Frugal Re-engineering: Innovatively Cutting Product Costs

As rising commodity prices, unrelenting competition, and price-sensitive customers squeeze profits, more manufacturers are turning to frugal re-engineering to reduce costs and improve margins.
Most manufacturers know about frugal engineering—the concept of developing innovative, no-frills products at the lowest cost possible. India’s Tata Nano, an urban vehicle with a $2,500 price tag that targets price-conscious customers, is the poster child for frugal engineering.

What, then, is frugal re-engineering? We define it as a structured, sustainable process of continually redesigning products to cut costs. Cost-effective continual re-engineering (or continuous improvement in manufacturing parlance) of a product is the essence of frugal re-engineering. For example, plastic parts can be redesigned to be made of polypropylene instead of costlier fiber-reinforced plastic, and low-temperature specs can be relaxed for window-channel grease in temperate regions that don’t have harsh winters.

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Frugal re-engineering builds on the concepts of value analysis, value engineering (VAVE). It encompasses the strategic imperatives of an empowered organization supported by processes, metrics, tools, and systems. It enables companies to continually reduce costs in a structured manner.

Material purchases account for about 60 percent of the typical manufacturer’s cost base, and rising commodity prices exert upward pressure on engineered material costs. But there is good news: Frugal re-engineering has the potential to drive year-on-year cost savings of between 7 and 12 percent.

Frugal re-engineering borrows from the Indian concept of “jugaad.” Indian entrepreneurs, using parts from junkyards, have been known to create their own local transportation to fill the void in low-cost vehicles. It is comparable to grassroots innovation that uses ingenuity to solve a problem at a minimal cost. In this paper, we discuss the processes and techniques used by these innovators to develop cost-effective solutions.

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**Building the Foundation**

We begin by looking at the framework to manage overall product costs (see figure 1 on page 3). All leading manufacturers have value-engineering or cost-reduction programs in place, but long-term success requires four strategic objectives:

- **Align your cost reduction strategy to the overall business strategy.** If material cost reduction is not articulated as a strategic objective and managed as a whole, those charged with reducing costs will struggle to push ideas through the system.

- **Link multiyear cost reduction plans to objectives at the business-unit level.** Frugal re-engineering ideally should translate into actionable targets for business units so that managers can integrate them with their business plans. When targets are regularly reinforced, frugal re-engineering objectives become an integral part of multiyear plans. An industrial goods company that broke down its corporate-wide cost-reduction targets to the employee level instilled a sense of both ownership and urgency and ultimately doubled cost savings.
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Employ a product life-cycle approach. While frugal re-engineering might provide immediate impact, the concept can reap consistent long-term benefits when viewed as a tool for reducing costs over the product’s entire life cycle.

Insist on a frugal value stream. Because a significant portion of material costs are paid to suppliers, it is important to get all value-chain players in step with the frugal re-engineering strategy. The cost of procured parts can be reduced by collaborating with suppliers. Suzuki in India launched a “one gram one component” weight reduction program, encouraging its design teams, employees, and vendors to suggest solutions. Nearly 300 suggestions were implemented with a 15 percent reduction in vehicle weight and a corresponding reduction in cost.

Organization Structure and Governance

A frugal re-engineering effort requires a strong, empowered (but not necessarily large) team with the following characteristics (see sidebar: Case Study: The Frugal Manufacturer on page 4).

- **Stand alone, and be independent.** Independence allows the team to drive the implementation of ideas in a timely manner. The harder it is for teams to push ideas through the system, the harder it is to get them implemented.

- **Focus on program management.** Aligning various stakeholders toward common objectives is essential for a dedicated program management team. The team’s role will include providing technical support to idea generators, breaking down barriers to putting ideas into action, and helping streamline implementation.
Plastic parts can be made of polypropylene and in temperate regions low-temperature specs can be relaxed for window-channel grease.

- **Be empowered.** A strong leader will break logjams and vouch for bold ideas in the face of vested interests that may be acting at cross-purposes. Ideally, the team leader reports directly to the chief operating officer (COO).

- **Feature strong governance.** A truly structured process requires a multilevel governance organization. Only then can ideas be properly evaluated and effectively used. For example, most obstacles are tactical, and the majority are easily overcome with structured, cross-functional meetings at the right levels. However, when issues need to be escalated for senior-level decisions, the structure will provide for a cross-functional forum chaired by senior leaders to arrive at a consensus. Finally, steering-committee reviews at the COO level will monitor adherence to strategic and business-unit objectives. In short, a well-defined governance structure acts as an internal auditing agency for implementing ideas.

- **Seek cross-functional input.** Frugal re-engineering is not just an engineering endeavor; it depends heavily on input from other areas. We recently helped an automotive original equipment manufacturer (OEM) by getting input from sourcing, marketing, and manufacturing; this doubled the amount the OEM would have saved had it worked solely with the engineering department.

**Case Study: The Frugal Manufacturer**

The chief operating officer (COO) of a large manufacturing company was relieved. He had just presented to the board of directors results of a program that had reduced material costs by 8 percent, thereby adding $30 million to the company’s bottom line.

The year before, the COO had chaired a meeting of his top executives to launch the program, informing them that the board wanted their division to double their cost-cutting goal for the coming year. For a company that had been achieving 2 to 3 percent cost reductions year over year, a 5 percent overall cut was intimidating. His team was skeptical of the target, and many questioned their ability to reach it.

This meeting marked the beginning of a journey toward an ambitious goal. With external support, the COO created a frugal re-engineering team comprised of engineering, manufacturing, and sourcing personnel and rolled out subsystem-level targets to all functional leaders. The team used a five-step process to identify and generate ideas. A strong governance structure was set up to evaluate the ideas. In just four months, the project generated some 600 ideas, of which nearly 200 were accepted after initial screening. Next, the team tracked idea validation and implementation.

Within a year, the frugal re-engineering project met and significantly exceeded the board’s goal. The COO was pleased—not only with the results but also about the companywide impact as departments worked together to achieve the daunting objective. He cited the upfront collaboration with stakeholders as instrumental in the implementation of nearly 70 percent of the ideas. And perhaps most important, frugal re-engineering dramatically improved the company’s ability to compete by instilling a frugal corporate culture.
The Frugal Re-engineering Process

We have developed a structured, straightforward process based on two core elements: idea generation, and idea validation and implementation (see figure 2).

Idea Generation

Because ideas come from many sources, both internal and external, idea generation begins with a reliable process for capturing them. A well-conceived process will also allow for innovative solutions to flow from studying the competition through benchmarking exercises. We advocate a suite of idea-generating tools—think of them as questions looking for answers—that become relevant at each stage of the re-engineering decision-making process. Each stage offers unique opportunities for frugal re-engineering (see figure 3 on page 6).

Do customers value all the current features? Customers won’t pay for features they don’t value, so continually targeting and either eliminating or redesigning nonessential elements becomes a priority. Two analyses—of functions and specifications—are excellent tools for systematically unearthing such opportunities. We used both analyses to help a construction-equipment manufacturer in China cut the cost of cabin components by 15 percent, eliminating nonessentials such as cup holders and headrests. Similarly, a North American automaker relaxed its specifications on axle backlash—a major cost in gear manufacturing—and saved more than 12 percent in processing costs.

Can the current design be optimized? Once a product’s features are defined, its design parameters—size and form, for example—can be optimized on the basis of functional and aesthetic requirements. Engineers often hesitate to modify design parameters even though they know the design can be improved; computer-aided optimization is an excellent tool that can help save material costs while enhancing product life span. For example, by redesigning the wing spoiler for a global supplier of aircraft systems, an Indian technology-solutions provider reduced the weight by 40 percent, cutting costs substantially.

Figure 2
Frugal re-engineering requires a straightforward process

<table>
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<tr>
<th>Prioritize components and sub-systems</th>
<th>Apply tools to generate ideas</th>
<th>Prioritize ideas</th>
<th>Manage stakeholder approvals</th>
<th>Fast-track implementation</th>
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<tr>
<td>• Conduct a spend analysis and focus on high-spend areas—80:20 rule*</td>
<td>• Use frugal re-engineering tool-kit to identify ideas in all key areas</td>
<td>• Address high-potential ideas first (a mix of technical and techno-commercial)</td>
<td>• Ensure governance structure promotes cross-functional agreements and fast-track approvals</td>
<td>• Identify and eliminate impediments</td>
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<td>• Treat modules as single systems</td>
<td>• Leverage all the tools to broaden “idea-hopper”</td>
<td>• Do not eliminate any ideas</td>
<td>• Appoint idea champions</td>
<td>• Implement mix of quick-win and long-term ideas</td>
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* The 80:20 rule refers in this case to the likelihood that 80 percent of the savings will come from 20 percent of the focus areas. Source: A.T. Kearney analysis
**Are substitute materials available?** Commodity prices are always rising, which makes material-substitution options an important component of frugal re-engineering. Recently, an Indian automaker that projected the rising cost of nickel generated significant savings by substituting components that contained nickel with non-nickel-based components. One of our clients cut costs by 5 percent and weight by 10 percent by judiciously substituting composite materials, which are less expensive than steel for low-volume applications.

Bundling ideas to test them simultaneously is simple but powerful.

**Have manufacturing advances occurred?** Manufacturing technology and process innovations offer further opportunities to cut costs by reducing input material requirements. New process technologies such as near-net forging and flow forming—technologies with implications in many discrete manufacturing companies—can dramatically cut costs.

**Idea Validation and Implementation**

Implementing ideas boils down to organization-wide acceptance. Without acceptance, there is little chance of success. We have seen many perfectly good cost-cutting ideas tripped up by a single stakeholder with either a vested interest or no interest at all. Strong governance will prevent such scenarios.

At the validation stage, bundling ideas to test them simultaneously is a simple but powerful technique. This approach not only ensures quick implementation but also reduces testing costs and allows ideas to be considered that might not be feasible otherwise.

**Figure 3**

*Asking the right questions at each stage of the frugal re-engineering process can uncover unique cost-cutting opportunities*

- **Do customers value all the current features?**
- **Identify nonessential elements**
  - Eliminate or re-specify features
- **Have manufacturing advances occurred?**
- **Recognize today’s possibilities**
  - Reduce or eliminate processes
- **Can the current design be optimized?**
- **Refine size, form, and function**
  - Optimize weight and design
  - Use optimization technology
  - Modularize
- **Are substitute materials available?**
- **Review frugal material opportunities**
  - Switch to less expensive substitutes

Source: A.T. Kearney analysis
The appointment of a champion to serve as the sole contact for the idea and drive its implementation is crucial, and it is wise to make the extent of an idea’s success one of the key performance indicators for each champion. Successful implementation requires the following elements:

**Performance management.** For frugal re-engineering to become part of a company’s DNA, establishing performance incentives is essential. It is advisable for business-unit managers to set targets for those charged with implementation and for suppliers to be rewarded for participating in the process. In our work with an industrial goods company, we found that transparent communication of ideas between manufacturer and suppliers, and equitable sharing of investments and benefits, encouraged suppliers to adopt frugal practices or come up with innovative cost-reduction ideas. New suppliers can be persuaded to participate in idea-generating sessions by offering them priority consideration for future business.

**Knowledge management.** The increasing complexities of global corporations have made knowledge management more important than ever. For example, functions linked to product life-cycle management (PLM) solutions have proved effective in many companies. But the effective use of these solutions is often lacking. Putting in place systems for tracking ideas from generation to implementation is an essential ingredient for success.

**People and culture.** Frugal re-engineering boils down to employees who have a frugal mindset and are eager to implement economically sound ideas for redesigning components. The concept becomes part of the corporate culture and the foundation of the organization and its processes.

**A Resourceful Concept**

In the same way that resourceful Indian entrepreneurs use jugaad methods to solve problems, companies can cut costs, increase profits, and change their corporate cultures in innovative ways. Frugal re-engineering—when applied consistently—is a strategic, all-inclusive, and structured cost-saving concept that offers immediate impact and long-term benefits over the product’s life cycle.

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