Resource-constrained product development: Implications for green marketing and green supply chains

Arun Sharma [a,*], Gopalkrishnan R. Iyer [b,1]

[a] Department of Marketing, University of Miami, P.O. Box 248147, Coral Gables, FL 33124, United States
[b] Center for Services Marketing & Management, Florida Atlantic University, Department of Marketing, 777 Glades Road, Boca Raton, FL 33431, United States

ARTICLE INFO

ABSTRACT

While academic debates and practical approaches to green marketing have matured over the past few decades, one central conundrum that has remained unresolved has been the trade-off between the higher prices of green products and the objectives of environmental sustainability. In general, it has been observed that green products are priced at a premium to account for their environmentally friendly consumption and use. We argue that resource-constrained product development approaches (alternatively labeled jugaad) that are observed in emerging countries such as China and India have the potential to change the traditional models of green product development. In addition to the competitive advantage that resource-constrained product development approaches provide, we suggest that these practices have sustainability and supply chain benefits. We show that the innovation process relies primarily on frugal engineering that reduces material use (thereby reducing burden on supply chain) and meets green marketing objectives at much lower, and therefore, more affordable prices. We draw out several implications for theory and practice.

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1. Introduction

Current approaches to green marketing rely on the fact that there exists a segment of customers who would pay a premium for a product that is environmentally friendly, and thus "green" (Elkington, 1994; Iyer, 1999; Menon & Menon, 1997; Vandermerwe & Oliff, 1990). The prospects of a price premium also provide the motivation and the business logic for companies to develop green products and to engage in specific operations and marketing practices, such as recycling, reusing materials, and forming green supply chain alliances (Hawken, Lovins, & Lovins, 1999; Nidumolu, Prahalad, & Rangaswami, 2009; Porter & van der Linde, 1995). However, the basic premise of a premium for environmentally friendly products has seen several challenges in the recent economic downturn, with consumers cutting back on their green product preferences and returning to traditional low-priced items (Clifford & Martin, 2011).

The discussion on green products and green marketing has also been quite muted in the context of business-to-business marketing. Trade-offs between price and environmentally sustainable objectives have been reported here as well, with studies reporting that organizational buyers view recycled products, such as paper, to be of lower quality (Polonsky, Brooks, & Henry, 1998), or think the products are more hype than they are actually green (Ginsberg & Bloom, 2004). Thus, for green marketing to enter the next phase, where green products are

the standard to which other products are compared, industrial marketing needs to take a hard look at how to resolve the tradeoffs of green quality and price.

We contend that there is potential for green marketing approaches worldwide to gain from the insights developed in customizing products for the rural poor in emerging markets, where the core focus of innovation has been on developing or acquiring technologies, or on altering business model and capabilities, to make products affordable (Prahalad & Mashelkar, 2010). The central thrust of innovations in such contexts is affordability, and a range of alternatives are explored along with several improvisations in order to develop products that fit-in with the consumption context (Prahalad & Mashelkar, 2010). Driven primarily by a resource-scarce environment, innovation approaches in emerging markets attempt to overcome resource constraints while meeting the demand for lower priced products. The result of such innovations, termed as "resource-constrained product development," (alternatively labeled jugaad) are products that use minimal resources and are affordable to end-customers. This idea of constrained development is now in vogue for other markets and customer segments as well. As a *Deloitte Review* article points out, external constraints often call for new products and services that ultimately enable competitive differentiation (Chaudhuri, Giffi, Kandaswami, & Singh, 2009).

Our thesis is guided by the simple precept that while a resource-constrained product development approach balances costs and other performance objectives, it also enhances environmental sustainability and supply chain efficiencies. Thus, instead of making environmental sustainability the central focus and then making new products that would be priced – at a premium – to niche markets, product development focuses

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* Corresponding author. Tel.: + 1 305 284 1770; fax: + 1 305 284 5326.
E-mail addresses: asharma@miami.edu (A. Sharma), giyer@fau.edu (G.R. Iyer).
[1] Tel.: + 1 561 297 0917.

on the needs of the mass market and aims to develop affordable products through explicit consideration of resource constraints. In this process, by utilizing minimal resources, environmental sustainability and supply chain efficiency objectives would also be met. Moreover, such an innovation strategy would be quite impervious to fluctuating economic conditions, since the market is not driven by customers who would be willing to pay premiums.

In a recent paper on the marketing function, sustainability, and business-to-business markets, Sharma, Iyer, Mehrotra, and Krishnan (2010) suggest that, in addition to traditional prescriptions of recycling and remanufacturing, better forecasting and build-to-order programs may provide sustainable benefits. They also suggest that there are three major strategies for which marketing's role in environmental sustainability is crucial for achieving superior competitive advantage and financial performance—the reduction of surplus supply of products, reduction of reverse supply, and internal marketing. This paper identifies resource-constrained product development as another facet where green marketing can play an important role in sustainability through reduction in surplus supply and reverse supply of materials. We specifically look at the critical interaction of frugal (or resource-constrained) innovation, green marketing and sustainability, and supply chain efficiencies.

The organization of this paper is as follows. In the next section, we outline the basic tenets of resource-constrained product development and contrast it to conventional product development approaches. We then engage in a review of the literature on such development processes and offer a framework examining the imperatives of resource-constrained product development and its impacts on green products and supply chain efficiencies. We then examine the competitive green marketing resource-constrained product development and conclude with suggestions for future research and implications for managers.

2. Resource-constrained product development

Traditional approaches to product development do not take into account the type and extent of resource use in product development efforts. Instead, they are focused overtly on the returns from the financial costs of development, including costs of R&D, product and process changes, and market tests. Projects are evaluated on the basis of returns on investments and profit margins and successful projects are those that exceed the firm's expectations. In this environment, it is not the scarcity of resources but financial success that drives product development and commercialization efforts. In fact, as Prahalad and Mashelkar (2010) observed: "Most innovation programs are built on assumptions of affluence and abundance" (p. 133).

In contrast, resource-constrained product development is driven by resource scarcity and/or the motivation to use the least possible resources in developing products that find an acceptable fit with the market. We define resource-constrained product development (RCPD) as the process of developing new products that use minimal resources and are affordable to a broader market. The overriding tenet of RCPD is the development of a new product at the lowest possible cost. The emphasis on low costs leads to several intended and unintended benefits. Intended benefits include lower prices and higher market penetration of new products. Unintended benefits include frugal use of resources and thereby conservation of scare resources. As the Economist (2010) noted in the context of frugal innovations in India: "Frugal often … means being sparing in the use of raw materials and their impact on the environment."

RCPD also involves new ways of approaching the product development process. With low costs as the key objective, the emphasis is on innovative designs or re-designs of underlying technologies and new ways of organizing production processes and supply chain relationships. As compared to the traditional approach to new product development which focuses primarily on the internal creation and development

of resources to cater to a market opportunity, RCPD focuses on leveraging existing scarce resources to generate market value. Thus, available technologies, skills and processes are assembled, sometimes haphazardly, to put together new combinations that are more accessible by the broader market. The entrepreneurial spirit behind such improvisation has been termed "bricolage" in French (Levi-Strauss, 1967), "jugaad" in Northern and Western India (Prahalad and Malshekar, 2010) and "shanzhai" in Chinese (Economist, 2010). Common to all these terms is the notion of making do with whatever is available or at hand. While initially used with negative connotations, the current use of the terms in innovation and entrepreneurial contexts refer to the creation of new products and new ventures with limited available resources, as in Baker and Nelson (2005), Economist (2010) and Prahalad and Malshekar (2010).

RCPD has been attempted through three methods—new product design, new process design, and leveraging scale economies. In terms of product design, RCPD examines the cost and functionality of each component in order to determine a price–functionality link. The product development team then develops products with new components that match the performance–functionality–cost link. The GE portable ECG machine is a good example of this approach. When GE's portable ECG machine was redesigned, the price, even at $1500, was sharply lower than the $10,000 developed-country model. The following changes were made (Kriplani, 2008):

- Lowered material costs by using less plastic and a smaller LCD screen
- Used primarily engineers from India (cheaper than U.S.)
- Used the same printer as that used in bus terminal kiosks in India (cheap, and works in dusty environments—dust from India's rural roads can jam the standard printers used in traditional ECG machines)
- Used a commercially available computer chip, at a fourth of the price of a customized chip
- Simplified software to reduce the memory requirement, thereby reducing the need for memory chips.

Chaudhuri et al. (2009) provide an example of another interesting product—Acme Tele Power. Cellular phone firms in India need to install sensitive electronic telecom equipment every 10–20 km, but inadequate and fluctuating power outside the metropolitan areas remains a major constraint. Acme developed a power interface unit (PIU) that worked on an electronic chip, unlike traditional voltage stabilizers that ran on motors, and was able to improve power correction and achieve a power savings of 20%. Also, to reduce capital costs, Acme charges for power used and the cost of running the sites, rather than selling products. Using this approach, Acme has an installed base of 50,000 and revenue of $500 million.

The second method involves rethinking processes and improving on existing processes. For example, blood collection and testing in India was traditionally done locally by local doctors and was not very accurate, due to quality control issues. Super Religare Laboratories Limited in India revamped the entire system. Blood is collected from doctors in over 400 cities across India and is sent by couriers to three cities, where it is tested overnight and results are faxed or emailed to doctors the next day. The company currently does more than 33,000 tests a day, and continues to grow (http://www.srl.in/srl-ranbaxy/milestones.asp). Because of high volume and process improvements, they have now expanded to various other countries. Another example of process improvement is Bharti Airtel, a mobile phone company in India. The average revenue per person is only $5, but Bharti Airtel has reduced its costs by outsourcing most activities, such as back office, network, and towers, and the company now concentrates only on marketing. They have become the fifth largest Cellular Provider in the World (163 million customers) with operations in various emerging markets in Africa, including Ghana, Kenya, Nigeria, Tanzania, Uganda, and Zambia.