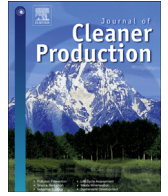




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## Co-production of frugal innovation: Case of low cost reverse osmosis water filters in India

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## ABSTRACT

The increased role of market actors in the provision of drinking water has implied a greater salience to issues of affordability. With its emphasis of increasing affordability without compromising on quality, the idea of frugal innovation holds out particular promise in resource constrained environments. In this paper, we study the case of low cost household water filters using reverse osmosis (RO) technology in the Indian city of Ahmedabad. Using mixed methods, we find the citizen to be an active participant – a co-producer – in the frugal innovation process that allows small scale, local entrepreneurs to customize their products and services to the needs and price expectations of their customers. This co-production process, that has been facilitated by the proximity of the user with the local entrepreneur, has not only reduced private costs borne by users but also been as successful as their more expensive counterparts in meeting the diverse needs of end users. Further, we find that the context facilitating such service co-production is characterized by institutional co-production, with actions of both the state and citizen creating the demand for innovation around more affordable, private solutions. While there is much to celebrate in the value created by the frugal innovation, we believe the implications of the contested and unregulated water filter technology suggest reasons for caution.

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### 1. Introduction

Innovation is a necessity if the world is to tackle the impending crisis in water (Leflaive et al., 2012; Shannon et al., 2008). This is considered true especially for water stressed societies like India. The debate on the kind of innovation that needs to be encouraged and how it can be promoted, however, is still an open one. With calls for governments to play an increasing role ring out (European Commission, 2014), the public sector is trying to negotiate a new role for itself in the provision of drinking water. Expenditure on bottled water, household water storage and treatment systems, private boreholes, and informal water vendors is projected to overtake spending on water provided by public utilities in a few years' time (Gasson, 2015). Despite repeated reminders that access to water is a human right (United Nations, 2010), market forces that rely on exclusion (Alchian and Demsetz, 1973) continue

to increase their influence in the water sector. Paradoxically, these market forces are also often credited for increased innovation (Baumol, 2002). The increased role of the market concomitant with the perceived state failure in providing basic services has implied that, in many societies, the human being is envisioned to have greater hope of accessing clean water as a customer than she is as a citizen.

Underlying this hope are market-based innovations that promise to meet the needs of previously underserved populations (Ahlstrom, 2010). Labeled many things including “bottom of pyramid” (BOP) innovations (Prahalad, 2009) and inclusive innovations (George et al., 2012), these activities seek to promote “inclusive growth [that] diminishes trade-offs between growth and inequality because the poor become enfranchised as customers, employers, owners, suppliers and community members” (George et al., 2012, p.662). A more recent term emphasizing a critical essence of the innovation process is the idea of frugal innovation (Radjou et al., 2012). The concept is used to designate innovations specifically developed for resource-constrained customers in emerging markets (Sehgal et al., 2010; Sharma and Iyer, 2012; Zeschky et al., 2014). Frugal innovation, it is claimed, “responds to limitations in

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resources, whether financial, material or institutional, and using a range of methods, turns these constraints into an advantage” (Bound and Thornton, 2012, p. 6). Despite the attention that the idea has received, there has been little discussion on the process of frugal innovation and the institutional contexts in which it develops.

Our study focuses on the dynamics of frugal innovation in the context of drinking water provision and uses a double lens of co-production: we distinguish between institutional co-production (Ostrom, 1996) and co-production (Vargo and Lusch, 2004) of frugal innovation. Institutional co-production is characterized by a mix of activities that both public agents and citizens contribute to in the provision of public services. The former are involved as professionals or “regular producers”, while “citizen production” is based on efforts of individuals or groups to enhance the quality and/or quantity of services they receive (Parks et al., 1981; Brudney and England, 1983; Ostrom, 1999). We describe the institutional co-production of drinking water among the state and citizens as the context in which the frugal innovation process occurs. The idea of co-production has also been used in the marketing literature to refer to the participation of the customer in the creation of the core offering of the provider and happens “through shared inventiveness, co-design, or shared production (Vargo et al., 2007, p.11). However, it has predominantly been used in the realm of new product development and relatively less in service innovation (Chen et al., 2011), an area we extend the idea to. We argue that co-production plays a critical role in the creation of shared value between the consumer and the producer, and describe how the process has been facilitated by the proximity of the local entrepreneurs with the end user. Rather than being a passive consumer, we find the end user to be an active agent in shaping the technology developed and the manner in which it is diffused via innovations in business models. However, this active demand driven participation that on the one hand encourages innovation also reflects the state’s inadequacy in meeting the demand for clean drinking water and regulating the private response to it. Coupled with concerns on the ecological footprint i.e. water wastage of the RO technology that are now being raised in formal governing bodies (Press Trust of India (2015)) leads us to recognize the tensions in evaluating the social implications of these frugal innovations.<sup>1</sup>

## 2. Frugal innovation: responding to resource constraints

The term frugal suggests “using money or supplies in a very careful way” (Merriam Webster, 2015). While that remains a defining characteristic of the idea of frugal innovation, it has also come to mean more in the literature. Other terms often used for frugal innovation include Gandhian innovation (Pralhad and Mashelkar, 2010) or *jugaad* (Sharma and Iyer, 2012; Radjou et al., 2012); terms that emphasize attributes often associated with frugal innovation. Such attributes include the creative and improvisational nature of the innovations (the word *jugaad* in Hindi) as well as the emphasis on “affordability and sustainability, not premium pricing and abundance” (Pralhad and Mashelkar, 2010, p.2). As *The Economist* (2010) points out, “frugal innovation is not just about redesigning products; it involves rethinking entire production processes and business models.” The idea of frugal innovation has contributed to a richer understanding of the process of innovation and like the literature on grassroots

innovations, it has brought recognition to the value of solutions developed in contexts where the problems themselves are located (Gupta et al., 2003; Smith et al., 2014). It has questioned notion of innovations as primarily outcomes of resource intensive processes and the exclusive domain of more developed economies with budgets to fund large investments in the development of technology (Kaplinsky, 2011). In doing so, the recognition has also overturned dominant views of developing economies as being mere recipients of technology transfer to having lessons in innovation for their more developed counterparts as well (Bound and Thornton, 2012).

Despite the attention it has received, the idea of frugal innovation remains under theorized (Bhatti, 2012; George et al., 2012). In part, this stems from the challenges in distinguishing it from other concepts like reverse innovation (Govindarajan and Trimble, 2013) or frugal engineering (Sehgal et al., 2010). In a very useful contribution, Soni and Krishnan (2014) disambiguate frugal innovation to three types: frugal mindset, frugal process and frugal outcome and organize existing related concepts to these three types. By mindset they refer both to the motivations (e.g., inclusive innovations (George et al., 2012)) as well as mental frames influencing problem solving (e.g., bricolage (Baker and Nelson, 2005)). Process, in their definition, refers to the process of production (e.g., lean (Womack and Jones, 2010) and the outcome, being the product or service (e.g., appropriate (Schumacher, 1973)). In examining the process of frugal innovation, attention has predominantly been engineering based and specifically on the ingenuity of the producer in being able to strip down the product to its bare essentials, catering to the resource constrained needs of the consumer. This conceptualization of the consumer as a passive agent in the innovation process is inconsistent with our empirical findings. Instead, we find that by being an active co-producer, the consumer plays a critical role in helping the innovator discover the sweet spot that allows a significant reduction in costs without compromising “the essential functions people seek to satisfy with a given product” (Cunha et al., 2014, p.206).

## 3. Co-production as a context and as a dynamic feature of frugal innovation

As described, frugal innovation takes needs of the resource constrained consumer as the starting point and “instead of adding ever more bells and whistles ... strip[s] products to their bare essentials” (*The Economist*, 2010). The task of discovering the essential needs of the consumer, what features constitute the “bells and whistles” and what the “bare essentials” cannot be an easy one. Unpacking how the frugal innovator is able to create shared value in doing this, is critical to understanding the frugal innovation process. Moreover, the context in which such innovation process develops requires greater examination. The lens of co-production that has been used both in the literature on public services (Ostrom, 1996) and the marketing literature (Normann and Ramírez, 1993; Prahalad and Ramaswamy, 2000) serves as a useful way to do so. While the public services literature and the marketing literature rarely speak to each other, the case of frugal innovation by private actors in the water sector transcends conventional sectoral and disciplinary boundaries pointing to the interactions between the state, citizens and market actors in co-producing new modalities of water provision (Ahlers et al., 2014). In this paper we investigate both the institutional co-production of public goods as a pre-defining context for demand-driven frugal innovation process, and co-production as a dynamic feature of frugal innovation. Thus, we conceptualize co-production on two different levels. In doing so, we place the user as a central actor in both processes.

<sup>1</sup> A recent report states that “it takes about 3 gallons (12 L) of wastewater down-the-drain to create one gallon (4 L) of clean water” with an RO technology (Comprehensive Initiative for Technology Evaluation, 2015, p.31).

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