC: From what you've been describing, this sounds like an opportunity for IT to demonstrate leadership as well.

CP: Absolutely. From an IT perspective, we're extremely proud. We've been awarded the InfoWorld Green 15 for the last several years, and we've been recognized by *Computerworld* for some of our innovations inside our IT organization. We're also very proud to have been recognized for supporting Intel's sustainability efforts at a corporate level.

45%

"Newer servers offer better energy efficiency—performance per watt—which allows us to meet 45 percent annualized growth in compute capacity with fewer servers, consuming less space and power."

Raising awareness with energy management

Ryan Whisnant of SunGard details the company's journey to get a handle on energy management in its operations.

Interview conducted by Vinod Baya and Bo Parker

Ryan Whisnant

Ryan Whisnant is the director of sustainability at SunGard, a software and technology services company with over 250 offices in 35 countries and 20,000 employees worldwide. Prior to joining SunGard, he founded a consulting practice that provided strategy, program management, and communications services to technology clients. His experience includes program development and training for an energy systems provider, environmental nonprofit strategy, and consulting on various sustainability and technology projects. Whisnant holds a bachelor's degree in environmental engineering from Northwestern University, an MBA from the Ross School of Business, and a master's degree from the School of Natural Resources and Environment at the University of Michigan.

In this interview, Whisnant details SunGard's experience of using an energy management system as part of broader sustainability efforts.

PwC: What does sustainability mean in your business?

RW: At SunGard, our employees have had a long-standing, grassroots interest in sustainability. We made a formal, public commitment in 2008. Sustainability is driven by values. For us it is about improving our competitiveness, reducing our risks, and being a responsible corporate citizen. Given the nature of our business—we're a technology business—we obviously have a strong focus on environmental sustainability, and our most important and challenging sustainability issue is around energy use in our business. But sustainability encompasses broader things—all the environmental, social, and governance factors.

PwC: What solutions or tools do you use to help with your sustainability initiatives?

RW: We've evolved, like many other companies. At first it was more of a manual process, putting together data and spreadsheets. Then we moved through some different tools, most recently to Hara for tracking and management of our energy use. For us that's important, because if you look at the profile of our business in terms of our emissions, it's pretty much all scope 2 emissions from purchased electricity. We're not the kind of business that has significant scope 1 emissions. We do, of course, have some scope 3 emissions with business travel. But it's really that purchased electricity. So, being able to track the energy use in our facilities is critical to managing and reducing our environmental footprint. The tool is also important for our ability to be transparent and report on our carbon footprint.

"Sustainability is driven by values. For us it is about improving our competitiveness, reducing our risks, and being a responsible corporate citizen."

PwC: What are some of the challenges that you've needed to overcome?
RW: Data is one of the biggest challenges in terms of getting a system in place. Using an energy management system has been very helpful. But there's a lot of work on the back end that must occur to even have the data available to pull into the system. Much of that has to do with the business process. You can't just come online with a platform like this and expect it to be a silver bullet for reporting carbon emissions. You really must change some of your processes.

PwC: As you move forward with sustainability, are there impacts that you did not anticipate?
RW: Part of the value of sustainability is the process that you go through in implementing an enterprise-wide management system. It's the conversations that you have internally, where you're realigning processes. For us, we could highlight—with different stakeholders within the company—the importance of tracking our energy usage and having an understanding of our carbon emissions. In places such as the UK, where they have the Carbon Reduction Commitment [CRC], if you're a certain type of organization and you use a certain amount of electricity, you essentially pay for your emissions. There's a direct cost not only for the electricity that you're using but also for the emissions.

It's important to be able to raise that as a material issue within the organization. Going through the process of changing the internal business process to pull together this data for these kinds of systems has been very valuable.

It's the same thing when you're developing and reporting and really working on being transparent according to a standard such as GRI [Global Reporting Initiative]. A whole internal conversation occurs around all the indicators. It raises awareness and forces companies to take a look at how they're performing in these different areas.

PwC: As you pulled together the data, what were the insights you gained that you probably didn't know before?
RW: It's sort of an 80/20 rule in this case. The first time, you slice and dice the data and see where some of the biggest insights come from. When we took our first pass at this, it was interesting to find that the majority of our energy use, about 85 percent, comes from our data centers. Every company has limited resources and limited time, so you need to know where to focus your efforts. For us, it became clear that we needed to focus on being efficient in our data centers—obviously not to the exclusion of working on the energy efficiency of our offices, but I think that was a real eye-opener. We had a hunch that the data centers were using more, but I don't think we knew that it would be quite to that degree.

And then after you evolve a little bit more on that process, the insight becomes more granular. Now we're down to the level where we're able to look at individual facilities. We can actually look at our energy intensity (kilowatt-hours per square foot) on an annual basis, and we can get a good sense as a normalizing factor what the facilities look like and how they're comparing to other facilities. We have a diverse real-estate footprint. We're in 30 countries and in most cases it's leased space, so you can have buildings that look dramatically different. In some of them, like the office where I am in New York, we built it out from scratch with sustainability and energy efficiency in mind. We've been in some other facilities a little bit longer, so they're less efficient. Being able to get down to a level of granularity allows us to identify those locations where we can focus our efforts on energy efficiency and retrofit.

PwC: Are these insights providing a greater appreciation for the inherent risks, and is business planning and modeling any different because of that?
RW: Yes. It gets back to the comment I made about raising the awareness within the organization. Before, energy usage may have been just another line item. Now there are all these other considerations around it. Especially because we're a technology business and what we do relies on access to affordable and reliable energy, highlighting the potential risks around any kind of energy price volatility is necessary to understand risk.

Also, there's so much uncertainty around carbon regulation. There's the CRC in the UK. They've looked at a carbon tax in France. Things have come up in Australia and Japan, and there are activities in the US as well. Being able to have some sense for what our carbon profile looks like in different parts of the world—that's important to build into the risk equation.

PwC: What are some open challenges to address in the future?

RW: A topic on the horizon and one we want to be prepared for is integrated reporting. Stakeholders are looking to ultimately have an integrated report that ties together the financial reporting and the sustainability reporting. With that reporting, you're able to convey the business value of sustainability or corporate responsibility indicators in terms that all understand. A lot of good work is being done in integrated reporting.

The biggest challenge to doing integrated reporting right now is that there isn't really a standard. We have good, solid standards for financial reporting, and something similar is needed for sustainability reporting. Standards like GRI are emerging, which is very important. We have chosen to use GRI to report our performance in a standard way. It'd be interesting to see what GRI grows into in the future.

PwC: How has implementing sustainability solutions affected the organization?

RW: We're at a stage where we're continuing to develop our ability to measure and monitor our energy use. Some of our employees have the ability to see the energy usage in their location. One of the things we've found—it's not unique to us—is that competition amongst employees can be a great tool in terms of driving organizational change and just having that awareness. One of the reasons we looked at Hara as a tool was the potential to pull the data into our intranet where we could create a dashboard where employees see the energy usage at their various locations, so they can start to play an active role.

The question I get more than any other from our employees is, "What can I do related to sustainability that will have an impact on the company?" We have a good level of awareness, and introducing granular information in the context of business activities is a way to take it to that next step, where employees can start to play a role in reducing our energy use. I've heard of studies saying the behavioral component accounts for between 3 percent and 5 percent of energy use at a location. So it's not an insignificant amount.

PwC: What advances would you like to see, so that you can continue to move forward with your sustainability goals?

RW: The more that we can move toward automation, the more benefit that companies will realize. We've gone through a learning process, and I'm sure other companies have had the same experience. We started from a manual process, going out to all the facilities and manually trying to gather that energy data. As much as you can, you want to remove that manual portion of the process and just have the energy data feed directly into the system. Today we use a service that aggregates the bills for us, and there are some other side benefits to that where the service helps us look for competitive pricing contracts in terms of energy. The service looks for billing errors and things like that, aggregates the data, and then uploads all of the kilowatt hours and cost into a system.

We can then feed that into our management system and get the combined view in terms of our scope 2 emissions (from purchased electricity) and scope 3 emissions (from business travel). I think it's leaps and bounds ahead of doing it manually. Ideally things would evolve to the extent where maybe you just have a web service that is getting the energy data directly from a submeter at the location or it's getting it directly from the utility in lieu of a paper bill. The more things can get automated like that, the better. You see that in other areas of business, and I would anticipate that we're going to see more and more moves in that direction.

"We have a good level of awareness, and introducing granular information in the context of business activities is a way to take it to that next step, where employees can start to play a role in reducing our energy use."

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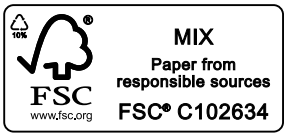

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Subtext

Sustainability	The processes by which enterprises manage their economic, environmental, and social obligations and opportunities to create long-term competitive advantage and growth. These are also often referred to as people, planet, and profits in popular media.
Embedded sustainability	Sustainability is embedded when every part of the business makes decisions that intelligently weigh the economic, environmental, and social impacts on the long-term ability to sustain the business.
Closed-loop system	A closed-loop system has active feedback mechanisms to monitor the output of the activities and thereby correct for deviations from targets or thresholds. In sustainability terms, it is the cradle-to-cradle or cradle-to-grave view of resources and information.
Enterprise sustainability planning (ESP)	A set of capabilities available as enterprise software solutions that allow enterprises to collect, track, model, plan and analyze sustainability information within the context of operations.