Reuse, Recycle and Reduce Complexity

Combining complexity reduction with sustainability principles—designing both into products, services and operations
For years, companies have been compelled to reduce complexity in products, services, internal operations and assets—all in an effort to eliminate unnecessary variability while improving performance. For manufactured products, these complexity reduction efforts yielded savings anywhere from 5 to 20 percent over two to five years, primarily by reducing design costs, supplier spending and lifecycle expenses such as training, customer service and maintenance. Increasingly, companies are going a step further—expanding their complexity reduction initiatives to also capture environmental and social benefits.

We call this Sustainable Complexity Reduction. The concept is being applied across industries as companies embed sustainability principles into the designs of their products, services and operations. For example, iterations of Toyota’s zero-emission hybrid system used in the popular Prius are increasingly common across the automaker’s product lines. Netherlands-based Philips recently designed a more efficient power management subsystem for magnetic imaging, making them standard across a line of MRI machines sold to the healthcare industry. Philips is also poised to use energy-efficient designs and components in its consumer product lines of flat-screen TVs, vacuum cleaners, phones and coffee makers.

These are a few examples of the internal value judgments companies make as they determine how to innovate, reduce complexity and make their products and businesses more sustainable.

**Designing for Sustainability**

As an approach, Sustainable Complexity Reduction provides a critical examination of necessary variation in products and operations. It determines the minimum number of assets needed to create a product line, and the minimum number of customer requirements that can be profitably served. Tools and frameworks used to reduce complexity are perfectly positioned to embed sustainability into product designs. There are two
analyses performed in a complexity reduction initiative that can help drive sustainability.

**Determine minimum number of assets.** Organizations are not always aware of all the assets they have to work with, especially when they are “siloed” into different businesses or product lines. Lack of information about supply chain, operations, engineering principles, or the physical and technical principles underlying these assets often prevents managers from identifying the best and most sustainable designs. There are numerous examples where financially focused tools fail to account for broader aspects of sustainability—such as waste or energy usage—and complexity was reduced without consideration for environmental factors. Although sustainability is generally considered a priority, managers rarely receive the appropriate metrics or information to know all the questions that should be answered.

A good example of identifying the best and most sustainable designs is fluorescent lamps. The question of whether a company should simplify its lighting systems around efficient fluorescent lamps seems straightforward enough. But dig deeper and you will find there is very little real data to answer fairly simple questions about the sustainability aspects of fluorescent lamps. For example, can the actual energy savings be quantified? Does it take less fuel to manufacture these lamps? How long will the bulbs last? Does bulb life affect maintenance operations? What about the mercury content; is disposal a valid consideration? What kind of ballast is used? Can these lamps be retrofitted into an existing footprint at low cost? (see sidebar: Lighting the Way on page 5).

**Align requirements with sustainability.** Requirements are those aspects of a product that a company views as necessary for performance, such as size, weight, color or serviceability. Often, product requirements are determined without consideration for environmental impact. For example, retailers offer plastic bags for their customers’ convenience, yet for years, decisions regarding bag color and thickness, while potentially harmful to the environment, were rarely considered. By understanding how product performance requirements affect a product, system or internal operation, managers are able to differentiate between what is needed and what is not.

However, in designing for sustainability, there is the risk of inadvertently increasing complexity in the business. This is where Sustainable Complexity Reduction provides the appropriate checks and balances. It is the means by which organizations can guard against over-engineering or unchecked design proliferation geared toward delivering what they perceive as what customers want. Figure 1 compares the attributes of standard complexity reduction and Sustainable Complexity Reduction.
Clearly, managers with some level of sustainability “savvy” are already reducing the complexity in their portfolio of products—and striving to make decisions that are essentially right for their companies and the resources they consume. However, behind the scenes there are still many unanswered, and ostensibly unanswerable, questions: How should these complexity reduction decisions be made? What is driving variations in products? What do we need to keep, and what should go? How can we continue to promote competition in the supply base? How do we simplify things without crowding out innovation? Are our proposals and ideas truly sustainable?

The problem of complexity can quickly become a runaway train, making it difficult to tackle the issue. For example, Carrier, a maker of HVAC equipment, uses compressors to drive its line of Energy Star rated heat pumps. Depending on the manufacturing base, there may be 10 to 20 different types of compressors used across the line. To reduce the complexity of its heat pumps in a sustainable manner, managers had to consider the sources of variation in the internal component. They might include both reciprocating and circular motion compressors, different stages, different compressor designs (which are the most sustainable and why?), costs, areas where the product could be simplified, and the environmental and financial benefits.

With a deep understanding of their assets and product requirements, these managers will be able to reduce complexity in a sustainable way.

The Approach
Sustainable Complexity Reduction embeds a sustainability perspective into each step of product evaluation. Companies assess the level of complexity that is necessary in their portfolio, while also considering the sustainability issues that are most important to them. These issues typically link directly to the firm’s broader corporate sustainability strategy, especially triple-bottom-line issues such as financial viability, energy usage, waste generation, supplier dependency, hazardous emissions, materials and employee well-being.

To drive at the heart of sustainability, the initiative cannot be timid. It has to have a profound impact on these areas, which means obtaining a true understanding of assets, rather than a superficial one. Let’s discuss this in more detail:

Evaluate underlying components of products. Much of what passes for complexity reduction today is focused on superficial aspects of a product rather than getting to the “gut” or internals. Yet getting beneath the surface is the only way to reduce complexity in a sustainable way. Understanding the underlying components and parts of products will help identify opportunities to design for...
sustainability and do so without affecting the customer experience (see figure 2)

Nike is a good example. In 2007, Nike introduced its Considered line of sustainably designed shoes. The shoes are manufactured with interlocking mid and outer soles instead of glue to reduce the amount of toxic adhesives. They are also made of environmentally friendly or recycled materials that use 80 percent less solvent than standard lines. The environmental benefits are obvious as production involves fewer hazardous materials. What is less obvious, however, are the substantial changes to operations necessary to produce the shoes, which include using inventive manufacturing techniques rather than traditional methods of layering, heating and cooling adhesives and stiffening agents.

The company has since found that these manufacturing principles could be selectively applied across all of Nike’s shoes—whether the shoes are designed for running, hiking, walking or tennis. The concept is now expanding to the marketplace as traditional shoe lines, such as the iconic Air Jordan, are being manufactured based on Considered’s principles.

Rather than maintaining multiple manufacturing platforms, Nike decided to reduce complexity and keep just one. The company was able to take its sustainable shoe idea, evaluate its constituent components and sub-processes, and “commonize” the pieces along all dimensions—financial, social and environmental.

Determine sustainability requirements. Evaluating the complexity of a company’s assets necessitates first knowing what the business requires—now and in the future. By paring down a product or service portfolio, all forward-looking decisions are made from a sustainability perspective. By this we mean decisions are made with an understanding of what is necessary versus what is nice to have. Managers distinguish between the attributes of a product that are considered “require-
ments” versus those that are truly required based on a good understanding of customer preferences. We have found that it is possible to reduce the cost of complexity to a minimally necessary point while deriving a broader environmental or social benefit. Figure 3 on page 6 shows the relationship between variation and total cost of ownership.

Xerox, for example, pioneered the practice of remanufacturing, reusing and recycling office equipment. Machines are designed for easy disassembly and durability and printer cartridges are designed for remanufacturing; a typical remanufactured cartridge contains an average of 90 percent reused or recycled parts. Xerox’s reuse-and-recycle programs have diverted billions of pounds of potential waste into more productive use. By defining the true requirements for printer cartridges to both retain customers and maintain

Lighting the Way

Lighting systems can be expensive. Large retailers, with a light fixture for every 250 square feet of floor space, can have anywhere from $50 million to $300 million worth of lighting across their stores. Add an additional $16 million to $96 million in annual costs to account for energy usage and bulb replacement, depending on bulb life and efficiency, and pretty soon we’re talking about real money. With new technologies and large amounts of money at stake, more companies are assessing their lighting systems for cost-saving opportunities (see figure).

But turning a lighting system into a cost-saving opportunity is not that easy. Not only are there operational hurdles to clear, but also few companies fully understand the intricacies of their lighting systems. For instance, large retailers are spread out across thousands of locations, making it difficult to coordinate lighting solutions across regions. Also, competing interests often prevent companies from accounting for all elements of a lighting system, leading them to focus instead on costs or on lighting quality, often at the expense of one another. Finally, broader sustainability guidance is often unclear. For example, the current LEED rating system for lighting applies a mix of recommendations, but offers few direct credits for employing sustainable lighting solutions.

Hoping to turn promising sustainability opportunities into medium- to long-term profits, one organization deployed a Sustainable Complexity Reduction initiative. Managers were assigned to evaluate product requirements, engineering principles and ownership costs to identify a lighting solution. By embedding sustainability principles into complexity reduction, the organization saved more than 5 percent in future space lighting costs, over half of which came from reduced power usage.
a remanufacture-friendly design, Xerox simplified its product set while pleasing customers, and addressing a social issue. Had Xerox approached cartridges differently, treating remanufacturing solely as a customer preference, its reuse-and-recycle programs would not be nearly as successful.

**Getting to the Heart of Decisions**

Going beneath the surface can be difficult for people stuck in silos or unable to broaden their perspective. Companies most prone to failed sustainability efforts are those that rely too heavily on their suppliers to build in sustainability, or those unable to integrate many different perspectives into one achievable goal. In our experience, making truly sustainable changes requires getting to the heart of the tradeoffs and preferences that are embedded within the organization, and getting there quickly.

In Sustainable Complexity Reduction initiatives, it is important to take a holistic approach so everyone is on board from the outset. If the initiative is heuristic or haphazard it could result in costly, poorly performing products, or worse, charges of “greenwashing,” which can damage a company’s brand.

Because these initiatives will unveil different perspectives, the justification for any decision must be well-structured, transparent, rigorous and linked to mandated sustainability principles. In turn, managers must be empowered to identify and implement complexity reduction in their portfolios of assets. They must be knowledgeable and capable enough to translate broad mandates for sustainability into discrete requirements and actions to achieve sustainability.
The Test of Time

By broadly embracing a sustainable mindset, companies can pursue initiatives to reduce complexity regardless of the economic climate. When complexity reduction initiatives are viewed as a way to enable sustainability rather than hinder it, the rewards are compelling:

• Reduced input costs
• Lower lifecycle and operational costs
• Stronger sustainability position
• Improved environmental profile

These rewards, embedded into the very fabric of a product, will endure the test of time and allow companies to maintain their goodwill and good corporate citizenship—even within the context of cost cutting. It is the essentially right thing to do.

Authors

Rick Kozole is a partner in the Detroit office and can be reached at rick.kozole@atkearney.com.

Tom Peddicord is a consultant in the Washington, D.C., office and can be reached at tom.peddicord@atkearney.com.

Cary Shiao is a consultant in the San Francisco office and can be reached at cary.shiao@atkearney.com.

Kevin Phillippi is a consultant in the Chicago office and can be reached at kevin.phillippi@atkearney.com.

Chris Callieri is a principal in the Washington, D.C., office and can be reached at chris.callieri@atkearney.com.

John Wolff is a principal in the Washington, D.C., office and can be reached at john.wolff@atkearney.com.
A.T. Kearney is a global management consulting firm that uses strategic insight, tailored solutions and a collaborative working style to help clients achieve sustainable results. Since 1926, we have been trusted advisors on CEO-agenda issues to the world’s leading corporations across all major industries. A.T. Kearney’s offices are located in major business centers in 36 countries.

AMERICAS
Atlanta | Boston | Chicago | Dallas | Detroit | Mexico City
New York | San Francisco | São Paulo | Toronto | Washington, D.C.

EUROPE
Amsterdam | Berlin | Brussels | Bucharest | Copenhagen
Düsseldorf | Frankfurt | Helsinki | Kiev | Lisbon | Ljubljana
London | Madrid | Milan | Moscow | Munich | Oslo | Paris
Prague | Rome | Stockholm | Stuttgart | Vienna | Warsaw | Zurich

ASIA
Bangkok | Beijing | Hong Kong | Jakarta | Kuala Lumpur

PACIFIC
Melbourne | Mumbai | New Delhi | Seoul | Shanghai
Singapore | Sydney | Tokyo

MIDDLE EAST
Abu Dhabi | Dubai | Manama | Riyadh

For information on obtaining additional copies, permission to reprint or translate this work, and all other correspondence, please contact:

A.T. Kearney, Inc.
Marketing & Communications
222 West Adams Street
Chicago, Illinois 60606 U.S.A.
1 312 648 0111
e-mail: insight@atkearney.com
www.atkearney.com

Copyright 2009, A.T. Kearney, Inc. All rights reserved. No part of this work may be reproduced in any form without written permission from the copyright holder. A.T. Kearney® is a registered mark of A.T. Kearney, Inc. A.T. Kearney, Inc. is an equal opportunity employer.